

Late Shri.Vishnu Waman Thakur Charitable Trust's



# VIVA Institute of Technology

Shirgaon, Virar (East), Dist: Palghar-401305, Maharashtra

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## National Conference

on

## "Role of Engineers in Nation Building"



6<sup>TH</sup> & 7<sup>th</sup> MARCH 2020



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Organized by



Late Shri. Vishnu Waman Thakur Charitable Trust's

## VIVA Institute of Technology

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## **PREFACE**

On behalf of VIVA Institute of Technology, I take great pleasure and pride to formally welcome you all to the 8<sup>th</sup> National Conference on Role of Engineers in Nation Building (NCRENB 2020) in cooperation with International Journal of Engineering Research and Science (IJOER) and VIVA-TECH International Journal for Research and Innovation (VIVA-TECH IJRI).

We are living in an age of remarkable competition of technology among the countries. In this competition we need to consider the role of Engineers in development of our nation. Looking at the immense rise in the technological area and the demands that are being placed, it is necessary for us to commence researches that will help to build a technologically advanced nation. The national/ international conferences provide common platform to contemplate the issues related to latest developments in the technology, research and development activities in this area.

We held the first national conference in 2013 with various disciplines such as Civil Engineering, Computer Engineering, Electronics & Telecommunication Engineering, Electrical Engineering, Humanities and Sciences and Mechanical Engineering.

NCRENB 2020 has received total 214 papers in 6 tracks. The selected full length papers will be sent for publication in IJOER and VIVA-TECH IJRI journal. These papers can be used as a reference for future work which will widen the horizon of technical advancement of our nation.

Dr. Arun Kumar  
Chief Editor



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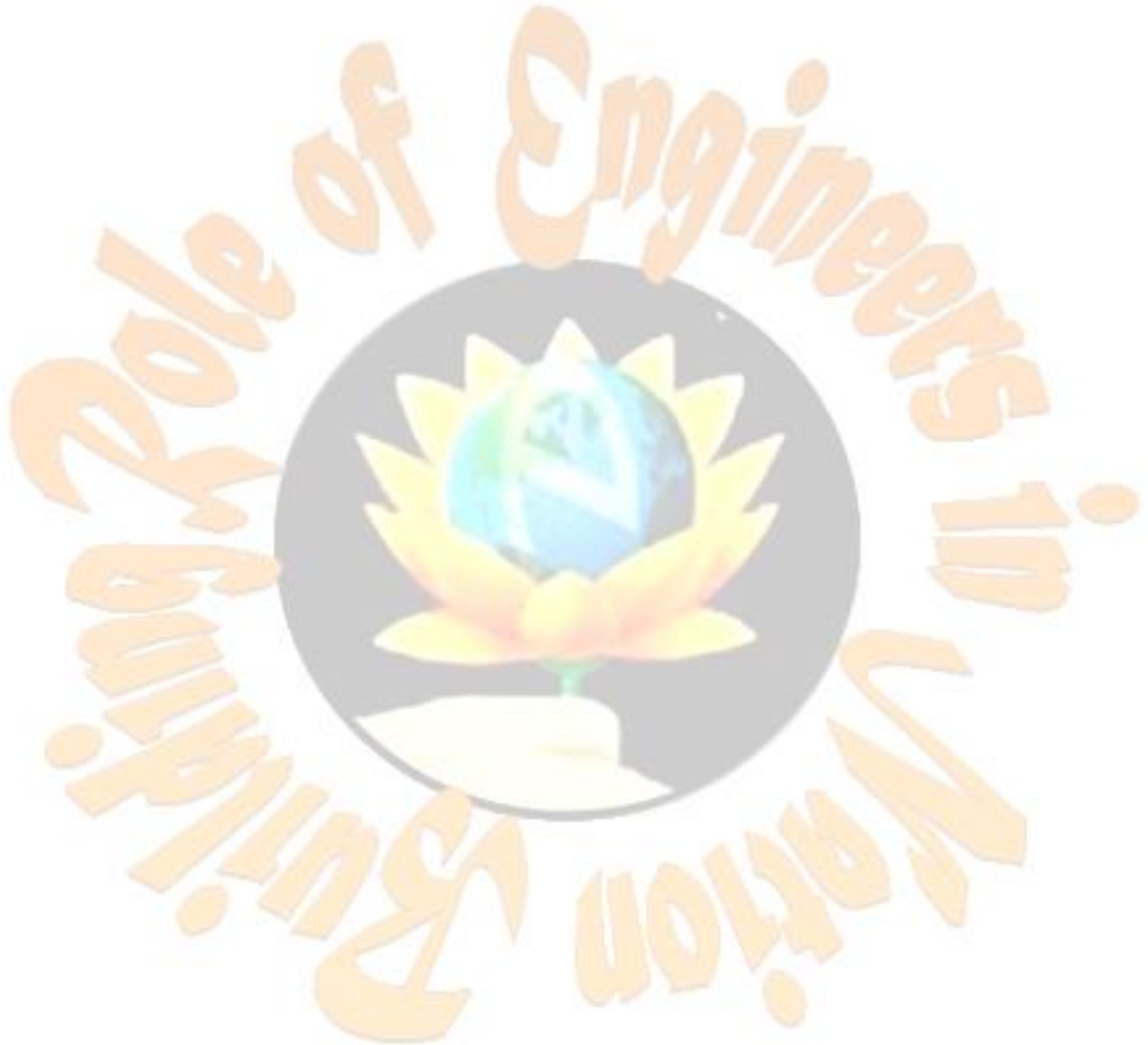
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# SECTION A

## CIVIL

## Feasibility study of Samruddhi Expressway (Six Lane Package Details)

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**Abstract**— Highway engineering is an engineering discipline branching from civil engineering that involves the planning, design, construction, operation, and maintenance of roads, bridges, and tunnels to ensure safe and effective transportation of people and goods. Highway engineering became prominent towards the latter half of the 20th Century after World War II. Standards of highway engineering are continuously being improved. Highway engineers must take into account future traffic flows, design of highway intersections/interchanges, geometric alignment and design, highway pavement materials and design, structural design of pavement thickness, and pavement maintenance. This paper deals with execution package details of samruddhi mahamarg and problems they are facing in execution stage.

**Keywords**— Contract, Risk, Samruddhi Mahamarg, Tender,

### I. INTRODUCTION

The Government of India has planned 10 world class express highways in order to boost the road infrastructure for faster connectivity between different cities. Simultaneously Government of Maharashtra has planned Nagpur Mumbai Expressway (NMEW) which intends to divert and redistribute the heavy traffic on existing corridors. The proposed NMEW is being implemented by Maharashtra State Road Development Corporation (MSRDC) which will pass through 10 districts from Vidarbha through Marathwada to Konkan regions. The major settlements which are set to be part of this plan are Nagpur District, Wardha District, Amravati District, Washim District, Buldana District, Jalna District, Aurangabad District, Ahmednagar District, Nasik District and Thane District. The NMEW will be designated as a Maharashtra State Highway (MSH) built on National Highway standards. The NMEW is a top priority project in the Government agenda. It will start from Shivmadka in Hingna, Nagpur and will end near Bhiwandi, Thane.

the project intends to develop a six lane expressway with paved shoulders from Nagpur to Mumbai in the state of Maharashtra. this six-lane Nagpur-Mumbai prosperity corridor has a row of 120 m and will bring the travel time between the two cities of Nagpur to Mumbai from 16 hours to six hours. this prosperity corridor will pass through all the five regions that make up Maharashtra vidarbha, north Maharashtra, Marathwada, western Maharashtra and Konkan thus linking developed and developing towns. the project ensures greater regional connectivity and equitable development as it passes through vidarbha, north Maharashtra, Marathwada, western Maharashtra and the Konkan region. it also promises to open new avenues of economic and social growth along the districts of Maharashtra. the project is so massive that it will open up multiple sectors including township along the expressway emerging as a self-reliant model. from textile sector to it hubs, each node will have its distinct character developed to tackle the local requirements of livelihood of the people and growth. an equal opportunity to grow and develop is the only way for a region to ensure a prosperous demography. cities have concentrated employment opportunities, skilled work force, financial independence and the infrastructure to keep the demand-supply cycle intact. most of the needs of the urban areas in terms of food and electricity are sourced from the rural areas. urban areas act as the drivers of economy for the rural regions, whereas the rural areas provide necessary resources. Thus the urban and rural areas in any state have an



interdependent relationship with each other.

## II. PROJECT DESCRIPTION

The NMSCE will be developed as a high-density corridor establishing high-speed connectivity between Nagpur and Mumbai. As a first step in this direction the Government of Maharashtra has decided to develop and strengthen the linkages and connectivity of major cities of state with Mumbai, the state capital. Exploring the viability of one such connectivity between Nagpur Mumbai, which includes links with and through Butibori – Wardha– Karanja – Aurangabad – Sinnar – Ghoti – Vadape along with link from Karanja – Loni - Nagzari corridor. The entire length of the proposed expressway is about 706.2 km and is divided into five packages as follows:

Sr No.	Name of Project work	Approximate Length in KMs	Estimated Cost (Crs.)	Cost per Km (Crs.)
1	Package-I: Jamtha-Butibori MIDC-Wardha-Pulgaon (in Nagpur Division)	89	3348.70	37.62
2	Package-II: Pulgaon-Karanja-Sindhakhedraja (in Amravati Division).	256	8173.00	31.80
3	Package-III: Jalna District Border-Aurangabad-Kopargaon (in Marathwada Division).	154	5372.28	34.88
4	Package-IV: Kopargaon-Sinnar, Sinnar- Igatpuri (in Nashik Division)	127	3668.40	28.88
5	Package-V: Igatpuri to Bhiwandi (in Mumbai Division)	80.2	3105.00	38.71
Total		706.2	23667.38	33.51

As discussed above, for ease in pre evaluation stage of project management had decided to break entire work in five packages to prepare pre-feasibility report and EIA (Environmental Impact assessment report) with respect to appointed consultant for each package. For ease in execution of project on site and proper control over project activity, these five were split into sixteen packages. For detail understanding, timeline of the project is given below:-

### A. Project Timeline

- 1) May 2016 - Consultants appointed for making Detailed Project Report
- 2) January 2017 - Request for Qualification (RFQ) bids opened for civil works
- 3) July 2017 - Land acquisition process started.
- 4) May 2018 - MSRDC opened financial bids submitted by qualified contractors
- 5) May 2018 - Maharashtra cabinet gave its official approval for Concession Agreement for the project
- 6) Jun 2018: Lowest bidders identified for thirteen packages, bidding for remaining packages to happen soon.

- 7) Nov 2018: 90% land acquisition done. Work to be done in 16 packages, contractors for which are already identified. Work to start in December.
- 8) Dec 2018: Hon. Prime Minister Narendra Modi performed ground breaking ceremony for the project on 18-December-2018.

Sr No	Package No And Detail	Length (Km)	EPC Cost (crore)
1	CP-01, From Km 0.00 To 31.00 (Village Shivmadka To Village Khadki Ambegaon) In Nagpur.	31	1420
2	CP-02, from km 31.00 to 89.413 (village khadki ambegaon to village pimpalgaon) in wardha.	58.413	2520
3	CP03, from km 89.413 to 162.667 (village ashta to village wadhona ramnath) in Amravati.	73.356	2665
4	CP04, from km 162.667 to 217.023 (village donad bk. To village januna kh) in washim.	54.356	1855
5	CP05, from km 217.073 to 259.900 (village kinhiraja to village kenwad) in washim.	42.877	1495
6	CP06, from km 259.900 to 296.000 (village belgaon to village parda) in buldhana.	36.1	1155
7	CP07, from km 296.00 to 347.190 (village banda to village sawargaon mal) in buldhana.	51.19	1720
8	CP08, from km 347.725 to 390.445 (village nhava to village georai) in jalna	42.72	1165
9	CP09, from km 390.445 to 444.485 (village bendewadi to village fatiabad) in Aurangabad.	54.4	1615
10	CP10, from 444.845 to 502.752 (village fatiabad to village surala) in Aurangabad.	57.91	1960
11	CP11, from km 502.698 to 532.094 (village dhotre to village derde) in ahmednagar.	29.396	1110
12	CP12, from km 532.094 to 577.739 (village pathare kh. to village sonari) in nashik.	45.645	1560
13	CP13, from km 577.739 to 623.379 (village sonari to village taranganpada) in nashik.	45.64	1630
14	CP14, from km 623.379 to 636.479 (village pimpri sadroddin to village vashala bk.) in nashik/thane.	13.1	1853.3
15	CP15, from km 636.479 to 664.479 (village vashala bk. To village birwadi) in thane.	28	1362.91
16	CP16, from km 664.479 to 701.362 (village birwadi to village amne) in thane.	36.883	2227.15
<b>TOTAL</b>		<b>700.986 (Km)</b>	<b>27313.36 (Crore)</b>

### III. PROBLEM FACED WHILE EXECUTION

After visiting Amravati region site (Package 2), there are various problem which are faced by contractors while working on site. Some of them are listed below.

Sr. No.	Source Of Risk	Type of Risk
1	It was observed that, borrow pits are getting dig more than what is allowed on site.	Managerial Risk
2	Water required for carrying out various construction activities is not available in adequate quantity in vidarbha region in summer.	Financial Risk
3	For project execution, Dhaba near project sites were demolished and compensations are given to dhaba owners but what about workers working on this dhaba?	Economical Risk
4	Workers are asking for more daily wages for working in summer season which is a problem for Sublette contractor.	Managerial Risk
		Financial Risk
5	Boulders are not available nearby for sub base preparation.	Technical Risk
6	Dust produced due to filling material making area polluted.	Environmental Risk
7	Inconvenience caused to people due to construction and hence they set strike against work.	Financial Risk
8	Due to heavy machineries village road will be damage so people set strike against work.(In Thane)	Financial Risk
9	Site office were demolished due to cyclone in Arvi (Nagpur division)	Financial Risk

### IV. CONCLUSION

Inspired by japan's Tokyo-osaka industrial corridor, the project will upgrade nine mega industrial zones, three ports, and six airports and boost the economy of the state as well as country. It will generate new employment and new education facilities to the society. The NMSCE will have optical fibre all along its stretch so that Wi-Fi connectivity is available. The proposed expressway is passing through a large number of backward districts and the government hopes to ensure their industrial development using the expressway as an infrastructural launch pad. Along with this it is also proposed to have area development, real estate development, emergency landing of plane, medical facilities, food courts, police stations, public toilets, petrol pumps etc.

Mentioned risks are major one which causes significant impact on project goal in either cost or scheduled time delay. Although these risks should not be neglected and taken into prime consideration to avoid them and also keeping record of risk mitigation in practice could help in determining the relative importance of these research and future risk mitigation in any highway project.

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## Waste water conditioning and treatment

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**Abstract-** Waste-water treatment consists of different processes which protect the environment and human health through cleansing the water pollutants. In the past people used to have different methods for this treatment which has been passed over or developed through history, due to the advancement of technology and the growing needs of society. Wastewater treatment is a vital process in the modern industrial world, alongside this, more than 97% of water is stored in Saline (Oceans) and only 3% in fresh water, however only less than 1% is available for consumption.. As time goes by, there will be population growth for which the government would have to provide more useable water for society. Wastewater treatment uses chemical, physical, and biological processes to cleanse wastewater in order to protect the environment and public health.. Wastewater is the water which has been released to the environment that is defined as a combination of the water plus wastes that have been added to the water from a variety of uses, such as industrial, commercial, residences and there are two sources which release the wastewater into the environment.

**Keywords—** biological process, industrial commercial residential waste in water, public health, saline water, waste water

### I. INTRODUCTION

Wastewater treatment is a vital process in the modern industrial world, alongside this, more than 97% of water is stored in Saline (Oceans) and only 3% in fresh water, however only less than 1% is available for consumption.. As time goes by, there will be population growth for which the government would have to provide more useable water for society. Wastewater treatment uses chemical, physical, and biological processes to cleanse wastewater in order to protect the environment and public health.. Wastewater is the water which has been released to the environment that is defined as a combination of the water plus wastes that have been added to the water from a variety of uses, such as industrial, commercial, residences and there are two sources which release the wastewater into the environment. MITHI River in Mumbai city, is a confluence of tail water discharges of Powai and Vihar lakes. Mithi River originates at Powai and meets Arabian Sea at Mahim Creek flowing through residential and industrial complexes of Powai, Saki Naka, Kurla and Mahim over a distance of about 15 km. This river is treated like an open drain by the citizens who discharge raw sewage, industrial waste and garbage unchecked. Besides this, illegal activities of washing of oily drums, discharge of unauthorized hazardous waste are also carried out along the course of this river. The organic waste, sludge and garbage dumping has reduced carrying capacity of the Mithi river. The water with mixture of sewage and Industrial waste is a threat to marine life and the river is showing sign of total loss of such support system. Therefore it is necessary to design a waste-water treatment plant and implement the conditions prevailed by the Indian Government for maintaining a cleaner eco-system. Although this assignment paper explains the methods of designing a wastewater treatment plant, the factors which have to be considered before and during the design, relation between these factors and finally answers to some common questions in this field.

### II. OBJECTIVES

- To design a waste-water treatment plant on MITHI river.
- To take samples on the river at various intervals.
- To study the samples and the effects of the waste on the surrounding environment as well as on the aquatic life.
- To reduce the effect of the waste-water on environment.



- To make the treatment plant design such that it is economic for construction.
- To make the environment more eco-friendly.
- To use new & advanced methods of treatment like electro-flocculation and coagulation.

### **III. MATERIAL AND METHOD**

Sewage treatment generally includes three stage, called primary treatment, secondary treatment and tertiary treatment.

Primary treatment consist of temporarily holding the sewage in a quiescent basin where heavy solids can settle to the bottom while oil, grease and lighter solids float to the surface. The settled and floating materials are removed and the remaining liquid may be discharged or subjected to secondary treatment. Some sewage treatment plants that are connected to a combined sewer system have a bypass arrangement after the primary treatment unit. This means that during a very heavy rainfall events, the secondary and tertiary treatment system can be bypassed to protect them from hydraulic overloading, and the mixture of sewage and storm-water only receives primary treatment.

Secondary treatment removes dissolved and suspended biological matter. Secondary treatment if typically performed by indigenous, water-borne micro-organisms in a managed habitat. Secondary treatment may require a separation process to remove the micro-organisms from the treated water prior to discharge or tertiary treatment.

#### **1. Pretreatment**

Pretreatment removes all materials that can be easily collected from the raw sewage before they damage or clog the pumps and sewage lines of primary treatment clarifiers. Objects commonly removed during pretreatment include trash, tree limbs, leaves, branches, and other large objects.

The influent in sewage water passes through a bar screen to remove all large objects like cans, rags, sticks, plastic packets etc. carried in the sewage stream. This is most commonly done with an automated mechanically raked bar screen in modern plants serving large populations, while in smaller or less modern plants, a manually cleaned screen may be used. The raking action of a mechanical bar screen is typically paced according to the accumulation on the bar screens and/or flow rate. The solids are collected and later disposed in a landfill, or incinerated. Bar screens or mesh screens of varying sizes may be used to optimize solids removal. If gross solids are not removed, they become entrained in pipes and moving parts of the treatment plant, and can cause substantial damage and inefficiency in the process.

##### **1.1 Grit removal**

Pretreatment may include a sand or grit channel or chamber, where the velocity of the incoming sewage is adjusted to allow the settlement of sand, grit, stones, and broken glass. These particles are removed because they may damage pumps and other equipment. For small sanitary sewer systems, the grit chambers may not be necessary, but grit removal is desirable at larger plants. Grit chambers come in 3 types: horizontal grit chambers, aerated grit chambers and vortex grit chambers. The process is called sedimentation.

##### **1.2 Flow equalization**

Clarifiers and mechanized secondary treatment are more efficient under uniform flow conditions. Equalization basins may be used for temporary storage of diurnal or wet-weather flow peaks. Basins provide a place to temporarily hold incoming sewage during plant maintenance and a means of diluting and distributing batch discharges of toxic or high-strength waste

which might otherwise inhibit biological secondary treatment (including portable toilet waste, vehicle holding tanks, and septic tank pumps). Flow equalization basins require variable discharge control, typically include provisions for bypass and cleaning, and may also include aerators. Cleaning may be easier if the basin is downstream of screening and grit removal.

### **1.3 Fat and grease removal**

In some larger plants, fat and grease are removed by passing the sewage through a small tank where skimmers collect the fat floating on the surface. Air blowers in the base of the tank may also be used to help recover the fat as a froth. Many plants, however, use primary clarifiers with mechanical surface skimmers for fat and grease removal.

### **1.4 Primary Treatment**

In the primary sedimentation stage, sewage flows through large tanks, commonly called "pre-settling basins", "primary sedimentation tanks" or "primary clarifiers". The tanks are used to settle sludge while grease and oils rise to the surface and are skimmed off. Primary settling tanks are usually equipped with mechanically driven scrapers that continually drive the collected sludge towards a hopper in the base of the tank where it is pumped to sludge treatment facilities. Grease and oil from the floating material can sometimes be recovered for saponification (soap making).

## **2 Secondary treatment**

Secondary treatment is designed to substantially degrade the biological content of the sewage which are derived from human waste, food waste, soaps and detergent. The majority of municipal plants treat the settled sewage liquor using aerobic biological processes. To be effective, the biota require both oxygen and food to live. The bacteria and protozoa consume biodegradable soluble organic contaminants (e.g. sugars, fats, organic short-chain carbon molecules, etc.) and bind much of the less soluble fractions into floc.

Secondary treatment systems are classified as fixed-film or suspended-growth systems.

- Fixed-film or attached growth systems include trickling filters, constructed wetlands, bio-towers, and rotating biological contactors, where the biomass grows on media and the sewage passes over its surface. The fixed-film principle has further developed into Moving Bed Biofilm Reactors (MBBR) and Integrated Fixed-Film Activated Sludge (IFAS) processes. An MBBR system typically requires a smaller footprint than suspended-growth systems.
- Suspended-growth systems include activated sludge, where the biomass is mixed with the sewage and can be operated in a smaller space than trickling filters that treat the same amount of water. However, fixed-film systems are more able to cope with drastic changes in the amount of biological material and can provide higher removal rates for organic material and suspended solids than suspended growth systems.

Some secondary treatment methods include a secondary clarifier to settle out and separate biological floc or filter material grown in the secondary treatment bioreactor.

## **3 Tertiary treatment**

The purpose of tertiary treatment is to provide a final treatment stage to further improve the effluent quality before it is discharged to the receiving environment (sea, river, lake, wet lands, ground, etc.). More than one tertiary treatment process may be used at any treatment plant. If disinfection is practiced, it is always the final process. It is also called "effluent polishing."

### **3.1 Filtration**

Sand filtration removes much of the residual suspended matter. Filtration over activated carbon,

### **3.2 Lagoons or ponds**

Lagoons or ponds provide settlement and further biological improvement through storage in large man-made ponds or lagoons. These lagoons are highly aerobic and colonization by native macrophytes, especially reeds, is often encouraged. Small filter-feeding invertebrates such as *Daphnia* and species of *Rotifera* greatly assist in treatment by removing fine particulates.

### **3.3 Biological nutrient removal**

Biological nutrient removal (BNR) is regarded by some as a type of secondary treatment process, and by others as a tertiary

(or "advanced") treatment process.

Wastewater may contain high levels of the nutrients nitrogen and phosphorus. Excessive release to the environment can lead to a buildup of nutrients, called eutrophication, which can in turn encourage the overgrowth of weeds, algae, and cyanobacteria (blue-green algae). This may cause an algal bloom, a rapid growth in the population of algae. The algae numbers are unsustainable and eventually most of them die.

The decomposition of the algae by bacteria uses up so much of the oxygen in the water that most or all of the animals die, which creates more organic matter for the bacteria to decompose. In addition to causing de-oxygenation, some algal species produce toxins that contaminate drinking water supplies. Different treatment processes are required to remove nitrogen and phosphorus.

### **3.4 Nitrogen removal**

Nitrogen is removed through the biological oxidation of nitrogen from ammonia to nitrate (nitrification), followed by denitrification, the reduction of nitrate to nitrogen gas. Nitrogen gas is released to the atmosphere and thus removed from the water.

De-nitrification requires anoxic conditions to encourage the appropriate biological communities to form. It is facilitated by a wide diversity of bacteria. Sand filters, platooning and reed beds can all be used to reduce nitrogen, but the activated sludge process (if designed well) can do the job the most easily.

### **3.5 Phosphorus removal**

Every adult human excretes between 200 and 1000 grams of phosphorus annually. Studies of Indian sewage in the late 1980's estimated mean per capita contributions of 500 grams in urine and feces, 1000 grams in synthetic detergents, and lesser variable amounts used as corrosion and scale control chemicals in water supplies. Source control via alternative detergent formulations has subsequently reduced the largest contribution, but the content of urine and feces will remain unchanged. Phosphorus removal is important as it is a limiting nutrient for algae growth in many fresh water systems. (For a description of the negative effects of algae, see Nutrient removal). It is also particularly important for water reuse systems where high phosphorus concentrations may lead to fouling of downstream equipment such as reverse osmosis.

Phosphorus can be removed biologically in a process called enhanced biological phosphorus removal. Once removed, phosphorus, in the form of a phosphate-rich sewage sludge, may be dumped in a landfill or used as fertilizer. In the latter case, the treated sewage sludge is also sometimes referred to as bio-solids.

## **4 Sampling**

The purpose of this procedure is to document both general and specific procedures, methods and considerations to be used and observed when collecting wastewater samples for field screening or laboratory analysis.

Wastewater sampling studies focus primarily on collecting wastewater samples of the influent or effluent at domestic and non-domestic facilities. Sampling activities are usually conducted for National Pollutant Discharge Elimination System (NPDES) compliance, compliance assistance, civil and criminal investigations, and water quality studies. Collection of wastewater samples is necessary in order to obtain reliable data that can support compliance or enforcement activities.

The main considerations in developing a wastewater sampling strategy are:

- Type of study (Compliance Sampling Inspection, Diagnostic Evaluation, etc.).
- Regulated or target pollutants in the wastewater stream to be sampled.
- Selection of the projected sampling locations to satisfy the study objectives.
- Quality control criteria of the parameters to be sampled (oil and grease samples need to be collected as grab samples, trip blanks are taken into the field for the collection of samples for volatile organic compound analyses, etc.).

Depending on the sample analysis the following treatment procedure are planned. The sampling analysis gives readings about the characteristics of the waste-water. The characteristics of waste-water are further divided into different types, they are as follows:

#### **4 Physical parameters**

The physical characteristics of wastewater include those items that can be detected using the physical senses. They are temperature, color, odor, and solids.

##### **Temperature**

Temperature of wastewater varies greatly, depending upon the type of operations being conducted at your installation. Temperature of sewage the sewage is slightly more than that of water, because of the presence of industrial sewage. The temperature changes when sewage becomes septic because of chemical process. The lower temperature indicates the entrance of ground water into the sewage.

##### **Color**

Color of fresh sewage is yellowish grey to light brown. While that of the septic is black or dark due to oxidation of organic matter.

##### **Odor**

Smell of the fresh sewage is oily or soapy while the septic sewage develops an objectionable.  $H_2S$  is the major source of pollution.

##### **Total suspended solids**

All matter except the water contained in liquid materials is classed as solid matter. The usual definition of solids, however refers to; "the matter that remain as residual upon evaporation and drying at  $103 \pm 20^\circ C$ ". Those solids that are not dissolved in wastewater are called suspended solids. When suspended solids float, they are called floatable solids or scum. Those suspended solids that settle are called settle-able solids, grit, or sludge.

All solids that burn or evaporate at  $500^\circ C$  to  $600^\circ C$  are called volatile solids. These solids serve as a food for bacteria and other living forms in a wastewater treatment plant. Most organic solids in municipal waste originate from living plants or animals.



#### IV. CONCLUSION

Today the world is under the effect of pollution which is causing a boon to the society. Problems such as global warming, extinction of animal species and plants, effect on the environment etc. are being caused which are because of such problems such as waste disposal into the sea, incineration etc.

Hence it is necessary to treat these wastes. We have taken an initiative to treat the Mithi River. The present project work emphasis on the construction and design of waste water treatment plant using advanced techniques such as electro-flocculation and coagulation. By designing a treatment plant on the Mithi River, the following things can be achieved:

- Waste-water can be treated
- Hydrology and Ecology of the nearby areas will be replenished
- Waste can be properly disposed of without disturbing the environment
- Treated water can be reused again for different purposes
- Decompose and manure & biogas is generated which can be used
- Will be a role model for other states and countries
- The treatment plant will clean the effect of foul odor and clean the surrounding creating a good area for the citizens to utilize
- It will generate job opportunities for the people
- The gardens near the plant will flourish the flora-fauna which will attract tourists as well as the Indian citizens.
- For the betterment of the country

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# Interfacial strength between prestressed hollow core slabs and cast in-place concrete toppings

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**Abstract**— This paper presents the effect of surface condition on the interface shear stress on hollow core slabs with in- situ concrete topping. Horizontal shear stress at the interface between two different concrete strengths varies between the various codes of practice. Lack of information and inconsistency between these codes of topping construction causes problems to the overall structural behaviour when cast in a monolithic manner. Experimental “push-off” tests have been carried out to study the effects of surface moisture, surface laitance and roughness at the interface. These parameters are the major concern in the construction of toppings, which shows inconsistency with the various codes of practice. The tests show that there are no significant differences on the interface shear strength between the rough and smooth surface. However, surface laitance and surface moisture have significance effects on the interface shear strength. It was found that excess water at the surface reduces the shear strength at the interface.

**Keywords**— Hollow core slabs; in-situ concrete topping.

## I. INTRODUCTION

Cast in-situ concrete toppings are added to precast reinforced or prestressed concrete floor slabs for the purpose of making a completed floor finish and to enhance the structural performance of the floor by producing a composite structure. The in-situ concrete topping is usually 40 – 100 mm in thickness and contains a small amount of steel reinforcement (usually a prefabricated welded mesh). Lack of information of topping construction causes problems to the overall structural behaviour when cast in a monolithic manner. This can be illustrated in Figure 4(a) when moisture content, shrinkage and surface characteristics of the precast units are neglected during topping construction. Some attempts to quantify surface texture are given in the Fédération Internationale de la Précontrainte (FIP) document on interface shear in composite floor structures (FIP, 1982). In the Guide to Good Practice (FIP, 1982), the types of surface which a precast unit may have, prior to receiving the in-situ concrete to form a composite section, are identified into ten categories. They were categorised based on the end production of the precast unit and difficult to distinguish between “smooth” and “rough” surface. In the Swedish Standard (Swedish Standard, 1981), a specified instrument had been established to measure the roughness at the interface. The surface roughness represented by  $R_a$  is the arithmetical mean deviation of the profile, which is the average value of the departure of the profile above and below the mean line throughout the sampling length,  $L$ .

## II. MATERIAL AND METHOD

The hollow core slabs were supplied with two different surfaces; “smooth” and “rough”. “Smooth” surface is as-cast surface, whereas “rough” surface was formed by means of a stiff wire brush in the transverse direction. However, in differentiating between the two surfaces, roughness was measured in the longitudinal direction and readings were taken at the centre where the surface of the concrete topping is to be cast. Roughness was measured using an instrument developed by Bensalem (Bensalem, 2001) as shown in Figure 9. Two linear potentiometers, LP1 and LP2 were attached to the frame to record vertical and horizontal movements. LP1 runs perpendicular to the concrete surface and detects peaks and valleys of the slab surface, while LP2 runs parallel to the surface and indicates the position of LP1 along the sampling length. The instrument is placed on top of the slab to measure the roughness along a sampling length of 200 mm. Once the instrument is in place, the slider moves freely without displacing the instrument itself. Readings are taken at an increment of 1 mm. Six concrete toppings (F1 – F6) of 300 x 300 x 100 mm deep were cast on each slab as shown in Figure 10. A layer of steel mesh (A142) with 6 mm high yield steel bars welded in a grid with spacing of 200 mm was provided for the toppings and the concrete cover to the main reinforcement is 25

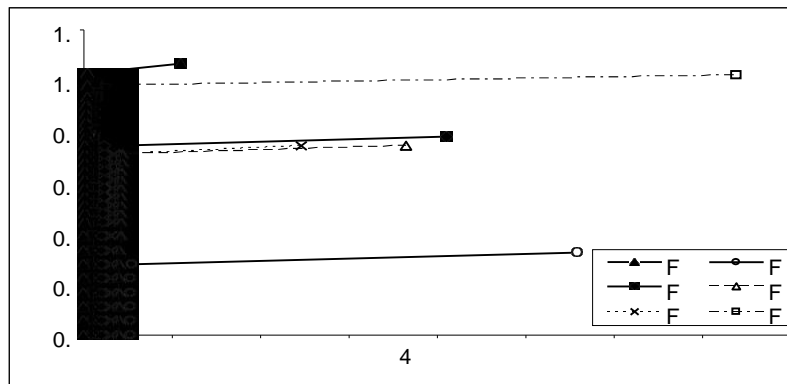
mm. The reinforcement is used to control any sudden differential shrinkage and to distribute the load equally within the concrete. To simulate dust or debris effect at the interface, a thin polythene sheet (0.01 mm thick) was laid on the hollow core slab for the half and full debonding parameters. The concrete strengths are cube compressive strength measured on 100 □ 100 □ 100 mm cubes.

## EXPERIMENTAL RESULTS AND DISCUSSIONS

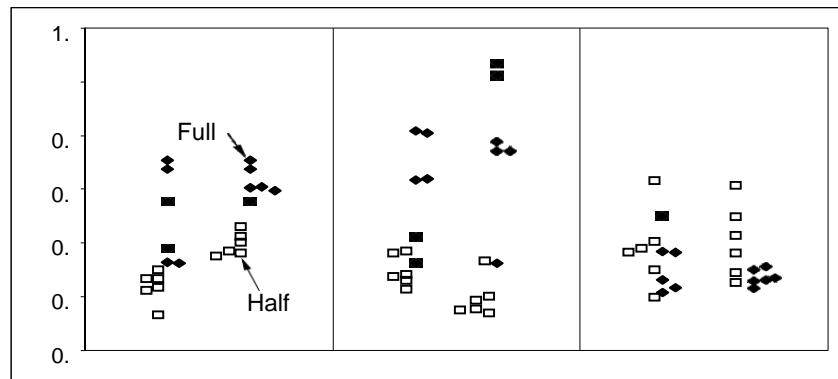
In all the specimens, sudden failure was observed when the topping separated from the hollow core slab. This sudden failure is illustrated typically in Figure 12. However, this behaviour was not observed for the full-debonding parameters since the failure load was zero. This is because there is no interaction between the hollow core slab and the concrete topping and the test was not continued for the other specimens. Shear stress is calculated by dividing the load against the contact area. The slip between the interface is relatively small for all specimens except at failure, where large slips were observed.

The relationship between shear strength and concrete strength for smooth and rough surfaces are shown in Figure 13(a) and 13(b). The results were also compared with the allowable shear strength given in BS 8110 (BSi, 1997). In general, for half-bond interface, the shear strength is slightly lower compared to the full-bond interface. It was also found that rough surface has higher shear strength compared to smooth surface; however, this is not significant to the overall observation.

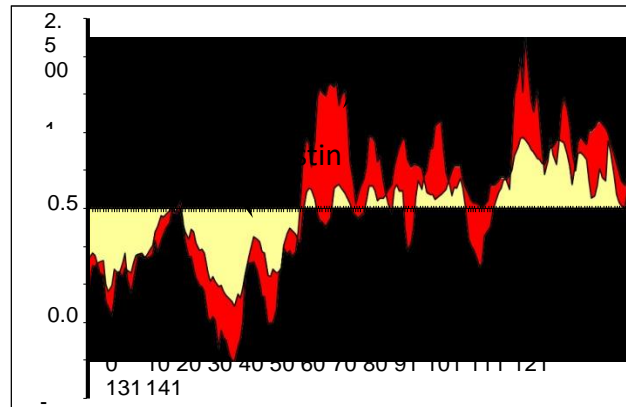
Although roughness was categorised as smooth and rough, the test shows no effect to the shear strength for different parameters. In fact, most of the data lies below the BS 8110 (BSi, 1997) values. This was further proved by looking into the relationship between the shear strength and the measured roughness as illustrated in Figure 15. For smooth surface, roughness ranges between 0.10 – 0.60 mm, whereas for rough surface, it ranges between 0.10 – 1.00 mm. The scatter of data is so broad that any trend or correlation is hardly distinguishable. The work by Gohnert (Gohnert, 2003) shows similar pattern where roughness amplitude of the brushed surface does not exceed 1 mm, the results were poor and below the codes values. However, when roughness amplitude exceeded 3 mm, the results were significantly better. The fault lies within the code itself for not specifying a minimum roughness amplitude.



**FIGURE 1: Typical relationship between shear stress and slip**



**FIGURE 2: Relationship between shear strength and concrete strength for rough surfaces**



**FIGURE 3: Surface profile before and after testing**

### III. CONCLUSION

Horizontal shear strength at the interface between hollow core slabs and concrete toppings were investigated in this paper. Parameters of surface roughness, surface moisture and contact surface were studied in details, which are a major concern in the construction of toppings. Close inspection of the results of small scale “push-off” tests implies that the surface should be properly wet before the execution of concrete topping. Dry and too much excess water will weaken the bond at the interface and thus reduce the shear strength. Ponded surface shows the critical states due to the weakened bond at the interface. There is also a reduction of shear strength due to the presence of surface laitance, debris etc. This was proved by debonding half of the contact area with a very thin polythene sheet. The scatter of data between shear strength and roughness indicates poor correlation and seems it does not differentiate between “smooth” and “rough” surface. Raking or brushing can produce vast range of roughness values depends on the amount of pressure applied by the operator and the viscosity or age of the mix. Therefore, it is necessary for the codes to give a minimum roughness amplitude as a guide to manufacturer.

### ACKNOWLEDGEMENTS

The author would like to acknowledge the Precast Flooring Federation (PFF) and Tarmac Topfloor for its support and financial assistance during its research.

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# Experimental investigation on use of cupola slag in concrete.

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**Abstract**— Nowadays waste materials are utilized in the preparation of conventional concrete. In the present work the waste material considered is cupola slag which is by-product of cast iron manufacturing. The design mix for M20 and M25 grade concretes were arrived and the target strength was found to be 25.860 N/mm<sup>2</sup> and 31.510 N/mm<sup>2</sup> respectively. Cupola slag was used in concrete as partial replacements for fine and coarse aggregates (5%, 10%, 15%, 20%, 25%, 50% and 100%) to ascertain applicability in concrete. Since the disposal of cupola slag in open area causes environment pollution, it can be recycled for use in construction industry without producing any harm to human and environment. The maximum compressive strength attained was 34.878 N/mm<sup>2</sup> and 38.432 N/mm<sup>2</sup> at 15% for both M20 and M25 grades of concrete respectively at 28 days. Similarly the maximum split tensile strength attained was 3.286 N/mm<sup>2</sup> and 3.789 N/mm<sup>2</sup> for M20 and M25 grades at 15% and 10% respectively. The concrete with cupola slag as partial replacement for coarse aggregates gives less strength when compared to fine aggregates.

**Keywords**— *Slag-cupola, Fine aggregate, Coarse aggregate, Sand, Compressive strength, Split tensile strength*

## I. INTRODUCTION

Nowdays, development in India is mainly by implementation of infrastructure projects. Due to that construction projects are executed at very rapid rate. In the developing country like India, availability of natural resources is also an influencing factor apart from funding due to this rapid infrastructural growth it requires large amount of construction material like cement, aggregates, wood etc. R.C.C. structures are preferred over steel structures in India which requires larger quantity of concrete. Since availability of natural resources of concrete is limited as we get it from natural deposits at present, there is a need to develop a new material that can effectively replace with conventional without compromising with strength and durability properties of concrete.

In recent research, waste products like rice husk, saw dust, paper waste etc. has been used in concrete as partial replacements for fine and coarse aggregates. Olutoge et al. (1995) concluded that Palm kernel shell is light and therefore ideal for substitution as aggregate in the production of light weight concrete. Olanipekun et al. (2006) investigated the properties of coconut shells (CCS) and palm kernel shells (PKS) as coarse aggregates in concrete. Baricova et al. (2010) concluded that blast furnace and cupola furnace slag can be utilized in the concrete production. Ivanka Netinger et al. (2010) studied the basic characteristics of slag and analyzed the possibilities of the application of slag in road as sub surface materials. Ahmed Ebrahim et al. (2012) revealed that the mechanical characteristics, and the resistance factors were improved by adding steel slag. Lewis (2012) discussed briefly the composition, properties, and uses of iron blast furnace slag and of steel slag and concluded that it can be used for structural fills, where very high stabilities are obtained. Based on the above literature review, in the present work cupola slag is used as partial replacements for fine and coarse aggregates in concrete in steps of 5 % up to 25%. Also study was extended for 50% and 100% replacements.

## II. OBJECTIVE

- i. To check the properties and strength of concrete without and with addition of cupola slag.



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### III. MATERIAL AND METHOD

#### 3.1 CEMENT

OPC 53 Grade i cement was used in this work with specific gravity of 3.03, standard consistency 26%, 42 and 240 minutes of initial and final setting time respectively, soundness of 2.25mm and compressive strength of 56.25 MPa at 28 days.

#### SAND

Sand obtained from Banas River, confirming to Zone-II, with fineness modulus of 2.31, specific gravity of 2.56, and water absorption of 3.05% was used in this work.

#### 3.2 COARSE AGGREGATES

Coarse aggregates obtained from basalt rock were used with combination of grits in 60:40 ratios with following properties

SR.NO	PROPERTIES	AGGREGATE VALUE
1	Specific gravity	2.56
2	Water absorption	1.21%
3	Impact value	16%
4	Crushing value	21%

#### 3.5 CUPOLA SLAG

Cupola slag procured from local distributor is used in this work after crushing and sieving operation.

### IV. EXPERIMENTAL INVESTIGATION

#### Test performed:

**1.Compressive Strength:** This test is carried out on conventional concrete and Cupola slag concrete on 7 & 28 days for M20 and M 25 grade of concrete.

**2.Split tensile test:-** This test is carried out on conventional concrete and Cupola slag concrete on 7 & 28 days for M20 and M 25 grade of concrete.

### CONCLUSION

The following conclusions were drawn from the experimental studies for M20 and M25 grades of concrete.

i. The maximum value of compressive strength obtained is 34.878 N/mm<sup>2</sup> and 38.432 N/mm<sup>2</sup> for M20 and M25 grades of concrete respectively when the fine aggregate is replaced by 15% cupola slag.

ii. The required strength of M20 concrete is achieved for 100% replacement in the case of M20 grade concrete and for 25% in the case of M25 grade concrete.

iii. The maximum value of compressive strength is 31.510 N/mm<sup>2</sup> for M20 grade when coarse aggregates is replaced by 5% of cupola slag, but the required strength is achieved up to 20% replacement.

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iv. The maximum value of compressive strength is 25.860 N/mm<sup>2</sup> for 5% replacement in the case of M25 grade concrete.

v. The maximum split tensile strength was achieved for 15% and 5% replacement of fine aggregates in the cases of M20 and M25 grades respectively. The split tensile strength gradually decreases when coarse aggregate is replaced by cupola slag in both the grades of concrete.

#### **ACKNOWLEDGEMENTS**

From the present study it is found that cupola slag when used as fine aggregate perform better than its use as coarse aggregate. The reason may be due to its mineralogical composition and size of crystals.

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## Experimental Study on Use of Corn Cob Ash in Concrete

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**Abstract**—Cement is the most utilized construction material, and second most consumed in the world after water. Its demand has increased proportionately with the rise in population in a bid to match the required development. The heavily energy-intensive processes that are involved in its production contribute to about 7-10% of the total global emissions, with potentially adverse environmental implications, and are also economically expensive. This study investigated the ability of Corn Cob Ash (CCA) to be used as partial replacement of cement. CCA was obtained and used to replace cement partially in specified ratios of 10%, 15%, 20%. Results were compared with a conventional concrete, which was made with 100% cement. The potential of corn cob ash CCA as an alternate cementitious material was calculated. The physical, chemical and mineralogical characteristics of CCA were studied and analyzed. CCA can be used as partial replacement for cement in concrete production as well as for walls of building units and other works of mild construction. Impact Test, Crushing Test and Shape Test were conducted on aggregates and found satisfactory results.

**Keywords**—Cementitious materials, Compressive strength corncob ash, partial cement replacements, pozzolanas

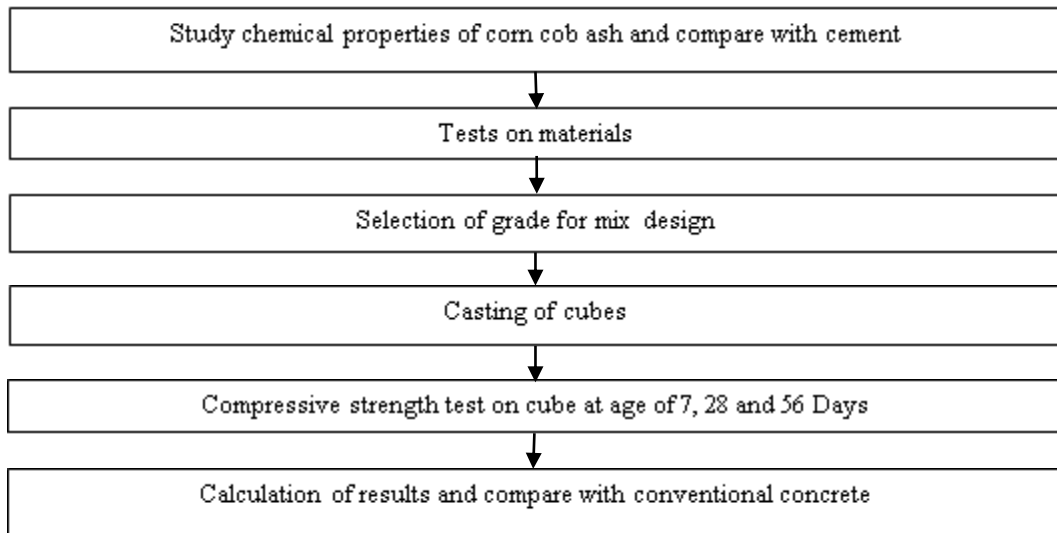
### I. INTRODUCTION

Concrete is a construction material composed of cement, fine aggregates (sand) and coarse aggregates mixed with water which hardens after specific time. For production of concrete the most commonly used material is Portland cement. Concrete technology give information about properties of concrete and its practical applications. Concrete is required for the construction of foundations, columns, beams, slabs and other load bearing elements of the structure. Apart from cement different types of binding material used are lime for lime concrete and bitumen for asphalt concrete which is used for road construction. Required strength is obtained by mixing the materials in required proportions. Strength of mix is given as M5, M10, M15, M20, M25, M30 etc, in which M signifies mix and 5, 10, 15 is their strength in kN/m<sup>2</sup>. When water is mixed with materials, hydration reaction starts. This reaction helps ingredients to form a bond that binds the materials together into a durable stone-like material. Concrete can be casted in any shape and size. Because it is a plastic material which is in normal state, various types of shapes and sizes of formworks are used to provide different shapes such as rectangular, circular etc. It is said that 7% of the world's carbon dioxide emission is because of Portland cement industry. Because of the significant contribution to the environmental pollution, to the high consumption of natural resources like limestone and the high cost of Portland cement etc., we cannot go on producing more and more cement. There is need to reduce the use of cement. One of the practical solutions to reduce use of cement is to replace cement with supplementary cementitious materials like corn cob ash. So by the research and test we decided to use Corn Cob Ash and replace it partially with cement. Corn cob is the hard thick cylindrical central core of maize (on which are borne the grains or kernels of near of corn). It is an agricultural waste product obtained from maize or corn which is the most important cereal crop in sub-Saharan Africa. Corn is the third most important food crops after rice and wheat in India. According to the advance estimate, it is cultivated in 8.7 m ha (2010-11) mainly during kharif season which covers 82% area. In India maize contributes nearly 10% the national food basket and more than ₹101 billion to the agricultural GDP at current prices apart from the generating employment to over 100 million man-days at the farm and downstream agricultural and industrial areas. The use

of corncob ash with normal strength is a new innovation of concrete design, and if large-scale applications will reform the construction industry through cost savings. The chemical composition of pozzolanas varies considerably, depending upon the source and the preparation technique. Pozzolanas contains silica, alumina, iron oxide and a variety of oxides and alkalis, each in varying degrees. Use of corn cob ash as a pozzolanas, without accounting this chemical CCA suitable for use as pozzolanas. In this study, it is working to produce CCA mixed cement in a factory controlled environment because it is an ordinary portland cement. The CCA used is produced by grinding the dried corn mandrel to a diameter of about 4.00 mm to enhance sufficient combustion and reduce the impact pozzolanas properties of CCA.

## II. MATERIAL AND METHOD

### 2.1 Methodology



### 2.2 Materials

**2.2.1. Cement:** The Ordinary Portland Cement (OPC) 53 grade cement is used in the project work. Table 1 shows the Compressive strength of the cement.

**Table 1**  
**Chemical Properties of Cement**

Sr. No.	Particular	Value
	<b>Chemical Properties (%)</b>	
1	SiO <sub>2</sub>	20.02
2	Al <sub>2</sub> O <sub>3</sub>	4.7
3	Fe <sub>2</sub> O <sub>3</sub>	3.0
4	CaO	61.90
5	MgO	2.60
6	Na <sub>2</sub> O	0.19
7	K <sub>2</sub> O	0.82
8	SO <sub>3</sub>	3.9
9	Loss of Ignition	1.9

**2.2.2. Coarse Aggregate:** Aggregates are important and most used constituents in concrete.

**2.2.3. Fine Aggregate:** Crushed sand is used as fine aggregate.

**2.2.4. Corn Cob Ash:** The CCA used is produced by grinding the dried corn mandrel to a diameter of about 4.00 mm.

**Table 2**  
**Chemical Properties of CCA**

Sr. No.	Particular	Value
	<b>Chemical Properties (%)</b>	
1	SiO <sub>2</sub>	62.30
2	Al <sub>2</sub> O <sub>3</sub>	6.24
3	Fe <sub>2</sub> O <sub>3</sub>	4.40
4	CaO	10.56
5	MgO	1.86
6	Na <sub>2</sub> O	0.35
7	K <sub>2</sub> O	3.89
8	SO <sub>3</sub>	1.02

## 2.3 Mix Design

**Table 3**  
**Mix Proportion**

Sr. No.	Replacement of CCA with cement	Cement Content (kg/m <sup>3</sup> )	Corn Cob Ash Content (kg/m <sup>3</sup> )	10 mm Aggregate (kg/m <sup>3</sup> )	20 mm Aggregate (kg/m <sup>3</sup> )	Crushed Sand (kg/m <sup>3</sup> )	Water (kg/m <sup>3</sup> )	Admixture (kg/m <sup>3</sup> )
1	0%	400	00	472	584	778	211	4
2	10%	360	40	472	584	778	211	4
3	15%	340	60	472	584	778	211	4
4	20%	320	80	472	584	778	211	4

## 2.4 Experimental Investigation

The commonly used mix of 30 MPa was used for this study. Concrete mix design was done as per IS 456:2000 and IS 10262:2009. Materials were tested for various properties needed for mix design. Three different replacement percentages (0%, 10%, 15%, 20% by weight of cement) were adopted. For each replacement percentage, three samples were casted for the experiments (3 specimen for 7 days, 3 specimen for 28 days, 3 specimen for 56 days, 3 specimen for 91 days) and the average of the three results has been reported on this paper.

Tests carried on the aggregates are Impact test, Crushing test and shape test. Tests carried on the hardened concrete were compressive strength test (Confirming to IS 516:2000). A compression testing machine was used for compressive strength.

## 2.5 Results and Discussion

### 2.5.1 Tests on aggregate:

Aggregate Impact Value was recorded as 15.89%.

Aggregate Crushing Value was recorded as 14.715%.

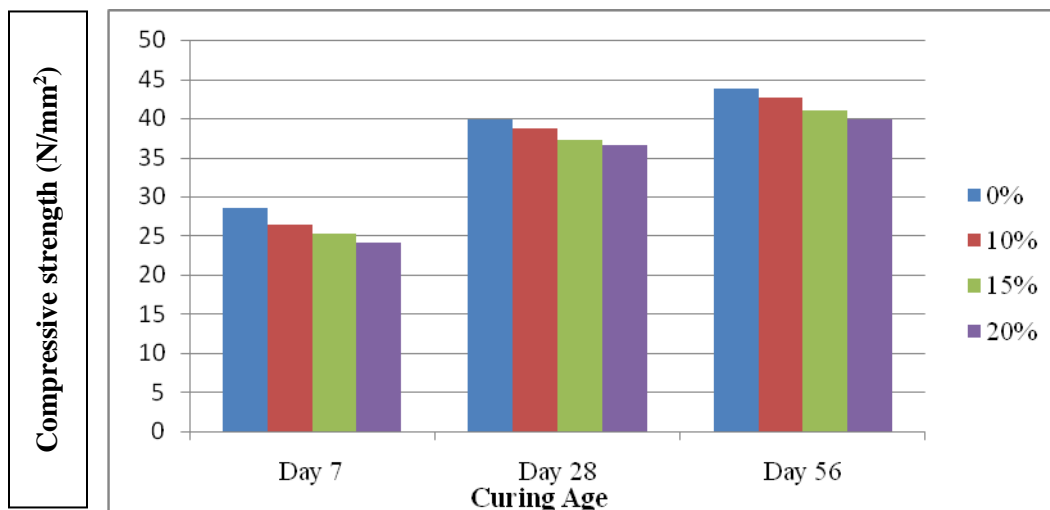
% Elongation was recorded as 14.01% and % Flakiness was recorded as 12.24%.

### 2.5.2 Compressive Strength of concrete



**Table 4**  
**Results of Compressive strength**

% added sugarcane liquid	Compressive strength (f <sub>c</sub> ) (MPa)		
	7 days	28 days	56 days
Convention Concrete	i. 27.48	i. 38.7	i. 43.40
	ii. 29.33	ii. 39.3	ii. 44.02
	iii. 28.69	iii. 41.7	iii. 43.68
	<b>Avg = 28.50</b>	<b>Avg = 39.9</b>	<b>Avg = 43.70</b>
10% CCA 90% Cement	i. 26.43	i. 38.6	i. 42.50
	ii. 27.30	ii. 37.23	ii. 41.98
	iii. 25.56	iii. 40.08	iii. 43.47
	<b>Avg = 26.43</b>	<b>Avg = 38.65</b>	<b>Avg = 42.65</b>
15% CCA 85% Cement	i. 25.20	i. 37.43	i. 39.89
	ii. 26.21	ii. 37.20	ii. 40.88
	iii. 24.22	iii. 37.06	iii. 42.2
	<b>Avg = 25.21</b>	<b>Avg = 37.23</b>	<b>Avg = 40.99</b>
20% CCA 80% Cement	i. 24.70	i. 37.20	i. 39.82
	ii. 24.19	ii. 36.27	ii. 40.20
	iii. 23.76	iii. 36.21	iii. 39.59
	<b>Avg = 24.05</b>	<b>Avg = 36.56</b>	<b>Avg = 39.87</b>



**Figure 1: Compressive strength of cubes at age of 7 Days and 28 Days**

**TABLE 5**  
**COMPARISON BETWEEN MAIN METHOD**

Sr. No.	Paper Name	Advantages	Disadvantages
01.	Experimental study on corn cob ash powder as partial replacement of cement in concrete.	Corn cob ash (CCA) is a suitable pozzolanic material.	Rebound hammer value decreases.
02.	Investigating effects of introduction of corncob ash into Portland cement concrete: mechanical and thermal properties.	Workability time of CCA blended cements increases with the increase of CCA percentage.	Increasing the percentage of CCA more than 10% reduces the bonding.
03.	Suitability of corncob as a supplementary cementitious material.	CCA can be used as a supplementary cementitious material to mitigate on the cost of cement and its impact on the environment.	When percentage of CCA were increased to above 10%, the overall concrete compressive strength was decreased.
04.	Strength properties of corn cob ash concrete.	The use of locally available material in construction will be met with the corn cob ash as a construction material.	Concrete with the presence of corn cob ash required 90 days of curing for gaining max strength.

### III. CONCLUSION

- I. CCA is a suitable pozzolanic material.
- II. These results show that CCA can be used as a supplementary cementitious material to mitigate on the cost of cement and its impacts on the environment.
- III. Strength of CCA blended concrete is lower than that of plain cement concrete at early curing ages.
- IV. Replacement of 10% of CCA gives satisfactory result and increased strength.

### ACKNOWLEDGEMENTS

We are using this opportunity to express our gratitude to everyone who has supported us throughout the completion of this project. We are thankful for their guidance, constructive criticism and friendly advice, during the project work. We express our gratitude to Prof. Vishal Urade for giving us an opportunity to carry out project on Experimental Study on Use of Corn Cob Ash in Concrete. We would also like to thank Prof. Lissy Jose, Head of Civil Department and Dr. Arun Kumar, the Principal for their whole hearted support.

Lastly, we express our gratitude towards all those who directly or indirectly helped us in the completion of our studies.

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# Economical Feasibility of High Speed Railway Corridor

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**Abstract**— India begins the largest country which has one of the most important rail networks within the world but doesn't have any high-speed rail (HSR) line capable supporting speed of 200 kmph or more. High-speed corridors are proposed but not yet implemented. The ministry of the railway had first proposed HSR in 2007-08 and have made pre-feasibility studies on various routes in the country. For building a high-speed railway line project besides its acquisition, operation and maintenance ones are very high which makes the project an expensive option of transportation. The implementation of an HSR project must be evaluated, which determines its costs and revenues, in order to justify its viability. This research proposes a model to gain the feasibility of an HSR line.

**Keywords**— *High speed rail (HSR), feasibility, Indian railway, rail network, bullet train.*

## I. INTRODUCTION

For Investing in HSR line require a very huge budget, and this budget to build rail route of a bullet train is substantially higher than the budget require for a conventional rail line. Despite its very high costs, this mode of transportation has not only been expanded but also been considered by countries which have not already implemented it considering the present condition of the Indian railways, it becomes important to evaluate as to whether it could be a better choice for the modernization of the existing plight of the railways rather than go for bigger investments such as the bullet trains. Indian railways by way of rail-networks modernization, renovation of coaches that are in bad condition, similar to the steps followed by countries like Japan and China, there could be a considerable amount of saving rather than investment in a bullet train eliminating this as a wasteful expenditure. The present study brings about the various pros and cons of the choice of making such investment vice versa the modernization of the current bad state of Indian railways. Therefore this becomes extremely vital to study for making comparative cost benefit analysis as regard to the incremental gain that could be generated or otherwise.

## II. OBJECTIVE

1. To understand Economical calculations behind the project
2. To study the various economical factors affecting the feasibility of project.
3. To check economic feasibility of HSR between Mumbai and Ahmedabad.

### Bullet train calculation:-

- No of trips = 72
- Let say 1000 passengers will travel
- Ticket fair per passenger = 3000rs
- Therefore one day revenue =  $72 \times 1000 \times 3000 = 216000000$  (216 cr.)
- For a yr. of about 250 days =  $250 \times 216000000 = 5400$  cr.

**TABLE 1**  
**CALCULATION OF PROFIT PER YEARS**

Years	Loan amount in cr.	Interest in per	Interest amount in cr.	Principal amount in cr.	Maintenance in cr.	Profit in cr.
1	89000	0.1	89	4000	412	899
2	85000	0.1	85	4000	412	903
3	81000	0.1	81	4000	412	907
4	77000	0.1	77	4000	412	911
5	73000	0.1	73	4000	412	915
6	69000	0.1	69	4000	412	919
7	65000	0.1	65	4000	412	923
8	61000	0.1	61	4000	412	927
9	57000	0.1	57	4000	412	931
10	53000	0.1	53	4000	412	935
11	49000	0.1	49	4000	412	939
12	45000	0.1	45	4000	412	943
13	41000	0.1	41	4000	412	947
14	37000	0.1	37	4000	412	9515



**TABLE 2**

**Calculation of number of train per week (from Mumbai to Ahmedabad Existing)**

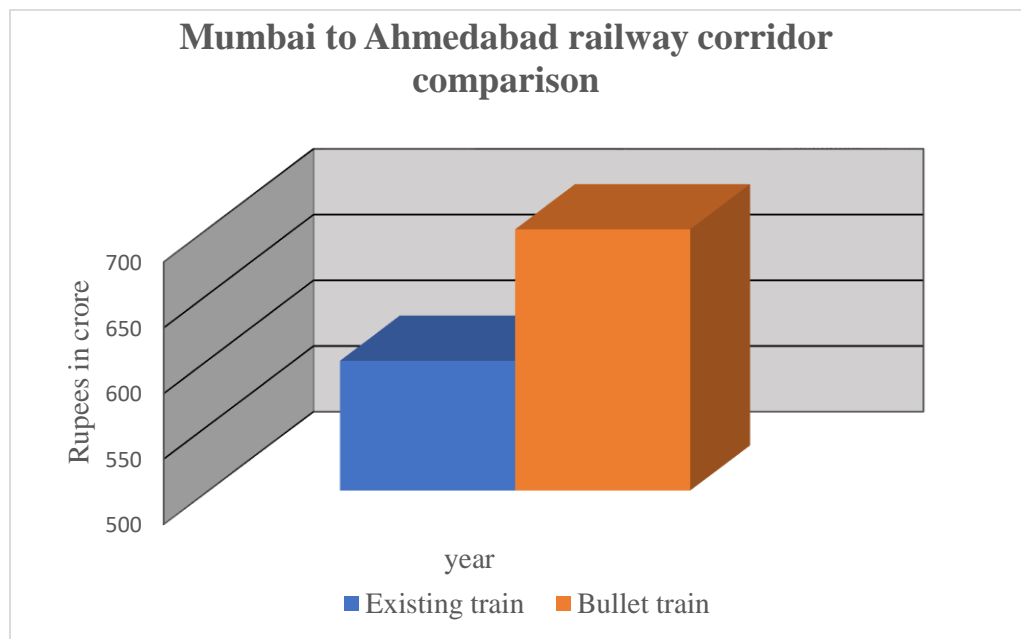
DAYS	NO. OF TRAINS
MONDAY	28
TUESDAY	19
WEDNESDAY	21
THURSDAY	18
FRIDAY	30
SATURDAY	32
SUNDAY	25
TOTAL NO . OF TRAINS IN A WEEK	173

**Calculation of amount gain by government per yr. (from Mumbai to Ahmedabad railway corridor)**

- 173 trains travels in 1 week
- 1 year consist of 52 week
- Therefore number of trains travels in a yr.  
i.e.  $(173 \times 52 = 8996 \text{ No.})$
- Number of seats in a train = 1944  
Therefore total number of seat in 8996 trains.  
i.e.  $(8996 \times 1944 = 17488224 \text{ No.})$
- Ticket price = 400rs
- Amount in a year. i.e.  $\{17488224 \times 400 = 6995289600 \text{ (699 cr.)}\}$
- Maintenance cost = 100 Cr.
- Amount left per yr. = 5995289600 (599 cr.)
- Amount in 23 yrs. i.e.  $\{23 \times 5995289600 = 137891660800 \text{ (13789 cr.)}\}$

**TABLE 3**  
**Mumbai to Ahmedabad railway corridor comparison**

Mumbai to Ahmedabad railway corridor	Existing trains	Bullet train
Income (per year)	699 cr.	5400 cr.
Maintenance cost (per year)	100 cr.	412 cr.
Remaining amount (per year)	599 cr.	4988 cr.
0.1 percent Interest (per year)	-	89 cr.
Loan paid (per year)	-	4000 cr.
Final remaining (per year)	599 cr.	899 cr.



**FIGURE 1: Mumbai to Ahmedabad railway corridor comparison**

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### III. CONCLUSION

The Indian rail government have 20,000cr rupees for updating the railway line but according to Suresh Prabhu (pervious rail ministry) 1, 20,000cr rupees will be require for updating the Indian railways networks. If India manages to brings 1 lakh crore rupees than the concept of bullet train will be not require at present

### ACKNOWLEDGEMENTS

We would like to express our gratitude to everyone who has supported us throughout the completion of this project. We are thankful for their guidance, constructive criticism and friendly advice, during the project work. We express our gratitude to Prof. Vishal urade for giving us an opportunity to carry out project on Economical feasibility of high speed railway corridor. We would also like to thank Prof. Lissy Jose, Head of Civil Department and Dr. Arun Kumar, the Principal for their whole hearted support. Lastly, we express our gratitude towards all those who directly or indirectly helped us in the completion of our studies.

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## FLOOD CONTROL TECHNIQUE

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**Abstract**— Natural floods are phenomena caused by exceeding surface flow generated from an intense rainfall. The urbanization of a basin generally tends to aggravate the floods as it promotes original vegetation covering removal, imperviousness increasing, canalization and occupation of the near river zones. Causes of floods are due to natural factors such as heavy rainfall, high tides, etc. and human factors such as blocking of channels or aggravation of drainage channels, improper land use, deforestation in headwater regions, etc. Population increases results in more urbanization, more impervious area and less infiltration and greater flood peak and runoff. Problems become more critical due to more serve and frequent flooding likely caused by climate change, socio-economic damage, population affected, public outcry.

Many techniques are available for evaluating flood control projects, but is it difficult to formulate and select the best alternative methods to solve the problem of flooding. Some structural and non-structural measures are available. Flood loss prevention and mitigation includes structural flood control measures such as construction of dams, reservoirs or river dikes and nonstructural measures such as flood forecasting The use of underground space can also be done for flood protection due to greater traffic congestion, air pollution and lack of green space.

**Keywords**— Flood protection, Flood control project, structural and nonstructural measure, Urbanization, underground space

### I. INTRODUCTION

Flood can be defined as a temporary covering of land by water outside its normal confines. It is a naturally reoccurring event. Growing cities are increasingly suffering from urban floods as a consequence of the urbanisation process itself. The fast urban development experienced after the industrial revolution was responsible for several significant changes in the urban water cycle, mainly due to the vegetation removal, the suppression of natural retention areas, and the high impervious rates.

Techniques for evaluating minor and major urban drainage and flood control projects are upcoming to overcome the problem. The location selected for our project is new VIVA collage where the area is in urgent need of flood control measurses. The planning defines the flood control for regulations purpose and providing definite guidelines for managing future development affecting the drainageways and associated flooding. Flood protection measures may reduce the frequency of inundation losses. In an effort to address the challenges of climatic uncertainties and continuous growth in flood plain, flood control project is implemented. Some

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techniques for evaluating flood problems are included in the report.

The primary environmental effect of urbanization is alteration of natural drainage patterns. Public works management seeks the best solution to the problem of flooding. It is difficult to formulate and select the best alternative methods to solve these complex problems. Many techniques are available for controlling flood and structural measures can be taken for flood control such as construction of dam, reservoir, levees and alter the characteristics of flood and reduce the probability of flooding in location of interest. Nonstructural measures alter the impact or consequences of flooding and have little to no impact on the characteristics of flood.

### 1.1PURPOSE

- To reduce flooding in New VIVA college area.
- To divert and store water.
- To study, analyse and design underground space.

## II. MATERIAL AND METHOD

### 2.1 PROPOSED WORK

#### 3.1.1 Area selection

#### 3.1.2 Land survey

#### 3.1.3 Discharge pattern

#### 3.1.4 Test on flood water

#### 3.1.5 Outlet discharge

#### 3.1.1 Area selection

The site selection for the construction of underground structure lies in Virar west. Ground of New VIVA college is selected for our project.

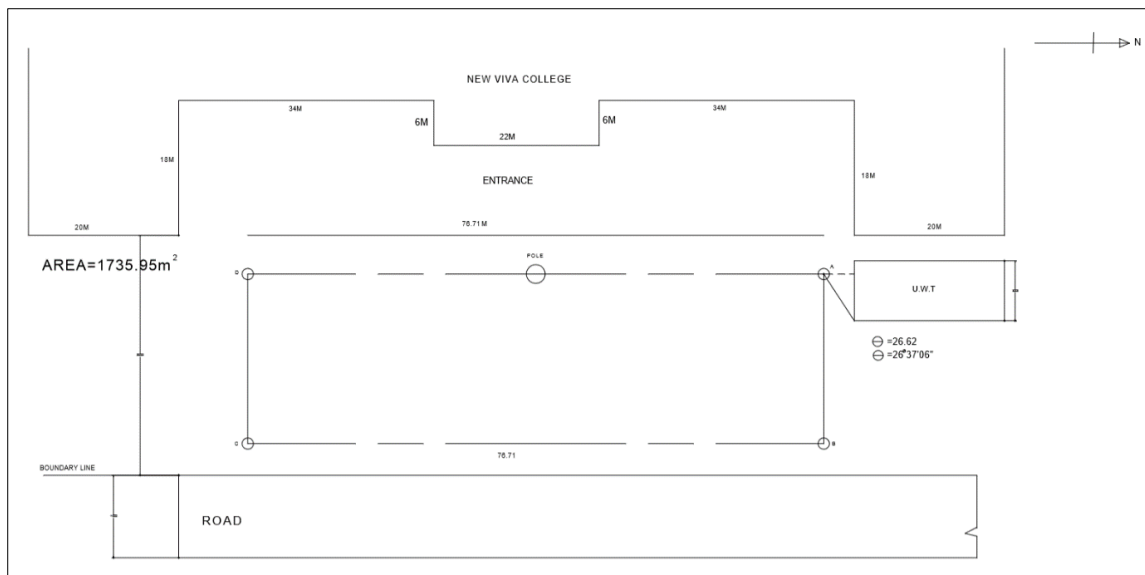


**Figure No. 1** Ground of New VIVA collage



### 3.1.2 Land survey

Survey was conducted in new VIVA collage on October 03, 2019 . Total station were used for surveying and site plan is prepared.



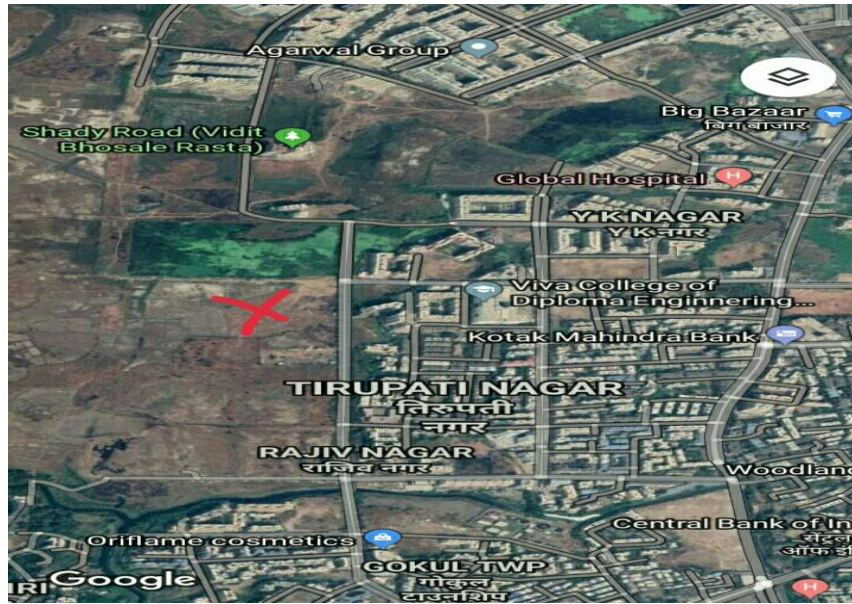
**Figure No. 2**Ground Plan of New VIVA college

### 3.1.4. Result of Tests conducted on flood water

Sr.No	Parameter	Result	Limits	Units
01.	p <sup>H</sup>	5.8	6.5 to 8.5	---
02.	Turbidity	---	Max. 1	NTU
03.	Total dissolved solids	27	Max. 500	Mg/L
04.	Chloride as cl	20	Max. 250	Mg/L
05.	Sulphate as So <sub>4</sub>	---	Max. 200	Mg/L
06.	Total Hardness as CaCo <sub>3</sub>	50	Max. 200	Mg/L

### 3.1.5 Outlet Discharge

Water collected in underground structure will be discharged in back side of the collage. .



**Table 1**

**COMPARISON BETWEEN MAIN METHOD**

Sr. No.	Paper Name	Advantages	Disadvantages
01.	Hydrological design of urban flood control detention pond	Use of design storm approach, continuous simulation approach, analytic probabilistic approach	Takes a lot of time to construct the database of the entire program.
02.	On site stormwater detention as an alternative flood control measure in ultra-urban environments in developing countries	Smaller commercial dimension reservoir volumes, aiming at contributing to minimizing the flood problem.	Requires adequate spaces to place these measures in developing countries.
03.	The Malaysian flood hazard management program	Use of new technologies such as use of remote sensing in flood forecasting, telemetry and automatic warning gadgets in flood warning.	New technologies are proved to be costly so not useful for small countries.

04.	Flood Control using Urban underground space	Large use of underground space, no disturbance on ground during flood	Not economical for small countries, no availability of large underground space in some countries..
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### 3 CONCLUSION

In this report planning for designing and storing flood water is been done. For this we have done survey in the ground of new VIVA college. For this survey we referred total station. Calculation for actual area of the ground and underground structure have been dealt with it. Since we are dealing with design of underground structure in VIVA ground. The design of underground structure will be done as per the IS requirements and rainfall data available from metrology department in Virar with detail study and research.

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# Microlevel Planning : A comparative Study of Urban Planning (or Town Planning) in Gujarat, Maharashtra & Karnataka

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**Abstract**— There is a reason behind every development that takes place, for example if an airport is proposed at a site then the area at a buffer of at least 20 km will be benefited by that and thus to prevent haphazard growth provisions should be made by the planning authority prior itself. Similarly, there are various reasons why Urban Development Authorities undertake the projects of Town Planning Schemes such as construction of ring roads, construction of new nodes and growth centers, etc. and often in the practice of preparation of plans, the green field is just regularized and re plotted neglecting the design parameters and thus aim of this study is to address the issues of planning & designing, and to generate opportunities for the betterment of the people. This paper gives a precise analysis about how Urban Planning or Town Planning is done in the three states of India namely Gujarat, Maharashtra & Karnataka.

According to the guidelines laid by Urban and Regional Development Plans Formulation and Implementation (URDPFI) and the Maharashtra Regional & Town Planning Act, 1966 and also other acts such as Gujarat Town Planning & Urban Development Act & Karnataka Town & Country Planning Act; there is a process undertaken to carry out planning of a region. It is considered to be both step down & bottom up approach because it gives provisions for Regional Plan which is to be made at the scale of 1:25,000 to 1:10,000 and Development Plan at a scale of 1:10,000 to 1:8,000. But however, planning a region to such a big scale has its own pros & cons. The state of Maharashtra & Gujarat has undertaken the procedures of Land Pooling & Readjustment or better known as Town Planning Schemes for the implementation of these Regional Plans & Development Plans. But it is observed that in the state of Karnataka, they do not opt for the procedures of Town Planning Scheme as the procedure itself is very time consuming and the rate of development is also higher with increasing population rate that the TP Scheme do not cater with the needs of the people.

So the main aim of this study is to figure out the planning practices in the three neighboring states of India.

**Keywords**— Architecture & Planning, Development Plan, Gujarat Town Planning & Urban Development Act, Karnataka Town & Country Planning Act, Maharashtra Regional & Town Planning Act, Regional Plan, Town Planning, Town Planning Scheme, Urban Planning, Urban and Regional Development Plans Formulation and Implementation (URDPFI) guidelines

## I. INTRODUCTION

The issue of social equity and balanced spatial development has now come to the forefront. Micro-planning is suggested for the all-around socioeconomic development. Because the space in which the people live and work is real and to ignore the space and its community is to ignore the basic reality of interface between habitat, economy and society. Micro-planning takes into cognizance the evolution of the spatial pattern of human activities without which economic, social and environmental goals of planning cannot be achieved up to expectation. Also to prevent Urban Sprawl, it is a must that the regions are precisely planned and designed so that the regions don't grow haphazardly and there is a systematic flow of resources to each individual residing in that area. Microlevel Planning is needed to perfectly manage and find solutions to the problems which are caused due to planning only at a macro scale and not on a micro scale.

This study titled “ Microlevel Planning : A Comparative Study of Urban Planning in Gujarat, Maharashtra & Karnataka” will focus on the analysis of various acts followed by the three states namely Maharashtra Regional & Town Planning Act, 1966 (MRTP) ; Gujarat Town Planning & Urban Development Act , 1976 (GTPUDA) ; Karnataka Town & Country Planning Act, 1961 (KTCP) and also performing a precise literature study for the topic and then with the help of various software such as ArcGIS, Google Earth Pro, Revit for Architecture, AutoCAD a plan analogous to TPS will be proposed with the consideration of basic infrastructural plans and urban design elements. This study will also look forward for an innovative development model which will then result in increasing the efficiency for implementation of the Microlevel Plan.

## II. AIM OF STUDY

This study aims to “To develop a plan to make the proposed site more livable and generate opportunities for the locals” there are various reasons why Urban Development Authorities undertake the projects of Town Planning Schemes such as construction of ring roads, construction of new nodes and growth centers, etc. and often in the practice of preparation of plans, the green field is just regularized and re plotted neglecting the design parameters and thus aim of this study is to address the issues of planning & designing, and to generate opportunities for the betterment of the people.

## III. OBJECTIVES OF STUDY

- To study and perform analysis of various acts such as MRTP, KTCP, GTPUDA.
- To make use of ArcGIS software to overcome the errors between a plan & real ground condition.
- To develop a plan in view of Urban Design for faster implementation.
- To study and propose a model against traditional Land Acquisition.

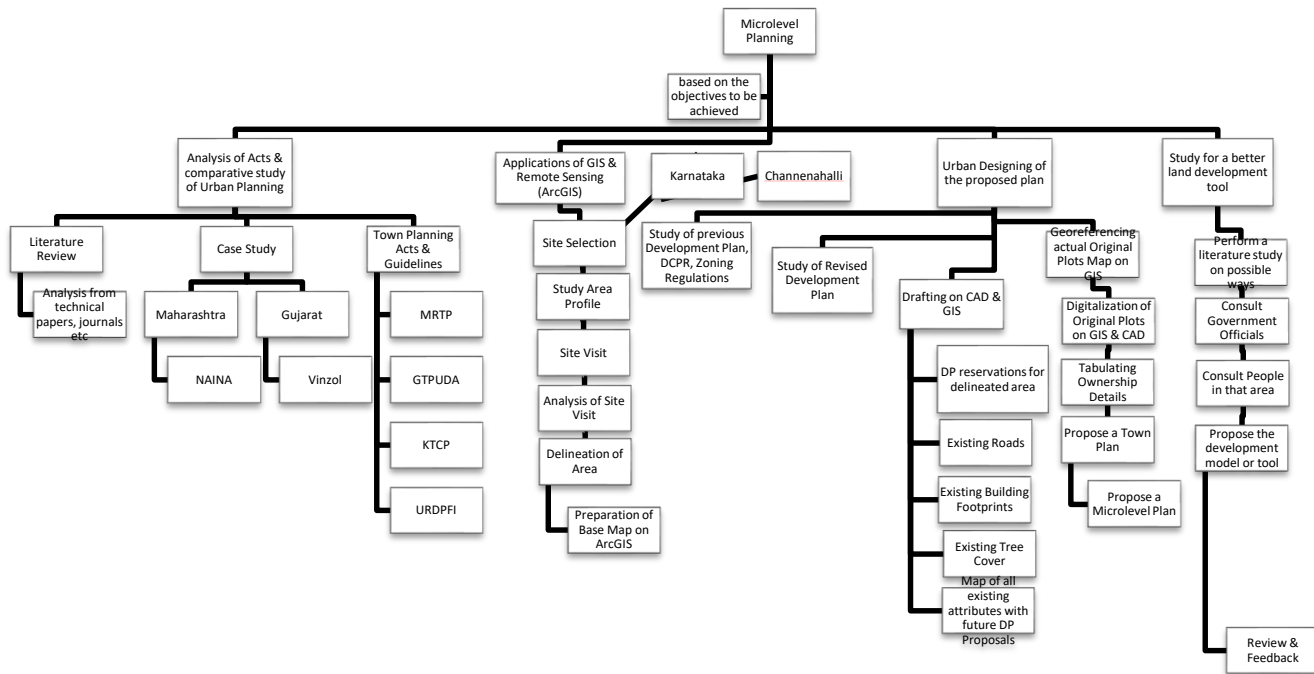
As the title of the study “ Microlevel Planning : A comparative Study of Urban Planning in Gujarat, Maharashtra and Karnataka” gives the gist that the study is actually a comparative analysis of urban planning in the three states and for that the respective states have their own planning guides and acts and thus first objective is to study the acts and perform analysis over the same. The next objective is to do research on applications of GIS & Remote Sensing by actually working on an area by making use of ArcGIS software to eliminate the errors between a plan & real ground conditions. Followed by the next objective which suggests to work a level more deeper than the ones practiced in day to day life. And lastly to study and propose a better model rather than traditional land pooling or land acquisition to fasten the implementation process. Because in this process a lot of Figures and Table should be in the below format. time is required due to transfer of ownership and again stamp duty & registration charges and many more other things which actually prolongs the entire implementation process and thus objective of this study is to look for other land development tool.

## IV. SCOPE OF WORK

The problems which we face today is the result of improper planning done in the past. We often compare the works done by the British with the current construction practices and however the work done by the Britishers have proved to be more durable & sustainable. The reason behind it is they had a vision for future. A most perfect example for this is Bangalore (now known as Bengaluru). In Bengaluru, to travel for a distance of 4 km itself it takes more than an hour and that compared to Nashik, it hardly takes 10-15 minutes, the reason is super narrow roads and congested streets. The immediate remedy to it would be widening of roads but imagine if there are no setbacks left by the owners and directly buildings are erected on the edges, in this case acquiring of land for widening of roads after a concrete construction has occurred is not everyone’s cup of tea. The goal of this project is to think and study about the problems that may arise in the future and plan accordingly. The limit of a TP Scheme may be just showing the plan of a road in typical grey colour onto a planar surface but a Microlevel Plan aims to detail out that grey coloured road with respect to all the street elements such as detail plan and section of each width, etc. and also creating a 3- Dimensional model of the same for better visualization. This thesis will also provide with a detail case study of how Local Area Plans – Town Planning Schemes are prepared and implemented by the SPA and Government. Also, a real touch to the study will be provided by personally meeting and interviewing the residents and knowing their problems. Along with that urban planners will be consulted to input their considerations and knowledge to make a better plan.



## V. METHODOLOGY

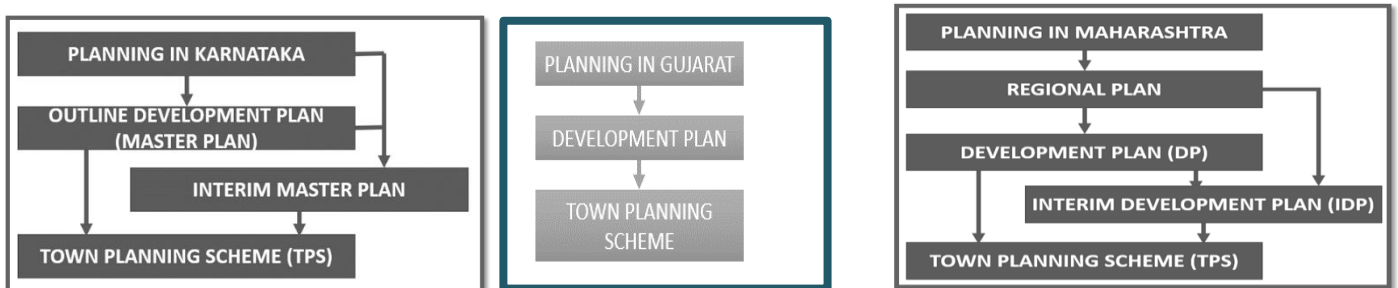


**FIGURE 1: Proposed Methodology to achieve objectives of study**

The proposed Methodology is set accordingly to achieve the objectives of the study. It is divided into 4 parts each being related with each other. The methodology is so made that several works or goals can be achieved simultaneously. For example along with literature study, we can also work on the digitalization of maps for proposals and on the other hand we can work on the case study as well. The main benefit of this is that the time can be properly managed and the work can be done more efficiently.

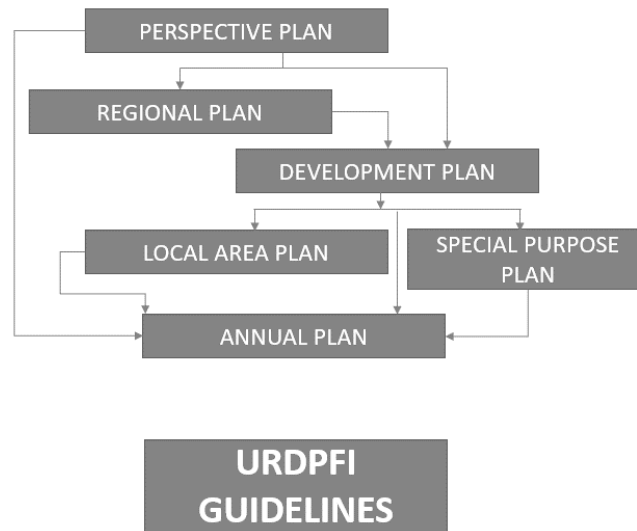
## VI. OBSERVATIONS FROM TOWN PLANNING ACTS

Town Planning mechanism has been working in Indian states since decades and every state has their own way of its preparation & implementation. Government has passed resolutions and acts which govern them. The following section of the paper would provide a quick analysis of the acts related to Town Planning in the states of Maharashtra (MRTP), Karnataka (KTCP) & Gujarat (GTPUDA). A complete study of the following acts is a must when one wants to practice it in real world.

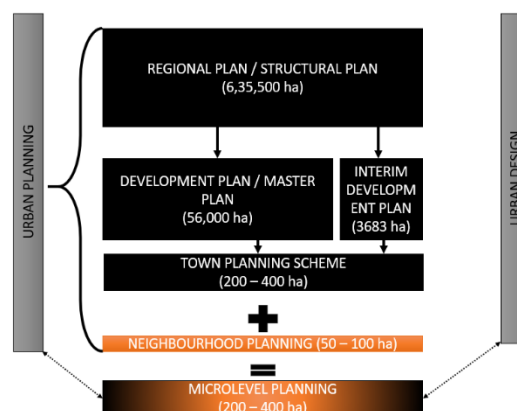


**FIGURE 2: Typical Planning Process according to Acts**

Hence after doing a deep and precise literature study of the various Town Planning Acts and guidelines, it has been inferred that the planning process being similar & analogous to each other yet is indifferent. In Maharashtra, a three tier process is followed such as Regional Plan, Development Plan & Town Planning Scheme but compared to that with the state of Gujarat & Karnataka, it is mainly a two tier process which takes into account the Development Plan or the Master Plan and then Town Planning Scheme. The main advantage of the system in Maharashtra is that it already gives a broader perspective of the entire region first and accordingly development is planned and thus to enforce that development a TP Scheme is taken into process. Whereas, in Gujarat & Karnataka, the planning is divided into various sub divisions and similarly planning organizations are put to force which ensures faster pace of development. URDPFI guidelines are however a framework that can be applied to any region within the country



**FIGURE 3: Typical Planning Process according to URDPFI Guidelines**



**FIGURE 4: Structure of Microlevel Plan**

## VII. CONCLUSION

Hence we may conclude from the study that the Microlevel planning or Microlevel Plan is planning from the lowest level i.e., from the functional community upward to a clearly defined region to fulfil the need of the local areas and ensuring the process of integration of the different areas with an objective to attain balanced regional development. The plan for its implementation would follow the steps as prescribed by the laws & acts of the government but with a more step down approach to Town Planning Scheme as in addition of Neighbourhood Planning with the same scale of a Town Planning Scheme.

## ACKNOWLEDGEMENTS

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## Review on Six Sigma in Construction

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**Abstract**— Six Sigma methodology is nowadays one of the most used approaches in the Quality Management field since its benefits coming from the improvement of the process outputs quality by identifying and removing the causes of defects and variability in manufacturing and business processes. Few studies are done on reviewing the literature of Six Sigma in all the areas including manufacturing, construction, education, financial service, BPOs, healthcare etc. All the literatures are in the way that it would help research academicians and practitioners to take a closer look at the growth, development, and applications of this technique. Globalization, advanced technology, increased sophisticated customer demands change the way of conducting business. Old business models no longer work in new economy. Defects rate of product plays an important role for the improvement of yield and financial conditions of any company. Organizations are increasingly adopting Six Sigma in a bid to improve the quality of their processes and products, and thus achieve competitive advantage. Six Sigma is a smarter way to manage business or department..

**Keywords**— Construction, Globalization, improvement, Quality management, Six sigma.

### I. INTRODUCTION

In order to remain competitive in the market, organizations look for ways to improve their production, manufacturing & management processes. This calls for ways to improve product quality, reduce production cost & enhance productivity. Therefore, in order to cater the customers with high quality products at low price, the organizations must utilize all the available resources efficiently & effectively. Various initiatives like Total Quality Management (TQM), Quality Awards, Total Preventive Maintenance (TPM), Lean & Six Sigma are used as improvement tool to tackle the problem of quality deployment. The productivity of the construction industry worldwide has been declining over the past 40 years. The construction industry has been suffering from low productivity and poor performance as compared to other industries. During the construction project, certain causes leads to delay in construction activities. There are a lot of wastes in construction processes, which were left unnoticed. In order to improve its performance, industrial experts and researchers have looked at the manufacturing industry as a point of reference and a source of innovation. One approach for improving the process is using Six Sigma concepts in construction. The critical objective of construction industries nowadays is to complete the project in time and within the scheduled costs and budget. Also need for contractors to improve performance relates mostly to quality assurance, Improving quality and customer satisfaction has received considerable attention in recent years.

Six sigma is a set of techniques and tools for improvement. It was introduced by engineer Bill smith while working at Motorola in 1986. It seeks to improve the quality of the output of a process by identifying and minimizing variability in manufacturing and business process. It just not provide quality assurance (QA) but also provide quality control (QC) function. It is systematic and organized methodology for existing as well as new product, process and service improvement. . Six sigma enables the organization to improve their process by making them more capable for delivering what the customer wants at right time. Sigma is nothing but a deviation from mean. Six Sigma derived from statistical distribution called "standard normal distribution". Six Sigma consider the range of lower and upper limit defect is +/- 6 sigma from the mean.

### II. PROCESS IMPROVEMENT IN CONSTRUCTION

The purpose of process improvement is to get better quality of product in less time. However there are many systematic approach for obtaining the process improvement. The process improvement methods under Total Quality Management includes:

- 
- Process Cost Model
  - Kaizen
  - Statistical Process Control

Out of all of the above process SPC proved to be beneficial for evolution of six sigma. Statistical Process Control is used in order to follow and improve the manufacturing processes and operations and has an important role in the quality improvement processes. The focus of this model is to analyze process defects and reduce them by root cause analysis and problem solving methods.

### **III. SIX SIGMA PROCESS**

Six Sigma project follows two project methodologies, composed of 5 phases in each. They are DMAIC and DMADV. DMAIC is used for the projects which is aimed at improving the existing business process. DMADV is used for the projects which aimed at creating new product or process designs.

The one known as DMAIC (define, measure, analyze, improve, control) aims to enhance the efficiency of the existing processes and increase customer satisfaction through designed methods or techniques. Whereas DMADV project methodology includes Define design goals, Measure and identify CTQs, analyze to develop and design alternatives, design an improved alternative and finally verify the design. Adoption of six sigma required to go through DMAIC (when product is actually existing and quality improvement is required) and DMADV (when newly developed product is required to improved quality) approaches. The result of Six Sigma will be an increased efficiency, improvement in performance, and the control of performance problems thus minimizing defects, risks and deviation.

DMAIC methodology offers structured framework in following steps to establish systematic continuous improvement.

**Define:** To define customer requirements and any things that do not meet those requirements are defects. Identify problems which affect quality.

**Measure:** Construction activity is a set of various dependent activities. Identify the performance requirements of the process with respect to its defects characteristics.

**Analyze:** To study and analyze the data collected in previous step and find out the root causes of defects.

**Improve:** Improve for eliminate the defects. Identify the ways to destroy the existing defects. Develop the solution.

**Control:** Measure the performance of the new process under a controlled plan to control the quality level of the process. For increase the sigma level.

### **IV. INNOVATIONS IN SIX SIGMA**

Latest trend in the field of quality engineering is the mixture of two powerful methodologies lean and six sigma to enhance performance. Lean is primarily focuses on exchange of information and materials between the process steps whereas Six Sigma is concentrating on addressing poorly performing value adding transformations within the process. Lean Manufacturing focuses on elimination of various losses associated with production system such as waiting time, overproduction, rework/rejection, unnecessary motion, over processing, excess inventory, unnecessary transport. Starting in 1980's, consultants trained in both techniques such as lean and Six Sigma. The different tools of Six Sigma focus on improving quality and Lean focused on removing waste, together, it's a combined management approach. Many of benefits of Lean Six Sigma include cost reduction, value addition, reduction in process variation, customer satisfaction, financial performance learning.



## V. REVIEW OF LITERATURE

This paper discusses different research papers that have been published in this field and present a literature review Related to Abstract.

Sneha P. Sawant and Smita V. Pataskar[1] in their research “Applying Six Sigma Principles in Construction Industry for Quality Improvement”, ICAET (2014) explained how important six sigma technique is in quality improvement in construction. This paper describes the basic theory of Six Sigma, principles, methodology and various tools used and also describe about a case study of a residential building. In this case study six sigma principles are applied for internal finishing work, and is adopted to improve the quality and to cross check against the sigma level. There are many factors have high impact on the quality of the construction. These factors must be identified as early as possible so that the quality can be improved. Six Sigma principles are adopted in such cases to identify and improvise the current process, and it can also be used to measure whether the quality has been improved or not.

Sarathkumar K, Loganathan R[2] published their paper, “Evaluation of six sigma concept in construction industry”, in IJSER (2016) which deals with six sigma concept in construction industry. In this paper author have tried to improve the Painting work, Tile work and Brick work of a building by using DMAIC methodology. The questionnaire is prepared which fulfils the criteria for control plans of construction and further questionnaire is distributed among Site Engineers, Contractors, Consultants and Project managers. With help of SPSS software, the collected data’s were analyzed and result stated that the implementation of Six Sigma in construction context will be achieved its aim by reducing the defects. The Six Sigma maturity level is a measure developed by the authors to be able to compare the wished position and the current situation to best practice according to Six Sigma.

Sandeep Bodke, Snehal Nikam[3] in their research “Quality Improvement in Building Construction Using Six Sigma” published in IOSR JMCE (2017) describes the study on Six Sigma and quality improvement in building construction using Six Sigma principle. There are number of factors which affect the quality of product, time of work, cost , waste of material, etc. The objective of construction industry is to complete a project within a stipulated time, cost as per required standard and specification. In this research DMAIC methodology of Six Sigma which help to identify the quality of existing structure by analyzing the defects is used that will suggest in DFSS for changes that is required in current work. These factors must be identified as early as possible so that the quality of construction can be improved. The methodology of six sigma principles gives systematic approach to identify and improve the current construction process. It also measure whether the quality has been improved or not. It is used to eliminate variation and improve quality through different six sigma methods.

Sukumar. S, Radhika. R[4] in their paper “A Study of Implementing Lean Six Sigma in Construction Industry” explained application of a new technology, Lean Six Sigma concept is likely to be effective for improving the efficiency of construction industry. It eliminate all defects so as to minimize the wastage of materials, time and effort in order to generate the maximum possible amount of value. The purpose of this study is to evaluate Lean six sigma as a process improvement method to improve the construction processes by understanding and analyzing the factors affecting the formation of construction wastes. Here DMAIC methodology is used where data is collected from the Respondents and by using SPSS software the collected data is analyzed. The expected results of the study is the reduction of defects and minimization of wastes by the implementation of Lean six sigma in construction industry. The purpose of lean six sigma is to enhance the performance, quality, capacity, cycle time, inventory levels, and other key factors such as reduction waste, energy sources and environment will also be enhanced. By implementing DMAIC method to any of the project following benefits were obtained like Use replacement, Reduce or recycle, Eliminate the unnecessary things, Doing different tasks at the same time, Easy work flow, Develop collaboration, Introduce cross training, enhance the level of inspection, concentrate on preventive maintenance of tools and equipment.

AmithaP, Dr.T.Shanmugapriya[5] in their research paper "Implementation of lean six sigma in construction : A review" describe that how most of the Indian Contractors are not much aware about the potential demands and hence the projects are always effected by low quality and cost-overruns. Occurrences of wastes in construction sites is one of the problems that we are facing. Introduction of Lean concepts have provided an opportunity to address the existing problems in the construction sector. There are many non-value-adding activities in construction sector that cause loss of quality and profits in quantitative or qualitative terms. In this paper, Lean Six Sigma concept is as waste elimination and process improvement technique .Lean Six Sigma framework is used for problem identification, providing suitable solutions to solve problem and controlling the improvement made. Lean Six Sigma is also used for improving performance, develop effective leadership, waste and variation reduction, customer satisfaction and bottom line results. DMAIC and DMADV are two methods of six sigma which can be used for enhancing the quality of product or process. The combination of six sigma and lean principle will provide a coherent approach for continuous improvement, and also provides a conceptual method for their successful integration. If the two methods such as Lean and Six Sigma are fused together, it acts as a powerful tool for improvement of construction process.

Shantanu Sathe, Dr. Satish B. Allampallewar[6] in the paper " Application of Six sigma in construction" stated that how important it is to improve the quality and maintain excellent performance in the highly competitive world market, lead many organizations, their top managers, project managers, and engineers to implement the new philosophies such as pull scheduling and lean principle at their organizations. In this paper Six Sigma is used as a statistical method that provides a structured framework to organize and implement strategic process improvement initiatives to attain reductions in process variability or defects. A case study on a commercial building was conducted to which six sigma principle of DMAIV were applied for few internal finishing works: Brickwork, Plastering, flooring and Painting. The improvement in this process is presented in terms of process sigma and standard deviation. The purpose of the study was understanding the needs of construction industry from process improvement perspective and matches these needs with the expected outcomes of Six Sigma. The studies conducted deploy that Six Sigma applications are widely accepted by manufacturing/ production industries and it is also possible to implement it in construction. Past case studies disclose that it requires team efforts involving top management and every worker in the organization to fully employ the concept. Actual awareness among consultants, engineers, employees should be produced regarding Six Sigma in construction for the actual execution of the process.

M.I.Solanki, Dr. D. A. Desai[7] published the paper "Literature Review on Six Sigma Quality Improvement Methodology" which has different quality improvement methods. Six sigma methodology works on principles of customer converging, process oriented, process data driven and breakthrough improvement strategy. The paper gives a brief literature survey regarding each phase of DMAIC methodology, latest trend of integration two powerful methodologies Lean and Six sigma as well Critical Success Factors for effective implementation of Six Sigma methodology and found that Lean and six sigma both focuses on concept of continuous improvement and also impact of management leadership & commitment and linking six sigma with the business and customer needs are the most significant among all success factor. The main aim is to understand concept of DMAIC methodology studied by various researchers and illustration of methodology in detail for learning purpose. Six Sigma is data driven, customer centric and process oriented methodology which focuses on elimination of causes producing variation. It is the powerful methodology for breakthrough quality improvement through effective use of statistical and non-statistical tools. However it is focusing only on trivial few root causes elimination however variation is also contributed by vital many root causes.

Neha P. Ninawe , Jyotsna A. Pawar[8] , in the paper " Quality management in construction industry by using six sigma: A literature review" explained how Construction sector is viewed as a service industry which generates substantial employment and provides growth impetus to other manufacturing sectors. The critical objective of construction industries nowadays is to complete the project in time and within the scheduled costs and budget. Also need for contractors to improve performance relates mostly to quality assurance, Improving quality and customer satisfaction has received considerable attention in recent years. Six Sigma which is a continuous improvement methodology is used to enhance the efficiency of the existing processes and increase customer satisfaction through designed methods or techniques. Output of Six Sigma gives increased efficiency, improvement in performance, and the

control of performance problems thus minimizing defects, risks and deviation. This research is carried out to show various techniques and how more research work is required in this field.

## VI. CONCLUSION

Six sigma concept is new to construction industry but is being used widely by production/manufacturing industries and it is also possible to use it in construction industry. From this research it is clear that various factors affected to quality of the construction, and these factors must be identified as early as possible so that the quality of construction can be improved. Six sigma is used in various industrial process as it is used to reduce and eliminate variation which cause defect, to meet the quality standards also improve the quality and ultimately customer satisfaction. The overall study indicate that Six Sigma framework is used for problem identification, providing suitable solutions to solve problem and controlling the improvement made. And it is hoped that, Implementation of Six Sigma methodology leads to process improvement and enhance the reduction in wastes. It is also concluded that DMAIC methodology which is a concept of Six Sigma which objects at developing and providing a highly effective process improvement and quality improvement technique in construction. For better result it requires team efforts involving top management and every worker in the organization to fully employ the concept. In recent trend it is most powerful methodology for breakthrough quality improvement through effective use of other tools.

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# Stabilized Mud Block Using Alccofines and GGBS

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**Abstract**— In these modern technology constructions, the height of structure is moving longitudinally higher. For the requirement of safe structure it is necessary to transmit the load from top floor to the foundation of the structure. Due to higher structural building, size of foundation is increasing and sometimes tends to do combined footing which leads to critical design of the foundation. Thus to tackle with this situation, it is necessary to minimize the load of structure. In this modern technology, there are few research has been conducted on cellular light weight concrete block which is need of future. With this concept, in this project few trials are conducted where cementitious material is replaced by foaming agent, like synthetic foaming agent by 0%, 25%, and 50 % in which the cementitious material is used as a combination of 50% OPC & 50% slag, 30% OPC & 70% slag and Ground Granulated Blast Slag has been replaced by 3% of alccofine in both cementitious combination. Specimens are casted for testing of compressive strength, water absorption and water sorptivity test. It is observed that 50% OPC and 50% slag with 3% of Alccofine is replaced by 50 % of foaming agent gives better result when compared to other combinations..

**Keywords**— Alccofine, foam concrete, GGBS, Cellular light weight concrete block

## I. INTRODUCTION

Masonry construction has been used for at least 10, 000 years in a variety of structures homes, private and public buildings and historical monuments. The masonry of ancient time's involved two major materials: brick manufactured from sun- dried mud or burned clay and shale; and natural stone. The first masonry structures were unreinforced and intended to support mainly gravity loads. The weight of these structures stabilized them against lateral loads from wind and earthquakes. Masonry construction has progressed through several stages of development. Fired clay brick became the principal building material in India during the middle 1800s. Concrete masonry was introduced to construction during the early 1900s and, along with clay masonry, expanded in use to all types of structures.

Historically, "rules of thumb" (now termed "empirical design") were the only available methods of masonry design. Only in recent times have masonry structures been engineered using structural calculations. In last 45 years, the introduction of engineered reinforced masonry has resulted in structures that are stronger and more stable against lateral loads, such as wind and seismic.

Masonry consists of a variety of materials. Raw materials are made into masonry units of different sizes and shapes, each having specific physical and mechanical properties. Both the raw materials and the method of manufacture affect masonry unit properties. The word "masonry" is a general term that applies to construction using hand-placed units of clay, concrete, structural clay tile, glass block, natural stones and the like

## II. LITERATURE REVIEW

Set A. K. Marunmale, A.C. Attar, "Designing, Developing and Testing of Cellular Lightweight Concrete Brick (CLC) Wall built in Rat-Trap bond" [1]

Researchers conduct study on an innovative technique for efficient brick work system with many advantages over the conventional brick work system which "CLC brick in Rat- Trap bond". It reduces the use of material (natural river sand and red soil) and uses the waste material (fly-ash), hence it is green construction material. CLC brick was designed specially to build wall in Rat-Trap bond as efforts had not yet been made to design CLC brick in Rat Trap bond. The test results on CLC brick

were satisfactory and it can be used for non load bearing exterior and interior wall. Also the light weight of CLC brick in Rat-trap reduces the dead load on the structure and provides good thermal insulation. Thus this CLC brick in Rat trap bond had a very good future scope for its development as a commercial product. Aniket Gupta, Mukul Rathore, "Comparative Study and Performance of Cellular Light Weight Concrete". [2]

In this paper researchers present a comparative study of CLC with equal strength of brick having lower density as compared to bricks. They analyzed the economical savings in structural design requirements as per the deduction in dead load of the whole structure, so this also includes an overall capital reduction. Also found that savings in steel due to use of CLC blocks in terms of weight of beam member were found to be 8.635kg. The amount of steel reinforcement used in the CLC block was found to be 1513.53 mm<sup>2</sup> whereas the amount of steel reinforcement required for brick masonry was 1681.64 mm<sup>2</sup>.

The paper focused upon comparison of two types of structures using fire clay bricks and ash blocks structure. Though ash blocks was 3 times costlier than fire clay bricks but the use of ash blocks had considerably reduced the size of air conditioning system, total usage of energy and finally the total cost of building due to its light weight and insulating nature. Hence, use of ash blocks had helped in conserving the natural resources, energy and environment. B. Surekha, M.

N. Hegde, & K. S. Jagadish, "Energy And Building Materials"[4]. Researchers conduct study on embodied energy of Building materials. The energy intensity was calculated as per the data collected from manufactures in and around Bangalore City. Building materials include natural material, processed materials and Building elements. Embodied energy for alternative building materials and building elements was also presented. Burnt brick was the major contributor to the embodied energy of a building since it represents the largest volume in a building besides having a high energy value ranging between 4.63MJ to 6.13MJ per unit. Alternatives to brick like the stabilized Mud Block, Hollow concrete Block and cut sand stone lead to significant reductions in embodied energy

### III. MATERIAL AND METHOD

#### 3.1 Material: Foam

Protein based foaming agent concentrate, is used to make the light concrete or foam concrete. First it is to diluted in water and then foam is produced in a concrete foam generator with compressed air. Foam produced has very fine and stable high quality foam. Stability and density depend on dilution & settings of the foam generator.

Protein based foaming agent gives high stability of the foam, successfully with standing the conditions when mixing, conveying (pump-able), pouring, casting and during the setting and hydration process.

#### 3.2 Material: Cementitious

Fly ash one such material obtained by combustion of coal. It is finely divided residue and transported by fuel gas. India is a resourceful country for fly ash generation with an annual output of over 110 million tons, but utilization is still below 20% in spite of quantum jump in last three to four years. Availability of consistent quality fly ash across the country and awareness of positive effects of using fly ash in concrete are pre-requisite for change of perception of fly ash from 'A waste material' to 'A resource material'.

Now a day's due to strict control on quality of coal and adopting electrostatic precipitators, fly ash of consistent quality is separated and stocked, and it is gaining popularity as a good pozzolonic material for partial replacement of cement in concrete. UFGGBS Fly Ground Granulated Blast furnace slag (GGBS) is a byproduct for manufacture of pig iron and obtained through rapid cooling by water or quenching molten slag. If slag is properly processed then it develops hydraulic property and it can effectively be used as a pozzolonic material. However, if slag is slowly air cooled then it is hydraulically inert and such crystallized slag cannot be used as pozzolonic material.

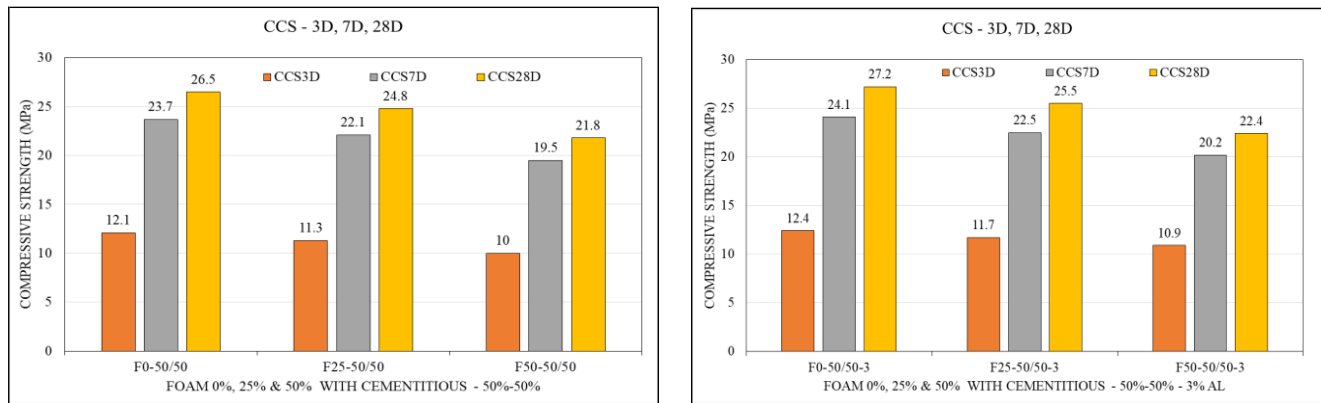


### 3.3 Methodology

In this paper we have considered 3 cases.

Case i) Increasing the volume of foam by 0%, 25% and 50%, with 50% OPC and 50% GGBS.

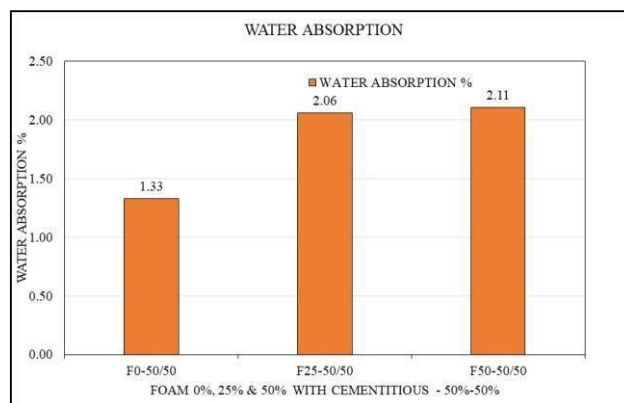
Case ii) Increasing the volume of foam by 0%, 25% and 50% with 30% OPC and 70% GGBS.



**Figure 1 & 2: Case 1 & Case 2**

### 3.4 Water absorption

The core cut of size 100mm diameter and 50 mm thick is cut through the cube casted for water absorption test. Total 18 specimen were tested and results are shown in graphical format below. Water absorption test was conducted on 28th day of casting. Graphical results showing in figure 3 & 4.



**Figure 2: Foam 0%, 25%, 50% with cementitious material**

## IV. CONCLUSION

From the experimental work and results, we can conclude the early and later strength increases with the increasing finer materials like GGBS and Ultrafine GGBS. The durability of concrete is better with the reduction in water absorption and water sorptivity properties and these properties shows better results when the ultrafine materials are used. Replacement of cementitious



material with foaming agent has great impact on concrete density as increase in foam percentage decreases the weight of concrete block. For the structural stability it is better to use CLC blocks as it reduces total weight on foundation, ultimately results in reduction of foundation sizes.

### ACKNOWLEDGEMENTS

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# Study on Concept of Six Sigma DMAIC Methodology

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**Abstract**— Six Sigma, a statistical measure of variation is used for improving business process. Implementation of Total Quality Management (TQM) is possible by using Six Sigma which targets 99.99927% defect free manufacturing. Six Sigma DMAIC methodology is meant of Define, measure, Analysis, Improve and Control. DMAIC is a problem solving process which may resolve the issues of defects or failures, deviation from target, time over run, cost over-run etc. DMAIC reduces variation by identifying the key requirements tasks and standard tools for utilize and tackle the problem. This paper contains a study on Six Sigma DMAIC methodology for improvement of existing problem in construction.

**Keywords**—Six Sigma, DMAIC, Total Quality Management, DPMO, Analyze, Problem.

## I. INTRODUCTION

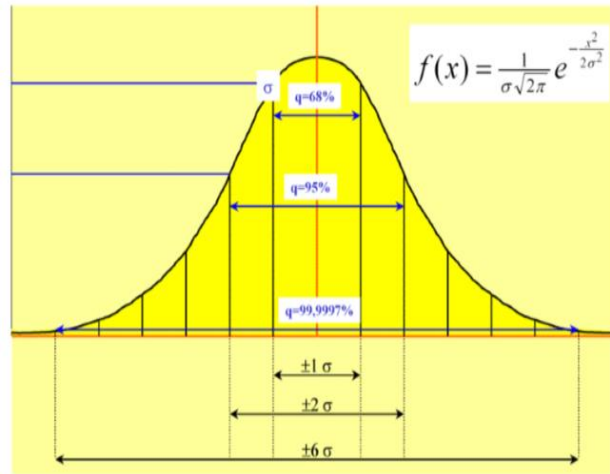
The development of Construction industry is highly influenced by two main factors which are construction management and technology. The completion of a project with stipulated time and cost as per required standards and specifications, waste minimize, efficient use of resources are the objectives of construction industry. For the improvement of Productivity, quality management has been introduced worldwide. Quality Management is defined as any approach used to achieve and sustain a high-quality output confirming to requirements and meeting customer satisfaction. The Total Quality Management (TQM) focuses on quality which became a comprehensive management strategy. Total quality Management is embedded on quality awareness at each step of production work or service.

Total Quality Management has evolved as a strategic approach in most of the manufacturing and service operations to respond to the challenges posed by competitive business world. Six Sigma is a quality tool which is used as a problem solving methodology, centered around defect reduction and variation management executed in the form of a disciplined, data driven and time bound approach and is provided by the top management in an organization. The methodology explained here is Six Sigma DMAIC, a five step improvement process as Define, Measure, Analyze, Improve and Control.

## II. SIX SIGMA

Six Sigma is a quality improvement technique based on statistics was used firstly by Bill Smith of Motorola in 1980s, who defined the concept as organized common sense to decrease cost, increase quality by improving process and reduce the production time. The concept of Six Sigma has been generated from Standard Normal Distribution which is a statistical distribution, illustrated by symmetrical bell shaped curve. Six Sigma is having statistics and management perspective. In the statistical approach mean is the arithmetic average of a process data set and standard deviation is the spread around the mean. Sigma can also be explained as the capability of the process to produce defect free work. Sigma is an index, which is used to describe the degree of dispersion for the output of a random set of data or process.

Six Sigma is a quantitative approach for improvement with the major objective being elimination of defects from any process, specially a numerical goal of 3.4 defects per million opportunities (DPMO). The graphical representation of six sigma levels is shown in Fig No 1. The curve of six sigma levels represents the total population by infinite series of segments in its both directions. Sigma symbolize the deviation from mean. In this curve shows the lower and upper limits as six times the standard deviation from the central line of mean.



**FIGURE 1. Graphical Representation of Levels of Six Sigma**

In this curve the range between  $-6\sigma$  and  $+6\sigma$  is the considerable part which covers 99.9997% of the population. Table No 1 shows the rate of defects per million opportunities and yield in different sigma levels. In fact, the Six Sigma represents the quality level in six sigma management method, there is only 3 or 4 faults in 1000000 opportunities in sigma quality level.

**TABLE 1**

**Overview of Sigma Levels, DPMO and Yield**

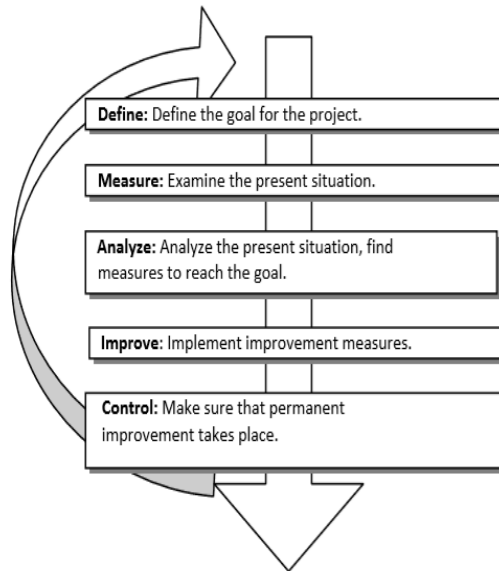
YIELD	DPMO	SIGMA LEVEL
30.9	690000	1
69.2	308000	2
93.3	66800	3
99.4	6210	4
99.98	320	5
99.9997	3.4	6

Six Sigma implementation is mainly done with sub-methodologies like DMAIC and DFSS or DMADV or IDDOV methodologies. DMAIC process is Define, Measure, Analyze, Improve and Control and DMADV is Design, Measure, Design, and Verify.

### III. SIX SIGMA DMAIC METHODOLOGY

The DMAIC is a problem solving process which is deeply integrated with the overall goal of the organization which follows the phases Define, Measure, Analyze, Improve and Control. Figure 2 shows the stages of DMAIC methodology. DMAIC is the core tool used in Six Sigma for the improvement, optimization and stabilization of business processes and business and is referred to a data driven improvement cycle.





**FIGURE 2 : The DMAIC Methodology**

### 3.1 DEFINE

The first step of DMAIC method is necessary to define the requirements of the customer and any thing that do not meet that requirements known as defects , define project goal of the project and identify the critical to quality characteristics of the process. The steps in this phases are Define Customers and Requirements, Develop Problem Statement, Goals and Benefits, Identify Champion, Project owner and Team, Define resources, Develop Project Plan. The tools and Techniques used in this phase are as follows:

- IPO Diagram
- Project Charter
- Process Flow chart
- SIPOC Diagram
- Stake Holder Analysis
- DMAIC Work Breakdown Structure
- CTQ Definitions
- Voice of the Customer Gathering

### 3.2 MEASURE

In this step of DMAIC measurement of performance of the existing process and its deviation from actual requirements are taken with the objective of measuring enough data or information from the process under development. The steps of measue phase are Define defect, opportunity, Unit and Metrics, Detailed Process map of appropriate areas, Develop DATA Collection Plan, Validate the measurement system, Collect the data etc. The tools used are given below:

- Process Flow Chart
- Data Collection Plan/Example
- Bench Marking
- Measurement system Analysis
- Voice of the Customer Gathering
- Process Sigma Calculation
- Pareto Charts
- Histograms

### 3.3 ANALYSE

In this stage the study and analysis of the collected data has carried out to find out the causes of defects and unsatisfactory performance. As team collected different set of data by different people, they may decide to adjust the data collection plan to include additional information. By this, the team analyse both the data and the process and verify the root causes of wastes and defects. The steps which follows in analyze phase is listed as define performance objectives, Identify value/ non value added process steps, Identify sources of variation, Determine root causes etc.

The tools used in this stage is given as,

- SWOT Analysis
- PESTEL Analysis
- Overall Equipment effectiveness
- TRIZ
- Innovative Problem Solving
- Control Charts
- Histogram
- Pareto Chart
- Scatter Plot
- Time Series/Run Chart
- Regression Analysis
- Cause and Effect/Fishbone Diagram
- Five Whys
- Process Map Review an Analysis
- Statistucal Analysis
- Hypothesis Testing (Continuous and Discrete)
- Non-normal data Analysis

### 3.4 IMPROVE

Elimination of the defects is done in this stage to improve the process. Identify the ways to destroy the existing problem and develop the potential solution. The steps in the improvement phase are perform design of experiments, Develop potential solutions, define operating tolerances of potential solutions, validate potential improvement by pilot studies, correct/reevaluate potential solution.

Tools used to implement this phase are as follows

- Brain Storming
- Mistake Proofing
- Design of Experiments
- Pugh Matrix
- QFD/ House of Quality
- Affinity Diagram
- Nominal Group Technique
- SMED
- Five S
- Value stream mapping
- Failure Modes and Effects Analysis (FMEA)
- Simulation Software
- Mind Mapping
- Force Field Diagram

### 3.5 CONTROL

Control phase helps to ensure the rectification of the problems which create the variations in the desired outputs. In this stage, measuring the performance of the new process under a controlled plan to control the quality level of the process is carried out.

Control phase can be considered as the mini version of project management. The steps of Control phase are Define and validate Monitoring and Control System, Develop Standards and Procedures, Implement Statistical Process Control, Determine process capability, Develop Transfer Plan, Handoff to Process owner, Verify Benefits, Cost savings, Avoidance, Profit, Growth, Close project, Finalize documentation, Communicate to business, celebrate.

The tools used in this phase are given below.

- Process Sigma Calculation
- Control Charts
- Cost saving calculations
- Control Plan
- GANTT Chart
- Activity Diagram
- Radar

#### IV. CASE STUDY

A case study was conducted on a residential building in which six sigma principles were applied to internal finishing work (tiling works) to enhance the quality of the existing process. A defect assessment sheet was prepared in which the possible defects that might occur in tiling works was listed. The assessment was done for each item, the one which met the standard requirement is marked as right mark else it is marked as 'X' and NA indicates that the item is not applicable. The total number of defects, total number of opportunities for defects in each assessment sheets is calculated and the yield is evaluated as follows:

$$\text{DPMO} = \frac{\text{No. of 'X' in data assessment sheet} \times 1000000}{\text{No. of opportunities of defects} \times \text{No. of units}}$$

Based on DPMO, using sigma conversion table the sigma level is calculated. Here the value of DPMO was 27449.32 and sigma was 3.37. Yield was 95.76%. Then by using the DMAIC procedure of Six sigma the quality of the ongoing process is improved.

In this paper the following tools are used in each stage of DMAIC methodology,

Define - SIPOC (Suppliers Input Process Output Customer)

Measure - Pareto chart

Analyze - Cause and Effect diagram

Improve - Brainstorming (Recommendation for corrective action)

Control - Control plan

One of the major challenges faced by the construction firms is to deliver the product within the stipulated time without compromise in Quality. Execution of works with the Standard Quality requirements reduces rework and hence the cost for it. There are various factors which have high impact on construction quality. These factors must be identified as early as possible so that quality can be improved. In this paper tiling work of a residential building has been studied and sigma level has been evaluated. DMAIC methodology has been implemented based on Six Sigma principles which give a systematic framework to identify the impact of defects, their root causes and ways to reduce them. DMAIC can be helpful to increase quality and quantity at the same time and it will affect technical and financial success of project considerably. Briefly, Six Sigma, as a quality initiative, that aims to reduce defects and variations in processes using statistical measurements, process design and quality control analysis in order to increase (external/internal) customer satisfaction.

#### V. CONCLUSION

Six Sigma is a performer indicator and process improver, a quality tool used in the industries. The main techniques of Six Sigma are DMAIC and DMADV. The improvement technique DMAIC is applied by five main phases which are Define, Measure, Analyze, Improve and Control and their tools discussed in this paper. This method gives systematic approach to identify and improve the current process which must be modified. This is helpful to reduce and eliminate variation which cause defect, to meet the quality standards also improve the quality and customer satisfaction.



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## Fuel Generation Through Sewage

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**Abstract**— A Country like India has been acute slowdown in the ongoing and coming quarters due to inflation, increasing in fuel prices, lack of energy, trade war. Fuel plays a vital role in the development of the country and economic. India with the population of around 135 crores require around 4.7 million barrels a day which is totally purchased by OPEC. OPEC is the organization of oil producing mandate which have the power for controlling the oil production and rates around the world. INDIA totally rely on these resources around the world. These cause a serious unbalance in the economy. The greenhouse gases are serious pollution factors in the environment..

**Keywords**— Energy, Slowdown, OPEC, Greenhouse gases, Fuel

### I. INTRODUCTION

**1.1 General** = Fuel is needed in all aspects of life and hence forms an essential part of human well-being. Nationally and internationally organizations and institutions are making efforts to provide adequate supply of potable development. India has witnessed a rapid increase in the urban population during last few decades. All towns and cities are augmenting fuel supplies to meet the increasing energy demand. To overcome this demand a sustainable source of fuel can be obtained from sewage gases

**1.2 Introduction of Sewage Gases** = Sewer gas is a complex mixture of toxic and nontoxic gases produced and collected in sewage systems by the decomposition of organic household or industrial wastes, typical components of sewage. Sewer gases may include hydrogen sulfide, ammonia, methane, esters, carbon monoxide, sulfur dioxide and nitrogen oxides

#### 1.3 Objectives

- Solution to fuel
- Usage of renewable source
- Reduction of green house gases
- Green cycle
- Bio methanation
- Multi object optimization

#### 1.4 Parameters At Inlet

**II. TABLE 1: Chemical analysis of Sewage water**

SEWAGE PARAMETERS INLET	RESULTS	PARAMETERS LIMIT
PH	6.9	7
BOD	300 MG/L	100 MG/L
COD	600 MG/L	200 MG/L
TOTAL SUSPENDED SOLIDS	400 MG/L	25 MG/L
OIL AND GREASE	5MG/L	-

---

## II. EQUIPMENTS AND METHOD

### 2.1 EQUIPMENTS:

1. Tanks
2. Uasb Reactor
3. Online Monitoring Device
4. Ballon
5. Cascade Compressor
6. Gas Holding Tank

### 2.2 METHOD OF EXPERIMENT:

A fresh sewage sample of 1 litre is taken in bottle of 2.5 litre and kept for duration of 5 days where the anaerobic digestion will be taking place and the gas generated will be then stored in the bottle and can be used as and when required for cooking and heat purpose

### 3. CALCULATION:

For every gram of BOD removed in the system around **300 ml** of methane gas is supposed to be produced.

Sewage which can be treated in the above system for producing the methane gas 9 MLD

For every litre = 200 mg/l BOD removed

For every litre =  $200 \times 300 = 60000$  ml

= 60 L of methane gas which compressed in ratio of 1/600 is equal to  $0.1 \text{ m}^3$  of liquid gas

## II. CONCLUSION

This experiment meets conclusions as follow:

- Sewage can be used as a green fuel
- The volume of gas generated changes with respect to time and chemical properties
- Properties of sewage can be broadly classified and monitored by replacing the Online Monitoring Systems and FOREMS for calculating the properties for sewage
- Wide question of methane a probable replace to fuel can be solved
- Green cycle can be maintained without major changes in the system

## ACKNOWLEDGEMENTS

We are using this opportunity to express our gratitude to everyone who has supported us throughout the completion of this project. We are thankful for their guidance, constructive criticism and friendly advice, during the project work. We express our gratitude to Prof. Pratibha Patil for giving us an opportunity to carry out project on Effects of Sugarcane Liquid on Concrete Properties. We would also like to thank Prof. Lissy Jose, Head of Civil Department and Dr. Arun Kumar, the Principal for their whole hearted support.

Lastly, we express our gratitude towards all those who directly or indirectly helped us in the completion of our studies.

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# Experimental Study on effects of Sugarcane Liquid on Concrete Properties

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**Abstract**— The initial hardening of concrete reaction usually occurs within a few hours. It takes some weeks for concrete to succeed in full hardness and strength. Admixtures take an important role to improve physical and economic benefits with respect to concrete and mortar. Sugar is well-known as a good retarder to delay the concrete hardening. In this research paper [I] Compressive strength test were conducted on concrete cubes in comparison with conventional concrete and sugarcane liquid added concrete on 7 days, 14 days and 28 days, [II] The effect of sugarcane liquid on concrete properties are tested based on strength gain in stages of 7 days, 14 days and 28 days. Two extreme dosages of sugarcane liquid admixture as 0.03% and 0.3% of cement weight is taken for the experiment. The specimens are cast in mortar cubes with desired compressive strength ( $f'_c$ )=30 MPa. This research meets conclusions as follow: (1) The sugarcane liquid can be used as 'green' concrete admixture, (2) The dosage of sugarcane liquid admixture of 0.03% by weight of cement can perform as 'retarder' which having compressive strength values for 7 and 14 days are 24.56 MPa and 28.12 MPa respectively, (3) The dosage of sugarcane liquid admixture of 0.3% by weight of cement can perform as 'accelerator' which having compressive strength values for 7 and 14 days are 31.07 MPa and 30.92 MPa respectively, (4) It is questioned whether compressive strength values increase or decrease in older ages.

**Keywords**— Accelerator, admixture, compressive strength, conventional concrete, retarder, sugarcane liquid

## I. INTRODUCTION

Versatility, durability, sustainability, and economy of concrete have made concrete the most widely used construction material in the world. About four tons of concrete are produced per person per annum worldwide. The concrete refers to a mix of aggregates, usually sand, and either gravel or crushed stone held together by a binder of cementitious paste. When aggregates are mixed with dry cement and water, the mixture forms a fluid slurry that is easily poured and molded into shape. The cement reacts with the water and other ingredients to make a tough matrix that binds the materials together into a durable stone-like material. Often, additives such as pozzolans or superplasticizers are included within the mixture to enhance the physical properties of the wet mix or the finished material. Most concrete is poured with reinforcing materials (such as rebar) embedded to provide tensile strength and yielding reinforced concrete.

The selection of concrete proportions involves a balance between economy and requirements of workability, density strength, durability, and appearance. Optimal proportions of concrete mix ingredients are vital for establishing a relationship between the simplest particle distribution and therefore the corresponding degree of packing. The maximum strength is attained when the porosity of the granular structure is minimum. The main objective of the mix design was to supply an optimum concrete mixture of required design stipulations supported combinations of optimized aggregate grading and effective estimation of the specified water and cement content. Chemical admixtures are mostly used to accelerate, improve workability, retard, reduce mixing water requirements, increase strength, or alter other properties of the concrete. The general approach of all existing methods of concrete mix design is to identify a starting set of mix proportions following the standard country code guidelines based on the paste to aggregate estimation, and by making adjustments to the proportions after every trial mixes until the desired mix requirement parameters are satisfied.

Concrete nowadays isn't just mixing of cement, aggregate & water but it also comprises chemical and mineral admixtures. It is becoming a more and more effective construction material as a result of the addition of admixtures and improvements in production techniques. The chemical admixtures, especially are frequently used to enhance the characteristics of both fresh and hardened concrete like to increase or accelerate setting characteristics, entrain air, reduce water content, increase cohesiveness, enhance flow, introduce compacting properties, improve durability and enhance strength parameters. Therefore, the role of chemical admixture in concrete is becoming important annually. It is often emphasized that the new admixtures play a more important role in concrete than new cement. Chemical admixtures are inorganic or organic materials. Ordinary Portland Cement, water, and aggregate are added to the combination immediately before or during mixing. These are added into the mix not normally exceeding 5% by mass of cement or cementitious materials. Admixtures react with hydrating cement by physical, chemical or physico-chemical actions. However, sometimes the value of admixtures is comparable to that of the cement in high-performance concrete due to its high dosage. There also are problems related to it including the assembly of stiffer concrete, variation in an initial slump and slump loss using some sorts of cement, large variations within the flow characteristics using a combination of different admixtures, etc. therefore using natural and green admixtures like sugarcane liquid is convenient.

Sugarcane is several species of tall perennial true grasses. It has stout, jointed, fibrous stalks that are rich within the sugar sucrose, which accumulates within the stalk internodes. The plant is 2 to 6 meters (six to twenty feet) tall. All sugarcane species can interbreed and therefore the major commercial cultivars are complex hybrids. Sugarcane belongs to the grass family Poaceae, an economically important spermatophyte family that has maize, wheat, rice, and sorghum, and lots of forage crops. Sugarcane is the world's largest crop by production quantity perspective. Sugarcane juice is that the liquid extracted from pressed sugarcane. It is consumed as a drink in many places.

## II. MATERIALS AND METHOD

### 2.1 MATERIALS:

- 1. Cement:** The Ordinary Portland Cement (OPC) of 53-grade is used in this experiment.
- 2. Coarse Aggregates:** Aggregates which are passing through 10 mm IS sieve and retained on 6.3 mm IS sieve and aggregates which are passing through 20 mm IS sieve and retained on 16 mm IS sieve are used in this experiment.
- 3. Coarse sand:** Sand which is passing through 4.75 mm IS sieve and retained on 2 mm IS sieve is used in this experiment.
- 4. Sugarcane liquid:** It is obtained from fruit market near the experiment area. It is the liquid extracted from pressed sugarcane with the help of fixed rebar, then it is filtered to remove some residual particles from sugarcane fiber. Table 1 shows the chemical analysis of sugarcane liquid.

Sr. No.	Parameter	Result	Standard
1.	pH	5.67	>5.2
2.	Specific Gravity	0.968	0.90 – 0.99
3.	Sugar Content (%)	15.1	-
4.	Total Solid (mg/kg)	67.6	< 83
5.	Water Content (%)	20.44	< 25
6.	Sulphur (mg/kg)	0.08	1.0
7.	Lead (mg/kg)	0.04	0.3
8.	Copper (mg/kg)	0.02	0.5
9.	Acidity (mg/koH/g)	0.70	1.5
10.	Arsenic Acid (mg/kg)	<0.01	0.2
11.	Salinity (ppm)	0.56	1
12.	Conductivity (us/cm)	5.06	-
13.	Iron (mg/kg)	2.80	5

**TABLE 1: Chemical analysis of sugarcane liquid**



## 2.2 METHOD OF EXPERIMENT:

Concrete cubes of size 150 mm x 150 mm x 150 mm are casted having desired compressive strength ( $f'_c$ ) is 30 MPa. Mix Design is done according to IS 456:2000. (1) 9 cubes of 0.03% added sugarcane liquid admixture by weight of cement, (2) 9 cubes of 0.3% added sugarcane liquid admixture by weight of cement and (3) 9 cubes of conventional concrete are casted. Total 27 numbers of cubes are casted. All specimens are cured for 7, 14, and 28 days, then it is tested for its compressive strength in Compression Testing Machine (CTM) as per IS 516:1959.

## 2.3 MIX DESIGN:

Table 2 shows the result of each ingredient of mix design

Ingredients		SSD mix (in kg)	Corrected (in kg)	Batch (0.04 m <sup>3</sup> ) (in kg)
Cement		400	400	16.000
Aggregates	passing through 10 mm IS sieve and retained on 6.3 mm IS sieve	450	443	17.720
	passing through 20 mm IS sieve and retained on 16 mm IS sieve	630	624	24.960
	Coarse Sand	810	778	31.120
Water		160	205	8.200
Sugarcane Juice added in % by weight of cement	For, 0.03%	0.120	0.120	0.0048
	For, 0.3%	1.200	1.200	0.0480
	For, Normal	0	0	0

**TABLE 2: Result of each ingredient of mix design**

## III. RESULTS AND DISCUSSION

### 3.1 Aggregates:

1. Passing through 10 mm IS sieve and retained on 6.3 mm IS sieve:

- 1) Specific gravity =2.81
- 2) Water absorption =1.63%
- 3) Flakiness index =11.28%
- 4) Elongation index = 13.08%
- 5) Combined index of flakiness and elongation =24.36%
- 6) Impact value =7.89%
- 7) Bulk density =1.508 kg/litre

2. Passing through 20 mm IS sieve and retained on 16 mm IS sieve:

- 1) Specific gravity =2.82
- 2) Water absorption =1.21%
- 3) Flakiness index =12.37%
- 4) Elongation index =12.24%
- 5) Combined index of flakiness and elongation =24.61%
- 6) Impact value =9.04%
- 7) Bulk density =1.519 kg/litre

3. Coarse Sand:

- 1) Specific gravity =2.69
- 2) Water absorption =3.09%
- 3) Bulk density =1.700 kg/litre

**3.2 Cement:**

- 1) Fineness =3.38%

**3.3. Concrete:**

1. Slump Cone Value:

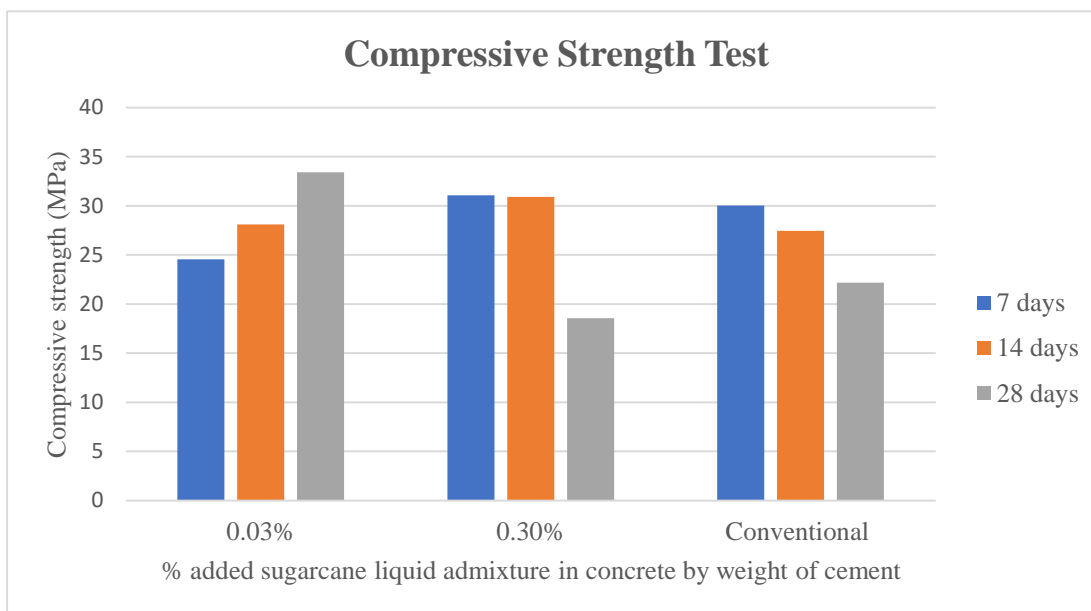
- 1) For 0.03% added sugarcane liquid admixture by weight of cement = 50 mm
- 2) For 0.3% added sugarcane liquid admixture by weight of cement= 60 mm
- 3) For conventional concrete =45 mm

2. Compressive Strength:

Table 3 shows the result of concrete compressive strength of concrete with sugar cane liquid admixture of 0.03% and 0.3% by weight of cement and conventional concrete.

% added sugarcane liquid	Compressive strength (f <sub>c</sub> ) (MPa)		
	7 days	14 days	28 days
0.03%	i. 23.94	i. 27.82	i. 34.21
	ii. 24.12	ii. 29.03	ii. 33.84
	iii. 25.62	iii. 27.51	iii. 32.21
	Avg =24.56	Avg = 28.12	Avg = 33.42
0.30%	i. 30.82	i. 31.05	i. 18.44
	ii. 31.13	ii. 30.88	ii. 18.39
	iii. 31.26	iii. 30.83	iii. 18.88
	Avg = 31.07	Avg = 30.92	Avg = 18.57
Conventional	i. 30.15	i. 26.98	i. 23.03
	ii. 30.03	ii. 27.35	ii. 22.82
	iii. 29.88	iii. 28.02	iii. 20.72
	Avg = 30.02	Avg = 27.45	Avg = 22.19

**TABLE 3: Results of Compressive strength (MPa)**



**FIGURE 1: Compressive strength (in MPa) of cubes 0.03%, 0.3% added sugarcane liquid admixture by weight of cement and conventional concrete at the age of 7 days, 14 days and 28 days**

#### IV. CONCLUSION

This experiment meets conclusions as follow:

- 1) The sugarcane liquid can be used as a 'green' concrete admixture.
- 2) The dosage of sugarcane liquid admixture of 0.03% by weight of cement can perform as 'retarder' which having compressive strength values for 7 and 14 days are 24.56 MPa and 28.12 MPa respectively, on average of 7 days and 14 days compressive strength it reduces about 8.33% in comparison with conventional concrete.
- 3) The dosage of sugarcane liquid admixture of 0.3% by weight of cement can perform as 'accelerator' which having compressive strength values for 7 and 14 days are 31.07 MPa and 30.92 MPa respectively, on average of 7 days and 14 days compressive strength it increases about 7.29% in comparison with conventional concrete.
- 4) It is questioned whether compressive strength values increase or decrease in older ages.

#### ACKNOWLEDGEMENTS

We are using this opportunity to express our gratitude to everyone who has supported us throughout the completion of this project. We are thankful for their guidance, constructive criticism and friendly advice, during the project work. We express our gratitude to Prof. Lissy Jose for giving us an opportunity to carry out project on Effects of Sugarcane Liquid on Concrete Properties. We would also like to thank Prof. Lissy Jose, Head of Civil Department and Dr. Arun Kumar, the Principal for their whole hearted support.

Lastly, we express our gratitude towards all those who directly or indirectly helped us in the completion of our studies.

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## A Literature review on reuse of plastic bottles

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**Abstract-** Plastic are produced from oil that is considered as non-renewable resource. Because plastic has that insoluble property. About 500 years in nature, it is considered as a sustainable waste and environmental pollutant so reusing or recycling of it can be effectual in mitigation of environmental impacts related to it. Building construction using plastic bottle is of low- cost and ecofriendly.

**Keywords—** plastic bottles, rebound hammer, cube test

### I. INTRODUCTION

The packaging and production of plastic bottles is at a large scale. About 100 million ton of plastic waste is generated per year in whole world. It is said globally, PET is the most recycled plastic and the current rate of PET bottles recycling in India is around 80 per cent. They comprise a large portion of the waste to form greenhouse gasses all around the world. So the reuse of plastic waste is more important rather than recycling and is more efficient. This reuse applied to building projects have gained popularity. The plastic bottles, now can be treated as a building block material similar to bricks for small scale construction. This hence will form a secondary function of bottles, to keep them rid from throwing into landfills.

### II. OBJECTIVES

- To use these bottle as replacement of bricks.
- To solve the disposal problem of plastic waste as the generation of plastic waste is on a large scale.
- To compare some characteristics between plastic bottles and brick block.
- To construct bio-climatic structure with plastic bottles.

### III. LITERATURE REVIEW

- **Siti Aishah Wahid (January 2015)-** The comprehensive strength decreases with increasing waste plastic ratios. The virgin (0% plastic waste) sand brick showed the highest value of compressive strength. It seems that the bonding between the plastic particles and the cement paste is weak. However, the mixes of sand bricks and plastics waste seems possible because water absorption less than 15% for all ratio. The reduced compressive strength values of waste plastic bricks mixes show that it can be used only in situations that required low- degree workability.
- **Yogesh Singh, Shubham Papal, Pravin Dhumal<sup>3</sup>, Bhaskar Kunjeer<sup>4</sup>, Prof. Savita Jangale (March 2018)-** Leads to green building construction, innovative use of material with sustainable application. The waste materials which are fine in size, if handled in controlled condition will provide sustainable development. Walls constructed using plastic bottle blocks have been less costly as compared to the regular bricks and also they provide greater strength than bricks.
- **Andrew J. Grattinger, Philip Johnson, Pramodh Sunkari, Matthew Duke and Jonathan Effinger (June 2016)-** Lightweight recycled plastic bottle fill has geo-environmental advantages over geofoam such as reusing a waste material. Not contributing to ground-level ozone, & compatibility with petroleum products. The density is similar to geofoam at approximately 2% of density of soil. Results are encouraging and show the new lightweight fill is approximately half as strong as geofoam, which is similar to strength of soft soil.
- **Ali (November 2014)-** The block of air filled bottles showed slightly higher strength than different types of bottle filling, and has proved to have structural stability with high factor of safety.

- **Z Muyen, TN Barna, MN Hoque (March 2016)-** The bottle bricks were found to be stronger than conventional bricks and concrete cylinders. These are cheaper than conventional bricks. The strength and relatively low cost can lead this material a successful next construction material. The compressive strength increased with increase in size of the bottle.
- **Mojtaba Valinejadshoubi, Masoud Valinejadshoubi, Azin Shakiba (January 2013)-** Use of innovative material with sustainable application, lightweight structure.
- **Himanshu Sharma (April 2017)-** The study comprises of methodology, material used, selection of bottles, strength parameters, sound insulation, light transmission, structural wall stability, thermal strength, cost analysis. The overall result is safe and economical and high strength with durability.

#### IV. CONCLUSION

*Use of plastic as a replacement shall be done at a larger scale, with this the pollution caused from plastic and the problem of disposing the plastic will be solved.*

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# Experimental Study on Use of Silica Fume in Concrete

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**Abstract**—Ordinary Portland cement is use for making the civil structures. Portland cement can partially replaced by silica fume. Silica fume is non-metallic , non-hazardous waste of industries. It is suitable for concrete mix and improves properties of concrete which is compressive strength , flexural strength etc. The main objective of this work is to determine the optimum replacement of silica fume percentages which can be suitably used under the Indian conditions. To achieve the objective various properties of concrete using silica fume have been estimated. Further to define the optimum replacement percentage comparison between the regular concrete and concrete containing silica fume is done .It has been seen that when cement is replaced by silica fume compressive strength increases up to certain percentage 15% replacement of cement by silica fume).But higher replacement of cement by silica fume gives lower strength.

**Keywords**—Cementitious materials, Compressive strength silica fume, partial cement replacements, pozzolana

## I. INTRODUCTION

Silica fume can be used either as a densified or undensified powder, a slurry, as a combination at the concrete mixer, or part of a factory-blended cement. The Report provides detailed information and references for further reading, on the effect of the materials on the fresh and hardened properties of concrete. Generally, the comparisons are made against a concrete made with 100% CEM I (Portland cement).The following terms are used with specific meanings:

- blending: mixing together cementitious components at the concrete mixer or in the cement
- factory (including inter-grinding):
- composite cement: the binder where the cementitious components are blended in a cement
- factory (including inter-grinding)
- combination: the binder where the cementitious components are blended at the concrete mixer
- strength class: the characteristic compressive strength of test cubes at 28-days
- w/c: water/cementitious ratio

The paper provide detailed information and references for further reading, on the effect of silica fume (SF) on the fresh and harden properties of concrete. Generally, a comparisons are made against a concrete made with 100% ordinary Portland cement.

## II. MATERIAL AND METHOD

### 2.1. Materials

#### 2.1.1. Cement:

A cement is defined as a binding material having cohesive as well as adhesive properties.

**2.1.2. Sand:** The black type is a bit unusual. The components of the black-sand can be different from those of the white-sand. It is normally found in 2 forms. One type consists of small pieces of lava and other as a combination of minerals formed by sedimentation. This specific black-sand consist of basalt which is the material produced by a volcanic eruption. The basalts grains get their form by the effect of the wind and wave. These minerals are regularly transported to the beach by the rivers.

**2.1.3. Silica Fume:** Silica fume, also known as micro silica, It is an ultrafine powder collected as a by-product of the silicon and ferrosilicon alloy production and consists of round particles with the average particle diameter of 150 nm. The main field of application is as pozzolanic material for HPC. The mix proportion of silica fume concrete used 3 different percentages of silica fume of 15%, 20% and 25%. Silica fume use in concrete can be found in wet and dry form, dry form was selected as a compound in this study

**2.1.4. Aggregate:** Aggregate which is used in this block of silica fume concrete is coarse aggregate and fine aggregate, Natural and washed recycled aggregates were used in the concrete mixes. In this study, two size fractions of crushed limestone and coarse aggregates were used. One with nominal sizes of 4/12 mm and the other with nominal size of 8/22 mm as the natural coarse aggregate. Size fraction of silica based on natural aggregate (river sand) with nominal sizes of 0/4 mm was used as a natural fine aggregate (sand) in the concrete mixes. The recycled aggregate contain almost totally of crushed concrete rubbles found from building demolition projects. By using laboratory jaw crusher. Demolition waste aggregates were crushed to obtain cumulative grain size distribution curve similar to that prepared with the natural coarse aggregates.

## **2.2. Testing On Aggregate**

Aggregates are very important component of concrete. Various test on aggregates are listed below

### **2.2.1 Aggregate Impact Value**

Test is done to determine the aggregate impact value of coarse aggregates as per IS: 2386 (Part IV) – 1963. The apparatus use for determining aggregate impact value of coarse aggregates is 1) Impact testing machine 2) IS Sieves of sizes – 12.5mm, 10mm and 2.36mm 3) A cylindrical metal measure of 75mm diameter and 50mm depth 4) A tamping rod of 10mm circular cross section and 230mm length, rounded at one end and Oven.

Preparation of Sample:

- i) The test sample must conform to the following grading:
  - Passing through 12.5mm IS Sieve – 100%
  - Retention on 10mm IS Sieve – 100%
- ii) The sample must be oven-dried for 4hrs. at a temperature of 100-110°C and cooled.
- iii) The measure must be about one-third full with the prepared aggregates and tamped with 25 strokes of the tamping rod. A further similar quantity of aggregate must be added and further tamping of 25 strokes given. The measure should be filled to overflow then tamped 25 times and the surplus aggregates struck off using a tamping rod as a straight edge. The net weight of the aggregates in the measure should be determined to nearest gram (Weight 'A').

Procedure to determine Aggregate Impact Value

1. i) The cup of the impact testing machine must be fixed firmly in position on the base of the machine and the whole of the test sample placed in and compacted by 25 strokes of a tamping rod.
2. ii) The hammer should be raised to 380mm above the upper surface of aggregates cup and allowed to fall freely onto the aggregates. The test sample must be subjected to a total of 15 such blows, each being delivered at an interval of not less than one second.

Reporting of Results

2. i) The sample must be removed and sieved through a 2.36mm IS Sieve. The fraction passing through must be weighed (Weight 'B'). The fraction retained on the sieve must also be weighed (Weight 'C') and if the total weight (B+C) is less than the initial weight (A) by more than one gram, the result must be discarded and a fresh test done.
3. ii) The ratio of the weight of the fines formed to the total sample weight must be expressed as a percentage.

Aggregate impact value =  $(B/A) \times 100\%$

### **2.2.2 Aggregate Crushing Value**

Test helps to determine - Aggregate crushing value of coarse aggregates as per IS: 2386 (Part IV) – 1963. The apparatus are 1) Cylindrical measure and plunger 2) Compression testing machine 3) IS Sieves of sizes – 12.5mm, 10mm and 2.36mm.

Procedure to determine Aggregate Crushing Value:

- i) The aggregates passing through 12.5 millimeter and retained on 10 millimeter IS Sieve are oven-dried at a temperature of 100 to 110°C for 3 - 4hrs.
- ii) A cylinder of the apparatus is full in 3 layers, each layer packed with 25 strokes of a tamping rod.

- iii) The weight of aggregate is measured (Weight 'A').
- iv) The surface of aggregates is then flattened and the plunger injected. The apparatus then placed in a compression testing machine and then loaded at a uniform rate as to achieve 40t load in 10 minutes. After this the load is released.
- v) The sample then sieved through 2.36 millimeter IS Sieve and the fraction passing through the sieve is weighed (Weight 'B').
- vi) Two tests must be conducted.
- Aggregate crushing value =  $(B/A) \times 100\%$

### 2.2.3. Water Absorption :

Test helps to determine the water absorption of coarse aggregates as per IS:2386 (Part 3) – 1963. For this test a sample not less than 2000 grams should be used. The apparatus are 1) Wire basket – perforated 2) electroplated or plastic coated with wire hangers for suspending it from the balance 3) Water-tight container for overhanging the basket 4) Dry soft absorbent cloth – 75cm x 45cm (2 numbers) 5) Shallow tray of minimum 650 sq.cm area 6) Air-tight container of a capacity similar to the basket and Oven.

Procedure to determine the water absorption of Aggregates:

- i) The sample must be thoroughly washed to remove finer particles and dust, drained and then placed in the wire basket and absorbed in distilled water at a temperature between 22 and 32°C.
- ii) After absorption, the entrapped air must be removed by lifting the basket and allowing it to drop 25 times in 25 seconds. The basket and sample must remain immersed for a period of 24 + 1/2 hrs afterwards.
- iii) The basket and aggregates must then be removed from the water, allowed to drain for a few minutes, after which the aggregates must be gently let down from the basket on to one of the dry clothes and softly surface-dried with the cloth, transferring it to a second dry cloth when the first would remove no further moisture. The aggregates must be spread on the second cloth and exposed to the atmosphere away from direct sunlight till it appears to be completely surface-dry. The aggregates must be weighed (Weight 'A').
- iv) The aggregates must then be placed in an oven at a temperature of 100 to 110°C for 24hrs. It must then be removed from the oven, cooled and weighed (Weight 'B').

Formula for Water absorption =  $[(A - B)/B] \times 100\%$

### 2.3. Mix Design

**Table1**  
**Mix Design**

Sr. No.	Replacement of silica fume with cement	Cement Content (kg/m <sup>3</sup> )	Silica Fume Content (kg/m <sup>3</sup> )	10 mm Aggregate (kg/m <sup>3</sup> )	20 mm Aggregate (kg/m <sup>3</sup> )	Crushed Sand (kg/m <sup>3</sup> )	Water (kg/m <sup>3</sup> )	Admixture (kg/m <sup>3</sup> )
1	0%	380	00	359	924	711	160	3.8
2	15%	323	57	359	924	711	160	3.8
3	20%	304	76	359	924	711	160	3.8
4	25%	285	95	359	924	711	160	3.8

### 2.4. Results And Discussion

#### 2.4.1 Tests on aggregate:

Aggregate Impact Value was recorded as 15.14%.

Aggregate Crushing Value was recorded as 23.64%

Aggregate water absorption was recorded as 0.206%

#### 2.4.2 Compressive Strength of concrete

Sr No	ID Mark of Specimen	Age of Specimen (Days)	Weight, (Kg)	Maximum Load , (KN)	Crushing Strength, (N/mm <sup>2</sup> )	Crushing Strength, (Kg/cm <sup>2</sup> )
1	15% Silica Fume	7	8.452	581.2	25.83	263.3
2		7	8.426	577.8	25.68	261.8
3		7	8.330	589.1	26.18	266.9
Average Value =					25.90	264.0
Sr No	ID Mark of Specimen	Age of Specimen (Days)	Weight, (Kg)	Maximum Load , (KN)	Crushing Strength, (N/mm <sup>2</sup> )	Crushing Strength, (Kg/cm <sup>2</sup> )
1	20% Silica Fume	7	8.378	488.3	21.70	221.2
2		7	8.420	487.5	21.67	220.9
3		7	8.354	491.2	21.83	222.5
Average Value =					21.73	221.5

Sr No	ID Mark of Specimen	Age of Specimen (Days)	Weight, (Kg)	Maximum Load , (KN)	Crushing Strength, (N/mm <sup>2</sup> )	Crushing Strength, (Kg/cm <sup>2</sup> )
1	25% Silica Fume	7	8.432	433.8	19.28	196.5
2		7	8.364	427.9	19.02	193.9
3		7	8.448	425.1	18.89	192.6
Average Value =					19.06	194.3

**Table 3**  
**COMPARISON BETWEEN MAIN METHODS**

	PAPER	ADVANTAGES	DISADVANTAGES
1	Concrete mix proportioning using micro silica	Silica fume in concrete increase the compressive strength of concrete.	Too much silica fume cause the concrete to become gluey and thus reduce the workability.
2	Study of Silica fume as Partial Replacement of Cement in Concrete	Silica fume in concrete increases the tensile strength of concrete and hence there is increase in flexural strength.	Silica fume concrete shrinkage rate is large especially when early dry shrinkage and easy to make crack in the use of silica fume concrete disturb/effect the overall strength.
3	Investigating effects of silica fume into cement concrete	silica fume in concrete has increased the strength and durability at all ages when compared to normal concrete . Silica fume reduces segregation and bleeding.	Silica fume requires a high amount of water and needs to be used with a superplasticizer.
4	Experimental study of Silica fume as Partial Replacement of Cement in Concrete	Silica fume is a good replacement of cement. The rate of strength gain in silica fume concrete (SFC) is very high.	Silica fume concrete (SFC) workability is poor and is not easy to make the concrete vibrating close grained as well as not easy to plaster.

### III. CONCLUSION

The use of silica-fume give rise to increase in fresh and hardened properties of concrete, with less cement and concrete having better resistance for freezing and thawing than ordinary concrete, durability is enhanced through significant improvement in resistance to chemical attack. Aggregate influence, to a great extent, the load transfer capability of structure. Not only that aggregates must and strong and durable, they must also possess proper shape and size to make the structure act monolithically. Aggregates are tested for impact, crushing and water absorption.

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## Design of Interlocking Paver Blocks

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**Abstract**— The rapid failure of a heavy duty concrete block pavement structure in projects in India and around the world.. This paper reports on the findings of the subsequent engineering failure study as well as the engineering remedies, and aims to provide better solution to prevent similar future failures. The main contributing factors to the rapid failures were identified to be a combination of incorrect and out of specification sand bedding thickness, incorrect sand bedding material, incorrect filler sand and deficient compaction of the paving block layer. These construction defects ultimately caused shear and differential settlements in the sand bedding layer and subsequent water infiltration into and overstressing of the cement stabilized subbase layers. The rehabilitation actions were designed to ensure continual operational usage of the site and maximum utilization of the original pavement structure. This paper proposes a new design of interlocking paver blocks where differential settlement and breakage can be controlled to a greater extent.

**Keywords**— Failure of pavement structure, sand bedding thickness.

### I Introduction

Block paving also known as brick paving is a commonly used decorative method of creating a pavement or hardstanding. The concrete paving bricks are a porous form of brick formed by mixing small stone hardcore, dyes, cement and sand and other materials in various amounts. In regular design of paver blocks problems faced can be visualized easily. This topic is actually a study on pavement of Paver blocks and a proposal of new design. Growing cities are increasingly adopting pavement of paver blocks which increase high demand of paver blocks. This wide use of it increases failures occurred in pavement of paver blocks. Design of interlocking helps in preventing the settlement of blocks due to undulation occurred in soil base. The fast urban development has introduced such modern techniques of pavement. Advancement in such techniques need to be implemented to overcome such problems.

Adopted design is totally new design which can be said as an experiment of a new design of paver blocks. In an effort to address the challenges of climatic uncertainties and continuous growth in flood plain, flood control project is implemented. Some reviews of different authors are expressed are mentioned in the report. Material used in paver blocks is concrete. Amount of each material is as per the IS Specification.

IS 15658: 2006 mentions details about the design of Paver Block. New proposed design will try and address these failures and their underlying causes. In the second phase of this project. we intend to cast pavers as per specification and assemble them as per our design and test them for different loads.

Concrete paver blocks were first introduced in Netherlands in the fifties. The pavements in which non-interlocking blocks are used are designated as "Concrete block pavements" (CBP) or non-interlocking CBP and those in which partially or fully interlocking blocks are used are designated as 'interlocking concrete block pavements' (ICBP). Interlocking paver blocks are installed over a compacted stone sub base and leveling bed of sand. Stress cracking and degradation of the surface is minimized because the numerous joints act as the means for load transfer.

## II Literature Review

### 2.1 Introduction

This chapter contains five research papers on Design of Interlocking Paver Blocks. The problem on existing type of paver blocks call for a new design which will mitigate the ill effects Different views of authors from different papers regarding this topics are given below.

### 2.2 Papers studied

#### 2.2.1 Study on Failure of Interlocking Pavement

Usual modes of failure Interlock pavements fail due to several reasons. Mostly failure may occur due to improper compaction of base, not providing suitable thickness for base or sub-base course, improper filling of filler sand in between the gaps etc. Drainage and cross slope is also an important factor regarding the serviceability of the interlock pavement. If proper drainage is not provided water will get puddled over the pavement and the sub surface layers will get washed off, hence cross slope of 3% must be provided surface water to be drained off. We visited several paver block sites where failure is severe. Following are the some of the usual modes of failures which we found in the visited pavement sites.



Fig - 2.1 - Paver are uneven and stay at different heights



Fig - 2.2 - Water puddling on interlock pavement

This mode of failure occurs when there is no proper edge restraints provided to hold the pavement tightly together or if there is any leak in the underground pipe drains provided in that area, the bedding sand and base course will get washed off and the pavers will fall off.



Fig-2.3- The border pavers look like they're falling off

This mode of failure occurs when there is no proper edge restraints provided to hold the pavement tightly together or if there is any leak in the underground pipe drains provided in that area, the bedding sand and base course will get washed off and the pavers will fall off.



Fig -2.4- Pavers are uneven and tipping

This occurs when filler sand is not swept in between all the joints of paver blocks. Filler sand is very important in completing the interlocking pattern of the pavement and also for load transfer throughout the pavement. Heavy rain can wash off the filler sand in between the paver blocks. Filler sand helps in holding the pavement together.

### 2.2.2 Analysis and Design Study of Concrete Paver Blocks with Feedback Loop

The surface of ICBP comprises concrete blocks bedded and joined in sand. It transfers the traffic loads to the substructure of the pavement. The load spreading capacity of concrete blocks layer depends on the interaction of individual blocks with joining sand to build up resistance against applied load. The shape, size, thickness, laying patterns are important block parameters which influence the block parameters.

Some early plate load studies (Knapton 1976, Clark 1978) suggested that load spreading ability was not significantly affected by block shape. Later accelerated trafficking studies (Shackel 1993) established that shaped blocks exhibited smaller deflection than rectangular blocks of similar thickness installed in same laying pattern under same applied load. (Shackel 1980, Jacobs and Houben 1988) found that, in their early life, block pavements stiffen progressively with an increase in load repetitions. However, Shackel clarified that the progressive stiffening did not influence the magnitude of resilient deflection of ICBP. Elastic deflection is decreased with an increase in number of load repetition, rather than an increase, as observed in flexible and rigid pavements.

### 2.2.3 Strength and Durability of Concrete Paver Block

#### 1. Method for determination of water absorption

**Saturation** The test specimen shall be completely immersed in water at room temperature for 24+2hr. The specimen then shall be removed from the water and allowed to drain for 1 min by placing them on a 10mm or coarser wire mesh. Visible water on the shall be removed with a damp cloth. The specimen shall be immediately weighed and the weight for each specimen noted in N to nearest 0.01N. **2. Drying** Subsequent to saturation, the specimen shall be dried in a ventilated oven at 107+7 °C for not less than 24hr and until two successive weighing at intervals of 2hr show an increment of loss not greater than 0.2% of previously determined mass of specimen shall be recorded in N to the nearest 0.01N.

#### 2. Methods for determination of tensile splitting strength

The specimen shall be placed on testing machine with the packing pieces on upper face and bed face, in contact with the bearers. It shall be ensured that the packing pieces and the axes of the bearers are in line with the splitting section shall be chosen according to the following order of priority.

#### 3. Method for determination of compressive strength Procedure

The dimension and plan areas of the specimens shall be determined as described in IS 15658:2006. The blocks shall be stored for 24hrs in water maintained at a temperature of 200C. The bearing plates of the testing machine shall be wiped clean. The specimen are aligned with those of the bearing plates. The load shall be applied without shock and increased. Continuously at a rate of 15N/mm<sup>2</sup>/min Until no greater load can be sustained by the specimen or delamination occurs. The maximum load applied to specimen shall be noted in N.

#### 4. Method for determination of abrasion resistance

#### 2.2.4 Interlocking Concrete Paver Blocks



Fig -2.5-Interlocking Pavers Blocks

An Easy Approach for Road Construction Interlocking Concrete Block Pavement (ICBP) has been extensively used in a number of countries for quite sometimes as a specialized problem-solving technique for providing pavement in areas where conventional types of construction are less durable due to many operational and environmental constraints. ICBP technology has been introduced in India in construction, a decade ago, for specific requirement viz. footpaths, parking areas etc. but now being adopted extensively in different uses where the conventional construction of pavement using hot bituminous mix or cement concrete technology is not feasible or desirable. The paper dwells upon material, construction and laying of concrete block pavement as a new approach in construction of pavement using Interlocking Concrete Paver Blocks.

Concrete paver blocks were first introduced in Holland in the fifties as replacement of paver bricks which had become scarce due to the post-war building construction boom. These blocks were rectangular in shape and had more or less the same size as the bricks. During the past five decades, the block shape has steadily evolved from non-interlocking to partially interlocking to fully interlocking to multiply interlocking shapes. Consequently, the pavements in which non-interlocking blocks are used are designated as Concrete Block Pavement (CBP) or non-interlocking CBP, and those in which partially, fully or multiply interlocking blocks are used are designated as Interlocking Concrete Block Pavement (ICBP). CBP/ICBP consists of a surface layer of small-element, solid un-reinforced pre-cast concrete paver blocks laid on a thin, compacted bedding material which is constructed over a properly profiled base course and is bounded by edge restraints/kerb stones. The block joints are filled using suitable fine material. A properly designed and constructed CBP/ICBP gives excellent performance when applied at locations where conventional systems have lower service life due to a number of geological, traffic, environmental and operational constraints [1-8]. Many number of such applications for light, medium, heavy and very heavy traffic conditions are currently in practice around the world.

##### **Advantages and Limitations**

There are many distinct features of ICBP as compared to the conventional methods of pavement construction and hence make it a suitable option for application in the specified areas [7 & 10]. Some of these are:

- Mass production under factory conditions ensures availability of blocks having consistent quality and high dimensional accuracy.
- Good quality of blocks ensures durability of pavements, when constructed to specifications.
- ICBP tolerates higher deflections without structural failure and will not be affected by thermal expansion or contraction.
- ICBP does not require curing, and so can be opened for traffic immediately after construction.
- Construction of ICBP is labor intensive and requires less sophisticated equipment.

- The system provides ready access to underground utilities without damage to pavement.
- Maintenance of ICBP is easy and simple and it is not affected by fuel and oil spillage.
- Use of coloured blocks facilitates permanent traffic markings.
- ICBP is resistant to punching loads and horizontal shear forces caused by maneuvering of heavy vehicles
- Low maintenance cost and a high salvage value ensures low life cycle cost.

### **III Methodology**

#### **3.1 Introduction**

In this chapter we will be designing paver blocks and their patterns for increasing efficiency of their use so as to prevent failures and reduce accidents.

#### **3.2 Materials**

- 1)Aggregates
  - a) coarse aggregates: 10-12 MM (IS 15658 2006)
  - b) fine aggregates : Crushed Sand
- 2) Cement : grade 43 & 53
- 3) Water

#### **3.3 Moulding**

Preparation of moulds and casting of paver blocks as per design and specifications. The mould will be made of MS plate 2.5mm thick which will be supported by ms flat plate of 50mm width and 5mm thickness. The mould will be made in exact shape of the paver block.

#### **3.4 Tests**

- 1) Pre assembly test 1.1) Compression strength test (IS 15658 2006) 1.2) Abrasion test (IS 15658 2006)
- 2) Post assembly test 2.1) Water tightness test
- 2.2) Visual examination

### **IV SUMMARY**

Paver blocks are highly preferred all over India and abroad. Visual analysis of different existing paver blocks was done in the above study in which we noted all the failures occurring in existing paver blocks. New proposed design will try and address these failures and their underlying causes. Our study shows that with better knowledge of the practical usage of the blocks and better knowledge of the defects occurring in the blocks a very suitable mix-design can be carried out to eliminate all the problems occurring in the interlocking paver blocks. Data of corner breaking and compressive failure of the blocks is accumulated from the different sites of same mix-design. This helped us to proceed and determine the failures occurring in the blocks. Hence, with enough knowledge of the usage and defects occurring in the blocks a very well worked out design mix for making concrete paver blocks is possible for maximum lifespan of the blocks.



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# Sustainable Local Mobility Plan to Improve Walkability (Bhiwandi)

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**Abstract**— Sustainability is the ability to exist constantly. Sustain can mean maintain, support or endure. Achieving sustainability will help the Earth to have a good healthy future life. The development of various technology and faster growth has lead to many traffic problems in cities. The focus has mainly been on greater road capacity, the design of high-speed roads in the city or providing a good car communication. This is known as the automobile-oriented attitude. Walkability is a measure of how good an area is to walk. Walkability has health, environmental, and economic benefits. The growth of cities is uncontrollable. A brief review has been done on already existing government initiatives. A Mobility Plan on a local scale intends to analyze and solve problems of a neighborhood that sometimes are not visible at a city scale. This paper presents the methodology to develop a Mobility Plan on a Local Scale.

**Keywords**— Local Mobility Plan, Neighbourhood, Street architecture, Walkability, Walk score.

## I. INTRODUCTION

The growth of cities is uncontrollable but guided and shaped by human interaction and by physical infrastructure. However, urban expansion round the world is characterized by uncontrolled urban sprawl resulting in inefficient use of space and natural resources. Interactions between humans and opportunities for innovations are constrained by minimal density and social segregation. At this juncture, urban planning includes a critical role to play in improving people's wellbeing and therefore the quality of life. During the last decade Mobility Plans are developed in many cities of the planet . These studies evaluate the configuration of the present mobility status and develop some interventions so as to resolve particular problems at a city scale, sometimes making use of legal instruments such as regulation. A Mobility Plan on a local scale intends to analyze and solve problems of a neighbourhood that sometimes are not visible at a city scale. These types of studies are specially oriented to pedestrians, residents parking and therefore the livable communities' concept. It has been acknowledged that transport should be good not only for drivers, but also people and their public health, also as for the environment and therefore the economy. As such, it's connected with sustainable transport policies. The idea of cities being good for pedestrians has led to the spread of the phenomenon referred to as "walkable cities". Its fundamental principle is to make public urban spaces that are available for pedestrians and friendly for walkers.

## II. AIM OF STUDY

To give a brief review of urban planning initiatives taken by government of India towards a sustainable urban mobility plans and to prepare a mobility plan on local scale to improve walkability and present idea of walkability.

## III. OBJECTIVE OF STUDY

- To prepare a local area mobility plan by carrying out necessary surveys
- To prepare maps for the same by having a GIS approach
- To allot a walk score for each road on basis of surveys carried.

#### IV. SCOPE OF WORK

- Improving the amount of safety on the streets.
- Decreasing the environmental footprint and reducing environmental pollution, traffic, noise or vibrations.
- Improving the attractiveness of public spaces, which will help to support local businesses and tourism, in addition, encourage investment.
- Decreasing spending on construction, repairs of road infrastructure.
- Improving the health of residents and prolonging their life.
- Balancing the transport system load.

#### V. METHODOLOGY

The entire process or methodology is planned in stages. Ideally there are four stages which has specific task and work included which may then bear the estimated output.

**TABLE 1**  
**METHODOLOGY AS PER STAGES**

Sr. No	Stages	Task and work included	Output
01.	Data Collection	Assessment of the study area and development of some field work. Collect studies and reports(i.e. statistical data) Mapped data in Geographic Information Systems (GIS)	Site Visit & Report 1.StatisticalData 2. Transportation studies Buildings, road, etc. in digital format
02.	Analysis	Transport generation factors, Transport Supply, Transport Demand, Mobility Patterns and Local Authority Expectations	Study Area Diagnosis Problems/Opportunities
03.	State of art	Scientific papers, Handbooks, Case Studies, Regulation Policies, Technical solutions	Custom solutions to Problem/ Technical solutions Opportunities
04.	Intervention Proposals	Pedestrian Interventions, Transit Interventions, Parking Interventions	Results and Impacts

#### VI. ILLUSTRATIVE EXAMPLE OF BHIWANDI

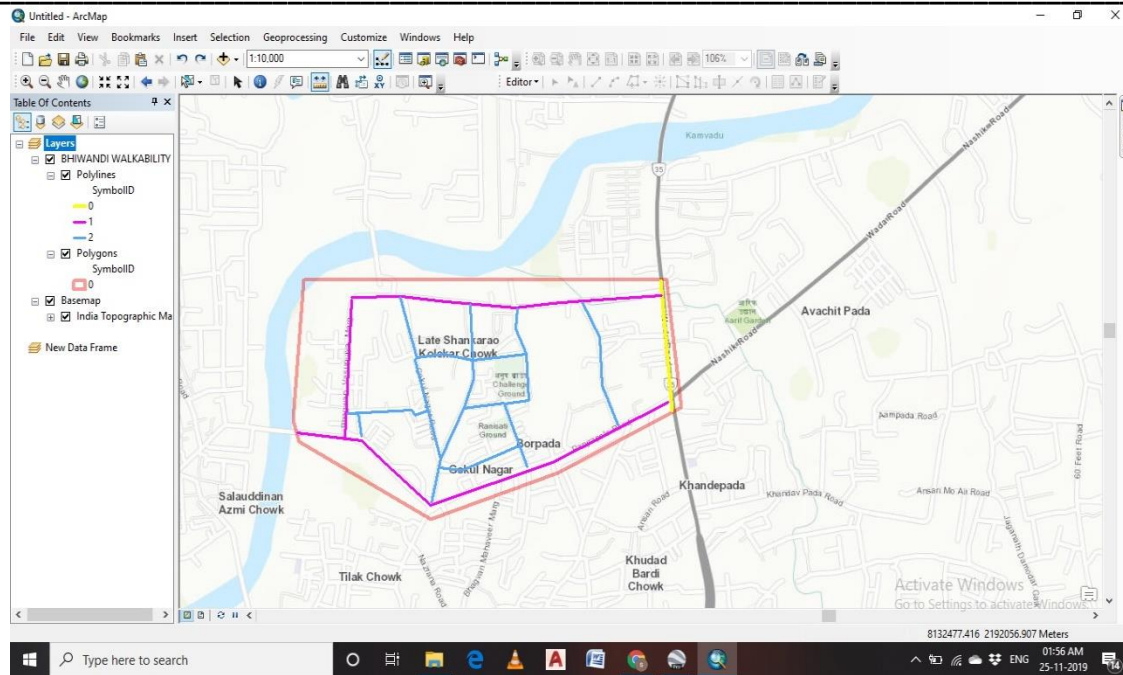
Bhiwandi Nizampur is Municipal Corporation city. It is in district of Thane, Maharashtra. The Bhiwandi Nizampur Municipal Corporation has population of 709,665 of which 415,339 are males while 294,326 are females as per report released by Census India 2011. The population density of Bhiwandi is 26,871 persons per square kilometer. Bhiwandi has been developing as an industrial hub for the textile industry in the past, and all industries and logistics sectors in recent times.

City –Bhiwandi  
 Place- Ajay nagar,Gokul nagar  
 Area in sq.km –0.63



**FIGURE 1: Area Boundary**





**FIGURE 2: Drafting on ArcGIS**



**FIGURE 3: Street Network**

### walkability survey

1. What is the purpose of your trip to \_\_\_\_\_

2. How did you get here?  
Check all that apply.

☐ walking  
☐ transport  
☐ own vehicle  
☐ Other: \_\_\_\_\_

### Walking behavior -In gene

3. how much time you generally spend walking?  
\_\_\_\_\_

4. what is the purpose of walking gen  
Check all that apply.

☐ Exercise  
☐ work  
☐ Other: \_\_\_\_\_

5. what will encourage you more for walking?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

6. Additional feedback  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Demographic information

7. Gender  
Mark only one oval.

☐ Female  
☐ Male  
☐ Prefer not to say  
☐ Other: \_\_\_\_\_

8. Age  
Check all that apply.

☐ 18-25  
☐ 26-40  
☐ 40-55  
☐ 55 above  
☐ Other: \_\_\_\_\_

9. Are you resident of this area  
Mark only one oval.

☐ Yes  
☐ No

10. purpose of visit in this area  
Mark only one oval.

☐ home  
☐ work  
☐ social  
☐ Other: \_\_\_\_\_

**FIGURE 4: Sample Survey Questionnaire**

## VII. CONCLUSION

To claim that a city is “walkable”, it is necessary to meet four basic conditions: security, functionality, attractiveness & convenience. Measuring the effectiveness of streets for pedestrians is connected with an indicator referred to as the “Walk Score”. Walk Score may be a number between 0 to 100 points and a mean 0-24 points - car-dependent (almost all works require a car), 25-49 points - car-dependent (most works require a car), 50-69 points - somewhat walkable (some works can be accomplished on foot), 70-89 points - very walkable (most works can be accomplished on foot), 90-100 points – “walker’s paradise” (daily works do not require a car).

Features(On basis of walkability)	Range	Distribution	Weightage
1.Footpath Width of footpath	0.5 M to 7.5 M		
2.Parking Footpath parking	no. of vehicles (ratio of length of footpath to no. Of vehicles present)		
3.Unevenness 3.1 Broken missing slab 3.2 Uneven footpath (because of propertyaccess)	Length of unevenness 0.5 to max. (whole footpath not usable)		
4. Obstacles 4.1 Trees 4.2 Garbage piles 4.3 Boards hoardings 4.4 Construction debris 4.5 Road work 4.6 Hawkers encroachment 4.7 Electric lines (vertical obstruction) Others	1.Garbage piles and construction debris considered lowest weightage. 2.Hawkers considered lower as compared to construction debris 3.Electric lines,vertical obstruction and trees are considered highest weightage 4. Others (4w parked obstructing whole footpath)		

**FIGURE 5: Walk score Analysis**

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## Waste-water treatment by phytorid technology

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**Abstract**—Constructed wetlands are artificial wastewater treatment system of shallow experimental tanks, ponds or channels that are planted with locally available wetland plants. They work on natural capacity of plants to treat wastewater from different sources. In view of rising concern about pollution of water bodies due to discharge of waste in them, it is necessary to initiate alternative thinking as conventional methods through STPs (sewage treatment Plants) had limited success. In recent years the application of specifically designed wetland based technology (popularly known as Phytorid technology) for treatment of wastewater-municipal, urban and agricultural, is becoming widely acceptable. It treats the wastewater in natural manner without the use of Chemicals. Phytorid technology is an improved wetland system for treatment of wastewater. The main objective of present research work is to provide and popularize a simple, feasible, practically sound, ecofriendly and cost effective technology for wastewater treatment. Phytorid technology is such a type of system, which reduces the impact of sewage and converts into useful water for gardening and irrigation purpose.

**Keywords**—Constructed wetland, Reed-bed technology, Root-zone technology, Phytorid technology, Phytorid species.

### I. INTRODUCTION

Water is needed in all aspects of life and hence forms an essential part of human well-being. Nationally and internationally organizations and institutions are making efforts to provide adequate supply of potable development. India has witnessed a rapid increase in the urban population during last few decades. All towns and cities are augmenting water supplies to meet the increasing water demand. But the lack of adequate wastewater treatment facilities is resulting untreated sewage disposal into lakes, river and other water bodies. The cumulative result of unmanaged wastewater that the system cannot cope with has negative effects on the health of both people and ecosystems and is a challenge. The fact is that Indian cities have the opportunity to reinvent sewage paradigms and they can leapfrog into new ways of dealing with wastewater pollution is a major global problem which requires continuous evaluation and special attention. Water pollution affects the entire biosphere-plants and organism living in these water bodies. It not only affects individual species but affects the entire biological community as a whole. Primary water source is polluted to a great extent through discharge of harmful substances. It is estimated that every Cubic meter of contaminated water once discharged into water bodies will contaminate further 8 to 10 cubic meter of pure water. Phytorid technology is such a type of constructive wetland. It was developed by National Institute of Environmental Engineering Research (NEERI) and Council of Scientific and Industrial Research (CSIR) in the year 2007, based on 5 years of research and development and 7 years of field experimentation on various plants. Use of plant species along with their root system along with the natural attenuation processes can be combined together to get the Phytorid Technology.

Problem concerning water sanitation stem from the rise in urban migration and the practice of discharging untreated wastewater. The uncontrolled growth in urban areas has made planning and expansion of water and sewage systems very difficult and expensive carry out. In addition, many of those moving to the city have low incomes, making it difficult to pay for any ware system upgrades.



It is common practice to discharge untreated sewage directly into water bodies of water or put onto agricultural land, causing significant health and economic risks. Water-related diseases include dengue, filariasis, malaria, and yellow fever etc.

- To treat the Waste Water.
- To reduce the spread of diseases cause by pathogens organisms.
- To reduce the threat of Water pollution.
- To Survey the selected site.
- To collect the waste water sample from these respective resources.
- To perform physical test on waste water samples.
- To collect the various plants species.

## II. LITERATURE REVIEW

### 2.1 "Root-zone Technology", Binita Desai, and Pratibha Desai, in International Journal of Pharmacy & Bioscience, (2014)

The main objective of this study was to identify energy-efficient design parameters for a conventional STP and comparison of construction, operation and maintenance cost of STP by phytoid technology. The mechanism of the treatment process involved: extraction of contaminants from soil or groundwater, degradation of contaminants by 12 various biotic or abiotic processes. , breakdown action carried out by microorganisms dwelling at the root zone degrade /breakdown pollutants. , filtration process / biofilm formed at surface of pebble /gravel / coarse sand bed. , processes like adsorption / absorption in soil strata or their combination. Vertical and horizontal flow patterns & another possible mechanism for contaminant degradation is metabolism within the plant.

### 2.2 "Using Box-Behnken experimental design", Mhaske, A.R., Taley, International Journal of Innovative Research in Science, Engineering and Technology, 1 January 2017

Removal of phosphorous (P) from sewage water by phytoid sewage treatment plant was studied at Agriculture College, Maharajbag, Nagpur to examine the efficacy of the phytoid sewage treatment plant in P-concentration removal from the sewage water, and to determine the optimum condition using response surface methodology during 2013-14. A Box-Behnken model was employed as an experimental design. The effect of three independent variables hydraulic loading

or flow (50 – 150 m<sup>3</sup>. d<sup>-1</sup>), dilution (10 - 80 %) and spatial length (16 - 100 %) was studied on P-concentration removal from the sewage water in bench mode of the experiment. The optimal conditions of the P-removal were found to be flow: 55.74 m<sup>3</sup> d<sup>-1</sup>, dilution: 40.59 per cent and spatial length: 100 per cent. Under these experimental conditions, the experimental P concentration removal obtained was 1.321 mg L<sup>-1</sup>. The proposed model equation using the RSM has shown good agreement with the experimental data, with a correlation coefficient (R<sup>2</sup>) of 98.21 per cent. The result showed that optimised condition could be used for the efficient removal of the P from the sewage water.

### 2.3 "Application of Natural Methods for Sewage Treatment and Polishing of Treated Waste-water", R. Biniwale, Journal for Application of Natural Methods, 2012

Phytoid Treatment Systems have been found to be effective in treating BOD, TSS, N and P as well as for reducing metals, organic pollutants and pathogens. The principal pollutant removal mechanisms in treatment systems include biological processes such as microbial metabolic activity and plant uptake as well as physio-chemical processes such as sedimentation, adsorption and precipitation at the water-sediment, root sediment and plant-water interfaces. Microbial degradation plays a dominant role in the removal of soluble/colloidal biodegradable organic matter in wastewater. Biodegradation occurs when dissolved organic matter is carried into the biofilms that attached on plant root systems and surrounding media by diffusion process. In further development after filing of the patent 2003, further improvement was undertaken to reduce the residence time of the overall system as also to improve the technology. This development involved use of isolated bacterial consortia in the system to mainly reduce the Suspended Solids load. It also leads to reduction in BOD as well. Suspended solids are removed by filtration and gravitational settlement. A pollutant may be removed as a result of more than one process at work. Conversion of nitrogen compounds

(Nitrification / Denitrification) occurs due to planned flow of wastewater through anaerobic and aerobic zones. Phosphorus is present in wastewaters as Orthophosphate, Dehydrated Orthophosphate (Polyphosphate) and Organic Phosphorus. The conversion of most Phosphorus to the Orthophosphate forms is caused by biological oxidation. Although plant uptake may be substantial, the sorption of Phosphorus (Orthophosphate P) by anaerobic reducing sediments appears to be the most important process. Pathogens are removed mainly by sedimentation, filtration and absorption by biomass and by natural die-off and predation. Evapotranspiration slows water flow and increases contact times, whereas rainfall, which has the opposite effect, will cause dilution and increased flow.

### III. Material and Method

#### 3.1 Materials

Coarse aggregate, stone chippings, phytoid plant, glass tank, PVC pipes, aerator etc. materials are used for making a phytoid plant.

##### 3.1.1 Coarse aggregate

Coarse aggregate of size 40 mm and 20 mm diameter are used. The main objective of using aggregates is to provide support to the roots of the plants and filtration of the waste water also to allow easy passage of water through the tank.

##### 3.1.2 Phytoid Plants

###### A] Reed

- Species – *Phragmites* spp.
- *Phragmites* as a native plant in North America.
- The erect stems grow to 2-6 meters.

###### B] Cattail

- Species – *Typha latifolia*.
- It is found as a native plant species in North and South America, Europe, Eurasia, and Africa.
- The plant is 1.5 to 3 meters high and it has 2–4 cm broad leaves.



**FIGURE 1: Common Reed**



**FIGURE 2: Cattail**

##### 3.1.3 Stone Chippings

The smallest granite aggregate fractions are used, besides the road construction, for decoration and paving paths, for covering sports grounds and children's playgrounds.

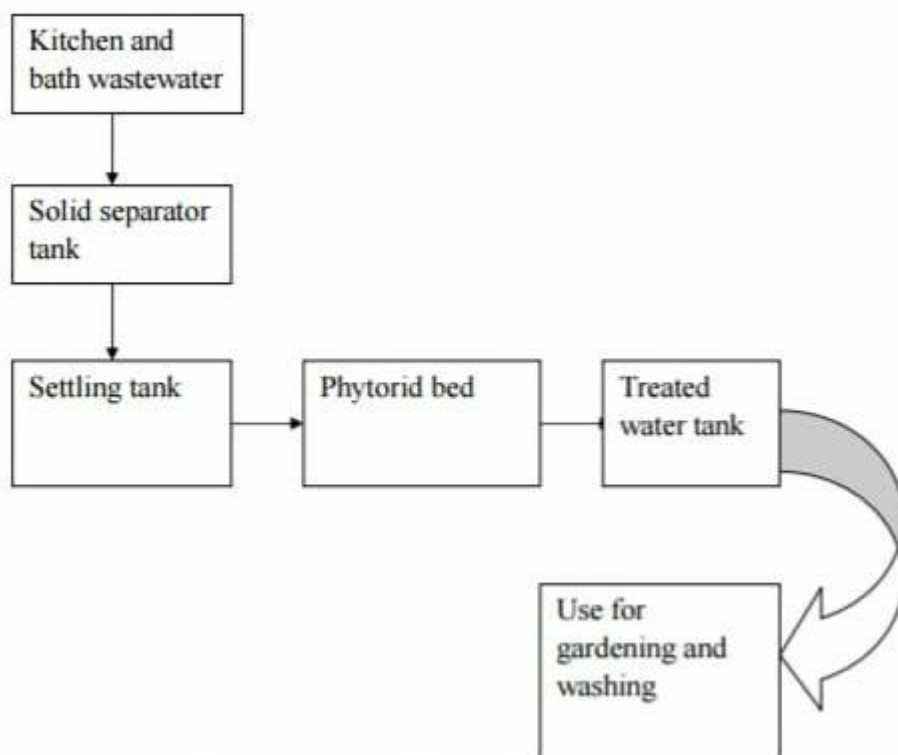
### 3.1.4 Aerator

A fish tank aerator was used to provide the air supply in the bed, through a perforated PVC pipe.

### 3.1.5 Glass Tank

Tank is of rectangular shape of size 0.6m x 0.3m x 0.4m. According to the weight of aggregates and volume of sewage the thickness of glass is determined.

## 3.2 Methodology



**FIGURE 3: Flow Chart of Phytoid System**

### 3.2.1 Working model

1. Firstly the waste water is collected from sources and stored in the sedimentation tank where sedimentation of suspended solids takes place under the process of anaerobic decomposition.
2. After this waste-water is allowed to enter in the phytoid tank by regulating valve with designed velocity. Once the water is passed through the root zone of canna indica actual treatment process is started.
3. When roots of plants come in contact with wastewater they uptake the nutrients present in waste water which are in form of nitrates, potash etc and used as food.
4. Simultaneously oxygen is added in waste water from roots due to process of photosynthesis and hence B.O.D removal takes place after the 24 hrs detention period treated water is collected into storage tank.
5. Treated water can be either send for tertiary treatment or directly used for gardening, etc.

### 3.2.2 Design of Phytoid Bed

**Volume of sewage:** 30 litres.

**Source:** At post Chikhle, vadakati pada, Dahanu

**Volume of phytoid tank :** 60 litres. It depends upon quantity of sewage. (Note: Volume of tank equals to two times the volume of sewage with 24 hours, detention time).

**Use of baffle walls:** Baffle walls are provided to increase the travel time in order to maintain the detention period i.e. 24 hours, they are spaced at 12 cm, 18 cm, 18 cm, 12cm from inlet to outlet respectively.

**Size of phytoid tank:**

Depth of tank = 50 cm

Length of tank = 60 cm

Breadth of tank = 30 cm

**Sedimentation tank:** Volume of the tank is equals to volume of sewage (i.e. 30 lit.)

**Aggregate:** Aggregates of two different sizes are provided in three different layers. Number of layers are decided from depth of tank. Three layers of aggregates are provided of depth 12mm, 13mm, 15 mm from bottom to top of size 40 mm, 20 mm respectively and third layer of stone chippings.

## IV. OBSERVATION AND RESULT

Collection of waste water from sink and bathroom and it was collected in 1 litre plastic bottle. The plant species are collected from Patil Nursery Mulund (E). The species which are collected from nursery are Reed, Cattail and Seed of alfalfa. Chemical characteristics of waste water was tested by Varni Lab.

**TABLE 1**  
**RESULTS OF TEST ON WASTEWATER SAMPLE**

Sr. No.	Parameter	Value of untreated water	Permissible value of treated water
1	PH	5.45	Permissible (6.5 – 8.5, as per B.I.S)
2	Turbidity	1170 NTU	Permissible (5 NTU, as per B.I.S)
3	Hardness	410.0 mg/l	Permissible (300 mg/l , as per B.I.S)
4	Chloride Concentration	197.7 mg/l	Permissible for Irrigation and Dilution (250 mg/l, as per B.I.S)

5	Total Dissolved Solids	642.0 mg/l	Permissible (85 - 95%, as per NEERI)
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## V. CONCLUSION

Based on the above analysis, It can be concluded that the test performed on waste untreated water should be between permissible value after treating the water. It can be concluded that phytoid technology is a kind of constructive wetland and a successful approach towards decentralization and reuse of wastewater, which gives fair quality results. Moreover, the treated water has its application in: Irrigation, River dilution, Flush tanks, Gardening etc. Water of high quality can be obtained if the retention period is increased (48 or 72 hours according to NEERI). The materials and methodology used to treat the wastewater with phytoid technology.

## ACKNOWLEDGEMENTS

We are using this opportunity to express our gratitude to everyone who has supported us throughout the completion of this project. We are thankful for their guidance, constructive criticism and friendly advice, during the project work. We express our gratitude to Prof. Purva Awari for giving us an opportunity to carry out project on Wastewater treatment by phytoid technology. We would also like to thank Prof. Lissy Jose, Head of Civil Department and Dr. Arun Kumar, the Principal for their whole hearted support. Lastly, we express our gratitude towards all those who directly or indirectly helped us in the completion of our studies.

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# Proposed Plan Of Solid Waste Management For Indira Nagar, Uttan.

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**Abstract**— Solid waste management had become a critical issue in rural areas as well as urban areas in India. In developing countries, the rate of generation of waste is very high. Any changes in lifestyles of urban areas attract the rural people leading to generate waste. The high rate of generation of waste is due to increasing industrialization and other developments and it creates major impact on environment. Two main activities to manage solid waste are recycling and composting. This paper focuses on the proper management of the waste generated and the its treatment used, to help the selected village known as Indira Nagar, Uttan.

**Keywords**—Refused derived fuel, Vermicomposting, Integrated solid waste management.

## I. INTRODUCTION

Solid Waste Management (SWM) is an organized process of storage, collection, transportation, processing, and disposal of solid refuse residuals in an engineered sanitary landfill. It is an integrated process comprising several collection methods, varied transportation equipment, storage, recovery mechanisms for recyclable material, reduction of waste volume, and quantity by methods such as composting; refuse derived fuel (RDF), waste to-energy, and disposal in a designated engineered sanitary landfill. The selection of a suitable SWM process is driven by the source and quality of waste produced. Solid waste is generated from a number of sources which include households, commercial areas, industries, institutions, construction and demolition sites, wild and domesticated animals, parks, and streets.

In India, specially in rural areas as well as in urban areas the major problems affecting solid waste management are unscientific treatment, improper collection and storage. In village level the amount of solid waste is high due to agricultural waste, animal waste, domestic waste. Presently the non-biodegradable materials like plastic, e-waste are increasing. The improper management makes environment unfit.

Solid waste management is a practice in which the waste is stored properly. Then the waste is collected, transported to the treatment plant. Further the refused waste is disposed properly in an organised way. In urban areas, the waste which is generated is stored at community bins and transported to the dumping site. Then this waste is directly burn out. Whereas in the coastal areas the waste is dumped into the sea but this method is very costly and not environment friendly.

Management of solid waste is a growing concern to the general public at large, local authorities and business communities in cities and town across India. The improper management of Solid waste leads to the pollution. Using public space as dumping area for waste, was the growing problem. The organic waste used in fields, often contaminates with plastic and hazardous waste. Direct release of chemicals in water bodies create water pollution.



The purpose of SWM is to collect waste at the source of generation. Recovery of the recyclable materials for recycling purpose. The main object is to convert organic waste into compost and non-recyclable materials are use for making RDF. This paper is helps to solve the problems are selected area and plan for integrated solid waste management suggest. This lead towards the direction are own. It provides efficient and economical collection and recycling process.

## II. MATERIAL AND METHOD

### 2.1 SOLID WASTE SURVEY

Sr. no.	Waste Types	Waste Types (%)
1	Organic	70.35
2	Fine Earth	7.00
3	Demolition Debris	3.00
4	Plastic Materials, Polythene Bags, Thermocol	10.35
5	Metals	0.30
6	Glass	1.00
7	Soiled Papers, Card Boards	6.00
8	Textiles	0.13
9	Miscellaneous	6.92
TOTAL		100.00

**TABLE NO. 01**

It is necessary to measure the quantity of waste which is generated. First of all, waste characterization assessment or study of characterization of waste was adopted.

(i). Waste collection: To study the waste characterization, collection of waste sample is done from bins. Then, about 5kg. of waste is collected.

(ii) Sorting: The waste collected from solid waste community bins were sorted, classified, weighted. After this biodegradable and non-biodegradable waste are collected in different bags and then set to lab.

### 2.2 PROPOSED PLAN FOR INDIRA NAGAR TO OVERCOME PROBLEM DUE TO WASTE

The ISWM scheme for Indira Nagar, Uttan have been designed to reduce the generation of waste at the source. Also, the amount of waste which is going to or sent to landfill after the recycling or treatment should be minimum in volume. The main factor in ISWM is community or individual person ISWM is successful achieved by their participation.

### ISWM SCHEME

1. Segregation of waste at house level. In this, individual participation is important. Separate containers should be used, community bins are provided with leads and placed by using GPS.
2. Composting should be done with the help of experts.

3.To avoid sweeping , open dumping, regular monitoring is necessary.

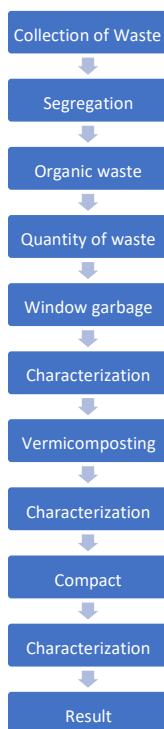
4.Appoint 'NGO' for awareness of people and organize various Campus exhibitions documentary filters.

5. Active participation of community in recycling and preparation RDF.

## 2.3 METHODOLOGY

### 1.Vermicomposting

The method of preparing enriched compost with the help of the earthworms is called Vermicomposting. It is the product of decomposition process. This compost improves biological, chemical, and physical properties of the soil.



### MATERIAL:

The material required for Vermi-composting are:

- 1<sup>st</sup> Layer - Dry leaves [5 cm]
- 2<sup>nd</sup> Layer - Organic waste [8 cm]
- 3<sup>rd</sup> Layer - Farm waste , cow-dung [9 cm] • 4<sup>th</sup> Layer – Earthworms (Eisenia Foetida) • Water as required .

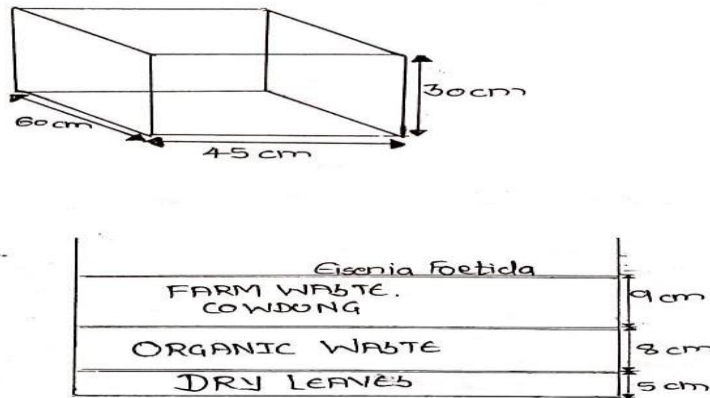


FIG NO.01 DESIGN OF PIT

## 2. REFUSED DERIVED FUEL

RDF is produced from domestic and business waste which include biodegradable material as well as non-recycling material. Materials such as glass and metal are removed during the treatment process, since they are non-combustible. The metals are removed using a magnet while the glasses by the mechanical screening. After that an air knife is used to separate the light weight materials from the heavy one. The light materials have high calorific value and thus they create the final RDF. The residual material can be sold in its processed form (depending on the process treatment) as a plain mixture or it may be compressed into pellet fuel, bricks or logs and used for other purposes either stand-alone or in a recursive recycling process. RDF is extracted from municipal solid waste and other waste using a mix of mechanical and/or biological treatment methods.

The production of RDF may involve the following steps:

- Bag splitting/Shredding

Sr. no.	Test	Result	Unit
1.	Moisture	35.6	-
2.	Temperature	26	°C
3.	Nitrogen	0.75	%
4.	Phosphorous	0.32	%

5.	Potassium	0.25	%
6.	pH	6.09	-

- Size screening
- Magnetic separation
- Air classifier (density separation)

## RESULTS

□ Sample Name :-

Vermicompost. □ Sample  
 quantity :- 86gm.

## CONCLUSION

The location is selected by keeping in view that the polluting environment created by the Solid waste. The detailed analysis of the waste helps in selecting suitable managing practise for waste disposal. The awareness of people regarding the reuse, recycle, reduce can lead to decrease in the waste load which is coming on Municipal Corporation.

It accelerate the burning process. We proposed a proper solution for the Indira nagar waste as it was suggested to utilize compost as organic fertilizer through the vermicomposting. Also the RDF is used as a fuel in various industries, as a substitute of coal, wood from dry waste.

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# Material Management and Supplier Selection using QGIS

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**Abstract**— Materials are one of the important part of the construction industry. Materials contribute about 50-60% of the total cost of the project. As materials forms a major constitute of the total cost of the construction project, therefore adequate control over the purchasing, supplier selection, receiving, delivery, issuing storage, movement and its consumption is necessary. The most important among this is supplier selection and it leads to the success of and construction project. Supplier selection includes qualitative and quantitative factors. In this project, for the purpose of supplier selection in VVCMC (Vasai Virar City Municipal Corporation) region various data about the supplier like personal detail, location, quantity, quality, cost, delivery services, discount, transportation, communication facility, etc. are collected. Collection of these information would be less time consuming using database. This all data is imported in QGIS (Quantum GIS), since it is very effective tool for database management. By using QGIS software, digitise map of study area and roads is done. To locate the location of suppliers as per the requirements various queries are generated. It will also help in finding shortest route between supplier location and construction site.

**Keywords**— - Material Management, QGIS, Supplier selection, queries, shortest path.

## I. INTRODUCTION

This report covers Study region, Data collection and Data analysis of construction material suppliers present in Vasai-Virar Municipal Corporation. The Vasai-Virar City Municipal Corporation, (VVCMC) is the civic body that governs areas and villages in Vasai-Virar tehsil in Maharashtra state, western India comprising the most populated part of Palghar district. It is an extended suburb of Mumbai. According to the 2011 census, it is the fifth largest city in Maharashtra with a population of more than 1.3 million. The city is located 50 km north of Mumbai, on the north bank of Vasai Creek, part of the estuary of the Ulhas River. It was formed on 3 July 2009 by combining four municipal councils and 53 gram panchayats. Vasai-Virar City is the only Metropolitan City (having population more than 10 lakhs in Palghar district which is also having Municipal Corporation. It is located at North Mumbai. The area of Vasai-Virar City is 311 sq. km. Vasai-Virar City has been separated from Greater Mumbai and Mira-Bhayandar City because of presence of Vasai Creek. The City is well connected to Mumbai by Western Railway and through Mumbai-Ahmedabad National Highway. The city is connected to Navi Mumbai, Thane, Bhiwandi, Kalyan and Panvel cities by the Vasai-Diva Railway line. Vasai Virar city has significant growth potential due to close proximity to Brihan Mumbai. The Vasai-Virar City Municipal Corporation (VVCMC) was established on 3rd July 2009. Vasai Virar Corporation is located between 19 deg. 28 min. north-90 deg. 47 min. north latitude and 72 deg. 48 min. east-72 deg. 8 min. east. The VVMC is responsible for aiding in prevention of epidemic outbreaks through mass production of medicines, Cemeteries and Crematoria, Fire Stations, Garbage disposal and street cleanliness, House Tax, Lighthouses, Maintenance of parks and open spaces, Markets, shops, and establishments, Municipal water, Public health and hospitals, Registering of births and deaths, Removal of encroachments, Security, Sewage treatment and disposal, Street lighting, Transport and Construction of Roads.



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## 2. LITERATURE REVIEW

### Materials Management

Materials management is a process for planning, executing and controlling field and office activities in construction. The goal of materials management is to ensure that construction materials are available at their point of use when needed. The materials management system attempts to ensure that the right quality and quantity of materials are appropriately selected, purchased, delivered and handled on site in a timely manner and at a reasonable cost. Materials management is the system for planning and controlling all of the efforts necessary to ensure that the correct quality and quantity of materials are properly specified in a timely manner, are obtained at a reasonable cost and most importantly are available at the point of use when required. Thus, Materials management is an important element in project management. Materials represent a major expense in construction, so minimizing procurement costs improves opportunities for reducing the overall project costs.

### Purchasing procedure

- Step 1 – Material Indent
- Step 2 – Enquiry to Suppliers/Vendors
- Step 3 – Vendor Comparison
- Step 4 – Vendor Selection and Negotiations
- Step 5 – Purchase Order
- Step 6 – Suppliers/Vendor Evaluation

### Receiving of materials

The receipt system can be divided into:

- a) Receipt from outside suppliers
- b) Receipts from internal divisions.

System of receipt starts even before the material reaches the site. The three documents that should be dispatched are copy of purchase order, supplier's advice document and the consignment note. This enables the Stores manager to organize and plan for clearances of materials. For receipt from internal divisions, usually transfer notes and return to stores documents are used.

### Inspection of materials

- a) Pre-dispatch inspection
- b) Inspection on site

It is the responsibility of the inspector to inspect all materials delivered to the site prior to their being used in the work. It is desirable to perform inspection of materials or fabricated products prior to their delivery at site. The inspector shall have rights to reject faulty material and have it removed from site. With respect to manufactured goods, the quality requirements should be specified in the purchase order.

### Geographical Information System (GIS)

A Geographic information system is a computer based system capable of capturing, storing, and analysing and displaying geographically referenced information; that identified according to location. Practitioners also define a GIS as including the procedures, operating personal and spatial data that goes into system. A GIS tool is used for mapping and analysing spatial data. GIS technology integrates common database operations such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps.

### Working of GIS

GIS stores information about the world as a collection of thematic layers that can be linked together by geography. This simple but extremely powerful and versatile concept has proven invaluable for solving many real world problems from modelling global atmospheric circulation, to predicting rural land use, and monitoring changes in rainforest ecosystems. 1. Geographic references 2. Input of data 3. Map making 4. Manipulation of data 5. File management 6. Query and Analysis 7. Visualization.

### 3. CASE STUDY

#### 3.1 Study Region

The Vasai-Virar City Municipal Corporation, (VVCMC) is the civic body that governs areas and villages in Vasai-Virar tehsil in Maharashtra state, western India comprising the most populated part of Palghar district. It is an extended suburb of Mumbai. According to the 2011 census, it is the fifth largest city in Maharashtra with a population of more than 1.3 million. It was formed on 3 July 2009 by combining four municipal councils and 53 gram panchayats. Vasai-Virar City is the only Metropolitan City (having population more than 10 lakhs in Palghar district which is also having Municipal Corporation. It is located at North Mumbai. The area of Vasai-Virar City is 311 sq. km. Vasai-Virar City has been separated from Greater Mumbai and Mira-Bhayandar City because of presence of Vasai Creek. The City is well connected to Mumbai by Western Railway and through Mumbai-Ahmedabad National Highway. The city is connected to Navi Mumbai, Thane, Bhiwandi, Kalyan and Panvel cities by the Vasai-Diva Railway line. Vasai Virar city has significant growth potential due to close proximity to Brihan Mumbai. Vasai Virar Corporation is located between 19 deg. 28 min. North-90 deg. 47 min. North latitude and 72 deg. 48 min. East-72 deg. 8 min. East.

#### 3.2 Data acquisition

Approximately, Total 68 major construction materials suppliers are available in Vasai Virar City Municipal Corporation region. Most popular and mostly available suppliers are present in Nallasopara and Vasai highway area, virar east etc. The scope of materials was restricted to only sand, crushed sand, cement, aggregate, brick, steel and concrete owing to its importance and availability. Moreover, six materials were chosen to prepare the GIS model since the same methodology can be applied to other materials also subsequently. Collection of data included personal information of suppliers like name and address, details of materials like cost, brand, quarry source, available stock, lead time, discount, transportation, guarantee for safety, replacement, test certificates, etc. It could be observed that the cost of materials varied among the suppliers. The Vasai Virar City Municipal Corporation map was obtained from Vasai Virar Municipal Corporation (VVCMC) office Virar. The map comprised of basic data like latitude-longitude, boundary area, roads, railway lines, and river, apart from depicting the legend. The scale of map is 1:10000, ideal to enable digitisation using QGIS software. In my project most required boundary of Vasai Virar City Municipal Corporation, Roads, supplier's data and supplier's location in Vasai Virar City Municipal Corporation. The data required for digitisation of the Vasai Virar map and the attribute data required for building the data base were collected through a data collection sheet. Simultaneously, GPS was used on site to record the Latitude-Longitude details of the locations of various suppliers.

### 4. MEHODOLOGY AND APPLICATION OF GIS MODEL

This chapter will give information about suppliers present in Vasai Virar City Municipal Corporation and related their data with QGIS software. It also shows the queries run in various modules. Vector analysis are used to run different query are described. This chapter gives the procedure of data base generation, showing different queries run in QGIS and its need and application.

#### 4.1 Preparation of data base

The database is prepared using Microsoft Excel.

Inserting field name in Column of Excel Sheet as follows

Name of shop, Cost of sand, Cost of Crushed sand, Cost of cement, Cost of steel, Cost of brick, Cost of Concrete, lead time, address, mobile number, Longitude , Latitude etc. and fill available data of all suppliers in particular column.

Digitisation of supplier's locations of Vasai-Virar City Municipal Corporation in point layer is done using database.

#### 4.2 Procedure for database generation

**Step 1:** Open QGIS icon→ Web→ Google Maps → Google Streets

Google Street Map is opened.

**Step 2:** Digitisation of supplier's locations of Vasai Virar City Municipal Corporation in point layer.

Open layer → Add Layer → Add Delimited Text Layer

**Step 3:** Click on Browse→ Select this file from computer “Data of Vasai-Virar Shops” →Select File format as CSV→Select Geometry Definition as Point Co-ordinates→Select X Field as LONGITUDE and Y Field as LATITUDE →Click on OK

**Step 4:** Select Co-ordinate Reference System as EPSG-4326 → Click OK

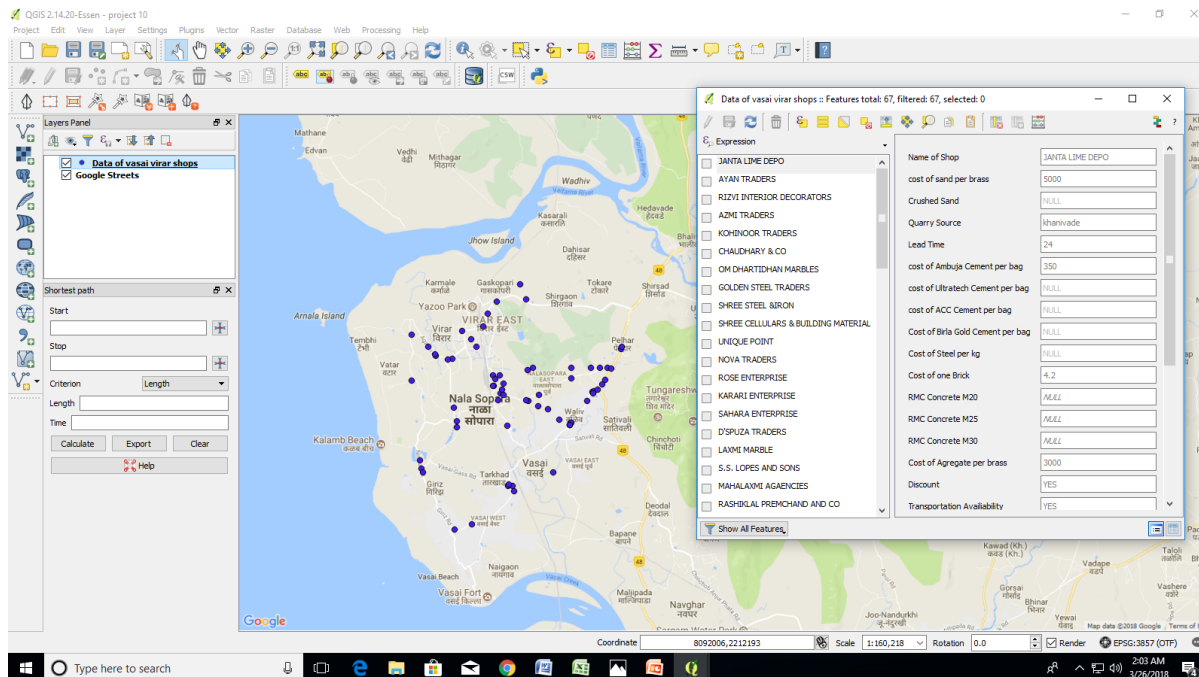
**Step 5:** Select Data of Vasai Virar shop → Right click → Select Zoom to Layer

**Step 6:** Digitilization of Roads

Select Plugins → InaSAFE →OpenStreetMap Downloader

**Step 7:** Select Roads →Select Drag on Map → Select VVCMC Region

By following the above Steps the data base is generated.



**Fig-1:** Digitised map shows table creation of supplier location layer of supplier's data

## 5.RESULTS

### 5.1 GENERATION OF QUERIES

**Query No.1:** Find out cost of ACC cement equal to Rs. 330 per bag.

If supplier selection manager wants to know the number of supplier's having cost of ACC Cement equal to Rs. 330 per bag in Vasai Virar then he easily gets the related information within minutes just by running the query in GIS vector analysis.

**Procedure:**

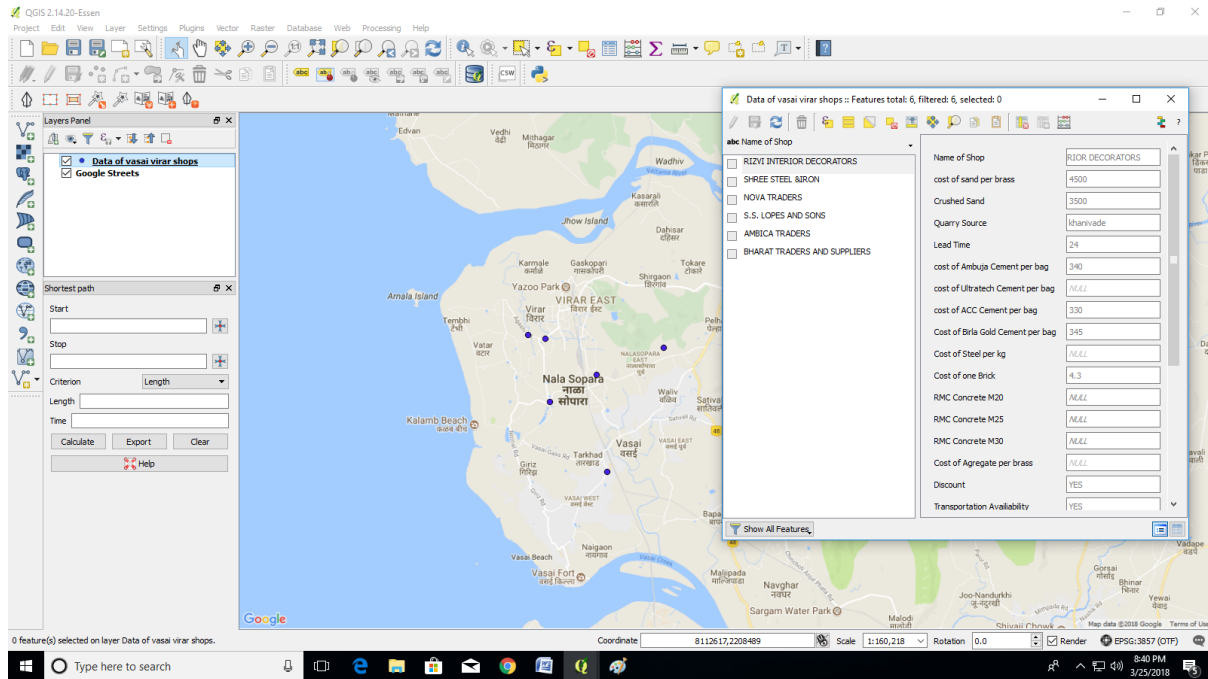
- Open QGIS → Vasai Virar project
- Click on layer → Data of Vasai Virar shop →Select filter
- Then enter the condition of query i.e. Cost ACC Cement = “330”.
- Then click on OK button to get result of query.

**Result of Query 1:**

The result shows that 6 out of 68 supplier's having cost of ACC Cement equals to Rs. 330 per bag.

### Utility of Query:

- It gives better information of all suppliers present in Vasai Virar City Municipal Corporation who having cost of ACC cement is Rs. 330 per bag.
- It helps to find maximum suppliers along with location and easily compare each other.
- After comparing it helps to select nearest best suppliers for purchasing ACC cement of Rs. 330 per bag.



**Fig-2:** Image shows the result of Query No 1.

### Query No.2: Find out cost of sand is less than Rs. 6000 per brass and lead time is less than or equal to 18 hrs and quarry source is vaitarna with discount.

If supplier selection manager wants to know the number of supplier's having cost of sand less than Rs. 6000 per brass, lead time is less than or equal to 18 hrs, quarry source is vaitarna with discount. Then he easily gets the related information within minutes just by running the query in GIS vector analysis.

### Procedure:

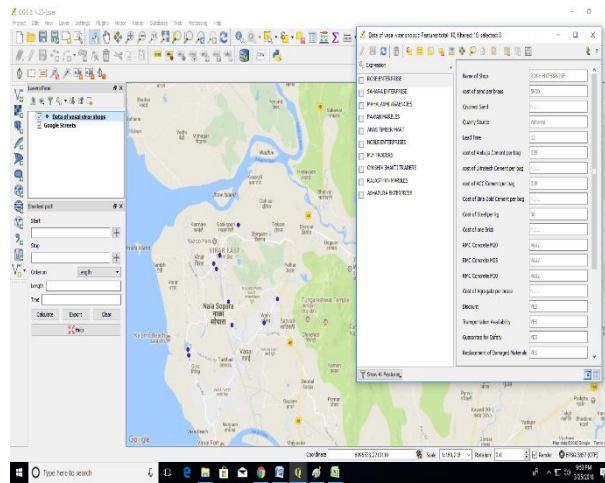
- Open QGIS → Vasai Virar project
- Click on layer → Data of Vasai Virar shop
- Then enter the condition of query i.e. Cost Sand per brass < "6000" AND "Lead Time" <= 18 AND "Quarry source" = vaitarna and "Discount" = Yes.
- Then click on OK button to get result of query.

### Result of Query 2:

The result of this query is 10 out of 68 suppliers are eligible for this condition.

### Utility of Query:

- Supplier selection manager collect multiple data together by using this query.
- This information helps to give the scale points to suppliers in supplier selection process in one click.
- It will help to reduce the time for supplier selection process.
- And hence supplier selection manager selects ideal supplier in very short time by using no. of condition.



**Fig-3:** Image shows the result of Query No 1.

### CONCLUSION

- Excellent performance of material suppliers is most essential for the smooth obtaining of materials. Supplier evaluation and selection is a usual main issue. The multi-criteria signify both qualitative and quantitative characteristics. Construction contractor should be able to select the appropriate decision-making tool which is easy, reliable and affordable.
- It is essential to have an applicable structured decision-making system in today's complex construction industry. This particularly helps quality decisions and consistency and transparency under complex multi-criteria conditions. The rationale for this research being predicated on the need model the construction material supply behaviour to optimise the material purchasing decisions. In practice, supplier selection is based on perceived importance of selection criteria.
- The nature of the multi-criteria decision method influences on each criterion (e.g. quality, delivery dependability, price, etc.). Therefore, there a possibility for examination of the effect of interdependencies among the criteria towards the decision making process of supplier selection in the construction industry.
- Here GIS tool is very effectively to avoiding problems in very short time which are creating for supplier selection. And which is very helpful for integrate and categorised of supplier's data so any time ideal supplier selection is very easy.
- Approximately 130 major construction materials suppliers are available in Vasai-Virar City Municipal Corporation region. So, it is very time-consuming process to collect required data for supplier selection process from all suppliers present in Vasai-Virar City Municipal Corporation.
- GIS gives information of all data of suppliers like location of suppliers, available materials, cost of materials, quantity, lead time, stock, discount etc.

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## QGIS For Management Of Land Records

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**Abstract**—Land is measure of wealth, status and power. India is a predominantly an agricultural economy and now it is rapidly transforming into an industrialized economy because of which it is suffering from urban overcrowding, unlimited exploitation of precious natural resources like land are being put to enormous strain, screaming for proper management. But India do not have an efficient Land Management System which covers detailed information of each aspect. Land records maintained manually have different formats and use different terms to convey same information. Therefore, there is need to develop a uniform terminology and generalized database scheme for land records. Efficiency in land management gives the overall idea of a nation's developmental status. GIS deals with spatial data collection, storage, management, retrieval, conversion/changing, analysis, modeling, and display information about the features that make up the Earth's surface. It can decrease the cost and time of the decision makers and planners in arranging the data in reaching the accurate conclusion. GIS is a tool that can be effectively used for better visualization and spatial analysis applications.

**Keywords**—analysis, GIS, land, record, spatial data, query

### I. INTRODUCTION

Land is measure of wealth, status and power. Any developmental activity is almost can't take place without taking land into consideration. Therefore, efficiency in land management gives the overall idea of a nation's developmental status. India having 29 States and 7 Union Territories and each state has been divided into Districts and then to Villages and so on. There is Land, which belongs to Government, land which is Private Property, land which is totally unused. As population grows, infrastructure tends to grow and property value starts increasing. The family disputes in villages make more and more divisions on the land. So keeping Land Records has become a necessity. Also India is a predominantly an agricultural economy and now it is rapidly transforming into an industrialized economy because of which it is suffering from urban overcrowding, unlimited exploitation of precious natural resources like land are being put to enormous strain, screaming for proper management. But India do not have an efficient Land Management System which covers detailed information of each aspect. Due to Lack of proper land records management, poor records keeping and inefficient judiciary has resulted in a high demand of a system that keeps the accurate record of lands, Records of right ownership and makes it available in time. Land records maintained on paper or cloth has preservation, updating and retrieval problems. Computerization is natural solution for all these problems. And Geographical Information System (GIS) technology provides municipal governments with extraordinary quantitative and qualitative benefits. GIS solution is the need of the hour taking into consideration the voluminous information that needs to be made available to various decision makers in various departments. GIS tool integrates non-spatial and spatial datasets for query and better display.

### II. LAND RECORD MANAGEMENT

Geographic information system (GIS) is a computer based system that deals with spatial data collection, storage, management, retrieval, conversion/changing, analysis, modeling, and display information about the features that make up the Earth's surface. It provided the potential for mapping and monitoring the spatial extent of the built environment and the associated land use/ land cover changes. Gathering of basic information is the primary step in taking the proper decision in developmental activities of the study areas. The basic information can be obtained by different methods like field surveys, aerial surveys, Census of India. The information necessary to make available all kinds of data related to the village, easily and concisely for planning at micro- level.



### III. STUDY AREA FOR LAND RECORD MANAGEMENT

Khochivade village is located in Vasai Tehsil of Palghar district in Maharashtra, India. It is situated 3km away from sub-district headquarter Vasai. As per 2009 stats, Khochivade village is also a gram panchayat. The total geographical area of village is 149.99 hectares. Khochivade has a total population of 2,219 peoples with 50.83% males and 49.17% females. There are about 476 houses in Khochivade village.

### IV. METHODOLOGY

The methodology adopted in the study can be described in the following steps.

- Collection of spatial and attribute data of khochivade village.
- Plot-wise land use map is prepared and attributes were assigned for every plot with full ownership and built-up information using grass GIS
- For case study area develop land record management model using grass GIS.
- Run queries on the model for immediate and ready extraction of information through Web.

### V. INTEGRATION OF GIS MAP AND SPATIAL DATA

Taluka Inspector of Land Records in Vasai Taluka keeps all the spatial data of lands. Map of KhochivadeVillage of vasaitaluka were provided by the Taluka inspector, which is considered for this study.

#### 5.1 Generation of GIS Map of Study Area

The scanned copy of study region (Khochivade village). In this map, there are 81 plots.

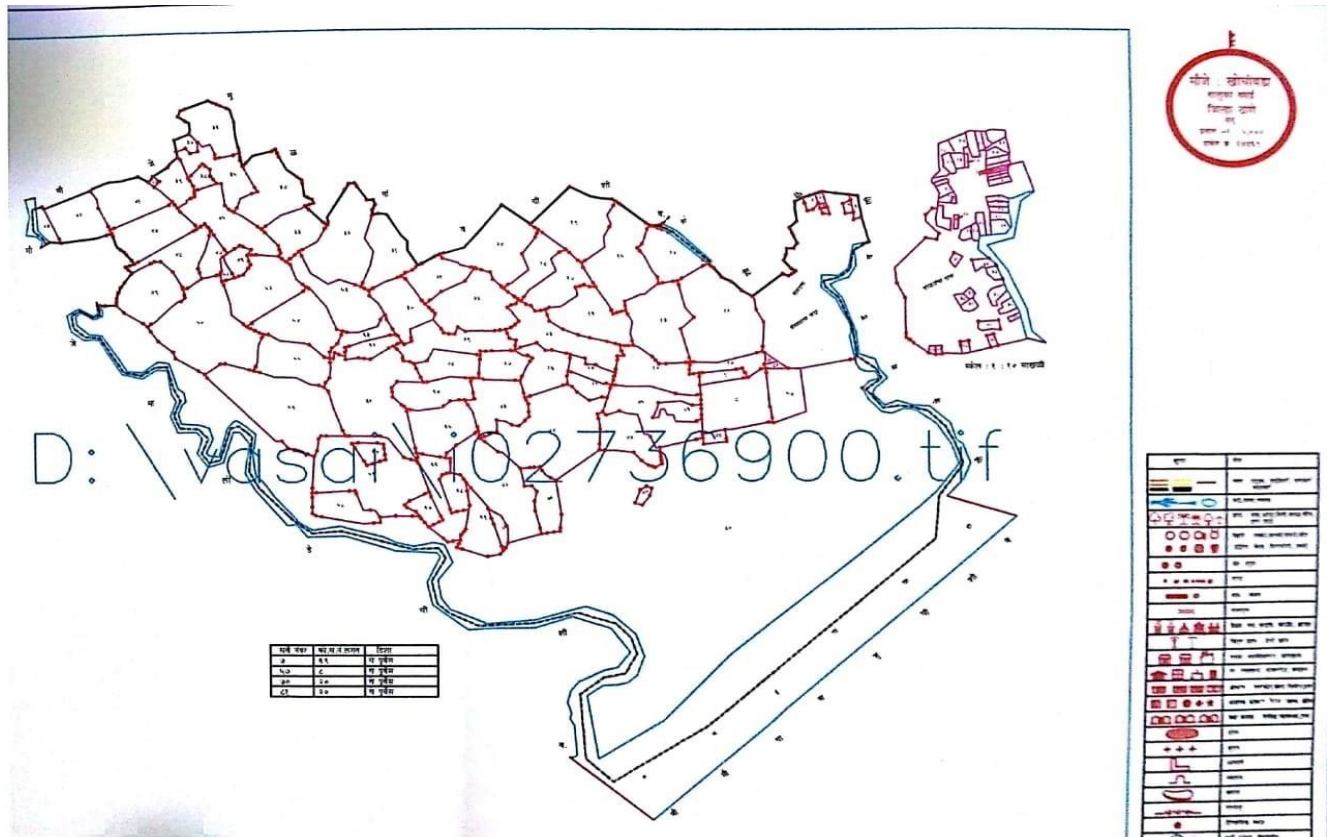
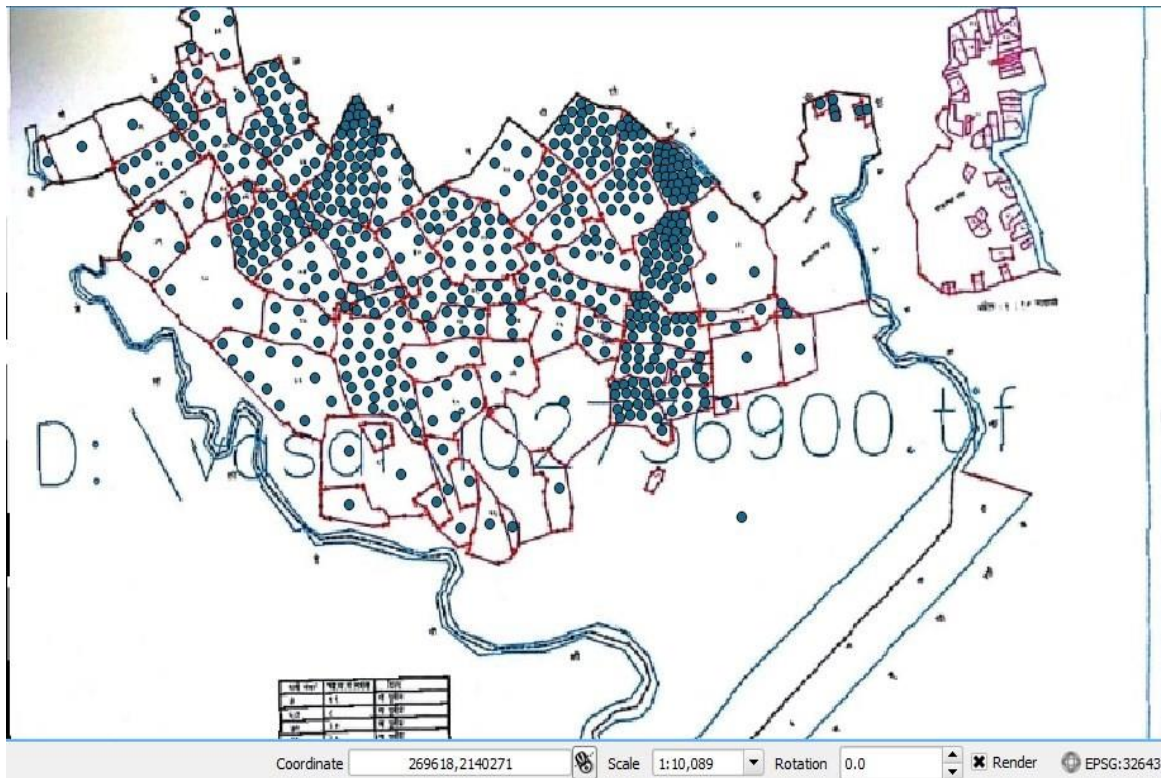


FIGURE 1 MAP OF KHOCHIVADE VILLAGE



**FIGURE 2: PLOTTING OF SURVEY POINT**

## 5.2Preparation of database:

The data collected for all the plots is digitized. It includes all the attribute data:

- Survey No, Sub-survey No
- Total area in acres/hectares
- Owner name
- Account book No.
- Akarani
- Name of crop
- Area of cultivation
- Hydrous, anhydrous
- Season of crop

SurNo	SubDiv	District	Taluka	Village	NameOfOwner	AccountBookNo	TotalAreaInHectre	Akarani	NonCultivable	Anhydrous	Hydrous	Zone
1	1	PALGHAR	VASAI	KHOCHIVADE	KASHINATH HIRAJI RAUT	191	7.60.00	76	0	7.60.00	0	non
2	2	PALGHAR	VASAI	KHOCHIVADE	JIVUBAI SHYAMRAV CHURI	191	0.00.00	29.1	0.05.18	0.05.18	0	non
3	3	PALGHAR	VASAI	KHOCHIVADE	JIVUBAI SHYAMRAV CHURI	191	0.01.30	0.9	0.01.30	0	0	OTHER
4	4	PALGHAR	VASAI	KHOCHIVADE	JIVUBAI SHYAMRAV CHURI	191	0.00.00	2.5	0.01.26	0	0	non
5	5	PALGHAR	VASAI	KHOCHIVADE	DEEPAK JAGGANATH RAUT	85, 429, 711, 712	1.44.34	1.42	0	0	0	non
5	5	PALGHAR	VASAI	KHOCHIVADE	NARSIH	85, 429, 711, 712	1.44.33	1.42	0	0	0	non
5	5	PALGHAR	VASAI	KHOCHIVADE	JITENDRA GANPAT RAUT	85, 429, 711, 712	1.44.33	1.42	0	0	0	non

**Fig. 3.**

Database of all plots

## 5.4. QGIS for land record management:

For better visualisation and spatial analysis GIS can be used effectively. One of the most common products of a GIS is a map. They are often the most effective means of communicating the results of the GIS process. Therefore, the GIS is usually a prolific producer of maps.

### 5.5. Running Queries

Queries are then run to get the desired information from the database. GIS applications are tools that enable clients to create interactive queries, analyze spatial information and present the results of all these operations. Different Queries will be run in QGIS after integrating with the spatial and attributes data. The yields of different inquiries keep running in the Vector Analysis Module of QGIS are appeared as follows:

- Query 1: Show Plots whose sub survey no is 12-1-A

**FIGURE 3: QUERY 1.**

Utility: From this query, all the plots recorded whose sub survey no 12-13 can be identified. Attributes related to the plot like, owner of the land, area, location, taxation details etc. can be collected. Therefore, it becomes easier for land records department to handle the records of land.

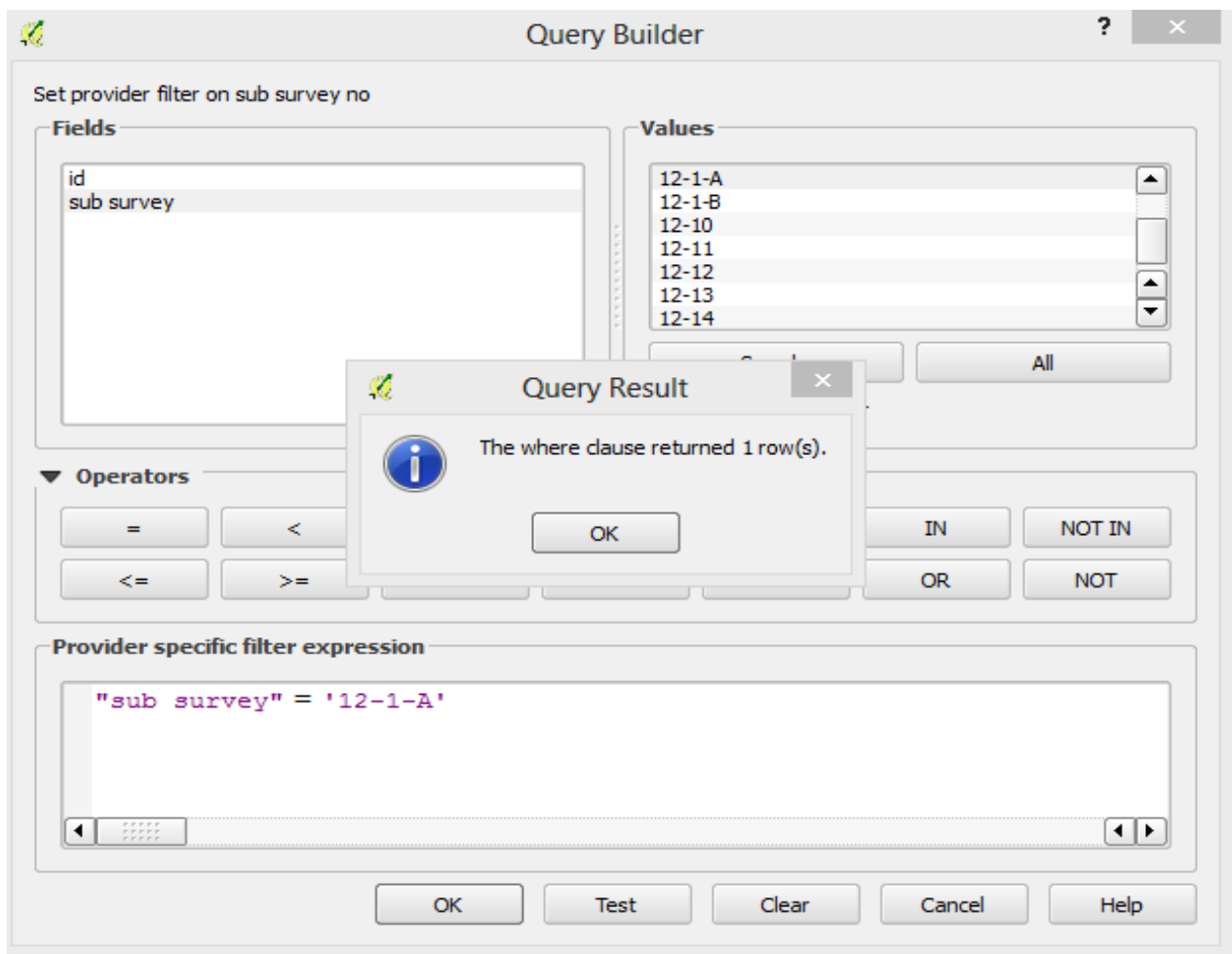




FIGURE 4 : SHOWING RESULT OF QUERY ONE

- Query 2: Show Plots whose account book no is 104

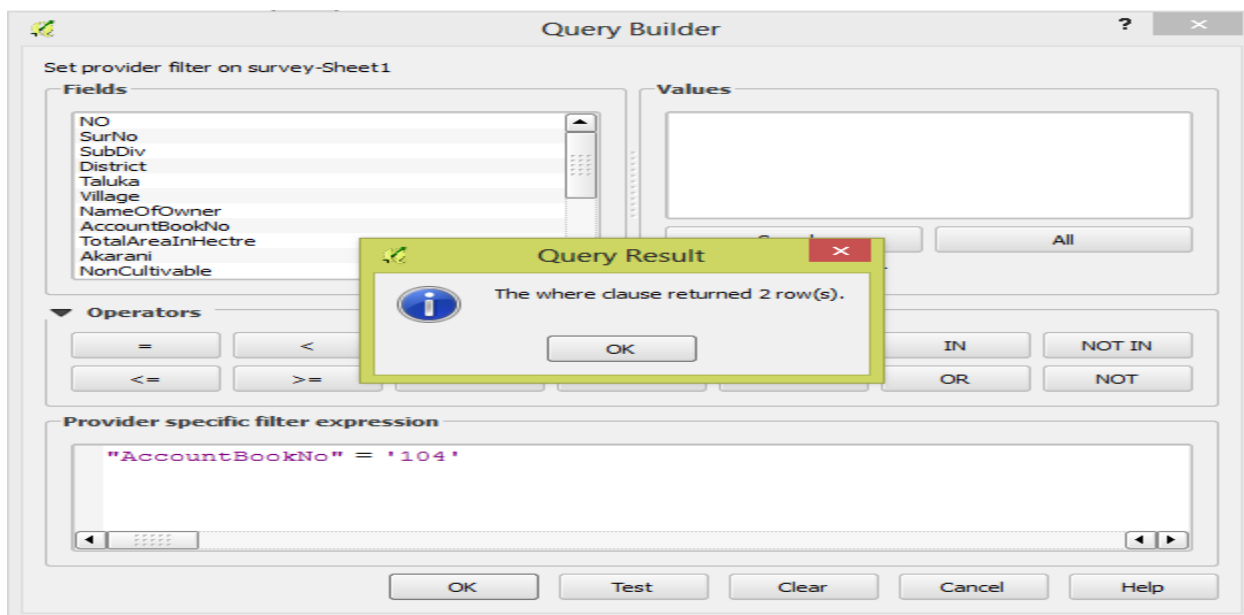


FIGURE 5 : RESULT OF QUERY 2



Utility: From this query, all the plot whose account book no is 104 is identified. Attributes related to the plot like, owner of the land, area, location, taxation details etc. can be collected. Therefore, it becomes easier for land records department to handle the records of land.

## VI. CONCLUSION

In this paper, an adaptable and easy to understand data framework on GIS stage utilizing QGIS programming was produced to help planners, administrators, land managers and common public for village level planning with reference to managing the records the lands of Khochivade village. Development of GIS model included digitization and geo referencing of village map, extensive survey and interaction on ground in order to obtain attribute data, integration of the geo referenced map with the attribute data and its application in land records management by running various queries. GIS solution is the need of the hour taking into consideration the voluminous information that needs to be made available to various decision makers in various departments. For this, Re-survey of lands with the help of GPS and linking of its attribute data with the cadastral maps/village maps through GIS should be taken up. Timely and easy access to accurate information on land records will facilitate easier, faster and more effective decision making. It will benefit all the stake holders including land owners, planners, policy makers and land administrators by the improved, effective and efficient methodology of land records management offered by GIS platform. One of the major limitations in preparation of such GIS models is the extensive attribute data that need to be converted for integration into the GIS platform. Moreover, regular updating needs to be carried out at stipulated intervals on regular basis to keep the data updated. A certain degree of expertise needs to be acquired in the handling staff in order to understand the operating procedures of QGIS so that they can operate the GIS models as per their requirement.

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## COMPARATIVE STUDY OF REAL ESTATE ACTS AND ANALYSIS ON IMPACT OF MAHARERA

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**Abstract**—Government of India has enforce the Real Estate (Regulation and Development) Act 2016 and all the sections of the Act shall come into force with effect from May 1, 2017. Under the mahaRERA, Government of Maharashtra established Maharashtra Real Estate Regulatory Authority (MahaRERA), vide Notification No. 23 dated 8 March 2017, for regulation and promotion of real estate sector in the State of Maharashtra Under mahaRERA Act, appropriate government shall establish Real Estate Regulatory Authority for regulation and promotion of the real estate sector in the Maharashtra. The Authority shall strive to facilitate the growth and promotion of a better, healthy, transparent, efficient and competitive real estate sector while protecting the interest of buyers, promoters and real estate agents, Protecting the interest of buyers in real estate sector; Establishing adjudicating mechanism for speedy dispute solution and Establishing Appellate Tribunal to hear appeals from the decisions, directions or orders of the Real Estate Regulatory Authority. Before RERA, there was no clarity on carpet area, was sort of monopoly of developers regarding loading, rates, modes of payments. There were lots of Frauds, no clear picture of project, possession, sanctions. An attempt has been made to find out the immediate impact of this act on the developers, agents, and the customer. The scope of study is limited to Mumbai area region.

**Keywords**—Appellate Tribunal, RERA, Transparency, sanction, parliament

### I. INTRODUCTION

Real estate sector in India is one of the fastest growing sectors contributing 10-11% to the National GDP. It involves residential housing, retail, hospitality and commercial sectors. According to technical group of housing, India has a shortage of 18.78 million urban houses (2018), thereby creating huge gap in demand -supply market. It is the second largest employment generating sector in India after Agriculture. Unprecedented growth in Real estate sector is mainly driven by strong growth in retail and service sector in the last decade. The RERA passed by the Parliament grants powers to the State Government to make rules for carrying out provisions of the Act. The State Government can make the rules under section 84 of the RERA regarding the information and the documents required from the promoters and fees to be paid for the registration and real estate agents. However, the main feature pertain to the power of making the rules regarding the rate of interest payable to the allotted when he intends to withdraw from the project or in case of false advertisement by the builder or failure of the promoter to give the possession of an apartment, plot or a building. The state governments are empowered to make the model agreements which are to be compulsorily incorporate in the agreement.

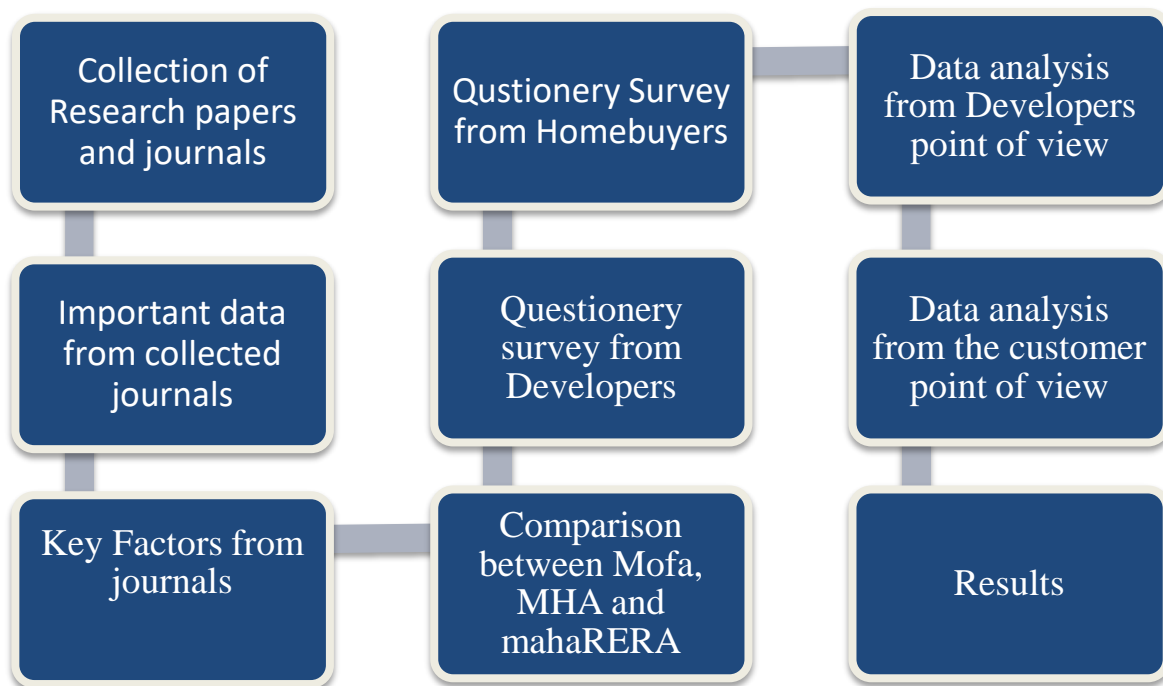


## II. OBJECTIVE

- To evaluate the application of the ACT on different fields of construction.
- To find out problem arising due to act of MahaRERA act.
- To compare the pre (MOFA and MHA) and post RERA conditions.
- To suggest possible improvements in MahaRERA.

## III. METHODOLOGY

Various Stages followed to make the study of MOFA, MHA and mahaRERA. The methodology of the study consists of following stages.



**FIGURE 1:Flow chart of methodology**

**TABLE 1**  
**COMPARISON OF REAL ESTATE ACT BASED ON FOLLOWING FACTORS:-**

S.R. NO.	FACTORS	MOFA (1963)	MHA (2012)	mahaRERA (2016)
1	Sale of parking	Not permissible	Not permissible	Only car parking space/garages including mechanical car parks.
2	Carpet area	Balcony in included and net usable area was permissible.	Same as MOFA	Includes:-Area covered by the internal walls of the apt. Excluded area covered by the external wall, exclusive balconies, veranda, service shafts and terrace not included.
3	Defects liability period	3 years	5 years	5 years
4	Advance payments	Not to exceed 20%	Not to exceed 20%	Not to exceed 10%
5	Proportionate charging of common area	Chargeable	Chargeable	Chargeable
6	Refund of money if delay in possession then refund of money with interest to the buyers	Simple interest @ 9% p.a from the date sums are received.	Simple interest @ 15% p.a from the date sums are received + investment.	Simple interest 2% + M.C.L.R rate of the state bank of India from the date sums are received.
7	All receipts	Mentions maintain a separate account.	Mentions maintain a separate account for each bldg.	70% to be maintain with designated account and to be withdrawn as per progress of construction.
8	Share of outgoings	In proportion to floor area of flat.	In proportion to carpet area.	In proportion to carpet area.
9	Conveyance	If no period mention, within 4 months of formation of society.	Within 4 months of formation of society in case of layouts, conveyance, i.e. minimum 60% of flats been sold.	If no period mentioned then for single bldg. within 3 months of issue of O.C of 51% of total number of allottees in bldg. per wing.
10	Disclosure	To be available on site.	To be available on site.	To be available on site and website.

S.R. NO.	FACTORS	MOFA (1963)	MHA (2012)	mahaRERA (2016)
11	Title liability	Up to the conveyance is done.	Up to the conveyance is done.	Liability in perpetuity.
12	Unfinished project	No provision to take over.	Authority with approval of state government may allow development of project by any other person including first right to take over and complete the project	Authority with approval of state government may allow development of project by any other person including first right to take over and complete the project will rest with allottees who has purchase in the project.
13	Offences and penalties	Imprisonment and nominal fines were prescribed.	Imprisonment direction of authority not follow for both promoter and buyers	Heavy fine linked with up to 10% of estimated and imprisonment only if direction of authority not followed for both developer as well as allottees.
14	Insurance	Of building.	Of building and title.	Of building and title.
15	Formation of society	As soon as min no. of 60% require to take flats within 4 months of 60% occupation.	Within 4 months of date of 60% allottees book there apts.	Within 3 months of date of 51% of allottees that have booked their apts.
16	Consent to change sanctioned plans	Consent not required unless individual unit is affected.	Addition without consent after plans are disclosed.	Consent of 75% of allottees required for making any major modification in sanction plans or revised plans.
17	Development of project and amenities	Phase wise development not mentioned.	phase wise development required as per different date of possession.	Detailed phase wise development permitted along the different dates of possession for apartment and amenities.
18	Payment terms	Not practical therefore no developers follow.	Same as MOFA	Liberal and practical for promoters and allottees.

S.R. NO.	FACTORS	MOFA (1963)	MHA (2012)	mahaRERA (2016)
19	Registration of project	Not required.	Registration required.	Compulsory before any Advertisement or receipt and payment.
20	Specification of material	Genetic declaration would suffice.	To mention brand or price of product.	To mention brand or price of product.
21	Escalation	Increase in local taxes, water charges insurance and such other levies, if any imposed local authority.	Penalty determine by the housing regulatory act.	Escalation free except duty increase in account to development charges.
22	Interest	Developer discretion.	Developer discretion.	M.C.L.R. plus 2% of SBI bank rate.
23	Payment terms	Very significant not practical therefore no developers follow.	Practical and liberal for both.	Liberal and practical for promoters and allottees.
24	Project potential	Till conveyance society any FSI increase is up to the developers.	Any FSI increased as per provision of section 1.	Disclosure to be made about expectation of FSI proposed to be including future FSI 75% allottees opinion is required.
25	Termination	Developers cantitle the project notice on defaultpayment.	Promoter convey title within 4 months from date on cop. Society.	Developer was entitled to terminate after 3 installments not paid and notices refund must be made within 30 days.
26	Marketing agents	Not required to be registration.	Not required to be registration.	Registration is mandatory with authority.

#### IV. CONCLUSION

Maharera was come in 2017 in Maharashtra to protect the home buyers and boost the investment in real estate industry. Before RERA act MHA and MOFA acts were followed by government. These were not stringent in construction industry. During the implementation of the act ongoing project are suffered. Amendments are still going on. Currently the developers are suffering from financial issues by this act. But according to current scenario developers are scared to take new project. This situation affects development of state. But very positive impact is expected in future as act becomes more intact.

### ACKNOWLEDGEMENTS

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## Experimental study on Hot Mix Asphalt

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**Abstract**— The construction and maintenance of roads consume large amounts of aggregates, which typically account for more than 90% by weight of the asphalt mixtures. Reuse and recycling of waste rubber results in a substantial reduction in the quantity of new aggregates required for road construction work, extending the life of non-renewable aggregate resources. Reuse and recycling also reduces the volume of reusable material that is placed in landfills, where it takes up ever-dwindling space that is better reserved for domestic waste, thereby extending the life of the landfill and decreasing the need for new landfills. This is one way of getting the road construction industry on track towards sustainable construction practices.

**Keywords-** Asphalt, Non-renewable, Polymer, Reuse, WGRTP.

### I. INTRODUCTION

- Experimental study on Hot Mix Asphalt.
- Hot Mix Asphalt (HMA) is a combination of approximately 95% stone, sand, or gravel bound together by asphalt cement.
- Aggregates and asphalt are combined in a mixing facility in which all of the constituent materials are heated, proportioned and mixed to produce the desired paving mixture.
- HMA pavement mix types include Open-Graded Friction Courses (OGFC), Stone Matrix Asphalt (SMA), and fine- and course graded dense mixes.
- HMA pavement mixtures are expected to perform over extended periods of time under a variety of traffic and environmental conditions. Specialized mixes have been developed to meet particular needs.

### II. HEADINGS

- Utilize this waste material as useful binding material in asphalt pavement.
- To reduce the content of cement and aggregates.
- To utilize the construction and demolition waste.
- Replacement of aggregate with tyre powder.
- Replacement of Conventional aggregate with demolition aggregate.



### III. Material

- Aggregate and Demolition aggregate
- Bitumen
- Tyre Powder
- Stone Dust (filler)

### IV. Methods

- Marshall Stability method

### V. Calculation and Result

Proportion of HMA (For DBM)

#### Part 1: 5% Constant Bitumen and 20 mm fully replaced with demolished aggregate

20 mm Demolished Aggregates	10 mm	Crush Sand	Filler
45%	5%	47%	3%

Mix	Rubber Powder gms	Bitumen gm	20 mm Demolished agg in gms	10 mm in gms	Crush sand In gms	Filler in gms	Total in gms
1	-	65	556	61	581	37	1300
2	65	65	527	58	550	35	1300
3	130	65	498	55	519	33	1300
4	195	65	468	52	489	31	1300

Marshall Mould Density & Stability Test

Mix 1: No Tyre powder and 20 mm Demolished aggregates.

Sr. no.	Weight in air gms	In water gms	SSD weight gm	Volume In m3	Density	Stability On ring	Marshall Stability value in KN	Flow in mm
1	1153	682	1160	478	2.41	130	8	3.2
2	1143	679	1150	471	2.42	80	4.9	2.8
3	1112	660	1116	456	2.43	60	3.69	3.4

Mix 2: 5% Tyre powder and 20 mm Demolished aggregates.

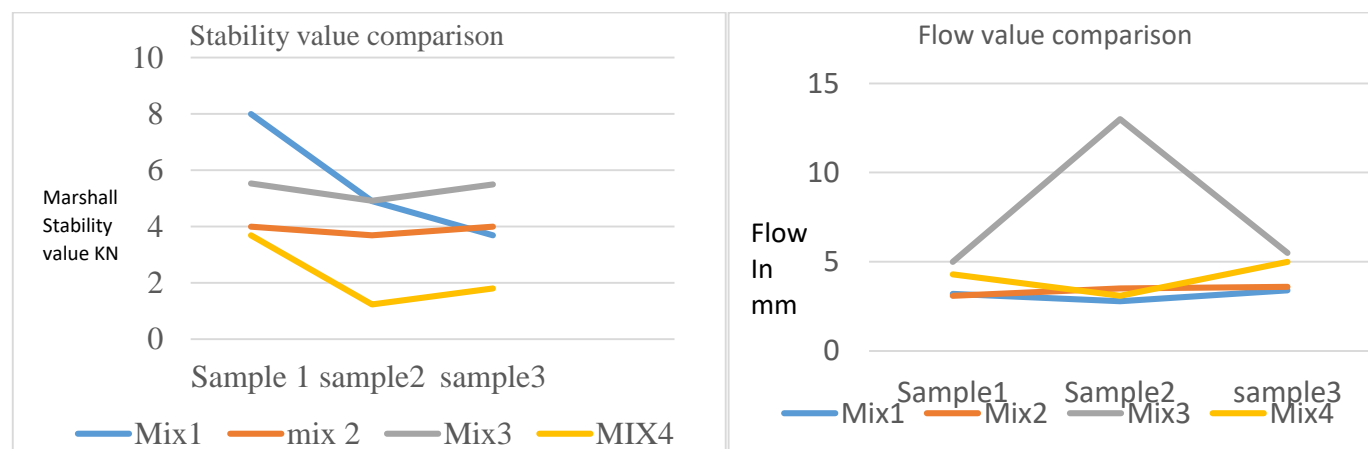
Sr. no.	Weight in air gms	In water gms	SSD weight gm	Volume In m3	Density	Stability On ring	Marshall Stability value in KN	Flow in mm
1	1191	677	1215	538	2.214	65	4	3.1
2	1210	688	1215	527	2.296	60	3.69	3.5
3	1216	697	1223	527	2.312	65	4	3.6

Mix 3: 10% Tyre powder and 20 mm Demolished aggregates

Sr. no.	Weight in air gms	In water gms	SSD weight gm	Volume In m3	Density	Stability On ring	Marshall Stability value in KN	Flow in mm
1	1026	554	1030	476	2.15	90	5.53	5
2	1126	592	1129	537	2.09	80	4.92	13
3	1062	570	1063	493	2.15	85	5.5	5.5

Mix 4: 15% Tyre powder and 20 mm Demolished aggregates

Sr. no.	Weight in air gms	In water gms	SSD weight gm	Volume In m3	Density	Stability On ring	Marshall Stability value in KN	Flow in mm
1	1026	554	1030	476	2.15	60	3.69	4.3
2	1126	592	1129	537	2.09	20	1.23	3.1
3	1062	570	1063	493	2.15	30	1.8	5



Proportion of HMA (For DBM)

**Part 2: 4.5% Constant Bitumen and 20 mm 50% replaced with Demolished aggregate**

Sr no	20 mm mix Aggregates	10 mm	Crush Sand	Filler replaced by tyre powder
1	42%	5%	50%	3%
2	42%	5%	48%	5%

Mix	Bitumen gms	20 mm normal aggregate gms (21%)	20 mm Demolished agg in gms (21%)	10 mm in gms	Crush sand  In gms	Tyre powder in gms	Total in gms
1	56	250.5	250.5	60	597	36	1250
2	56	250.5	250.5	60	573	60	1250

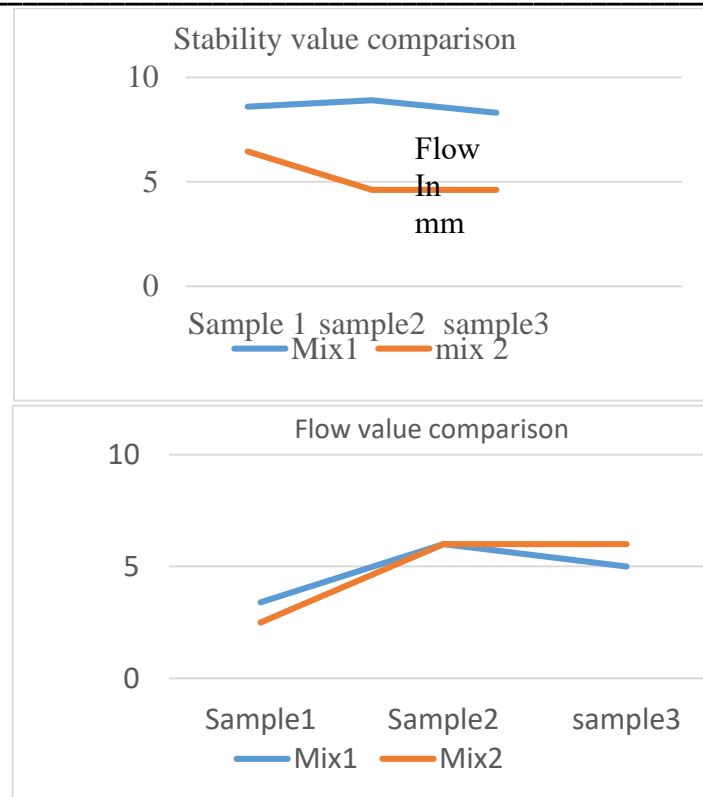
**Marshall Mould Density & Stability Test**

Mix 1: 3% Tyre powder and 20 mm Mix aggregates

Sr. no.	Weight in air gms	In water gms	SSD weight gm	Volume In m3	Density	Stability On ring	Marshall Stability value in KN	Flow in mm
1	910	525	912	387	2.35	140	8.6	3.4
2	1144	658	1150	490	2.33	145	8.9	6
3	977	561	1116	417	2.34	135	8.3	5

Mix 2: 5% Tyre powder and 20 mm Mix aggregates

Sr. no.	Weight in air gms	In water gms	SSD weight gm	Volume In m3	Density	Stability On ring	Marshall Stability value in KN	Flow in mm
1	986	560	990	480	2.29	105	6.45	2.5
2	1023	552	1026	474	2.15	75	4.61	6
3	1005	555	1008	453	2.21	75	4.61	6



## VI. CONCLUSION

- In 1st part the Full replacement of 20 mm aggregate with demolished aggregate is done and the variation in tyre powder according 0%, 5%, 10%, and 15% replacement of sand is carried out which result in increased in strength but after 10% strength started Decreasing. The first three mixes can be used for base course or in for sand asphalt course in flexible pavement.
- In 2<sup>nd</sup> part the half replacement of 20 mm aggregate is done and the replacement of filler with tyre powder is carried out the variation of tyre powder is 3%, 5%.
- 3% of tyre powder result in increased in strength and reached near to the minimum strength for DBM and after increasing in tyre powder result in decreased

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## Self-Compacting Concrete Jacketing – Tests and Analysis

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**Abstract---** This study presents experimental and analytical results obtained from the application of a reinforced self-compacting concrete jacketing technique for the rehabilitation of shear damaged reinforced concrete beams. Three shear-dominated beams were initially subjected to monotonic four-point bending loading. The damaged beams were first restored using self-compacting concrete jackets that encased the bottom width and both vertical sides of the beams including small diameter steel bars and U-formed stirrups and then retested. The applied jacket was designed to increase the shear capacity of the initially tested beams and to alter their brittle failure mode to a more ductile one. Test results indicated that this jacketing technique is a promising rehabilitation method since the strength and the overall performance of the jacketed beams was ameliorated with respect to the initial specimens. Analytical results of the flexural and the shear capacity of the tested beams are also presented. Comparisons between test data and predicted strength values showed a good agreement.

**Keywords:** Self-compacting concrete; reinforced concrete; jacket; tests; shear; flexure; damage; beam; analysis

### I. INTRODUCTION

Jacketing is a well-known rehabilitation technique of poorly detailed or damaged reinforced concrete members that provides increased strength, stiffness and overall enhancement of the structural performance [1]. Jackets constructed by conventional cast-in-place concrete [2], premixed, non-shrink, flowable, rapid and high-strength cement-based mortar [3], shotcrete [1, 4], Textile-Reinforced-Mortars [5] and Fibre-ReinforcedPolymers [6] have been examined in existing inadequate or damaged structural elements.

#### Nomenclature

1.  $b, d$  width and effective depth of the cross-section of the beam, respectively, mm
2.  $a$  shear span of the tested beams equal to 600 mm
3.  $x, c$  depth of neutral axis in flexural and in shear analysis, respectively, mm
4.  $f_c, f_{ct}$  mean cylinder compressive and splitting tensile strength of concrete, respectively, MPa
5.  $f_{yw}$  yield strength of the steel stirrups equal to 255 MPa
6.  $l_t, l_c$  ratio of the tension and compression steel longitudinal reinforcement, respectively, %
7.  $d'$  concrete centroid cover of the compression steel bars of the initially tested beams equal to 25 mm
8. size effect coefficient in shear analysis that equals to:  $1.08 = 1.2 - 0.2a/0.65$  ( $a = 0.6$  m)
9.  $V_u$  ultimate shear capacity, N (1 kN = 1000 N)
10.  $M_{Vu}$  bending moment corresponding to the ultimate shear capacity ( $= aV_u$ ), N-mm (1 kN-m =  $10^6$  N-mm)
11.  $M_{Ru}$  ultimate flexural capacity (ultimate bending moment resistance), N-mm (1 kN-m =  $10^6$  N-mm)
12.  $F_{si}$  force of the steel bars of the initial beam, N (1 kN = 1000 N)
13.  $F_{sj}$  force of the steel bars of the jacket, N (1 kN = 1000 N)



Recently, the rehabilitation of flexural damaged reinforced concrete beams using self-compacting concrete jackets has been experimentally investigated. Test results indicated that the flexural capacity of the jacketed beams was ameliorated with respect to the capacity of the initial specimens. The application of this self-compacting concrete jacketing technique is extended herein to shear-dominated beams.

## II. EXPERIMENT

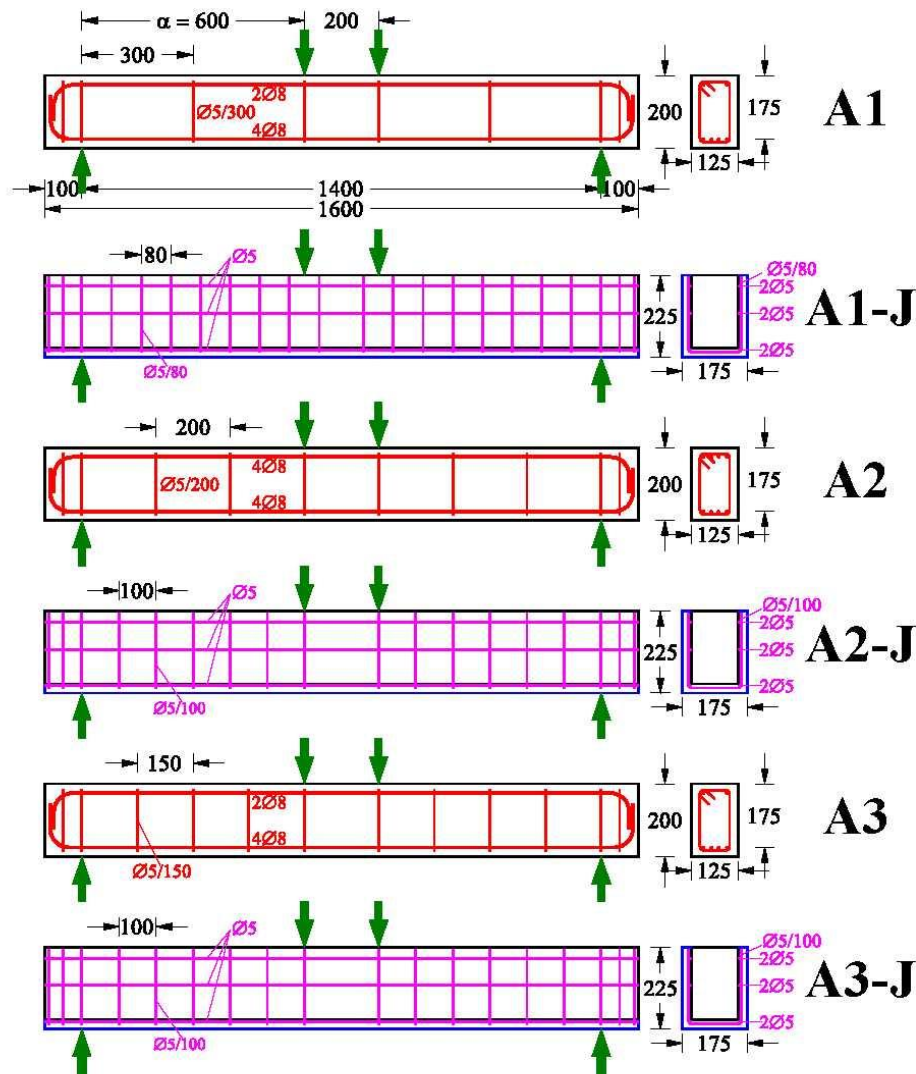
Three reinforced concrete beams with total length 1.6 m and cross-sectional dimensions 125/200 mm have been constructed. Geometrical and reinforcement characteristics of these specimens are displayed in Figure 1 (beams A1, A2 and A3). The mean compressive and tensile strength of the commonly used concrete of these initial specimens was 24.8 MPa and 2.1 MPa, respectively, as measured from uniaxial compression and splitting tests of six cylinders per testing, respectively. The measured tensile yield strength of the deformed longitudinal steel bars and the mild steel stirrups was 570 MPa and 255 MPa, respectively, whereas their ultimate tensile strength was found to be 770 MPa and 357 MPa, respectively. Beams were designed in order to demonstrate shear failure mode and for this reason inadequate amount of stirrups has been provided.

### 2.2. Jacketed beams

After the initial loading, the shear damaged beams were rehabilitated using reinforced jackets made of self-compacting concrete. The thickness of the jackets was 25 mm. Jackets encased the bottom width and both vertical sides of the damaged beams (U-formed jacketing). The steel reinforcement of the jackets consists of small diameter 5 mild steel straight bars and U-formed stirrups with tensile strength at yield 255 MPa and at ultimate 357 MPa. ment characteristics of the jacketed beams.

figure 1 (beams A1-J, A2-J and A3-J). The objective of the self-compacting concrete jacketing design was twofold; first to fully restore the shear damaged beams and second to increase the amount of the provided reinforcement, focused on the shear reinforcement, in order to enhance the performance of the jacketed beams with respect to the initially tested beams and, potentially, to alter their failure mode to a more ductile one.

Initially tested beams sustained severe shear damages, spalling of concrete cover and intense diagonal cracking. All loose concrete fragments were completely removed and the missing concrete parts reconstructed by jacketing reformed and re-casted by self-compacting concrete. No special roughening of the surface of the damaged beams was performed prior jacketing construction. L-shaped mild steel dowels with 5 mm diameter were installed in the vertical sides of the initial beams in order to support the longitudinal bars of the jacket. Dowels were bonded by injected epoxy resin into 7 mm holes that were drilled before. The amount of the provided dowels was rather low; every side bar of the jacket had dowels 5 per 150 mm. Steel bars, stirrups and dowels of the jacketed beams were all welded together



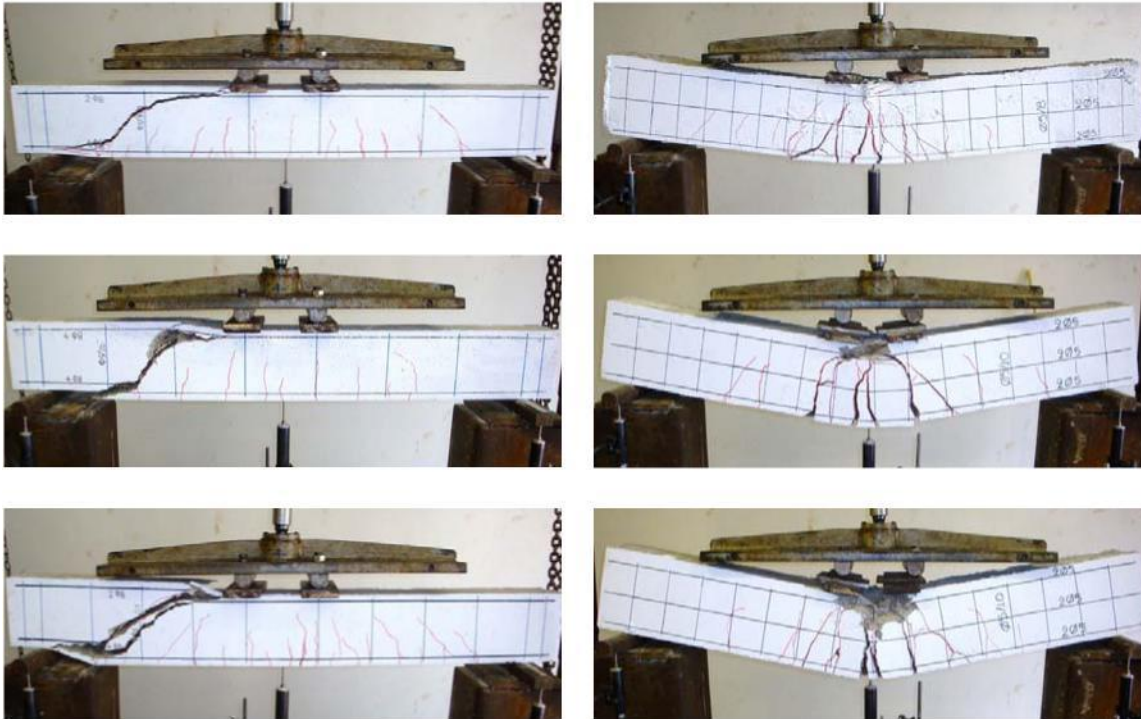
Cast-in-place self-compacting concrete with the mix proportions shown in Table 1 was used. The cement of the mixture contained 305 kg of CEM IV (W-P)/B 32.5 N and 51 kg of CEM II 42.5 N. Fine and coarse aggregates with maximum diameter 8 mm were also used. Further, superplasticizer (Glenium 21), retarder (Pozzolith 134 CF) and viscosity modifying admixture (VMA) were added in order to bring the required water reduction and fluidity, and to increase cohesion and segregation resistance [8]. The measured mean self-compacting concrete compressive and splitting tensile strength was 40.1 MPa and 3.3 MPa, respectively. After jacketing formwork stripping the final result was generally good and the limited superficial imperfections observed were fixed using high-strength, low-shrinkage and rapid-hardening cement paste [9].

### 2.3. Test setup

All beams were tested in monotonically increasing loading up to total failure. Beams were edge-supported on roller supports using a rigid laboratory frame. The loading was applied using a steel spreader beam in two symmetrical points in the mid-span of the beams adopting a four-point bending scheme with a shear span of 600 mm (see also Fig. 1). The ratio of the span to the effective depth of the initially tested and the jacketed beams was 3.43 and 2.93, respectively. Loading was imposed by a pinned-end actuator and measured by a load cell with an accuracy of 0.05 kN. The net mid-span deflections of

the beams were recorded by three LVDTs with 0.01 mm accuracy; one was placed in the mid-span of the beam and two in the supports. Measurements of load and corresponding deflections were read and recorded continuously during the tests.

### III. TEST RESULTS



experimental behavior of the initially tested and the jacketed beams is presented in Figure 2 in terms of bending moment versus mid-span deflection curves. An increase of the loading bearing capacity of the jacketed beams with respect to the corresponding initial beams can be observed. Further, the cracking patterns at failure of the beams are displayed in Figure 3

### IV. CONCLUSION

The examined self-compacting concrete jacketing seems to be an effective rehabilitation technique to shear damaged reinforced concrete beams. The load bearing capacity and the overall structural performance of the jacketed beams was ameliorated with respect to the initially tested specimens. A good agreement between the predicted results and the test data of this study can be observed.

Based on the experimental and analytical results, the following

Conclusions may be made:

1. Using steel jacketing techniques for strengthening RC columns has been proven to be effective since it increases the column capacity to a minimum of 20%.
2. The failure mode of the control reinforced concrete column was brittle while strengthening with steel jacket changed failure mode to be more ductile.

3. Specimen strengthened with angles or channel sections with batten plates recorded a higher failure load than that strengthened with plates.
4. Increasing number of batten plates in 4L series did not help increasing failure load, while it increased failure load for 2C series.
5. Using C-sections with batten plates or plates only in strengthening concrete columns needs cautions due to the buckling consideration of their thin thicknesses.
6. 4L series encountered less deformation than other specimens.
7. As the surface area of concrete covered by steel jacket increases the effect of confinement also increases.
8. The simulation of strengthened RC columns using F.E analysis in ANSYS 12.0 [1] program is quite well since mode of failure, failure loads and displacements predicted were very close to those measured during experimental testing.

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# Use of Alccofine 1203 and GGBS for Cellular Concrete Blocks

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**Abstract**— In these modern technology constructions, the height of structure is moving longitudinally higher. For the requirement of safe structure it is necessary to transmit the load from top floor to the foundation of the structure. Due to higher structural building, size of foundation is increasing and sometimes tends to do combined footing which leads to critical design of the foundation. Thus to tackle with this situation, it is necessary to minimize the load of structure. In this modern technology, there are few research has been conducted on cellular light weight concrete block which is need of future. With this concept, in this project few trials are conducted where cementitious material is replaced by foaming agent, like synthetic foaming agent by 0%, 25%, and 50 % in which the cementitious material is used as a combination of 50% OPC & 50% slag, 30% OPC & 70% slag and Ground Granulated Blast Slag has been replaced by 3% of alccofine in both cementitious combination. Specimens are casted for testing of compressive strength, water absorption and water sorptivity test. It is observed that 50% OPC and 50% slag with 3% of Alccofine is replaced by 50 % of foaming agent gives better result when compared to other combinations..

**Keywords**— Alccofine, foam concrete, GGBS, Cellular light weight concrete block

## I. INTRODUCTION

Masonry construction has been used for at least 10, 000 years in a variety of structures homes, private and public buildings and historical monuments. The masonry of ancient time's involved two major materials: brick manufactured from sun- dried mud or burned clay and shale; and natural stone. The first masonry structures were unreinforced and intended to support mainly gravity loads. The weight of these structures stabilized them against lateral loads from wind and earthquakes. Masonry construction has progressed through several stages of development. Fired clay brick became the principal building material in India during the middle 1800s. Concrete masonry was introduced to construction during the early 1900s and, along with clay masonry, expanded in use to all types of structures.

Historically, "rules of thumb" (now termed "empirical design") were the only available methods of masonry design. Only in recent times have masonry structures been engineered using structural calculations. In last 45 years , the introduction of engineered reinforced masonry has resulted in structures that are stronger and more stable against lateral loads, such as wind and seismic.

Masonry consists of a variety of materials. Raw materials are made into masonry units of different sizes and shapes, each having specific physical and mechanical properties. Both the raw materials and the method of manufacture affect masonry unit properties. The word "masonry" is a general term that applies to construction using hand-placed units of clay, concrete, structural clay tile, glass block, natural stones and the like

## II. LITERATURE REVIEW

Set A. K. Marunmale, A.C.Attar, "Designing, Developing and Testing of Cellular Lightweight Concrete Brick (CLC) Wall built in Rat-Trap bond" [1]

Researchers conduct study on an innovative technique for efficient brick work system with many advantages over the conventional brick work system which "CLC brick in Rat- Trap bond". It reduces the use of material (natural river sand and red soil) and uses the waste material (fly-ash), hence it is green construction material. CLC brick was designed specially to build wall in Rat-Trap bond as efforts had not yet been made to design CLC brick in Rat Trap bond. The test results on CLC brick



were satisfactory and it can be used for non load bearing exterior and interior wall. Also the light weight of CLC brick in Rat-trap reduces the dead load on the structure and provides good thermal insulation. Thus this CLC brick in Rat trap bond had a very good future scope for its development as a commercial product. Aniket Gupta, Mukul Rathore, "Comparative Study and Performance of Cellular Light Weight Concrete". [2]

In this paper researchers present a comparative study of CLC with equal strength of brick having lower density as compared to bricks. They analyzed the economical savings in structural design requirements as per the deduction in dead load of the whole structure, so this also includes an overall capital reduction. Also found that savings in steel due to use of CLC blocks in terms of weight of beam member were found to be 8.635kg. The amount of steel reinforcement used in the CLC block was found to be 1513.53 mm<sup>2</sup> whereas the amount of steel reinforcement required for brick masonry was 1681.64 mm<sup>2</sup>.

The paper focused upon comparison of two types of structures using fire clay bricks and ash blocks structure. Though ash blocks was 3 times costlier than fire clay bricks but the use of ash blocks had considerably reduced the size of air conditioning system, total usage of energy and finally the total cost of building due to its light weight and insulating nature. Hence, use of ash blocks had helped in conserving the natural resources, energy and environment. B. Surekha, M.

N. Hegde, & K. S. Jagadish, "Energy And Building Materials"[4]. Researchers conduct study on embodied energy of Building materials. The energy intensity was calculated as per the data collected from manufactures in and around Bangalore City. Building materials include natural material, processed materials and Building elements. Embodied energy for alternative building materials and building elements was also presented. Burnt brick was the major contributor to the embodied energy of a building since it represents the largest volume in a building besides having a high energy value ranging between 4.63MJ to 6.13MJ per unit. Alternatives to brick like the stabilized Mud Block, Hollow concrete Block and cut sand stone lead to significant reductions in embodied energy

### III. MATERIAL AND METHOD

#### 3.1 Material: Foam

Protein based foaming agent concentrate, is used to make the light concrete or foam concrete. First it is to diluted in water and then foam is produced in a concrete foam generator with compressed air. Foam produced has very fine and stable high quality foam. Stability and density depend on dilution & settings of the foam generator.

Protein based foaming agent gives high stability of the foam, successfully with standing the conditions when mixing, conveying (pump-able), pouring, casting and during the setting and hydration process.

#### 3.2 Material: Cementitious

Fly ash one such material obtained by combustion of coal. It is finely divided residue and transported by fuel gas. India is a resourceful country for fly ash generation with an annual output of over 110 million tons, but utilization is still below 20% in spite of quantum jump in last three to four years. Availability of consistent quality fly ash across the country and awareness of positive effects of using fly ash in concrete are pre-requisite for change of perception of fly ash from 'A waste material' to 'A resource material'.

Now a day's due to strict control on quality of coal and adopting electrostatic precipitators, fly ash of consistent quality is separated and stocked, and it is gaining popularity as a good pozzolonic material for partial replacement of cement in concrete. UFGGBS Fly Ground Granulated Blast furnace slag (GGBS) is a byproduct for manufacture of pig iron and obtained through rapid cooling by water or quenching molten slag. If slag is properly processed then it develops hydraulic property and it can effectively be used as a pozzolonic material. However, if slag is slowly air cooled then it is hydraulically inert and such crystallized slag cannot be used as pozzolonic material.

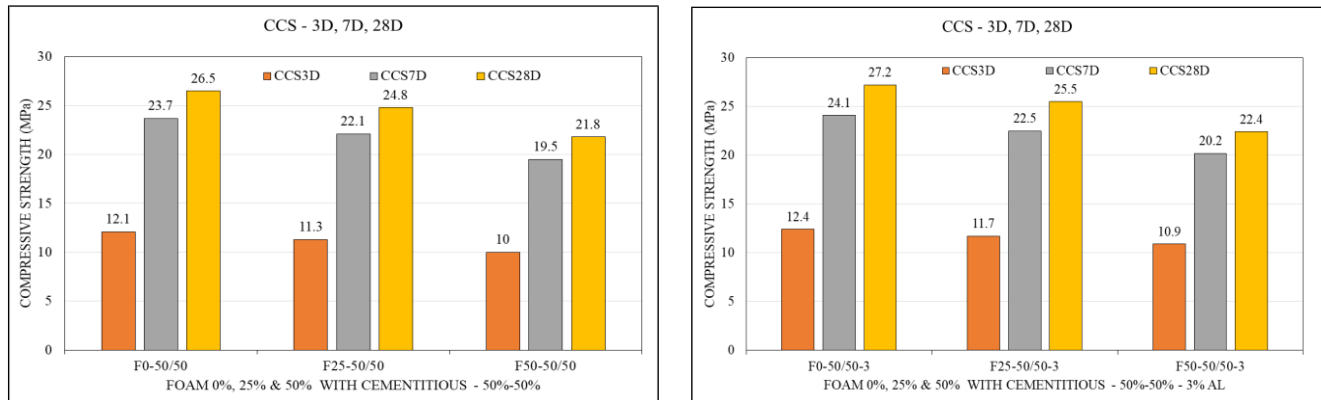


### 3.3 Methodology

In this paper we have considered 3 cases.

Case i) Increasing the volume of foam by 0%, 25% and 50%, with 50% OPC and 50% GGBS.

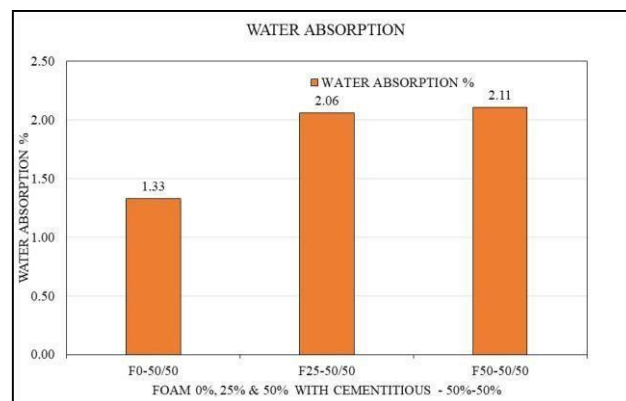
Case ii) Increasing the volume of foam by 0%, 25% and 50% with 30% OPC and 70% GGBS.



**Figure 1 & 2: Case 1 & Case 2**

### 3.4 Water absorption

The core cut of size 100mm diameter and 50 mm thick is cut through the cube casted for water absorption test. Total 18 specimen were tested and results are shown in graphical format below. Water absorption test was conducted on 28th day of casting. Graphical results showing in figure 3 & 4.



**Figure 3 & 4: Foam 0%, 25%, 50% with cementitious material**

## IV. CONCLUSION

From the experimental work and results, we can conclude the early and later strength increases with the increasing finer materials like GGBS and Ultrafine GGBS. The durability of concrete is better with the reduction in water absorption and water sorptivity properties and these properties shows better results when the ultrafine materials are used. Replacement of cementitious material with foaming agent has great impact on concrete density as increase in foam percentage decreases the weight of concrete block. For the structural stability it is better to use CLC blocks as it reduces total weight on foundation, ultimately results in reduction of foundation sizes.

### ACKNOWLEDGEMENTS

We beholden to Mr. S. Varpe (Deputy Manager, Ambuja Cements Ltd, Mumbai) for explaining to us the diverse facts of the experimental work involved in our present study. The experimental work of such an extent is not possible without the active help of the technical supporting staff.

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# The Use of Plastic Waste as Transition Materials in the Production of Pavement Block

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**Abstract**—Due to globalization many developing countries faces lot of challenge of waste. The plastic waste which is part of solid waste poses a menace to sustainable development due to its slow rate of degradability and the indiscriminate way it is disposed. To lessen the negative impacts on the environment and the associated effects on human health, plastic waste is being considered as materials in transition and are being used in the production of pavement blocks and other materials for construction purposes. The study reports some physical and mechanical properties of plastic waste pavement blocks produced by one company in Ghana which has taken a major lead in the direction of adding value to plastic waste for construction. Results are compared to two other pavement block types made from cement and fired clay pavement blocks and discussed. Using plastic waste as transition materials for pavement blocks may among other benefits listed, translate to reduction in construction cost and large quantities of plastic waste polluting the environment and may contribute to cleaner cities and towns.

**Keywords**— construction, environment, Plastic waste; Pavement blocks, transition materials

## I. INTRODUCTION

Economic growth and changing pattern resulting in rapid increase in the use of plastics in the world. Thus, consumption of plastic material has increased from 5 million tons in the 1950s to 100 million in the 2000s. In Ghana per capita generation of plastic waste has been reported to be between 0.0016- 0.035kg/person/day. And, plastics make up between 18-20% component materials in the waste stream [1]. There are however concerns about plastic waste disposal methods commonly employed in many developing countries as they do not deal effectively with the large tonnes of plastic waste generated. These disposal methods include dumping plastic waste in landfills, incineration and open littering. Since plastics take several years to degrade, there are challenges associated with their improper disposal which include:

- i. Blocking drains and choking of gutters which may contribute to floods.
- ii. Release of toxic gases into the atmosphere when openly burnt. Some of these gases may be harmful to humans and cause greenhouse effects.
- iii. Discarded bottles and containers may serve as breeding grounds for mosquitoes when filled with rainwater.
- iv. Washing of the littered plastic materials into water bodies including oceans contributing to decline of ocean life.

Common pavement materials used in Ghana include the cement pavement blocks and the fired clay pavement bricks. Portland cement imported into the country is used in the production of cement pavement blocks and is associated with increasingly high cost due the unstable value of foreign exchange. Fired clay pavers produced from available local clay materials are not very popular with a lot of people because they are perceived by many as expensive. The production of fired clay pavers currently in the country relies on firewood burnt at very high temperatures. This firing method is not sustainable and associated with consumption of a lot energy. In recent times, due to the ecological and environmental challenges associated with the disposal of plastic waste, there are a lot of interest in turning plastic waste into a resource in construction. Pavement blocks produced from waste plastic and other materials like sand, quarry dust etc., is recently being promoted in many developing countries as a more affordable and a sustainable material which may be used in construction and Ghana is no exception. Though it is generally known that these plastic waste

pavement blocks are strong and durable, there is little scientific data in Ghana to support this claim. This paper therefore reports a study on three types of pavement blocks produced from plastic waste, fired clay and cement.

## II. MATERIAL

The pavements samples under study were obtained from three different commercial paving factories in Ghana. The raw materials used in the production of these pavers comprised of cement, quarry dust and fine aggregates (sand), for the cement pavers, clay for the clay pavers, and waste plastics and sand for the plastic pavers. Six samples of each paver types were randomly selected and tested for each of the various physical and mechanical properties which include density, compressive strength, flexural strength, abrasive resistance, water of absorption and durability in sea water. Plastic pavement blocks were commercially produced in bigger sizes of 30cm by 30cm. They were cut into 4 equal part with half remaining. And test run on samples of dimension 20cm by 10cm with a thickness of 5cm. This is to make sure all types of pavement blocks have comparable sizes. Cement and fired clay pavement blocks are of hexagonal shape and with dimensions 23cm by 14cm with thickness 5m and 20m by 10.5 with thickness 6.5cm respectively. The samples were cured for more than 28 days to ensure maximum mechanical strength development before the various test were conducted.

## III. METHODS

### 1. Density:

The density of the various paving bricks was determined using Archimedes principle of water displacement. Dry weights of various pavers were measured and fully immersed in a tank containing water. The volume of water displaced was measured for each pavement type, and the average volume of water displaced was recorded for six samples each of the various pavers. The densities of the various pavers were determined by dividing the dry weight by the volume of water displaced [2].

### 2. Compressive strength:

The compressive strength is the most prioritized property to be achieved in the production of paving bricks in almost every factory that is actively involved in manufacturing of pavers [3]. Hydraulic universal testing machine which has a maximum capacity up to 2500KN was used to determine the compressive of the various pavers in this study. The load was applied to the nominal area of the cement, clay and rubberized pavers to determine the various compressive strengths. The corrected compressive strength was computed using correcting factors (BIS, 2006).

### 3. Flexural strength

Flexural strength is one of the tests performed on paver blocks which serves as a quality indicator and it is considered as a basis for comparison in terms of wearing resistance. Flexural strength test was performed by subjecting the various pavers to a that wise force which is perpendicular to its longitudinal axis. A center line was indicated on top of the pavers which is perpendicular to its length. The pavers were supported by two support rods over a span of 150mm and were tested under a central line load until failure occurred, using the INSTRON universal testing machine. The flexural strength values recorded are the average of six samples each for the various paver [4].

### 4. Water of absorption and durability in sea water

Water of absorption is the determination of the rate of absorption by measuring the increase in mass of the pavers resulting from absorption of water over a period. The pavers were fully immersed in a tank of fresh water for 24 hours and the weight measured to determine the percentage of water absorption. And, the pavements were fully immersed in a tank of sea water for four months to determine its durability by applying a load to determine the compressive strength using the universal testing machine.

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The percent water of absorption is determined using equation (1),

$$\% \text{ water of absorption} = ((\text{wet weight} - \text{dry weight}) / \text{dry weight}) \times 100 \quad (1).$$

## IV. RESULTS

### 1.Density

The density values of the various pavers are presented in Figure 1. The values range between 1.99g/cm<sup>3</sup> to 2.04 g/cm<sup>3</sup>, with fired clay pavement block having the lowest and cement pavement block having the highest.

Figure 1: Average density of the three different pavers.

### 2.Compressive Strength

As shown in Figure 2 , fired clay pavement block recorded the highest compressive strength followed by the plastic pavement blocks with the cement pavement blocks recording the least compressive strength. tests were carried out using different kind of plastics with varying percentages of substitution. Decline in compressive strength was observed with increase in percentage of plastic. Among the different kinds of plastics tested , the highest strength was obtained with polythene bags. This may be attributed to the fibrous nature of the material.

Figure 2: Average Compressive strength of the three different pavers.

### 3.Flexural Strength

the test results of flexural strength of plastic paver, cement paver and fired clay paver to be 6.04MPa, 5.86MPa and 5.09MPa respectively. Flexural strength up to 75% is achieved for a mix of PCA up to 15%. Flexural strength up to 52% is achieved for a mix of PCA up to 30%. The reduction in strength of plastic replaced concrete is due to deficient bonding of plastic aggregate in the matrix.

### 4.Water of Absorption

the percentage water of absorption test results for fired clay, cement and plastic pavers as 11.82, 8.075 and 0.369 respectively. It was absorbed that percentage of water absorption was increased with the addition of plastic aggregates. For concrete specimen containing 20% volume of plastic, water absorption was higher than that of the specimen without plastic aggregate. When substituting part of the natural fine aggregates by PET ,The latter creates a proper and different porosity to that one created by the sand since its shape is plane and elongated.

### 5.Abrasion Resistance

Abrasive resistance is a measure of the resistance of paving brick to the wearing action due to traffic and can be calculated using equation (2).

$$\text{Abrasive index} = (\text{water absorption} / \text{compressive strength}) * 100 \quad (2)$$

The maximum abrasion index for Type III i.e. pedestrian and light traffic pavement is 0.50 and the minimum abrasion limit for a 28day cured concrete paver is 1.20 for footpaths and car parks (ASTM C 902-15). The three types of pavers have abrasion index of 0.35, 0.14 and 0.014 for clay, cement and fired clay pavement blocks

## V. DISCUSSION

The density of fired clay pavers has been stated to be between 1.826g/cm<sup>3</sup> and 1.985g/cm<sup>3</sup>, and specific gravity of special masonry varies between 1.20g/cm<sup>3</sup> and 2.40g/cm<sup>3</sup>(ASTM C-902). From the results in Figure 1, Clay pavers had the minimum density value

followed by the plastic and cement pavers of densities 2.04g/cm<sup>3</sup> and 2.10g/cm<sup>3</sup> respectively. The 3 types however fall within the standard specification. Clay pavement blocks recorded higher average compressive strength, followed by plastic pavement blocks and then cement pavement blocks. Clay pavement blocks have highest thickness compared to plastic and cement pavement blocks and this may have contributed to the high compressive strength. Also, the compressive strength of the plastic pavement blocks was not determined on full blocks but on a cut-out section, may have caused a reduction in the compressive strength of plastic pavement blocks as noted by Vila et al. [5]. The production of fired clay pavement blocks currently in Ghana relies on firewood and requires much energy during firing. Harmful gases such CO<sub>2</sub> may also be released into the environment which is not eco-friendly. When firing is not well controlled, clay bricks can develop cracks which may lead to reduction in strength. Cement pavers recorded the least compressive strength value as compared to the plastic pavers. Poor compaction is a major factor that influence the strength of cement pavers which creates more pores to absorb water. Secondly, decreased strength in concrete pavers can be attributed to variation in the mix proportions in the batching process.

## VI. CONCLUSION

In this study clay pavement and plastic pavement blocks obtained higher average compressive strength than the cement pavement blocks. Durability studies suggested that plastic pavement blocks may perform better in areas prone to flooding and high saline content. Though the various pavement blocks may be used for footpath, light traffic, walkway etc., the plastic pavement blocks made from waste plastic and sand may be cheaper and represent an alternative way of turning waste material into useful product for a more sustained construction. Plastic waste use as transitional material in construction is a demonstration of how waste could be turned into a resource for cost effective, yet a durable and sustainable material for construction. Other advantages include minimizing plastic waste in the environment, the landfills and water bodies contributing to cleaner cities and towns and creation of more jobs.

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# Pushover Analysis for Steel Frame Structure with Bracing

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**Abstract**— In last few periods steel structure has played an essential role in industry of construction. it is necessary to design a structure so that it implement well under seismic loads. The seismic performance of a multi-story steel structure framed building is designed in accordance to the provisions of the Indian standard code (is 800 -2007). The ductility of the structure can be improved by introducing steel bracings in the structural system. Different type of bracings can be used for retrofitting too. performance of frame is studied through nonlinear static analysis (pushover analysis) using a software package e-tabs 2016, diagonally braced, alternative diagonally braced, v-braced, inverted v-braced, k- braced etc. in this study a typical multi-story (g+5) steel frame building is designed with and without different types of bracings. Deformed shapes, hinge results, lateral displacements, modal period and frequencies of the altered building frames and corresponding type shapes are compared for frame with and without bracings. Pushover curves and performance points for the different frames with and without bracing systems are compared to find the relative performances of several frames considered.

**Keywords**— steel structure, seismic performances, braced frame, pushover analysis, retrofitting.

## I. INTRODUCTION

### 1.1. General

In last few decades Steel structure have been played an important role in Industry of Construction. It is necessary to design a structure that should be perform well under seismic loads. The ductility of the structure can be increased by introducing Steel bracings in the structural system. Different type of bracings can be used for retrofitting as well. There are many different numbers of ways to arrange Steel bracings such as X-braced, diagonally braced, alternative diagonally braced, V-braced, inverted V-braced, K-braced etc. Frames of such structure should have adequate ductility property to perform well under seismic loading. To estimate the ductility and other properties like lateral displacements modal period and frequencies for each type of bracing considered, push over analysis is performed on E-Tabs 2016. A simple program-based push-over analysis is a technique for performance-based design (non-linear analysis) of building frames subjected to earthquake loadings.

## II. PUSHOVER ANALYSIS

Pushover analysis or non-linear analysis an accurate analysis method in which the whole structure is subjected to monotonically increasing lateral load with a varying height distribution of lateral force until a desired displacement is arrived. Pushover Analysis consists of a series of sequential elastic analyses, superimposed approximate the force- displacement curve of the overall structure. A two or three dimensional diagrams of all lateral force resisting elements is first created and gravity loads are applied initially. The structure is subjected to pre-defined lateral loads pattern which are distributed along the building height. The lateral forces are increased until the some members start yield. The structural model is modified account for the reduced stiffness of yielded members and lateral forces are again increased until additional members yield. The process is continued until a control displacement at the top of building reaches to certain level of displacement at the top of building reaches a certain level of deformation or structure becomes unstable. The displacement is plotted with base shear to get the static pushover curve.

## III. Literature review

### 2.1. General

In this chapter we are providing a brief description of the literature review of the modeling of structure would be difficult to

explain in this chapter. A proper description of previous studies on pushover analysis is presented in this section. This literature review enables us to access the recent contributions related to pushover analysis on steel structures mainly and the past contributions made which nearly matches the present work.

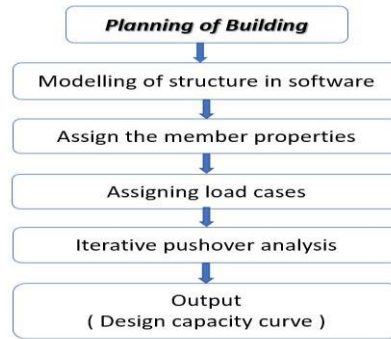
## 2.2.Literature review on pushover analysis

- **DR. P.Eswaranoorathi et.al.(2014)[1]** studied the thorough investigation of the pushover analysis of steel frames such as bare frame that is by not using bracings, Braced frame are done by them. The pushover analysis is done by using ANSYS and through experiment under the lateral loading has been carried out with the intention to note the percentage of strength achieved. After analysis the result shows that the yield load of steel braced frame is 1.22 times greater than the yield load of bare frame in the analytical investigation and the yield load of steel braced frame is 1.32 times greater than the yield load of bare frame in the experimental method. Similarly the ultimate load of the steel braced frame 1.07 times greater than the ultimate load of bare frame in the experimental investigation. At the ultimate load, Deflection of the braced frame Is reduced 3.09 times compared to bare frame in the experimental investigation. The deflection value range through ANSYS is also validated by Stiffness method.
- **Kurapati Nikhila et.al.(2017)[2]** base shear and displacement capacity of the braced steel space frame with considering uniformly collapse case is decreased by 89.47% and 89.38% when compared to regular space frame without considering uniform collapse case at Seismic zone 2. Base shear and displacement capacity of the braced steel space frame with considering progressive collapse case is declined by 89.7% and 89.7% when compared to regular space frame not taking in to account the uniform collapse case at seismic zone 3.
- **Mayank Chouhan and Dr. Savita Maru et.al.(2017)[4]** Many recommend are studied for linear and non-linear analysis and the seismic evaluation of the structure are discussed. Most of the researchers have reviewed that the steel structure were assumed to be placed in various zones of India are carried out the investigation on the non-linear pushover analysis and associated the performance of the steel components, maximum base shear capacity and displacements of the structure located I the various zones. The software used for the analysis are described in numbers SAP2000, ETABS are mainly the software used to find out the seismic estimation and performance of the structure. All these studies require further research not based on assumption, but in real terms it is necessary to think through existing steel structures under seismic evaluation.
- **Prince kaley and Mirza aamir baig et.al.(2014)[6]** The performance point is to study the steel structure with and without bracing, the steel structure in performance point of view with bracing has less susceptible damage states than the steel structure without bracing. Comparing the results of structure with and without bracings, base shear vs. displacement curve indicates that the braced structure are far most better than the steel structure without bracing. It also indicates that the capacity curve is far more linear therefore steel structures with bracing. Study of hinges formed during pushover analysis for structure without bracing. The severe and collapsed state of damage is observed more in structure without bracing than in structure with bracing. Therefore bracing reduces the plastic hinge state and consequences less damage. Study of storey wise lateral displacements, modal period and frequencies shows the lateral displacement is reduced significantly in case of braced frame. Also modal period for different modes of braced steel frames is comparatively less than that of unbraced steel structures or frames. Further frequencies of braced steel frames is comparatively higher than that of unbraced frame. When the storey wise displacements were compared and the modal with 'single diagonal bracings' was found to give better results for non-linear static analysis where compared to other models. Also, model with the X bracing was found to giving better results in terms of modal periods and frequencies for non-linear static analysis.
- **Jayram Nayak B et.al.(2018)[5]** From the pushover analysis results it can be observed that, the braced frame have enhanced base shear capacity compared to bare frame. One storey for all configurations have higher seismic performance compared to two storey bracing and three storey bracing. Also, X bracing with one storey bracing and diamond bracing with two and three storey bracings shows highest seismic performance. Aspect ratio of one has shown better performance for all the structural models considering.

## IV. MATERIAL AND METHOD

Covering various levels of irregularity in plan and elevation, structural ductility and directional effects, using pushover analysis a

characteristics non-linear force displacement relationship can be determined



**Fig no 3.1 Pushover methodology**

### 3.2.Pushover analysis

Pushover or non-linear analysis is defined as an analysis in the mathematical model directly including the nonlinear load-deformation characteristics of individual components and elements of the building shall be subjected to monotonically increasing lateral loads representing inertia forces in an earthquake until a target displacement is exceeded from target. Target displacement (elastic plus inelastic) is the maximum in the building at roof expected under selected earthquake ground motion. The structural Pushover analysis assesses performance by estimating the force and deformation capacity and seismic demand using a non-linear static analysis algorithm.

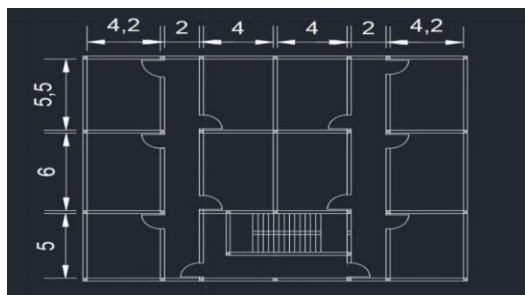
- a) A thorough literature review to understand the seismic behavior of building structures and application of pushover analysis.
- b) Seismic behavior of steel frames with various types of eccentric bracings geometrical and their structural details
- c) Model the selected in seismic behavior of steel frames with various eccentric bracings computer software ETABS (2016).
- d) Carry out pushover analysis or non-linear analysis of seismic behavior of steel frames with various types of bracings and arrive at a conclusion.

Response characteristics that can be obtained from the pushover analysis are summarized as follows:

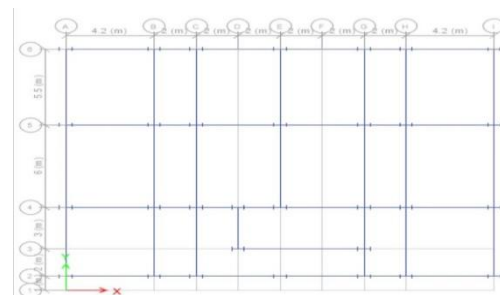
- a) Estimates of force and displacement capacities of the structure.
- b) Estimates of all force (axial, shear and moment) demands on likely brittle elements and deformation demands on ductile elements.
- c) Sequences of the failure of elements and the consequent effect on the overall structural stability.

### 3.3. PUSHOVER ANALYSIS PROCEDURE

- 1) A two or three dimensional model that represents the overall structural is created.

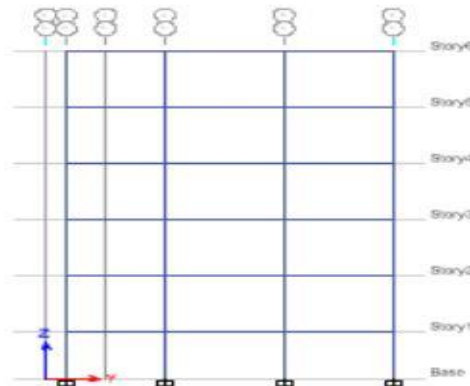


**Developed plan in AutoCAD**

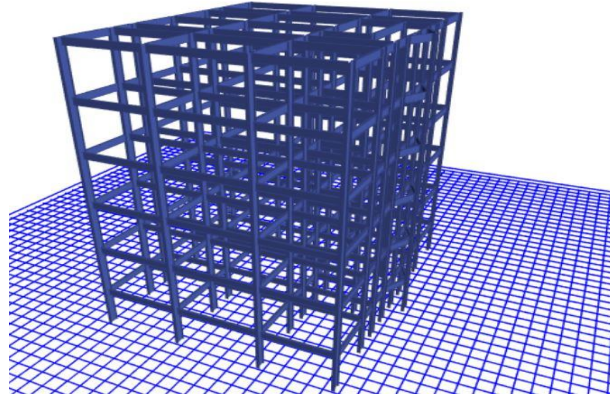


**Centre line plan in Etabs**

2) Assigning the member properties



**Elevation view in Etabs**



**Render view of model**

3) Gravity loads combine of dead load, live loads and lateral loads are applied to the structural model initially

**Description of model**

Sr.No.	Particular	Details
1.	Live load	5 kN/m <sup>2</sup>
2.	Earthquake load	As per IS 1893 (Part 1)-2016
3.	Slab thickness	150 mm
4.	Depth of foundation below ground	4 m
5.	Type of soil	Type II, medium as per IS:1893-2016
6.	Storey height	4.2 m
7.	Grade of steel	Fe410 structural steel
8.	Column size	ISWB 600
9.	Beam size	ISMB 550
10.	Bracing size	ISMB 400
11.	Building importance factor	1
12.	Height of building	24.5 m

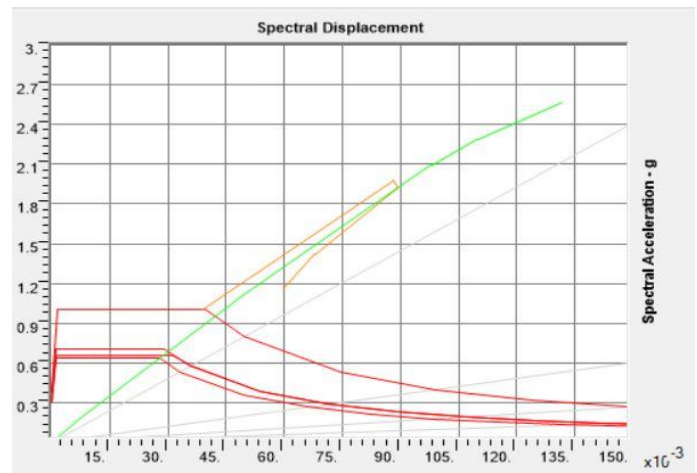
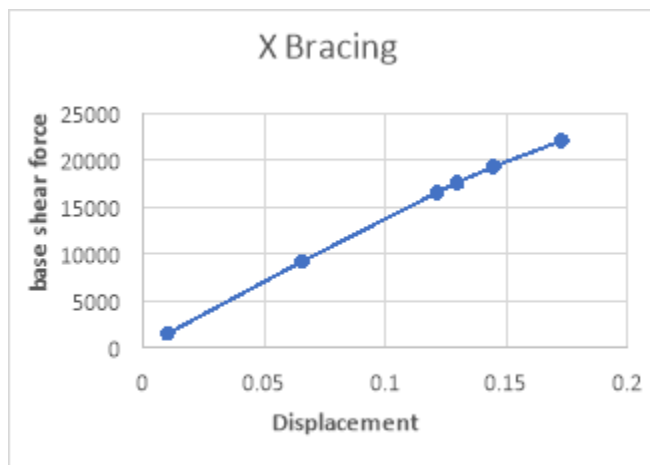
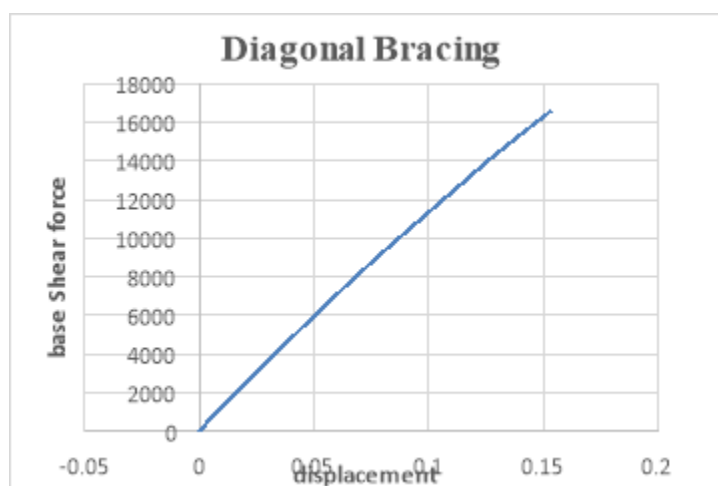
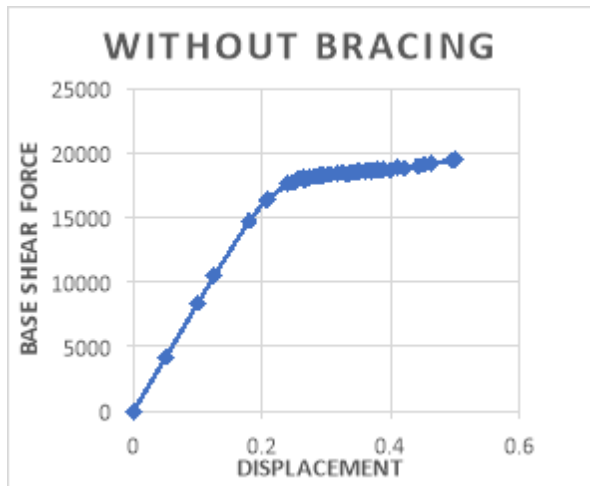
4) Lateral loads are increased until some member(s) yield under the combine effects of gravity and lateral loads.

- 5) Base shear and roof displacement are recorded to yield first.

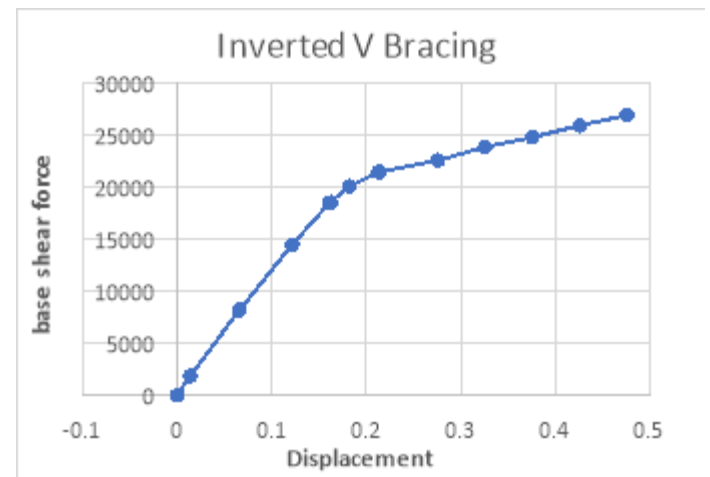
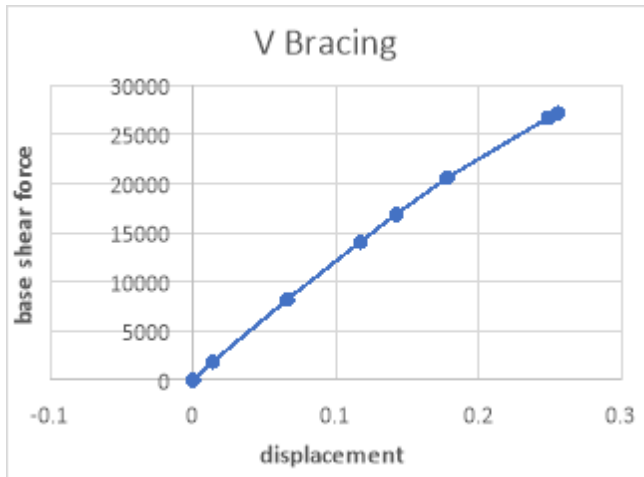
### 3.4. Location of bracing

1. Bracing in vertical planes (between lines of columns) provides load to transfer horizontal forces to ground level and provide lateral stability
2. Horizontal bracing At each floor level the bracing in horizontal plane where generally provided by floor plate action and also provides a load path to transfer the horizontal forces to the planes of vertical bracing.
3. The location of the bracing is placed such that, where plastic hinge condition is established.
4. It is provided to the failing member so as to decrease the seismic activity.

### V. RESULT OUTPUT:- BASE SHEAR FORCE VS DISPLACEMENT







## VI. CONCLUSION

The models structure frame are analyzed using pushover analysis. The seismic performance of a multi-story steel structure frame building is designed according to the provisions of Indian code (IS 800-2007). Shear capacity of the structure can be increased by introducing Steel bracings in the structural frame system. Bracings can be used as retrofit as well. There are „n“ numbers of possibilities to arrange Steel bracings such as cross (X), inverted V ( $\Lambda$ ), and diagonal ( $\backslash$ ) type eccentric bracings. A typical six-story steel structure frame building is designed with various types of eccentric bracings as per the IS 800- 2007. cross bracing (X), inverted V ( $\Lambda$ ), and diagonal ( $\backslash$ ) are the different types of eccentric bracings considered for the present study. Performance of the each frame structure is studied through non-linear static analysis. Fundamental period of the Building frames and corresponding mode shapes are calculated. Pushover curves and behavior factors for the different eccentric steel frames are compared to find the relative performances of various frames considered.

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# PLANNING OF AIRPORT AND DESIGN OF RUNWAY PAVEMENT IN MARINE CLAY

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**Abstract**— The paper shows the importance of planning of an airport. It includes the planning and location of various components of an airport such as Runway, Taxiway, Hangar, Aprons, Terminal building, etc. The planning of these components is done on the basis of calculations which are also shown in this paper. A part of this paper also includes the design of runway pavement in marine clay. The tests which are needed to be conducted for determining the nature of soil i.e. its geology, stratification are shown in the paper. Also the different soil consolidation methods are also been described.

**Keywords**— Planning of airport, Runway Design For 4F Aircrafts, Test on the Soil of the Runway. ICAO, design of pavement in Marine Clay, Consolidation

## I. INTRODUCTION

Airport planning in its own sense is a vast phenomenon. The installation of an airport facility not only improves the way of communication for the local people but also increases the economy of the nation by increasing the inflow of foreign tourists. Therefore the planning of an airport for the proper flowing of air traffic is of utmost importance. Not only the runway for the landing and takeoff of an aircraft is of prime importance in an airport but the value of taxiway, hangars, aprons, terminal building for the Maneuvering of aero planes ,their parking and maintenance, as well as for the loading and unloading of the big sized Boeings cannot be neglected.

For the governing, planning and design of an Airport facility various organizations and agencies have put forth safety and necessary standards .These standardizing agencies are as follows

1. International civil aviation organization (ICAO).
2. Federal aviation organization (FAA).
3. Airport authority of India (AAI).

The planning of the different airport components have been carried out by us under the standards of these agencies.

### 1.1 PLANNING OF AN AIRPORT

#### 1.1.1 RUNWAY

As the runway in marine clay comes under 4F category it can accommodate an Airbus A380.

ICAO gives standards for runway falling under 4F category as

Minimum width = 45m.

Maximum width-should not exceed 75m.

Runway end safety areas

- 1 The runway must extend 90m to the end of runway strips to mitigate over runs and undershoots which result from adverse operational factors.

- 2 Distance of at least 240m beyond runway strips for code number 3 or 4 Runway strips (field length more than 1200m)
- 3 Basically 240m for space and other development must be provided ahead of the runway.
- 4 If not an arrest or bed or other mitigating measures must be used.

### 1.1.2 TAXIWAY

As per ICAO

For code letter E runways

Minimum width-23m

For code letter F runways

Minimum width-25m

Width should not exceed 60m for F category Runway.

### 1.1.3 HANGAR AND APRON ( To accommodate Airbus A380 )

Length of an Airbus A380 aircraft-73m+7m clearance from both side=87m.

Wingspan of an Airbus A380=80m+7.5m clearance on both wings=95m.

Hence to accommodate 10 such aircrafts an area of 950mx87m will be required per bay. Bays are the areas in which aircrafts are parked.

Taking reference from Chattrapati Shivaji Maharaj international airport Mumbai

1million m<sup>2</sup> area is provided for each bay.

## II METHODOLOGY

### 2.1 DESIGN OF RUNWAY

#### 2.1.1 CALCULATIONS FOR RUNWAY.(ACTUAL RUNWAY LENGTH)

Data collected for 4F class of runway:

1. Runway length-2900m
  2. Airport reference temperature-32 degree Celsius
  3. Effective gradient-1.59for runway lengths greater than 2100m
  4. Elevation -11m
- Solution- 1.correction for elevation= $\frac{7}{100} \times 2900 \times \frac{11}{300}$   
 =7.44m  
 Therefore, length=2900+7.44  
 =2907.4m
2. Determination of standard atmospheric temperature at taken elevation  
 = $15^{\circ} - 0.0065 \times 11 = 14.92^{\circ}\text{C}$
3. Correction for temperature  
 In temperature= $32 - 14.92 = 17.08^{\circ}\text{C}$   
 Correction=496.59m  
 Therefore corrected length=2907.4+496.59=3404.03m
4. Check for total correction for elevation plus temperature  
 = $\frac{3404.03 - 2900}{2900} \times 100 = 17.38\%$   
 According to ICAO, this should not exceed 35%.
5. Correction for gradient= $\frac{20}{100} \times 3404.03 \times 0.15 = 102.12\text{m}$   
 Therefore, corrected length=3404.03+102.12=3506.15m

#### 2.1.2 TAXIWAY CALCULATIONS

Data collected:

1. Velocity= 80kmph (high turnoff speed by using a compound curve)
2. Coefficient of friction=0.13
3. Runway width= 45m (For F class runways)

1. Radius of central curve

$$R2 = \frac{125f}{\pi} = \frac{125 \times 0.13}{\pi} = 394\text{m}$$

2. Length of entrance curve =  $\frac{45.5 \times C \times R2}{\pi} = \frac{45.5 \times 0.39 \times 394}{\pi} = 73.23\text{m}$

3. Deflection angle of entrance curve

$$D1 = 180 \times \frac{L1}{\pi \times R1} = 180 \times \frac{73.23}{\pi \times 731} = 5.75\text{m}$$

4. Length of central curve

$$\text{Deflection angle of central curve} = D2 = 35^\circ - 5^\circ 45' = 29^\circ 15' = 29.25\text{m}$$

$$L2 = \pi \times 394 \times \frac{29.25}{180} = 201.14\text{m}$$

5. Stopping distance

$$S.D. = \frac{25.5d}{\pi} = \frac{25.5}{\pi} = 250.98 = 251\text{m}$$

This distance is to be measured from edge of runway pavement along the exit OF taxiway.

6. Separation clearance:

Assuming a major airport installation with instrument landing facilities,

The separation clearance as per ICAO = 198.70m

7. Available length of exit taxiway =  $198.7 / \sin 30^\circ - (45 + 25 / 2 \sin 30) = 327.4\text{m}$

## 2.2 DESIGN OF RUNWAY PAVEMENT IN MARINE CLAY

The runway to be designed in marine clay faces many problems since the soil such as soft clay, silt, etc. is expansive soil which is weaker in nature. The soil of this type is subjected to periodic and continuous settlements which are undesirable to have as a pavement supporting soil. For avoiding such conditions which are likely to occur tests are conducted on soils such as triaxle compression tests, atterberg's limits, unconfined unconsolidated tests etc. to check the nature of soil and the degree of consolidation required

Various consolidation techniques for improving soil strengths are as follows

1. Blast furnace slag
- 2 Preloading Method
- 3 Prefabricated Vertical drain
- 4 Sand Drain Method
- 5 Vacuum Method

## III CONCLUSION

In this research paper planning of the basic components of an airport is been done. For this we have done the calculation for actual length of the runway, main taxiway and exit taxiway and the basic details of hangars have been dealt with. For these calculations the ICAO (International Civil Aviation Organization) specifications and standards are considered and referred by us. Since we are dealing with design of runway pavement in marine clays we have mainly concentrated on the runway class 4F which can accommodate an airbus A380 which is one of the largest aircraft exist. The design of the runway pavement in the marine clay will be conducted by us in the later part of the project for which we will be conducting several tests on the pavement material and the soil on which the runway would be resting. Test such as CBR (California Bearing Ratio) for determining the sub grade strengths of our desired runway pavement will be performed and the method for stabilization of expansive soil will be recommended by us by the detail study and the research.

The results to be obtained are as follows,

- 1) Solution for reducing air traffic in existing Mumbai International Airport
- 2) Use of lime cement for stabilization of marine clay
- 3) Increase in the UCS of soil.
- 4) CBR value is to be improved up to 80% – 85%
- 5) Decrease in void ratio of marine clay & plasticity index.

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# ANALYSIS AND MITIGATION OF DISPUTE CAUSATION IN CONSTRUCTION PROJECT

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**Abstract**— ‘Conflict’ and ‘dispute’ are two different notions. The conceptual difference between the two is explored and second one is reviewed through the literature on conflict and dispute in the field of construction. Conflicts or a dispute which is general consensus that projects are plagued with risk in order to manage the conflicts. Dispute is associated with distinct justiciable issues. All Disputes require resolution methods. So that they can be managed: the processes of dispute resolution require proper methods of management of disputes. The methodology is a review of published cases and a survey conducted among professionals with experience. The research of survey in this field will discuss and the empirical work on the causes of conflict and dispute. So, the surveys will collect some resolution methods of disputes which useful for dispute management.

**Keywords**— Conflict, Disputes, Dispute Resolution Methods, Litigation, Mitigation

## I. INTRODUCTION

Construction industry is large organization in which different construction participants with the different ideas, different background, different knowledge and different mentality about construction project. They work together "To achieve maximum profit", so with these differences in thoughts, mentality and knowledge the results in clashing of each other's idea and perception in particular decision, hence disputes in such situation become inescapable, so it is always necessary to manage disputes as soon as possible.

Construction projects are prone to conflicts this is happened due to the multiplicity of different people handling different phases of projects, any type of construction work conflicts or disputes are affects projects. Disputes are described as 'Any divergence of interests, objectives, delay in payment, and priorities between individuals, groups or organization to requirement of a process.

Research of determining the causes of disputes are identified and continue to manifest in projects. Because most of the studies undertaken have been based upon Research of determining the causes of disputes which are identified and continue to manifest in projects. Because most of the studies depend upon questionnaires or derived from case law, the factors identified for example, poor communication has been identified as a cause of disputes. Fundamentally, work processes, policies, and procedures as well behavior's need to change in concert if disputes are to be reduced in construction.

### 1.1 OBJECTIVES

Following is the objectives of analyzing and mitigation of dispute: -

- To identify the causes of disputes and their impact on projects.
- To reduce, manage and resolve construction related disputes.
- To analyze the most important and probably occurring disputes in construction field.
- To avoid post construction claims, litigation and related costs.



## **II. LITERATURE REVIEW**

### **2.1 DISPUTE**

Nowadays, disputes in construction industry are a common thing and sometimes could not be avoided. Every construction project is bound to have conflict. Conflict would exist when incompatibility of interest happened. Construction disputes arise from misunderstanding or disagreement between two parties or more, which always arise as assertions for extra money or time in a project. There are many types of methods / techniques to resolve disputes. Disputes usually arise out of delays in obtaining the work down, disappointing work, or a customer's failure to form payments. Construction-related disputes will consume plenty of your time and cash on a part of everybody concerned.

### **2.2 CAUSES OF DISPUTE**

- Changes in not paid.
- Differing in unusual site condition.
- Suspension of work.
- Variation of quantities.
- Damage due to natural disasters and force-majeure.
- Re-inspection and acceptance
- Termination for the convenience of the client.
- Possession prior to completion.
- Escalation of price due to inflation.
- Acceleration of work progress.
- Ripple effect.
- Currency fluctuations effect.
- Ambiguity in specification and drawings.

### **2.3 IMPACT OF DISPUTES ON PROJECT**

Changes and delays in any project can cause disputes that have a disastrous impact on major construction projects, often involving cost overruns, late delivery and a compromise on the quality and scope of work being done. Disputes in construction projects may influence cash flows, insurance, overheads, and reputation.

## **III. MATERIAL AND METHOD**

### **▪ Literature collection and review: -**

From the above collected literature review we get the idea about the different opinions of the researchers about dispute resolutions. So, we study the different methods to resolve the dispute such as ranking method, litigation, mitigation, mediation. From all of these methods we adopted ranking method.

### **▪ Causes of dispute: -**

Construction disputes have many causes according to the point of view of each participant within any construction project, these causes may include delays, additional work and variation in contractual work causes because of disagreement between two parties, slow client responses, etc.

### **▪ Data collection: -**

The first stage involved interviews in face to face discussion. A group of contracts, clients, builders, architecture, consultant, manager in that particular construction project was selected for interview. The second stage involved a questionnaire survey was conducted in between participants involved in construction project.

### **▪ Questionnaire Survey**

We are analysis the dispute by using two different methods and interview on those 30 causes.

Given these 30 questionnaires was distributed to random sample for contractor etc. These questionnaires causes were personally handed over to respondents and interviewer. The sample of questionnaire survey was distributed to the participants and collected their reviews on the disputes on construction sites. The respondents were asked to express their perceptions of the relative importance of each of the causes of delays by scale approach as either; 1) very low, 2) low, 3) moderate, 4) high, 5) very high. The samples of questionnaire were personally handed over to respondents. From these two steps we get the idea about most occurring disputes in every construction project. The opinion of respondents about the impact cause by dispute on construction sites is been ask. According to their opinion dispute resolutions methods are find out. This method helps to get the impact of the dispute on site.

▪ **Analysis the responses: -**

The responds given by the participants is collected and analyzing it by the ranking method. There are two methods we used for the analysis purpose 1) RII Method 2) Cronchbach's alpha Method.

1) **RII Method: -**

$$\frac{\sum_{i=1}^5 W_i X_i}{\sum_{i=1}^5 X_i}$$

Where,

i = response category index = 1, 2, 3, 4, 5 for very low, low, moderate, high, very high, respectively.

W<sub>i</sub> = the weight assigned to the i<sup>th</sup> response = 0, 1, 2, 3, 4, respectively.

X<sub>i</sub> = frequency of the i<sup>th</sup> response given as percentage of total responses for each cause.

2) **Cronchbach's Alpha: -**

$$\text{Alpha} = \frac{NC}{V + (N-1) \cdot C}$$

Where,

N = the number of items

V = the average variance

C = the average inter-item covariance

From above these two methods, which ranking method gives high rank of dispute that we will find out.

- **QUESTIONNAIRE SURVEY FORMAT: -** The study of literature survey to obtain causes of conflicts was design based on review of related research paper of disputes in construction industry. We are going collect Rating of 1 to 5 was given to each factor, which represents, 1 very little effective, 2 little effective, 3 average effective, 4 high effective, 5 very high effective respectively. Ratings were given to each factor to evaluate the relative effectiveness of each factor in causing the time delay disputes as table (3.2.1)

**TABLE 1**  
**Questionnaire Survey Format**

Sr. No.	Name of Causes	Name of respondents				
		Very high impact (5)	High impact (4)	Medium Impact (3)	Low Impact (2)	Very low impact (1)
1.	Delay in payment					
2.	Finance difficulties					
3.	Delay in commencement					
4.	Poor site management					

5.	Ineffective planning and scheduling of project					
6.	Labor dispute and strikes					
7.	Delay in delivery of materials and equipment's					
8.	Rework because of errors during constructions					
9.	Incomplete tender information					
10.	Bad weather considerations					
11.	Delay in approving design documents by consultant or contractor, etc.					
12.	Inadequate contract documents					
13.	Obstacles from government					
14.	Error in design drawing details and specification and it is estimation					
15.	Site accidents due to lack of safety measures					
16.	Lack of skilled operator to handle equipment's					
17.	Lack of funds					
18.	Political situation					
19.	Different attitude towards people					
20.	Investigation of site condition (Geological conditions)					
21.	language problem's					
22.	Global financial crisis					
23.	Poor client satisfaction					
24.	Work change orders					
25.	Unfair allocation of risk					
26.	Return of security deposit					
27.	Damage business relationship					
28.	difficulty of co-ordination between various working on the project					
29.	Poor organization of the contractor or consultant					
30.	Inadequate modern equipment					



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## Use of Non-Newtonian Fluid To Fill Potholes

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**Abstract**— A Country like India has been witnessing traffic congestion and potholes problem in the past few years. A potholes is a structural failure in a road surface caused by failure chiefly in asphalt pavement due to the presence of water in the underlying soil structure and the presence of traffic passing over the affected area. City like Mumbai, the occurrence of potholes on the city street is increasing day by day. The possible solution for the problem has been created by us for filling the potholes by placing a specially designed bag which is made of tarpaulin sheets which is filled by a shear thickening Non-Newtonian fluid which will help it to maintain its shape and prevent it from contamination. The method is economical, relatively less taxing than conventional methods of repairing potholes. It is also environmentally friendly as the fluid is organic. This method provide a solution which gurantees a smooth and safe ride for the commuters of the city. This method is also cost effective, time saving.

**Keywords**— Potholes, Shear thickening Non-Newtonian fluid ,Viscosity, Container bag ,Compressive strength test, Viscosity variation test, Decay test.

### I. INTRODUCTION

#### 1.1 General

A hole in a road surface that result from gradual damage caused by traffic or weather. A pothole is a hole in the roadway pavement that vary in size and shape. A deep natural underground cave formed by the erosion of rock, especially by the action of water or a depression or hollow in a road surface caused by wear or subsidence. The unprecedented development of potholes during the 2009/2010 summer rainfall season on particularly the Indian provincial and metropolitan roads with bituminous surfacing led to widespread concern among road users and significant media reporting.

- Numerous claims were laid against road authorities for vehicle damage caused by potholes and even for serious vehicle accidents resulting from excessively large potholes.
- Potholes have always been a problem on sealed/paved roads, but never to the extent experienced during the summer of 2009/2010. The causes of the large increase in the degree and extent of potholes during this period were many, but can probably be attributed mainly to the following insufficient routine, periodic or preventative maintenance leading up to the summer.
- Unusually wet conditions for sustained periods. Ineffective or no repair of existing pothole

#### 1.2 Introduction of Non-Newtonian Fluids

- When shear stress is applied to Non Non-Newtonian fluid, the viscosity of the fluid changes.
- The fluid does not follow the Newton Law of viscosity.
- Newton's Law of viscosity "The shear stress between adjacent fluid layers is proportional to the velocity gradients between the two layers"



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## II. LITERATURE REVIEW

### **2.1.1 "RFP Patch using Non-Newtonian Fluid", Arpit Vyas, Rahul S Gupta, Rishabh Gupta (International Advanced Research Journal in Science, Engineering and Technology (IARJSET) 3<sup>rd</sup> February 2018.[5]**

The presence of water is that the primary reason for potholes, their formation differs somewhat counting on the road pavement structure and materials used. When testing the merchandise, the Non-Newtonian material ready gave sensible results to achieving the objectives like pertinency in fixing potholes, time saving, simply mobile, etc.

### **2.1.2 "Use of Non-Newtonian Fluid To fill Potholes" Deepak Vishwakarma, Rahul Yadav, Sameer Mehdi (International Journal Of Research In Science And Engineering) 3<sup>rd</sup> March 2017[2]**

In most cases non-Newtonian characteristics square measure ascertained within the therefore known as structured fluids, however there's an on the spot link between the kind and extent of non-Newtonian fluid behavior and therefore the influence of the outwardly applied stress on the state of the structure. Therefore, the activity of non-Newtonian characteristics is often accustomed ascertain the state of structure in a very fluid. Conversely, one will engineer the structure of a sub-stance to impart the required rheologic properties to a product. However, before examining the role of structure, it's helpful to review 2 key assumptions inherent the thought of shear or elongation or complicated viscousness.

### **2.1.3 "Patch A Potholes with Some Corn Starch and Water" Brad Mccarty, (Science Mag) 6th April 2012[3]**

One of the foremost wonderful things is non-Newtonian fluid. This batter-like mixture, typically comprised of amylum and water, turns into a rock-hard surface once it's fleetly wedged. Chances are high that you've seen demonstrations wherever folks can see pools crammed with the sludge, solely to sink after they stop. In step with Science magazine, that's specifically what a bunch of faculty students hope to accomplish. By filling baggage with non-Newtonian fluid, then inserting them into a hollow and covering them, they're making temporary fixes till a lot of permanent repair may be created. " What they came up with could be a pulverized mixture that's hold on in specially designed waterproof baggage, that square measure made from a robust fiber like Kevlar lined with polymer. To supply a ready-made hollow patch, town employees would merely add water and seal the bag."

### **2.1.4 Potholes: A technical guide to their causes, identification and repairs", S. Komba (CSIR Built Environment ISBN987-0-79885594-5) 10th December 2010[4]**

Although the presence of water is that the primary reason for potholes, their formation differs somewhat counting on the road pavement structure and materials used. Potholes will, of course, conjointly result from numerous, non-structural causes like diesel (or alternative chemical) spillages; mechanical injury to egress from vehicle rims and/or accidents and fires.

### **2.1.5 "Prototype of Non Newtonian Fluid To Fix Potholes", Damien Gayle And Mayank Saxena (Case Western University Cleveland, Ohio, U.S.A.) 12th March 2012[1]**

The process consists of a pulverized mixture hold on in specially designed waterproof baggage made from a robust fiber like Kevlar and lined with polymer. they'll be carried around within the boots of police cars or road maintenance vans and, once a hollow is noticed, all that has to be done is add water, seal the bag and drop it into place. the baggage square measure designed to be durable enough to even get up to cold winters and, once permanent repairs square measure finally created, they'll be removed and reused.

### **2.1.6 "System and methods employing Non-Newtonian fluids", Nicholas H. Barron (Hole Patch llc journal) 12th September 2013[8]**

A system and methodology for briefly filling surface voids, like cracks, potholes or alternative surface breaches includes a versatile instrumentality, like a bag. The bag is crammed with Associate in Nursing built viscousness fluid. The fluid

properties square measure chosen in accordance with a specific application in accordance factors as well as hole properties, anticipated traffic properties and close temperature. A bag with acceptable properties is placed in a very void, and provides a brief travel surface. Embodiments embrace fluids with built viscousness properties, as well as non-Newtonian fluids. further embodiments embrace by selection crammed, by selection drained, or multiple baggage. Another embodiment includes hollow, versatile containers move size in accordance with hole characteristics..

### **2.1.7 “Application of Non-Newtonian Fluid to Fix Potholes”, Mitali Kandalgaonkar,Ruturaj Mane (ICGTI) March 2017[10]**

From test perform it can be concluded that Cornstarch + water (2:1) can be used to fix potholes. This method can be used where hot mix method is inefficient especially during monsoon season. The life span of the material is 30-40 days. Hence it is a temporary method to fix pothole. With further study and research the life span can be increased by adding admixtures to the material. According to gazette published by ministry of road transport government of India the maximum axial load permitted on Indian roads is 35.7 tons. Hence this method can be used for all vehicle loading conditions.

## **III. MATERIAL AND METHOD**

### **3.1 Materials**

The material we used in this project are cornstarch, water and Tarpaulin. To prepare the shear thickening non Newtonian fluid we used cornstarch and water as per volumetric proportions. To make homogenous mixture take water and cornstarch in volumetric proportion and mixed it vigorously.

#### **3.1.1 Tarpaulin:-**

A tarpaulin, or tarp, is a large sheet of strong, flexible, water-resistant or waterproof material, often cloth such as canvas or polyester coated with polyurethane, or made of plastics such as polyethylene. Tarpaulins often have reinforced grommets at the corners and along the sides to form attachment points for rope.

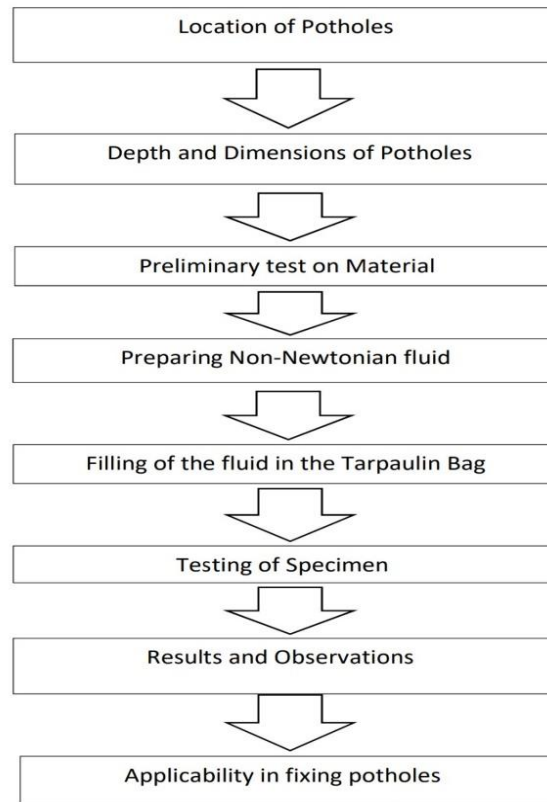
#### **3.1.2 Water:-**

Water is a transparent, tasteless, odorless, and nearly colorless chemical substance, which is the main constituent of Earth's streams, lakes, and oceans, and the fluids of most living organisms. Organic nutrients.

#### **3.1.3 Cornstarch:-**

Cornstarch or maize starch is the starch derived from the corn grain. The starch is obtained from the endosperm of the kernel. Corn starch is a common food ingredient, used in thickening sauces or soups, and in making corn syrup and other sugars. It is versatile, easily modified, and finds many uses in industry as adhesives, in paper products, as an anti-sticking agent, and textile manufacturing.

### 3.2 Methodology



**FIGURE 1: FLOWCHART OF PROPOSED WORK**

### 3.3 Test to Be Performed

- **Fineness test**  
Fineness of material is measured by sieving cement on standard sieve. The proportion of material of which the material particle sizes are greater than the 90 micron is determined.
- **Specific gravity –pycnometer method**  
Pycnometer test is done to determine the specific gravity of the soil. It is the most common and easiest method to test specific gravity of cornstarch as well.
- **Decay test**  
In this test a sample of the fluid with standard mix proportion is prepared and left open to atmosphere for 10 days and the condition of the fluid is then evaluated
- **Compression test on UTM**  
A universal testing machine (UTM), also known as a universal tester, materials testing machine or materials test frame, is used to test the tensile strength and compressive strength of materials.
- **Non Destructive test –Ultrasonic pulse velocity meter**  
This test is conducted by passing a pulse of ultrasonic through material to be tested and measuring the time taken by pulse to get through the structure. Higher velocities indicate good quality and continuity of the material, while slower velocities may indicate material with many cracks or voids.
- **Live demonstration on site**

In this test the unit of bag filled with the Non-Newtonian fluid is placed in a pothole of appropriate size and it is tested by being run over by vehicles of increasing loading.

### 3.4 Proposed Work

#### 3.4.1 Introduction

We did survey at Vasai-Virar. There we found different dimensions of potholes. Then we conduct several preliminary test on material such as fineness test & specific gravity using pycnometer.

**TABLE 1**  
**DIMENSION OF POTHOLE**

Sr. no.	Diameter(cm) approx..	Depth (cm)	Volume (cubic cm)
1.	30	4	2827.43
2	17	1.25	283.72
3.	43	5.5	7988

#### 3.4.2 Fineness Test on Corn-Starch

Basically Fineness test is done to determine the particle size of the cement. It is the most common and easiest method to test fineness of cornstarch.

##### 3.4.2.1 The fineness of Cornstarch Formula:-

$$\% \text{ of cornstarch retained on sieve} = \frac{W_2}{W_1} \times 100 = \frac{7.5+6.5+7}{3 \times 100} \times 100 = 7\%$$

**TABLE 2**  
**DIMENSION OF POTHOLE**

Sample per 100g	Sieve size	% retained	% pass
Sample 1	90 micron	7.5	92.5
Sample 2	90 micron	6.5	93.5
Sample 3	90 micron	7	93

Results: The fineness test of cornstarch is avg of all sample is (7%) when sieved with the 90 micron sieve. which is below than IS code 4031 (part 1)-1996 result (10%) ,therefore it is good quality/condition of cornstarch.

### IV. CONCLUSION

From the above test it can be concluded that cornstarch which we used as the material for preparing the mixture is finer by the method of fineness test. Finer material offers greater surface area for hydration and also faster the development of strength and we also got the density of cornstarch for the calculation of volumetric proportion of mixtures by using the pycnometer test. this method can be used where hot mix method is inefficient specially during monsoon season. The life span of this can be increased by adding admixtures to the material. hence this method can be used for all vehicle loading conditions.

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# GROUNDWATER RECHARGE USING RAINWATER HARVESTMENT METHODS AT VIVA INSTITUTE OF TECHNOLOGY, VIRAR (E)

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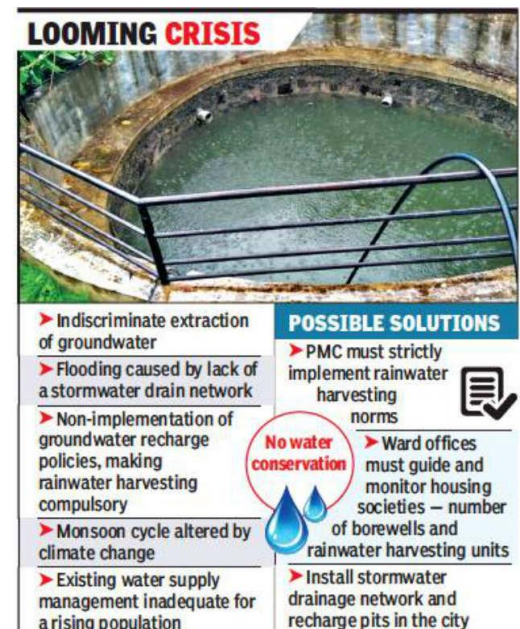
**Abstract**—The various techniques used for artificial recharge of ground water aquifers prove to be effective in storing water for human use in all over states of India, with the possible exception of coastal zone where the extreme porosity of aquifer and its connection to the sea resulted in less water being available for harvest than was injected. In general, recharge was effective in minimizing water loss due to evaporation compared with similar surface storage system, so we have designed effective rain water harvesting system by adopting ground water recharge technique & proposed to our esteemed Institute "Viva Institute of Technology Virar (E)" to help and meet with the demand using rain water harvesting techniques. Our design incorporates in a circuit which will collect water into storage tank and the overflow of water will further help to replenish the ground water level once the tank is filled.

**Keywords**—Aquifer, Evaporation, Ground Water Recharge, Porosity, Replenish

## I. INTRODUCTION

Water is one of the most widely used substances on our earth. We need water for all our activities in day- to-day basis. Water supply in urban area is continuously short against the total demand. Surface water is inadequate to meet our demand and we must depend on ground water. Due to rapid urbanization, infiltration rate of rainwater into the subsoil has decreased drastically and recharging of ground water has diminished. This scenario requires an effective alternative source to bridge the gap between demand and supply. Rainwater which is primary source of water is easily available and is the purest form of water, would be an immediate source to augment the existing water supply by catching water wherever it falls.

VIVA Institute of Technology Virar, East is suffering through the scarcity of water. So it is mandatory to list out necessity of master plan towards bright vision and towards conservation of water by any means with addition to that descriptive objective of planning & methodologies that we should adopt for sustainable development.

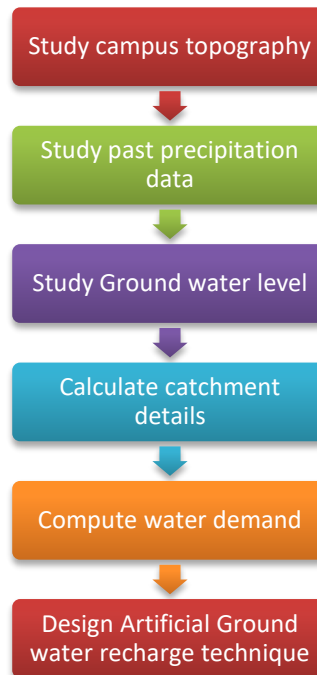




## II. OBJECTIVE

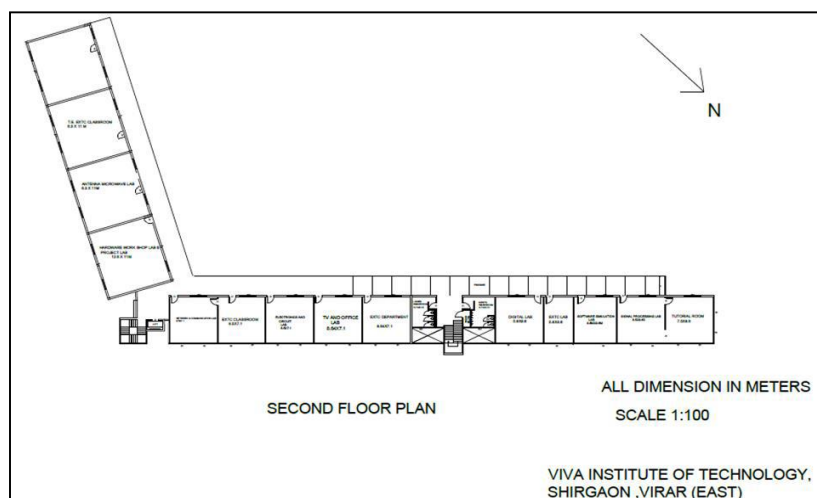
To design efficient rain water harvesting system for college, So that we can conserve primary source of water for future use.

## III. METHODOLOGY



## IV. DATA COMPUTATION

### ❖ L shape building



**FIGURE 1: L Shape building of VIVA Institute of Technology**

### Calculation of precipitation at L shape building

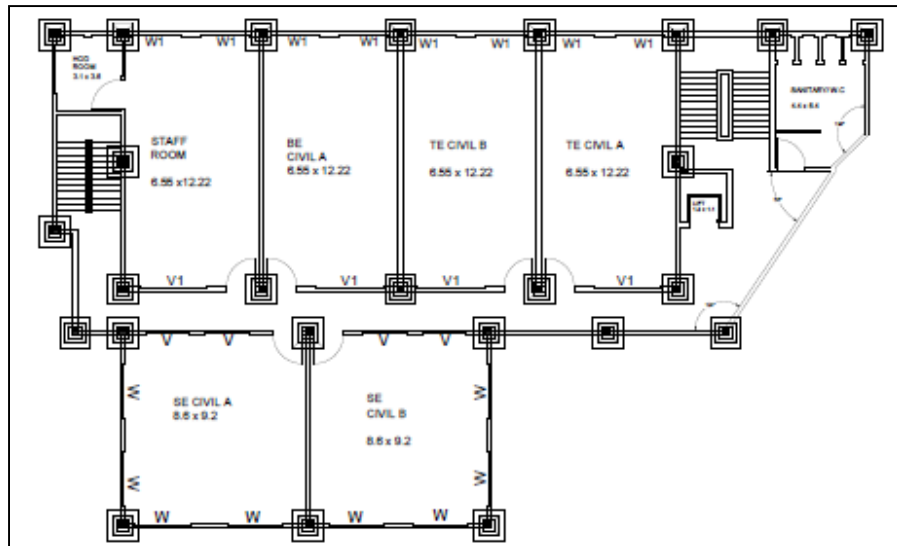
Terrace area of L shape building (A) = 1711.13m<sup>2</sup>

Average annual rainfall (R) = 0.706

Runoff coefficient (C) = 0.8

$$\begin{aligned}
 \text{Rainwater harvesting by terrace area} &= A \times R \times C \\
 &= 1711.13 \times 2.787 \times 0.8 \\
 &= 3812.13 \text{ m}^3 \\
 &= 38,15,130 \text{ L}
 \end{aligned}$$

### ❖ Civil building



**FIGURE 2: Civil building of VIVA Institute of Technology**

### Calculation of precipitation at Civil building

Terrace area of civil building (A) = 603m<sup>2</sup>

Average annual rainfall (R) = 0.706

Runoff coefficient (C) = 0.8

$$\begin{aligned}
 \text{Rainwater harvesting by terrace area} &= A \times R \times C \\
 &= 603 \times 2.787 \times 0.8 \\
 &= 1344.48 \text{ m}^3 = 13,44,480 \text{ L}
 \end{aligned}$$

**TABLE 1**  
**COMPARISON BETWEEN MAIN METHOD**

Sr. No.	Paper Name	Advantages	Disadvantages
01.	Ground water response to artificial recharge of rainwater in chennai, India	Construction of percolation pond which, <ul style="list-style-type: none"> <li>- control rate of evaporation</li> <li>- Facilitate recharge into surrounding ground which in turn improves soil moisture, improves agricultural productivity and mitigates against drought</li> <li>- Can assist recharge of shallow wells, boreholes and springs</li> <li>- Can reduce salinity in groundwater</li> </ul>	Construction of percolation pond which, <ul style="list-style-type: none"> <li>- Low efficiency due to imperfect control over water flow</li> <li>- Great loss of water by Surface Runoff, Infiltration, Deep Percolation</li> </ul>
02.	Roof top rain water harvesting	<ul style="list-style-type: none"> <li>- Simple Construction</li> <li>- Easy of Maintenance</li> <li>- System are flexible &amp; Adaptable</li> </ul>	<ul style="list-style-type: none"> <li>- Vulnerable water quality</li> <li>- Water supply is climate Dependant</li> <li>- Storage capacity is limited</li> </ul>
03.	Alternative Technologies for Freshwater Augmentation	<ul style="list-style-type: none"> <li>- surface water runoff is controlled due to aquifer recharge, resulting in less sedimentation problems</li> <li>- Groundwater recharge collects water during wet season for use in dry season, when demand is highest</li> <li>- Technology is easy to understand and operate</li> </ul>	<ul style="list-style-type: none"> <li>- Recharge can degrade the aquifer unless quality control of the injected water is adequate</li> <li>- Discharge of nutrients and micro-pollutants may negatively affect the receiving soil and the aquifer</li> <li>- Unless significant volumes can be injected into an aquifer, ground water recharge may not be economically feasible</li> </ul>

## V. CONCLUSION

The recharge structures established in the Viva Institute of Technology, Virar (E) has been effective in recharging the roof top water harvested and stored in the underground storage tank in the study area as well as the existing recharge wells established in the campus. The recharge is very effective in increasing the level of the water table in the study area and also some ground water flow appears to take place to further downstream. This case study brings to the light the importance of micro level management of water sources that may influence the sustainable management of water as common property resource.

## ACKNOWLEDGEMENTS

We are using this opportunity to express our gratitude to everyone who has supported us throughout the completion of this project. We are thankful for their guidance, constructive criticism and friendly advice, during the project work. We express our gratitude to Prof. Ashish Shetty for giving us an opportunity to carry out project on Ground water recharge using rain water harvestment method at Viva Institute of Technology, Virar (E). We would also like to thank Prof. Lissy Jose, Head of Civil Department and Dr. Arun Kumar, the Principal (VIVA Institute of Technology) for their whole hearted support. Lastly, we express our gratitude towards all those who directly or indirectly helped us in the completion of our studies.

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## Manufacturing Tiles By Use Of Plastic Waste

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**Abstract**— The present investigation aims at manufacturing Floor Tiles using waste plastic in different proportions with sand, without use of cement and comparing it with the normal cement tiles. To evaluate different physical and mechanical properties, tests like water absorption test, transverse resistance, resistance to impact and abrasion resistance tests were carried out as per IS specifications on the plastic tiles and these test result were compared with the normal cement tiles. The results obtained have shown better results as compared to normal cement tile. As per this study it can be considered to use plastic waste as a binding material instead of cement in the manufacturing of floor tiles. The population growth, industrialization, consumption and technological development have led to uncontrollable accumulation of waste. Proper waste disposal is of great importance in both rural and urban areas. This study discussed the suitability of plastic waste materials for manufacturing of plastic flooring tile. The waste is mix the different proportion of soil sample and their influenced on the geotechnical properties studied. The result of the test indicated that plastic alone is not suitable for production of plastic waste flooring tile. There were no signs of softened plastic observed. A solid waste management (SWM) system includes the generation of waste, storage, collection, transportation, processing and final disposal. Agricultural and manufactured products of no more value are discarded as wastes. Once items are discarded as waste, they need to be collected. Waste collection in most parts of the world is centralized and all kinds of waste generated by a household or institution are collected together as mixed wastes. Solid waste management (SWM) is a basic public necessity and this service is provided by respective urban local bodies. SWM starts with the collection of solid wastes and ends with their disposal and/or beneficial use. Proper SWM requires separate collection of different wastes, called source separated waste collection.

**Keywords**—Plastic Waste, Flooring Tile, Plastic Tile

### I. INTRODUCTION

The increasing plastic waste causes a lot of threat to the environment and even repeated recycling pose a potential danger. This waste plastic can be reused to make tiles that can be used in floorings for houses, terraces and bathroom. Polypropylene co polymer (PPCP) is a colorless solid in granular form with no odor. It is non-reactive with environment. PPCP is widely used in Plastic Processing Industries to make a variety of products such as sheets, boxes, containers, home ware, brushes, combs, etc. PPCP is a non-hazardous material and its overexposure by short term or long term doesn't cause any harmful health effect. Plastic is a non-decaying and non-biodegradable material which has led to accumulation of large amount of plastic waste which will never be decomposed. In this work we have used a plastic from household waste in order to make tiles. Sand has been added to it to increase its strength and durability. In order to verify whether the plastic tiles are able to withstand high atmospheric temperature, it is put in water heated till 50-60°C. Then the tile was removed. There were no signs of softened plastic observed. This confirmed that the tiles can also be used for terrace as it can withstand the sunlight easily. The tiles can be used for flooring due to their high durability and strength. The plastic will not cause any harm to the environment or life in any form. Also, various textures can be given to the tiles which also look to be attractive. Also, we can use sawdust, soil, etc. in order to increase the strength of tiles. Later we can also use cow dung, which is an insulator and would prohibit the heating of the tiles.

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## II . AIM OF PROJECT

The aim of this research is to carry out a comparative analysis of recycled plastic tiles and a conventional tile such as plastic flooring tile and the main objective here is to validate the results of a waste recycled plastic tile with that of a conventional (flooring ) tile. Use of plastic waste in concrete improves the mechanical properties of concrete, eliminates the plastic shrinkage cracking of concrete and reduces the drying shrinkage, increases the lifespan and reduces the cost of construction.

In brief, the objectives are:

- To protect the environment and human health and safety,
- To reduce the volume of solid waste
- Reduce the pollution

## III. MATERIAL

- **Cement:** Cement of 53 grade or 43 grade cement will be taken into consideration for the purpose in which it can be used as a binding material.
- **Metal-1 (>9.55 mm aggregate):** Shall consist of crushed or broken stone 95 % of which shall be retained on 4.75 mm IS test sieve. It shall be obtained from crushing granite, Quartzite, Trap, Basalt or similar approved stones from approved quarry and shall conform to IS 383 and IS 515. Course aggregate shall be chemically inert when mixed with cement and shall be cubical in shape and free from soft, friable, thin, porous, laminated or flaky pieces.
- **Stone powder:** Stone powder produce from the crushing zone appears as a problem for effective disposal. Sand is common fine aggregate used in making tile as fine aggregate.
- **Color (Iron oxide color):** Natural iron Oxides are used in colors, paints, etc. product may be used in flooring tiles. Color coating for flooring tiles, iron oxide pigment is the best use for giving colors to flooring tiles. Waste plastic: Waste plastic in shredded form. The plastics collected at one place and then the segregation or separation of low density plastic waste and high density plastic waste. After the separation of plastic waste the metal detection process is done. Thus, further the two different types of plastic are melted and then put it in the mold or the plastic is directly placed in blender for the purpose of cutting pieces into fine particles.
- **Fly ash:** Fly ash is used for raw material making flooring tiles. Knowing to its chemical composition and its physical characteristics fly ash can be used as partially replacement for clay in flooring tiles.  
**Plasticizer chemical:** Plasticizers are low-molecular weight polymers that increase the spacing between chains of crystalline polymer to make them more flexible and thereby tougher. Thus it is an additives that increase the plasticity or decrease the viscosity of a material. These are the substances which are added in order to alter their physical properties. They decrease the attraction between polymer chains to make them more flexible.

## IV. METHODOLOGY

The methodology adopted for producing floor tiles using waste plastic involves following experimental work.

- **Melting of plastic waste:** The selected waste plastic from different elements is weighed, crushed to smaller pieces and then melted in a container as its melting point (150 to 170 C).
- **Mixing of materials:** After the waste plastic is melted the sand is added to it the same container during heating and the mixture is stirred continuously. The sand shall be added little in quantity and stirred well so that a homogenous mix is obtained. Care shall be taken so that the mixture doesn't catch fire.



- **Placing of mixture in molds:** Once the homogenous mixture of waste plastic form and sand is formed, the mixture is fed into a mold. The molds are coated with oil for easy demolding, before placing the mixture. The molds are prepared by MS base plate and 2.5 cm steel angle with nut and bolt connections for easy demolding.
- **Demolding:** Once the mold is completely prepared, the mold is cooled either by air cooling or by placing it in water. After the mold is cooled the tile is removed from the mold. The floor tile is now ready with a good surface finish at the top.

## V . CONCLUSION

With the reference to the literature and this study , plastic waste can be used as a binding agent instead of cement in the manufacturing of tiles in pavement construction. We will use plastic by melting and mixing process for plastic tiles instead of using crushed plastic. the bearing capacity of plastic flooring tile by using melting and mixing of plastic will show better bearing capacity rather than by using crushed plastic in flooring tiles. The waste plastic with proportions of 10% and 20% by weight of sand were found to be insufficient to prepare tile. The compaction is the main factor though more dense mixing of material give higher bearing capacity.

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# Stabilization of Marine Clay a Viable Means to Rain Harvesting

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**Abstract**—Providing water to India's ever-increasing population is a growing problem. The quantity of water available is reducing year by year. The challenge before us is to preserve the available free rain water to the maximum for future use. This is profoundly true because water is needed not only for the basic needs of human beings, and livestock but also for agriculture, power generation and all kinds of industry. In fact water is an unavoidable commodity for all of creation.

This study proposes to suggest economically viable solutions to this problem through the storage of water in earthen structures—including reservoirs, canals and ground tanks. Maintaining surface storage of harvested rainwater with minimum or no loss is a major concern, although there are various methods to preserve harvested water. Most modern solutions are costly and unaffordable to the general public. Therefore, this study evaluates methods to maximize water storage on ground surface reservoirs. This calls for minimum, if not zero permeability, and good shear strength. Clay has a detrimental effect on structures, especially when there is variation in moisture movement. Permeability and shear strength play an important role in determining the behavior of clayey soil under wet conditions; hence these are two major factors considered in this study. A sincere effort has gone into determining the optimum percentage of admixture to reduce the permeability of soil using the commonest ingredients such as cement, lime and their combinations. This paper presents the findings of an experimental study.

**Keywords**— surface reservoirs, permeability, shear strength, detrimental effect, optimum percentage of admixture

## I. INTRODUCTION

Water harvesting is the need of the hour. Drinking water is a basic necessity for the growing population. Studies conducted by various agencies prove this fact beyond doubt. Consider New Delhi, India's capital, for example: In 1961, New Delhi had a population of 26.6 lakhs, while its sources of raw water were from wells sunk along the Yamuna. There were 5 water treatment plants having a total capacity of 35 MGD and one sewage treatment plant having a capacity of 18 MGD. In 1981 the population was 62.22 lakhs, while the sources of raw water were wells sunk along the Yamuna, Bhakra, storage / Yamuna, upper Ganga canal and eight water treatment plants having a total capacity of 303 MGD and seven sewage treatment plants with a capacity of 122 MGD. In 2001, the population of Delhi was 138.5 lakhs, the sources of raw water were wells sunk along the Yamuna, Tehri, upper Ganga Canal, Bhakra, storage / Yamuna, upper Ganga Canal Ground water and 11 water treatment plants having a total capacity of 715 MGD and 11 sewage treatment plants having a capacity of 346 MGD (figures courtesy studies published by Centre for Science and Environment) The demand for water is growing in many cities. India's urban population has grown by almost five times in five decades. Till a few years ago, our cities were self-sufficient in meeting their water needs, thanks to the available water bodies. But the condition today is different: most water bodies have completely disappeared. The municipalities are under increasing strain to provide water to the multiplying urban population.

Currently, the people depend on the governments for management and distribution of water. Therefore, the governments are under pressure to launch new projects to meet the need. Rather than helping to provide solutions, the public continues to be a demanding group. Public participation in collecting and preserving water is now the need of the hour. We also need to revive traditional systems for collecting and distributing water.

An old technology is now gaining popularity—it involves collecting and using rainfall from a catchment's surface. Rainwater harvesting in a large scale has existed for more than 4000 years in Palestine and Greece. In ancient Rome residences were built with individual cisterns and paved courtyards to capture rain water. Rain water harvesting is essential because surface water is inadequate to meet our demands. Rapid urbanization has resulted in decrease in infiltration of rain water into the sub-soil and recharge of ground water has diminished.

Rain water harvesting is done either through storage of water on the surface for future use or through recharge to ground water. The storage of rain water is a traditional technique and the structures used were underground tanks, ponds, check dams, weirs etc. Recharge of ground water is a new concept in rainwater harvesting and is done through pits, trenches, dug wells, hand pumps, recharge shafts, lateral shafts with bore wells, and spreading technique. There are various methods of water harvesting available but we need to choose cost-effective ones, depending on the catchment area available. One of the most effective methods is to store water in large open reservoirs, and preserve it with minimum or no loss. Stabilizing the interior of the pond with admixture is found to be a good and cheap solution.

Soil stabilization is the process of improving the engineering properties of the soil, and thus to make it more stable. It is required when the soil available for construction is not suitable for its intended purpose. In its broad sense, stabilization includes compaction, preconsolidation, and many other processes. However the term stabilization is generally restricted to the process which alters the soil material itself for modification of its properties.

Soil stabilization is generally used to:

Increase or reduce strength or reduce sensitivity to the environmental changes, especially moisture changes

Increase or reduce permeability

Reduce compressibility

Check frost susceptibility

The need for maximizing water storage in earth structures like reservoirs, canals, and ground tanks calls for a minimum, or zero permeability and good shear strength.

## **II. OBJECTIVES OF STUDY**

The objective of this study is to evaluate the quality and sustainability of soil lining of ground water storage at Bhayander. Marine clay soil abounds in this place as in other parts of Mumbai. These soils are characterized by low strength, high compressibility and sensitivity to disturbances. These properties make such places unsuitable and problematic for civil engineering construction. Marine clay deposits exhibit very low shearing strength and great affinity towards water. So it is very difficult to use such soil for any type of structure without suitable treatment. This study will investigate the mechanical properties of Bhayander soil. The permeability characteristics of the soil is analyzed, along with the variation of SL, UCS & CBR on stabilization. Strength and shrinkage characteristics along with permeability is studied. Though there are various methods available, stabilization by additives are preferred. The additives usually employed are cement, lime, fly-ash, asphalt, and other chemicals. The commonest stabilizers, cement and lime have been proved to be very effective and are preferred for soil selected.

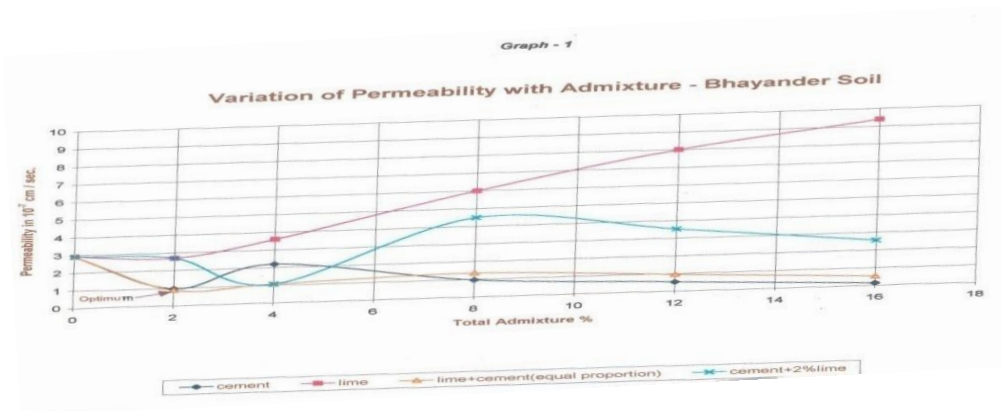
## **III. DISCUSSION OF RESULTS**

Results of the tests have been presented and discussed below for Bhayander soil. The results are superimposed for the comparison of the effect of different types of stabilization on different properties like permeability, UCS and CBR

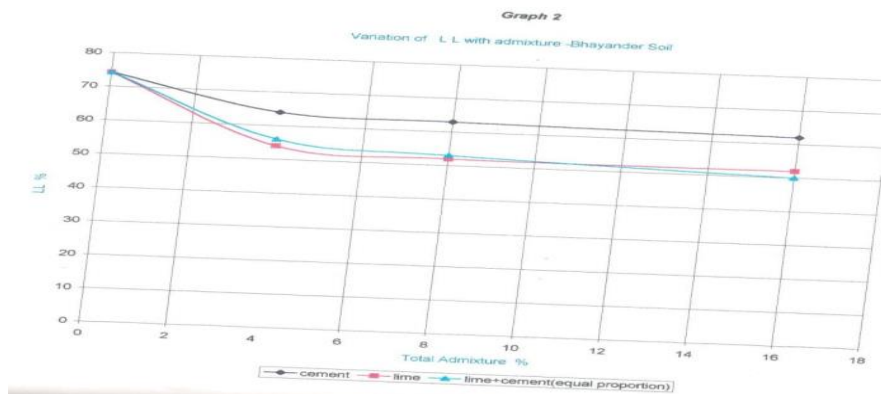
**TABLE**

**Bhayander soil**

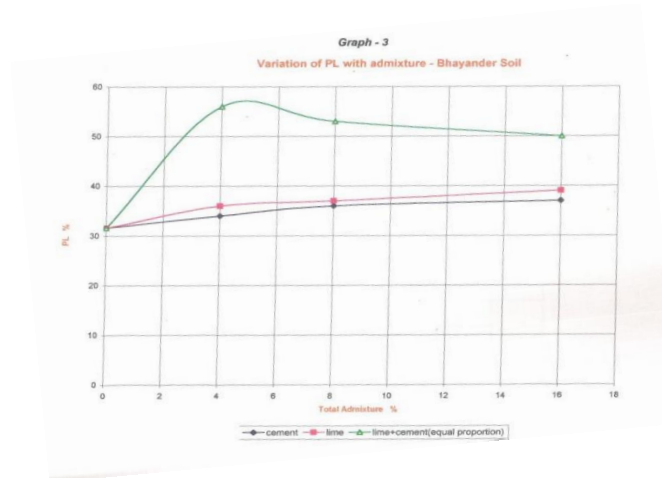
Coefficient permeability cm/sec X 10 <sup>-7</sup>				
total concentration of admixture	Cement	Lime	Cement + Lime	Cement + Cont. 2% Lime
0 Percentage	2.93	2.93	2.93	2.93
0.5 percent	2.81	-	2.6	-
2 percent	0.97	2.7	0.89	2.7
4 percent	2.2	3.6	1.07	1.07
8 percent	0.97	6	1.36	4.49
12 Percent	0.53	-	0.95	3.53
16 Percent	0.14	9.4	0.53	2.56



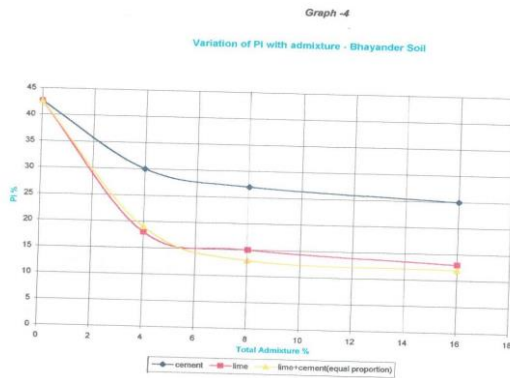
**FIGURE 1:Variation of permeability with admixture-Bhayander soil**



**FIGURE 2:Variation of LL with admixture-Bhayander soil**



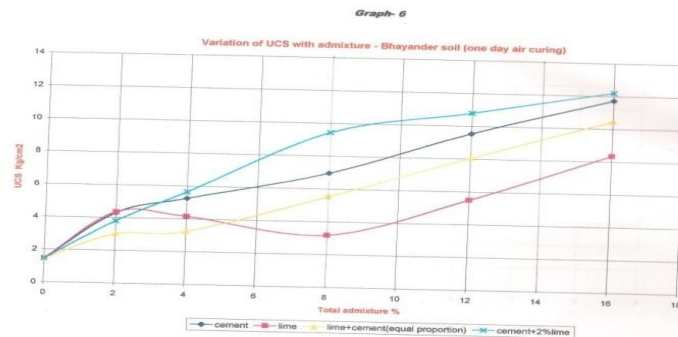
**FIGURE 3: Variation of PL with admixture-Bhayander soil**



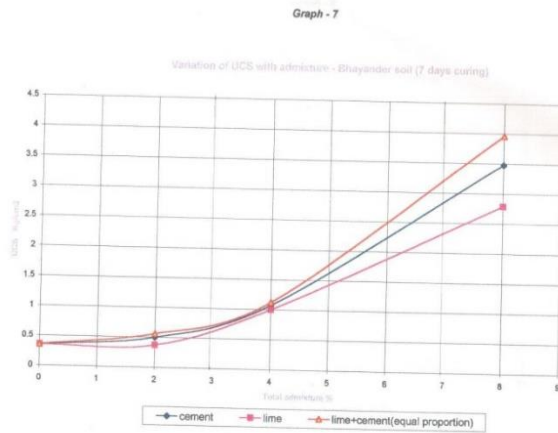
**FIGURE 4: Variation of PI with admixture-Bhayander soil**



**FIGURE 5: Variation of SL with admixture-Bhayander soil**

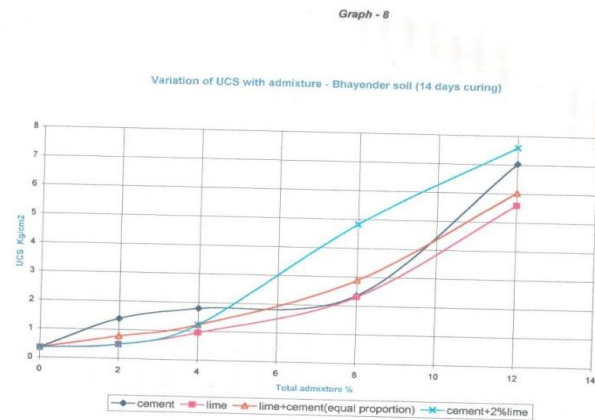


**FIGURE 6: Variation of UCS with admixture-Bhayander soil**

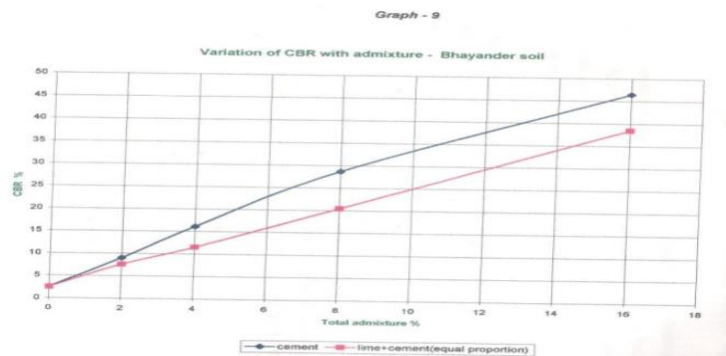


**FIGURE 7:Variation of UCS with admixture-**

**Bhayander soil**  
**Bhayander soil**



**FIGURE 8:Variation of UCS with admixture-**



**FIGURE 9:Variation of CBR with admixture-Bhayander soil**

The variation of permeability on stabilization of Bhayandersoils is shown in **Graph 1, Graph 2,3,4,5** give LL, PL, PI and SL respectively of the stabilized soil. The variation on UCS on stabilization of Bhayander Soil is shown in **Graph 6, 7, 8**. The Variation on CBR on stabilization of Bhayander soil is shown in Graph 9.

This particular soil is predominantly clay of about 96% as per particle size analysis. Differential free swell index of 17.9 % indicates that the soil is a non-swelling soil. Shrinkage limit is also quite high as 17.3% confirming the non-swelling character. Therefore detrimental effects due to swelling are negligible

Keeping permeability as the first and foremost important property to be considered for lining of ponds, reservoirs, canals etc., the variation in permeability is discussed first. Permeability for this soil is found out as  $2.93 \times 10^{-7}$  cm/sec, which is generally a low value of permeability. Stabilization further reduced the permeability to a great extent.



**Graph 1** indicates that, when lime is used as an admixture, till 2% lime, permeability decreased slightly due to the introduction of fines into the soil and afterwards it increased continuously as the percentage lime is increased. This is due to decrease in the LL and PI due to addition of lime. By adding lime the CaO reacts with alumina, silicate and calcium ions and reduced the plasticity of cohesive soils. Increase in effective grain size distribution is observed by adding lime to clay soil. This increased the permeability. Similar trend is reported for sandy clay. Hence it is not advisable to use lime for reducing the permeability of the soil and can be used where better drainage is required.

In the case of cement, effects of decrease in LL, PI and gelling or pozzolanic reactions are seen. The permeability depends on which reaction is predominant. When cement is used as an admixture, till 2%, permeability decreased as in case of lime due to introduction of fines. It is understood that the quantity of cement used is small (2% to 4%) though it reacts with clay particles together into coherent mass. Effect of decrease in LL and PI is predominant compared to pozzolanic action of cement. That is why at a particular range i.e. between 2 to 4% in this case there is a slight increase in permeability. A further increase in cement decreased the permeability continuously to a lower value since pozzolanic reaction is predominant. This decrease in permeability of the cement-stabilised soil is due to interlocking network throughout the soil mass and due to the hydration of cement and the gelling action.

When equal amounts of cement and lime were added initially there is a decrease in permeability till 2% (cement + lime) as in the above two cases, then increased slowly up to 8%. Further addition did not yield an appreciable change giving a compensating behavior.

When (cement + 2% lime) were added permeability decreased up to 4% due to the introduction of fines into soil. The increase in permeability up to 8% is due to decrease in LL and PI and inadequate cement content for pozzolanic reaction. Above 8% permeability continuously reduced, though marginally, as the percentage of admixture is increased due to pozzolanic reaction being predominant.

Out of the four types of combination tried, equal amount of (cement + lime) is found to give the least permeability at the earliest trial; that is at 2% (cement + lime) as shown in the Graph. Hence a combination of 2% (cement + lime) taken equally is considered as the optimum combination for the soil-lining. The least permeability  $0.89 \times 10^{-7}$  cm/sec is considered as the optimum permeability. A percentage reduction in permeability with reference to original permeability  $2.93 \times 10^{-7}$  cm/sec is about 70% or reduction is approximately one third of the original permeability.

**Graphs 2, 3 & 4** indicates that on stabilization, in all types of combination of admixture, the liquid limit decreased and the plastic limit increase thereby reducing plasticity index as the percentage of admixture is increased indicating a reduction in swelling potential as the percentage admixture is increased. The Graph 5 shows that the shrinkage limit of the soil increased indicating a reduction in swelling potential as the percentage admixture is increased. Stabilization changed the failure mode of the soil from plastic to brittle and developed a high tensile stress of the soil causing high shrinkage. It is found that cracks started appearing in the shrinkage limit soil at 4% of admixture in all combination and the cracks widened as the percentage is increased. These cracks are due to the hydration reaction and not due to swelling properties. Since these shrinkage cracks are very much undesirable and cause further loss of water, these higher proportion of admixture should be avoided in stabilization work. Though higher percentage (above 4%) of admixture gave low permeability, due to adverse effect of shrinkage these cannot be recommended for soil lining.

Unconfined compressive strength test is carried out with one-day air curing because the tests on cement and lime revealed that minimum three hours' time is required for cement and lime for its final setting. **Graph 6** shows that in three types of combinations like cement, equal (cement + lime) and (cement + 2% lime), the strength increased as the % of admixture is increased. However the test results are obtained with (cement + 2% lime) where strength increased to 1.21 Kg/cm<sup>2</sup> from 1.46 Kg/cm<sup>2</sup>. In case of lime also there is an increase in strength up to 2% then it reduced up to 8% then continuously increased. This change in the increasing trend of strength in case of lime could be due to bad specimen.

The optimum combination defined earlier with reference to the permeability criteria and shrinkage criteria is 2% (lime + cement). At this proportion the corresponding UCS is 3.01 Kg/cm<sup>2</sup> and is sufficient for the lining of canals, ponds etc. The percentage of improvement in UCS with reference to the natural soil of 1.46 Kg/cm<sup>2</sup> is 106% or the increase is approximately two times the original value.

UCS Tests were also conducted with 7 days curing, covering the specimens with wet sackcloth; the specimens with lower percentage of cement gave very low strength after curing. Table 13 shows that the cured strength of natural soil is less than that of the uncured, due to softening of the soil after curing. 7 days as well as 14 days cured strength of natural soil is reduced to 0.35 Kg/cm<sup>2</sup> with respect to the uncured strength of 1.46 Kg/cm<sup>2</sup>. Curing reduced the strength in stabilized soil also. **Graph 7 & 8**

shows the increasing trend of cured UCS in stabilized soil. The value of cured UCS at optimum proportion is 0.56 Kg/cm<sup>2</sup> and 0.78 kg/cm<sup>2</sup> for 7 days and 14 days respectively.

CBR tests were conducted and the effect of stabilization is very good on CBR. Two types of combinations, cement and equal (cement + lime) were carried out. **Graph 9** shows rapid increase in CBR. At optimum proportion of 2% (cement + lime), the CBR increased to 7.5% with reference to 2.48% of natural soil. The percentage increase is 204%.

Thus stabilizing Bhayander soil, which is non-swelling type with proper combination of cement and lime showed the required reduction in permeability while strength characteristics of the soil were improved

#### IV. CONCLUSION

Studies on the stabilization effect of inorganic chemicals like cement and lime in Mumbai Marine clay revealed that these soils are very responsive to stabilization in reducing their permeability and increasing their strength characteristics. The shrinkage characteristics played a very important role in deciding the extent of stabilization for a particular soil. The optimum proportion based on permeability and strength criteria for Marine clay from Bhayander is 1% cement + 1% lime. Hence soil stabilization by admixtures would be a viable and economic solution for storage of harvested water on surface reservoirs in marine clays.

#### ACKNOWLEDGEMENTS

Author Prof. Lissy Jose would like to thank the Almighty for providing the right guidance and resources for this study. She expresses her gratitude to Prof. Dr. Mahaiskar for his able guidance and constant encouragement to complete this project. She is indebted to Sardar Patel College of Engineering Civil engineering department soil lab staff for enabling her to complete the experiments fairly accurately.

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# Comparatively Analysis and Design of shear wall of G+8 storey building

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**Abstract**— Shear wall is a structure element which provides stability to structure from lateral loads like wind load and seismic loads. The stiffness and strength of wall may decreased by the reduction in the concrete area and the discontinuity of the reinforcement due to opening. In this paper a review is taken out over the analysis and design of RCC shear walls. Shear wall systems are one of the most commonly used lateral resisting system in high rise buildings. Shear wall have very high in plane stiffness and strength which can be used to simultaneously resist large horizontal loads and supports gravity loads, making them quite advantageous in many structural engineering application. A study has been carried out to determined the structure of RC shear wall location shear wall of G+8 storey building by changing shear wall locations. In the seismic design of building, reinforced concrete structure wall, act as major earthquake resisting members. Structural walls provide an efficient bracing system and offer great potential for lateral load resisting members. The proprieties of these seismic shear wall dominate the response of the buildings. The main focus is to determine shear wall location in G+8 story building

**Keywords**—Earthquake resisting, lateral loads, RCC, Shear wall, stiffness and strength.

## I. INTRODUCTION

Shear wall are the bearing wall which are generally known for its bearing capacity against various forces which affects the structure. Shear wall represent the most efficient structure element to take lateral forces acting on multi storey building and to transfer them to foundation. A shear wall is a vertical element of a seismic force resisting system that is designed to resist in plane and lateral forces and typically wind and seismic load as hear wall is stiffer in its principal axis that is in the other axis. It is consider as a primary structure which provide relatively stiff structure to vertical and horizontal forces acting in its plane. Under the combine loading condition, a shear wall developed compatible axial, shear, tensional and flexural strain, resulting in complicated internal stress distribution. In this way, load are transfer vertically to the building foundation.

## II. DESCRIPTION OF BUILDING

The building that has been considered for modeling with or without elastomeric base isolated structure is the residential building in Mumbai. The following combination of structural member has been used to form the frame work of the building; -

**Table 1**  
**Description of Building**

Floors	All floors slabs considers as RCC slab with beam supporting them
beams	Predominantly conventional RCC beams have been provided which contribute in transferring slab loads and wall loads to column and resisting the lateral loads arising due to wind and seismic forces along with shear walls.
column	RCC columns have been placed at periphery of plan, mainly acting as support acting as support for transferring the gravity loads from floors till foundation level & contributing as lateral frame formed by connection of strong beams.

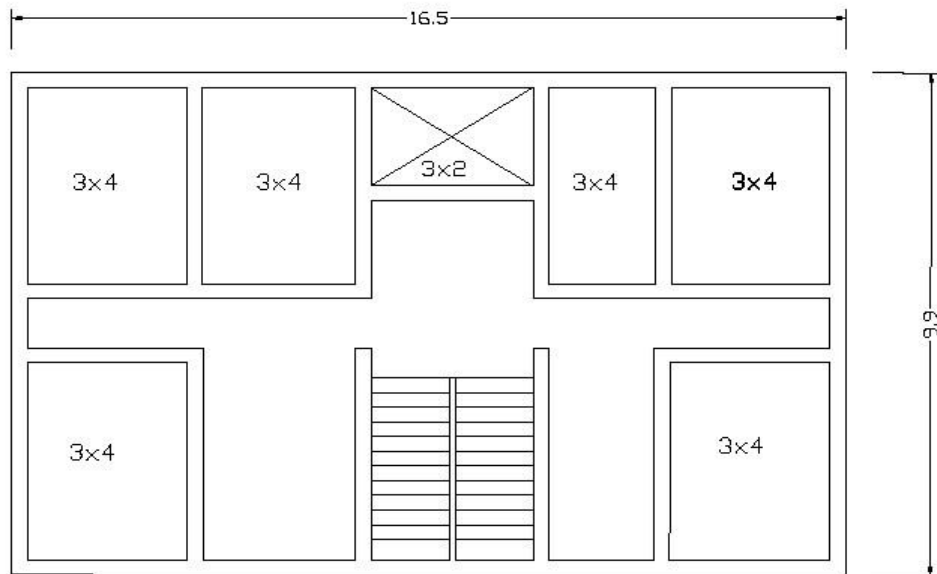
**Table 2**  
**Detail description of building**

Plan dimension	Rectangular shape of building have plan dimension as 16.5m X 9.9m
Building heights	The total building height above natural ground level is m and height below ground till foundation level is 4.5 m
Typical floor	<sup>st</sup> 1 to 4 floor are used for residential purpose. And ground floor are used for parking purpose
Terrace floor	<sup>th</sup> 8 floor is a the terrace floor and has been housing the mechanical equipment along with many other service equipment and parapet mounted façade cleaning equipment.

**Table 3**  
**Description of Building**

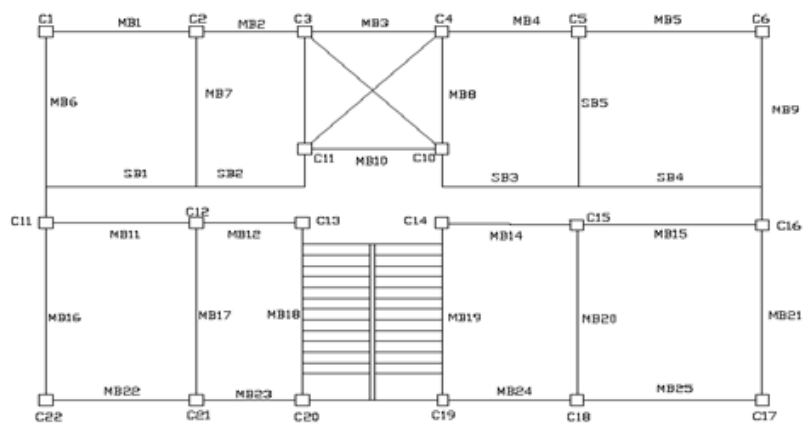
SR .NO.	POINTS	DESCRIPTION
1.	Type of structure	RCC structure  Stage 1- Without elastomeric rubber bearings  Stage 2 – With elastomeric rubber bearings
2.	Type of Building	Residential Building
3.	Type of storey	Typical throughout
4.	No. of storey	Basement+ G+8 floors

5.	Height of each storey	Typical story height - 3m Height of base storey – 3.5m
6.	Height of building	27.5m
7.	Building plan dimension	16.5m X 9.9m
8.	Location of building	Mumbai
9.	Soil condition	Medium soil
10.	Seismic zone	Zone 3
11.	Basic wind speed	44 m/sec
12.	Structural member in used building	a) Footing b) Column c) Beam d) Slab
13.	Passive devise used	Elastomeric rubber bearing between footing and column
14.	Grade of concrete used	Varies with member and storey
15.	Section sizes used	Varies with member and storey
16.	Seismic load analysis	As per method stated in IS 1893-2002
17.	Software used	a) Stadd pro. b) Auto Cad



DEVELOPED PLANE

**FIGURE 1: DEVELOPED PLANE**



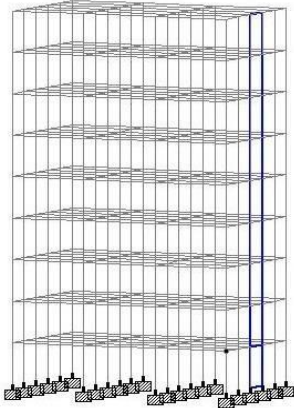
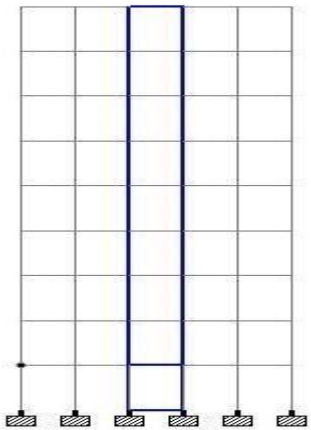
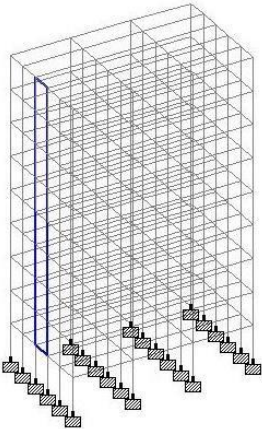
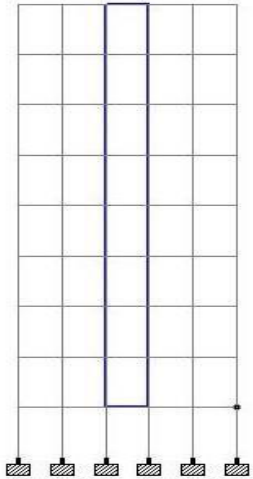
COLUMN BEAM PLANE

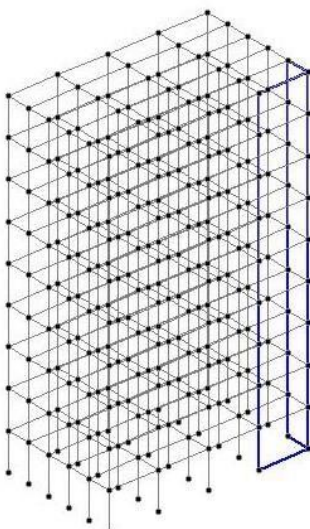
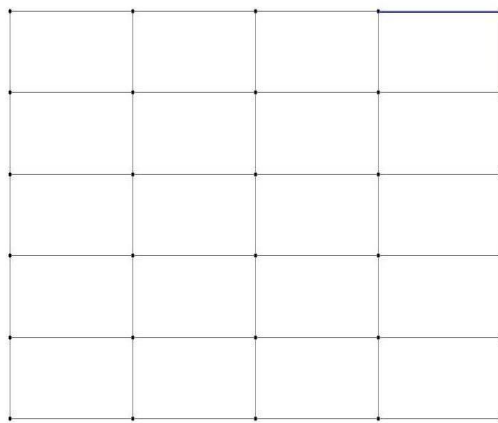
**FIGURE 2: COLUMN BEAM PLANE**



### III. METHODOLOGY

**TABLE 4**  
**LOCATION OF SHEAR WALL**

3D VIEW	SECTIONAL VIEW	REASON
		To resist lateral stiffness caused by wind or earthquake so that deflection are within the limits
		For lifts large strength and stiffness in the direction of orientation, which significantly reduces lateral sway of building and thereby reduce damage to structure and its content

		<p>Ground acceleration in earth quake is like the inertial force for creating instability in the structure</p>
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#### IV. CONCLUSION

The zone selected for Earthquake resistant structure was zone 3 in which the RCC building. Is subjected to various loads like wind load, undulations, lateral displacement and more which was resist by shear wall .In which different locations are selected for effective results which is analyzed and design by IS 1893-2002 (part 1) and STAAD PRO simultaneously and a location is selected and shear wall for respective zone is selected and thus conclude that shear wall analysis through STADD PRO and theoretically are equally verified and shear wall stabilities and strength at different locations are design

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## Optimization of agricultural waste in roofing tiles

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**Abstract**— The scenario of living in huts in slum areas is becoming very difficult day by day due to vast change in climate. Replacing the ordinary huts and conventional poor class roofs with much efficient alternate roof cover is being the most required. On the other side, proper and efficient disposal of agricultural wastes is being the key factor in solid waste management in most of the Indian States. Having both the problems in a single line, in this project we have prepared and evaluated the performance of low cost roofing tiles using agricultural wastes as raw material. Based on the results, it is suggested that we can efficiently replace significant quantity of river sand in making roofing tiles with the corn cob powder and rice husk powder in appropriate proportions which gave compressive strength as similar as before replacement. By replacing the river sand in making roofing tiles would reduce its manufacturing cost as well as selling price and makes it more affordable. Thus preparation of such sand replaced roof tiles will significantly reflect healthy environmental and economic benefits<sup>[2]</sup>.

**Keywords**— Roofing tiles, Corn cob, Rice husk, Partial sand replacement, Compressive strength.

### I. INTRODUCTION

Building materials have undergone a lot of modification from ancient times till this present technology era. With everyone seeking for affordable and comfortable houses to live in, every scientist and engineer is working hard to develop and optimize new building materials that would be durable and cost effective. Building materials range from roofing sheet, block, concrete, gravel, sand, clay, stone, cement, roofing tiles, steel, fine aggregate, coarse aggregate, laterite among others.

Materials used for roof cladding in building have evolved over time. A number of them have been deployed for specific reasons such as: building type, weather condition, availability, cost, durability, and weight, among others. Common ones in use are: metal, asphalt, wood, ceramic, polymers and quite recently concrete has been explored as a suitable material and found to be useful.

Cement as the major classical binder in construction industry is very expensive. This is because of phenomenal population growth and urbanization which have triggered high demand of cement for several construction purposes to meet up with the need to expand infrastructures (Otuoze, et.al 2012). Therefore the need to connect the gap between demand and high price has warranted the need to investigate the use of cheaper alternative sources<sup>[3]</sup>.

## II. OBJECTIVE

1. To produce low cost roofing tiles.
2. To reuse the agricultural waste in production of low cost tiles, as there is no proper channel for the disposal of agricultural waste.
3. To compare the obtained result with standards for low cost roof tiles.

## III. Literature review

**1. Author : Mrs.K.SaranyaM.E.,Mythily.K** <sup>[1]</sup> Replacement of Rice husk ash in making roof tiles will be light effective if the replacement ratio lies below 7%. This study prove that 7% replacement of Rice husk ash in roof tiles with similar compressive strength, it would be a great benefit in both economic and environmental concern. And further replacement of Rice husk ash at the percentage of (14%, 21%, 28%, 35% and 42%) effectively, it will indirectly reduce the strength of the low cost roof tiles.

**2. Author: Saravanan J, Imthiyasahamed S,Muniyasamy X, Muthu Ganesh P, Rawther Ibrahim Ali Sait** <sup>[2]</sup>  
Replacement of river sand in making roof tiles will be effective if the replacement ratio lies below 5%. For example, if future study prove that 2% replacement of river sand in roof tiles with similar compressive strength, it would be a great benefit in both economic and environmental concern. If we replace 1% river sand with agricultural wastes (Corncob, Rice husk, etc.) effectively, it will indirectly reduce the demand for river sand and reduce the manufacturing cost of clay roof tiles, which induce the conversion of huts in slum areas into tiled houses.

**3. Author: Unmesh Tayade, Priyanka Tupe ,Shradha Lonikar** <sup>[3]</sup>  
Replacement of Rice husk ash in making roof tiles will be light effective if the replacement ratio lies between 5% - 10%. This study prove that replacement of Rice husk ash in roof tiles with similar compressive strength, it would be a great benefit in both economic and environmental concern. And further replacement of Rice husk ash at the percentage of (14%, 21%, 28%, 35% and 42%) effectively, it will indirectly reduce the strength of the low cost roof tiles.

**4. Author: Zainordin Firdaus Zulkefli, Dr. Mohd Remy Rozainy Mohd Arif Zainolandnorhayati Osman** <sup>[4]</sup>  
The strength test show, the average maximum pressure will increase as a percentage of the waste increased. Through the water absorption test shows the average percentage of water absorption for rice husk and palm fibre is less than 7%, with the tiles produced in accordance placed on the bathroom wall. The water absorption increase when the waste is increase. Lastly for anti slip test, the pendulum value increase when the waste value increase.

**5. Author: Momoh Omuya RAHEEM ,Hassan Suleiman OTUOZE P. ,And Usman ABDULHAFIZ** <sup>[5]</sup>  
The result of TBS shows that 5% to 25% RHA proportions in the tiles is above 0% RHA (control) showing that hydration of RHA has provided binding strength to the tiles. A further increase of 30% RHA accounts for excessive fines beyond what is need and caused a decrease in the result of TBS as a result of low particle bonding which reduces the mechanical strength. However, 15% RHA proved to be the most optimal result for TBS of RHA roof tiles. TBS result also, decreased in value with increasing firing temperature because of disintegration and breaking of particles contact bonds due to excessive temperature. All the tiles produced met the minimum TBS requirement of (0.182N/mm<sup>2</sup>) of [14], 15% RHA at 900°C provided the best result.

### III. MATERIAL AND METHODS

#### 3.1 Materials used

Fine Aggregate, Corn cob, Red Soil, Clay, Rice Husk, Water

#### 3.2 Testing of materials:

##### 3.2.1 Specific Gravity Test

➤ Results for Specific gravity test on Materials

Table No. 3.1. Specific gravity of materials

Sr. No	Material	Specific gravity
1.	Red soil	2.29
2.	M-Sand	2.57
3.	Clay	2.10
4.	Rice husk ash	2.3
5.	Corn cob	1.9
	Average	2.232

##### 3.2.2. Results for Particle size Distribution test on Sand

Table No. 3.2. Sand

IS Sieve	Weight retained (gm)	Cumulative weight retained (gm)	Cumulative % retained	Cumulative % passed
10	0	0	0	100
4.75	28.5	28.5	2.85	97.15
2.36	64.5	93	9.3	90.7
1.18	109	202	20.2	79.8
0.6	290	492	49.2	50.8
0.3	366.9	858.9	85.89	14.11
0.15	126	984.9	98.49	1.51
0.075	12.6	997.5	99.75	0.25
Pan	2.5	1000	100	0

Finness modules = 2.6

∴ The sand is medium sand

#### 3.3. Mix Ratio:

1) Mix design for Rice Husk

Rice Husk mix				
Material	7%	14%	20%	25%
M-Sand	43	36%	30%	25%
Red soil	23	23%	23%	23%
Clay	27	27%	27%	27%

## 2) Mix Design For Corncob

Corncob mix				
Material	7%	14%	20%	25%
M-Sand	43	36%	30%	25%
Red soil	23	23%	23%	23%
Clay	27	27%	27%	27%

### 3.4. Mix design: Specimen size

Density =  $2.232 \times 1000$

= 2232 kg/m<sup>3</sup>

Volume of

mould Length

= 8" Width =

8" Thickness =

1"

Mass = Volume \* Density

=  $(0.2032 \times 0.2032 \times 0.0254) \times (2232)$

= 2.34 ~ 2.5 kg

Total weight = 2.5 kg (8" \* 8" \* 1

### 3.5 Tests on roofing tiles:

Two test have been made for low cost roof tiles. This test are made to find out the water absorption capacity of low cost roof tiles and ultimate strength of the low cost roofing tiles. The tests are:

1. Water Absorption Test.
2. Compressive Strength Test.

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### SUMMARY

In this project we are preparing and evaluating the performance of low cost roofing tiles using agricultural waste as a raw material. We are replacing quantity of sand in making roofing tiles with corn cub and rice husk ash in appropriate proportion. Replacement ratios are 7% , 14% , 20% and 25%.

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# Sustainable Transit Oriented Development

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**Abstract**— Urbanization has led to horizontal growth of the cities thus creating problems of urban sprawl. This has resulted in increase of trip lengths and higher usage of private vehicles, problems of pollution and increased demand of infrastructure. To address these issues, many cities have strengthened their public transport by developing mass rapid transit systems (MRTS) such as metro rails and Bus Rapid Transit Systems (BRTS). It is however, important to efficiently use these systems by integrating the land use with the transport infrastructure to make the cities livable, healthy and smart. Transit oriented development is a set of transportation and land use planning principles and strategies that are sweeping the nation by connecting communities with vibrant, people-centric places in city after city. The public has embraced the concept, and real estate developers have quickly followed to meet the high demand for quality urban places served by rail systems. This is not only because TOD can offer a higher quality of life, but because it offers a triple bottom line solution to economic, social, and environmental sustainability.

**Keywords**— Environmental Sustainability, Land Use Planning Principles, Transit Oriented Development, Transportation, Urbanization

## I. INTRODUCTION

India is urbanizing at a rapid pace with urban population rising much faster than its total population. Level of urbanisation has increased from 17.29% in 1951 to 31.6 % in 2011.. The urban population in India, which is nearly 377 million is poised to grow to 600 million by 2030. The urban population of India contributes 65% of country's Gross Domestic Product (GDP), which is expected to grow to 75% in the next 15 years. With India witnessing a high economic growth, Indian cities are growing at a rate faster than other cities in the world.

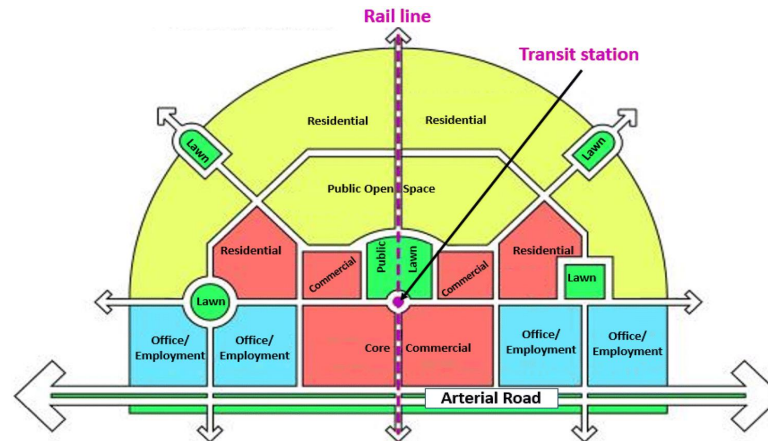
Well-designed TOD allow people with the choice to walk, cycle, or take public transportation to meet their daily needs by providing greater transit accessibility and a mix of uses within the community fabric. This is an urban development response to the congestion, carbon emissions, and inefficiency of single-use, suburban sprawl.

Transit oriented development is an effective strategy for the sustainable and balanced development of metropolitan areas and can be a tool to mitigate the negative externalities of car dependence, urban sprawl and the dispersion of mobility trips in space and time (Banister, 2002, 2008; Cervero, 1998; Meyer & Miller, 2001; TRB, 2004; European Commission, 2007).

Sustainable development seeks to create an urban environment which maximizes economic development and social equity, whilst minimizing negative externalities upon the natural environment. From a land use and transport perspective, this means reducing automobile dependence through mixed use and compact cities with an array of travel alternatives focused on walking, bicycling, and public transport (Newman and Kenworthy, 1999, Banister et al., 2006).

Though, the TOD concept is coined by Calthorpe, its definition has been individualized by different agencies and governments based on their regional and local needs. For example, Bay area Rapid Transit Authority, San Francisco has its own definition of TOD as "Moderate- to higher-density development, located within an easy walk of a major transit stop, generally with a mix of residential, employment, and shopping opportunities designed for pedestrians without excluding the automobile. TOD can be new construction or redevelopment of one or more buildings whose design and orientation facilitate transit use." Where as the Regional Transportation Authority of Northeast Illinois (RTA), Chicago has a simple definition as "Development influenced by and oriented to transit service that takes advantage of the market created by transit patrons" (Cervero et al, 2004).

This paper focuses on sustainability, Elements of TOD, Functional Characteristics of TOD, Challenges, Action Plan, Benefits of TOD & sustainable development, conclusion of study.



**FIGURE 1: A basic structure of the TOD community**

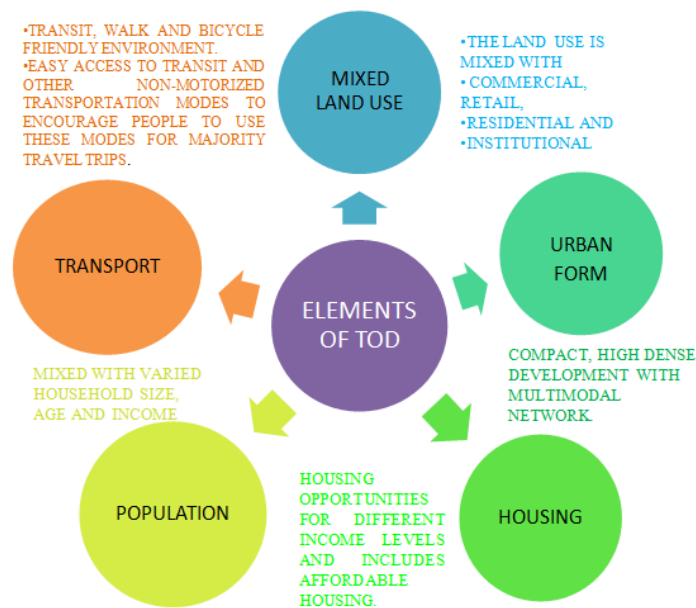
## II. SUSTAINABILITY

The operational definition of sustainability is a mean of developing civilization and human activity to meet the demand of human society In an economically feasible way without hampering the biosphere and ecology. Sustainability means to achieve economic growth and developing simultaneously in an eco-friendly way.

According to UN conference (WCED,1987)sustainable development means a development that meets the needs of present without compromising the ability of future generation to meet their own need.

## III. ELEMENTS OF TOD

Though, some of the elements of TOD might overlap with Smart Growth characteristics, the TOD has an additional goal to encourage people to use transit. Therefore, the characteristics include the combination of these two key objectives. The below characteristics are essential to recognize a place to be a TOD.



**FIGURE 2: Elements of TOD**

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#### IV. FUNCTIONAL CHARACTERISTICS OF TOD

It is important to note that the TOD has a comprehensive approach towards its goal. It needs to be flexible to adapt to different situations, look beyond creating compact physical form and should measure success rate at regional level. It is necessary to see the following three functions are considered when visioning the TOD. Belzer and Autler (2002) have formulated the following as important functional characteristics of TOD.

##### *4.1 Adaptability in different situations and places:*

Not any two locations are same geographically or socially. And any place may change with itself in a given period of time. For this reason, the TOD guidelines are flexible to adapt the requirements and issues in its solutions for the given location or situation.

##### *4.2 Functionality:*

It is important to note that the TOD is a concept and the outcomes should be measured from the functionality of the development rather than with just fixed amount of density or the number of passengers using the transit station. The characteristics of TOD do not end with the providing physical form, but in fact compliment the development to achieve its primary goal i.e. reducing auto dependent travel behavior.

##### *4.3 Continuum success:*

Not all TODs can provide all the characteristics that are defined for TOD with a hundred percent success rate. The outcomes may vary depending upon the geographical location, size of the development, quality of the project, role of the stakeholders and the time of implementation. The measure of success should include various levels such as local, regional, social and economical success.

#### V. CHALLENGES

From the concept vision to implementation of TOD, one may face many challenges. The following are some the challenges to address for a TOD to implement efficiently.

##### *5.1 Land Use/ Zoning regulations*

Land use/ Zoning regulations are very complex and critical part of the plan proposal. Land uses of the selected area depend on the specific land use/ zoning regulations (Cervero et al, 2004, Boarnet & Compin, 1999). If the TOD proposal is not matching with the local land regulations, it is necessary to see that the related regulations being amended (Report to Congress by FTA & HUD, 2008)

##### *5.2 Coordination of Stakeholders/ Bringing Awareness*

TOD is a complex concept that includes various stakeholders from local to regional governments, transportation agencies, interest groups such as bicycle groups, and the public. Coordination between various stakeholders and awareness of the development proposals by them is critical to realize a TOD (Cervero et al, 2004, Boarnet & Compin, 1999).

##### *5.3 Local Economy & Financing the Development*

Since TOD is a comprehensive development, it requires large scale investments. Public funds may not be sufficient to finance the whole project and may need to share the burden with private partnerships (Cervero et al, 2004) or use other fund generating techniques. Sometimes, despite the intentions of stakeholders to implement the TOD, the local economy may not be suitable to implement it (Boarnet & Compin, 1999).

##### *5.4 Implementation*

Along with all the above hurdles, there might be other practical issues may come up in the implementation level. They may be such as political changes, or social and demographic changes due to long time lapse between the conceiving the TOD plan and the actual implementation. As long as there is flexibility in the concept, these hurdles may be overcome.

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## VI. ACTION PLAN

An action plan helps to formulate the framework and methodology for the given goals and objectives of the plan proposal. It also helps to check the feasibility of the goals to achieve. Preparing a proper action plan would help a TOD to get over the hurdles mentioned above and implement the plan proposal smoothly. The following action plan is a general outline and may include other tasks as needed, based on project specific requirements.

### *6.1 Coordination between different stakeholders*

It is necessary to bring awareness of the goals and objectives of the TOD project from the initial stages of the proposal so that there is a coordinated effort to bring the best results at the implementation level. Develop different approaches based on the need to coordinate with different groups (Report to Congress by FTA & HUD, 2008).

### *6.2 Develop TOD characteristics, indicators and Performance measurements*

It is important that the intended TOD has its own characteristics that include the general characteristics discussed above. To preserve the uniqueness of the area, develop a site specific, location specific characteristics for the selected development.

Indicators help to identify the goals of the plan. Develop TOD indicators related to transportation, built form, economic development, social structure, and environmental protection/ improvement. (Rene & Wells, 2005)

Develop performance measurements such as number of transit users, available transportation modes, traffic congestion, density, available housing choices (Cervero et al, 2004, Report to Congress by FTA & HUD, 2008), infrastructure facilities, land and housing values, mixed uses etc.

### *6.3 Develop Best Practices to promote, implement and update TOD*

Develop ideas to reach the public and different stakeholders involved in the TOD (Report to Congress by FTA & HUD, 2008).

Develop procedures to implement the plan without any constraints.

Develop a system and methodology for plan update.

### *6.4 Regulatory Constraints*

Check the local, regional and state regulations to see if the TOD proposal fits in to these regulations. If there are any changes need to be made to the plan or need to amend the regulation, it should be done at the initial stage of development proposal (Report to Congress by FTA & HUD, 2008).

### *6.5 Data collection and analysis, policy research and guidelines*

For proper policy research, it is necessary to have appropriate and complete data. Formulate a methodology to collect data from different resources (Report to Congress by FTA & HUD, 2008).

Formulate policy guidelines based on the policy research and data analysis.

### *6.6 Plan, Design and Implementation*

Develop databases for various information needs. It is important to see what the existing land uses in the areas of TOD proposal are, and whether they are fitting in the plan proposal.

Develop alternatives with positive and negative attributes of each alternative.

### *6.7 Review, Evaluation and Update*

Review TOD plans periodically and evaluate the impacts and benefits the developments (Cervero et al, 2002). It is important to feed the information in to the plan updates for accurate results.

## VII. BENEFITS OF TOD & SUSTAINABLE DEVELOPMENT

- Environmental benefits, reduced social and economic isolation has made TOD a sustainable development concept. TOD is applied for in-fill development in suburban area. So, it is a mean of achieving compact development.
- Low and moderate income TOD housing ensures available supply of labour. Besides, TOD provides an efficient transportation system. These two factors attract more investment on employment generation activity in the area and pave the way for economic revitalization.
- TOD increases profit for the businessman and so the tax paid to government. Efficient communication system increases land value which increases local government revenue. So, government can easily regain money spent for development.
- So, TOD is an economically feasible planning procedure. It reduces household fuel cost associated with heavy auto use. As all the necessary service and facilities are located within easily accessible walking distance, transportation cost of LMI people decreases. They can use this saved money for food, education and other necessity to gain a better living standard. This accelerates the process of attaining social equity.
- Rails and buses are more convenient mode of transportation than automobile considering cost and service. Bus provides services to more people than an automobile at a time at very cheap rate and rail never falls in traffic jam.
- TOD ensures inter-generational equity. Reduced car parking space provides more spaces for affordable housing and providing more development opportunity to meet present demand or for future expansion. In the distant places from the TOD station density is kept low which also keeps a room for future development.
- Pollution is resisted and air quality is improved by implementation of TOD as emission of green house gases from automobiles gets reduced. Preservation of open spaces keeps the ecology sustainable
- Pedestrian friendly environment increases social interaction and creates a community sense for achieving a sustainable community.
- Pure air and movement of pedestrian in walkways make people healthy and make their life sustainable.
- With reduction of parking space, urban water run-off also decreases. So, infiltration increases and ground water table is recharged and soil erosion decreases.

All above stated benefits of TOD makes it a strategy of sustainable development.

## VIII. CONCLUSION

TOD is a best solution to cater to high density development with provision necessary services. Design criteria of TOD suggest the way towards a sustainable development in terms of affordability, social equity, economical feasibility and balanced ecology. Living and working near transit not only increases transportation options, it can also increase housing choices, broaden work opportunities, and reduce household cost. Transit-oriented development represents one form of “sustainable urban development,” achieving twin benefits in energy-efficiency by virtue of both the building envelope and location. To meet the increasing housing demand of cities, TOD can be a successful planning approach by the mean of provision of high density housing in suburbs of cities. TOD is the exciting, fast grown trend in creating vibrant, livable and sustainable communities

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# Stabilization of Silty Soil Using Lime and Natural Pozzolana

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**Abstract**— Poor engineering properties of silty soil create difficulties during construction and hence it is needed to improve its properties. This study investigates the use of lime or natural pozzolana with silty soil to improve its application. Laboratory tests will be performed to study the effect of natural pozzolana or lime on the physical and mechanical characteristics of silty soil.

**Keywords**— laboratory tests, lime, silica, silty soil, stabilization.

## I. INTRODUCTION

### 1.1 GENERAL:

Soil Stabilization is a general term used for any of the physical, chemical, or biological methods, or a combination of them, which is used for improvement of soil properties. Improvement of soil engineering properties is an inevitable necessity, when the structures are founded on a problematic soil. Expansive, collapsible, liquefiable, soluble, dispersive, silty soil fine sands and highly organic weak soils are the most serious kinds of problematic soils. Silty sand soils are kinds of problematic soils which found in different areas of the world and are susceptible to collapse when come in contact with water.

Soil improvement can be undertaken by a variety of ground improvement techniques such as compaction, reinforcement, drainage and addition to natural and synthetic materials or a combination of physical and chemical methods. Chemical stabilization or addition of different natural and synthetic material of soil has experienced in recent years. Lime, cement and pozzolanic materials are the most common construction materials which are extensively used for stabilization of soils. Recently different modern technologies such as nanoparticles were used for stabilization of soils.

There are many types of problematic soils that hinder urban development in large cities. These could be swelling/shrinking clays, collapsible soils, quick sands, frozen soils and peat. The consequences that may be attributable to the behavior of such problematic soils can result in considerable financial loss. Problematic soils have been avoided for long time for construction sites in favor of more quality soils with reduced technical difficulties and hence lower construction costs. Nowadays, it has become difficult to find suitable sites for construction and suitable materials for structures such as highways, dams or runways at an economic distance.

### 1.2 Stabilization of Silty Soil:

Lime and cement are the most used chemical stabilizers. Lime as an additive is most commonly used to stabilize fine soils due to its effectiveness and economic usage. Moreover, lime improves significantly the engineering properties of soft soils. Lime stabilization is achieved through cations exchange, flocculation/agglomeration reaction take place rapidly bringing immediate change in soil properties, whereas pozzolanic reactions are time dependent. These pozzolanic reactions involve interactions between soil silica and /or alumina and lime to form various types of cementation products responsible for the gain of strength.

In recent years, industrial by products have been added and mixed with soft soils to improve their engineering properties. The improved characteristics of soft soils, resulting from the utilization of cementing additives like fly ash, rice husk ash and silica fume, bring about environmental and economic benefits. The effectiveness of these by- products for stabilization of soils has been investigated.

## II. MATERIAL AND METHOD

### 2.1 Silty Soil:

The soil used in this project is collected from an excavation site in Shirgaon, virar-east, Mumbai-401303. The properties of silty soil collected are present in Tables 1 and 2. Silt is a sediment material with an intermediate size between sand and clay. Carried by water during flood it form a fertile deposite on valleys floor. The particle size of silt ranges from 0.002 and 0.06 mm. Silt is a non-plastic or low plasticity material due to its fineness. Due to its fineness, when wet it becomes a smooth mud that you can form easily into balls or other shapes in your hand and when silt soil is very wet, it blends seamlessly with water to form fine, runny puddles of mud.

### 2.2 Lime:

The lime used for the study is commercially available lime in hydrated form. Chemical analysis of the lime stated as the lime was assessed as 68.38%.

### 2.3 Natural Pozzolana:

Pozzolana is also known as pozzolanic ash, is a natural siliceous or siliceous-aluminous material which reacts with calcium hydroxide in the presence of water at room temperature. For the study silica is used it also consist of various other minerals containing calcium, magnesium, iron, potassium and sodium. A pozzolan's activity refers to both its capacity of binding lime and the rate at which the binding reaction takes place, therefore, it covers all the reactions taking place between the active components of the pozzolan, lime and water.

## III. TEST AND RESULTS

### 3.1 Sieve analysis:

The distribution of different grain sizes affects the engineering properties of soil. Grain size analysis provides the grain size distribution and it is required in classifying the soil. The result obtained is as follows:

**Table 1**  
**Sieve analysis**

Sieve number	Diameter (mm)	Mass of empty sieve (gm)	(Mass of sieve)+ (soil retained) (gm)	Soil retained (gm)	Percentage retained	Percentage passing
4	4.75	116.23	166.13	49.9	9.5	90.5
10	2.0	99.27	135.77	36.5	7.0	83.5
20	0.84	97.58	139.68	42.1	8.0	75.5
40	0.425	98.96	138.96	40.0	7.6	67.8
60	0.25	91.46	114.46	23.0	4.4	63.4
140	0.106	93.15	184.15	91.0	17.4	46.1
200	0.075	90.92	101.12	10.2	1.9	44.1
Pan	-	70.19	301.19	231.0	44.1	0.0
				Total wt.=523.7		

### 3.2 Moisture content:

The test conducted for calculating moisture content was carried out by oven dry method. The following is the result table noted after the test carried out.

**Table 2**  
**Oven drying method**

Wt. of container, $W_1$ (gm)	39.5
Wt. of container + wet soil, $W_2$ (gm)	133.5
Wt. of container + dry soil, $W_3$ (gm)	115.14
Wt. of moisture, $(W_2 - W_3)$ (gm)	18.36
Wt. of dry soil, $(W_3 - W_1)$ (gm)	75.64
Water content, $\frac{w_2 - w_3}{W_3 - W_1} \times 100$ (%)	24.27%

## IV. CONCLUSION

This project specify the properties of the material as well as source of the same. The various test are specified and perform in the lab and the results are as mentioned. The silty soil is very poor in mechanical properties it is must to stabilize the soil. Lime as well pozzolana will stabilize the soil and the test will be carried out on the sample comparing with the original sample. The project will give a stable mixture of the silty soil, pozzolana and lime. The plasticity index decreased with increasing lime contents. Moreover, when both natural pozzolana and lime were added to the cohesive soils, an appreciable change of the plasticity behaviour was observed. However, the addition of natural pozzolana has a minor effect on the plasticity index of the grey soil. Both grey and red soils tend to change according to the unified soil classification system. The use of lime alone and the combination of natural pozzolana-lime, transformed grey soil (CH) and red soil (CL) into MH class soils.

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# Management of Urban Stormwater Using Bio-retention Filter Technique

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**Abstract**— The continued development of urban areas in recent decades has caused multiple issues affecting the sustainability of urban drainage systems. Urban runoff is surface runoff of precipitation created by urbanization. This runoff is a major source of flooding and water pollution in urban communities worldwide. Impervious surfaces, such as roads, parking lots, rooftops and footpaths are constructed during land development. During rain storms and other precipitation events, these surfaces carry polluted stormwater to storm drains, instead of allowing the water to percolate through soil. Most municipal storm sewer system discharge stormwater without treatment to streams, rivers and other water bodies. Urban runoff carries a mixture of such pollutants as sediment, fertilizers, bacteria, metals and more. Effective control of urban runoff involves reducing the velocity and flow of stormwater, as well as reducing pollutant discharges. A variety of stormwater management practices and systems may be used to reduce the effects of urban runoff. Bioretention is the process in which contaminants and sedimentation are removed from stormwater runoff. Stormwater is collected into the treatment area which consist of a vegetation, sand bed, ponding area, organic layer or mulch layer and under drain collection system.

**Keywords**— Bioretention, stormwater management practices, urban drainage systems, under drain collection system.

## I. INTRODUCTION

### 1.1 General

A bioretention cell is a type of under drained soil filter that collects, filters, and treats moderate amounts of stormwater runoff using conditioned planting soil beds, gravel under drained beds, and vegetation. The filter basin captures and retains runoff and passes it through a soil filter media that contains a mixture of silty sand and organic matter to remove a wide range of pollutants, including suspended solids, phosphorus, nitrogen, metals, hydrocarbons, and some dissolved pollutants. Once through the soil media, the runoff is collected in a perforated underdrain pipe system and discharged downstream. Bioretention basins are usually located in close proximity to the origin of the stormwater runoff and should be scattered throughout a residential area or along the downhill edge of smaller parking areas with a maximum drainage area to each individual filter.



## 1.2 Objectives

- To identify the area which frequently gets affected by stormwater.
- To design a bio-retention filter system using plantation, soil bed, engineering soil media, under drained pipe system.
- To collect the stormwater, filter it and store for various purposes including groundwater recharge.

## 1.3 Scope of Study

This paper gives the information about the management of urban stormwater using bio-retention filter technique. Due to implementation of bio-retention filter we can remove various impurities such as nitrogen, phosphorous, chlorine etc. from the stormwater and will be able to use this water during the dry seasons and also for groundwater recharge. Large amount of stormwater gets wasted during rainfall also the water scarcity is the major problem in our country thus implementation of bio-retention filter technique can manage this stormwater by quality as well as quantity purpose to use it in future.

## II. MATERIAL AND METHOD

### 2.1 Materials

#### Under Drain Collection System

The underdrain collection system collects the storm water runoff that has filtered through the planting soil.

The underdrain collection system consists of 150 mm (6 in) perforated PVC pipe laterals placed in a 305 mm (1 ft) gravel layer.

#### Underdrain Gravel

Gravel of size 10 mm to 20 mm will be used and gravel layer will be of 305 mm.

#### Sand Layer

Fine sand of size 0.5 mm to 1 mm will be used. Depth of sand bed will be 305 mm.

#### Planting Soil

The planting soil provides bedding and nutrients for the planting material in the bioretention area.

#### Organic Layer

An organic layer consisting of fine shredded hardwood mulch will be applied over the top of the bioretention area.

The purpose of the organic layer is to filter finer particles from the storm water runoff and maintain soil moisture in the planting soil.

The mulch layer should be well aged, stockpiled or stored for at least 12 months; uniform in color; and free of other materials, such as weed seeds, soil, roots, etc.

The mulch should be applied to a maximum depth of 76.2 mm (3 in).

#### Plantation

##### Vetiver Grass

Maximum height: 1.5m

Water preference: Moderate Water

Origin: Tropical India

Percentage of Nitrate Removal: 93%

##### Garden Croton

Maximum height: 3 m

Water preference: Moderate Water

Origin: South India

Percentage of Nitrate Removal: 67%

##### Lemon Grass

Maximum height: 1.2m- 1.8m  
 Water preference: Moderate Water  
 Origin: Southern Asia  
 Percentage of Nitrate Removal: 95%

## 2.2 Methodology

The project is basically divided into two main stages.

1. Initial stage
2. Final stage

In initial stage the stormwater is collected from surface runoff and tested in lab without filtering the water. According to Maharashtra Pollution Control Board (MPCB) nine water quality parameters are selected for calculating the water quality index are as follows,

- Dissolved Oxygen (DO)
- Fecal Coliform (FC)
- pH
- Biochemical Oxygen Demand (BOD) (5-day) □
- Temperature change (from 1 mile upstream)
- Total phosphate
- Nitrate
- Turbidity
- Total Solids

The expression for calculation the NSFQI is expressed as;

$$\text{NSFWQI} = \sum_{i=1}^P W_i I_i$$

Where;

$I_i$  = sub index for  $i^{\text{th}}$  water quality parameter

$W_i$  = weight (in terms of importance) associated with water quality parameter

$P$  = number of water quality parameters

Weights for computation of WQI based on DO, FC, pH and BOD, Sub index equation used to calculate NSF WQI for DO, FC, pH and BOD, Water Quality Classification and Best Designated use are calculated as per given BIS 10500, (2004-2005)

In final stage of project, the same stormwater is tested in lab again but this time the water is filtered through bioretention filter constructed using the materials used.

Relative Weight of chemical parameters used for calculating WQI for Ground water can be calculated using BIS 10500

Thus, after calculations the water quality can be determined using the ground water classification based on water quality index given in Water Quality Status of Maharashtra 2018-2019.

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### III. RESULTS AND CALCULATION

Due to implementation of Bioretention filter we can collect the stormwater which gets wasted due to lack of stormwater management techniques. Bioretention filter helps to collect, filter and store the stormwater and use the same in dry season. This water can be used for groundwater recharge, floor cleaning in malls, gardening and household purpose.

### ACKNOWLEDGEMENTS

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# Cluster Development Proposal for Ramwadi with Special Emphasis on Physical Infrastructure”

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**Abstract**— India is becoming a largest populated country in the world. People are getting migrated from rural to urban areas due to poor economic conditions and to get employment, though people are facing scarcity of houses, in urban areas and getting pressure on urban lands. Nashik is one of the based cities to line in. Sizes of family getting more and sizes of housing are becoming less. So people are encroaching the area, where ever gets place to expand. Though the spaces between two buildings are becoming less and road width area getting small. So need to develop such areas to improve their living of standard and control population in different areas, which are overcrowded. In this paper, an area of Ramwadi is overcrowded and lacking all the facilities.

**Keywords**— Cluster Development, Dilapidated, Physical infrastructure, Ramwadi, Smart city Area.

## I. INTRODUCTION

Development of Ramwadi area will get good impact on cities road side development and help to form a smart city. People are facing many problems due to lack of infrastructure facilities .i.e. insufficient parking, sewage treatment plant, storm water disposal, narrow roads, no recreation areas etc. Small areas need to work out as per regulations to form smart city. To minimize non – point source pollution by reducing the area of impervious surfaces. Area need to be developed by considering natural features, topography and protect environmentally sensitive areas. The higher densities of clusters of housing get more efficiently services like public transport can encourage bicycle usage and pedestrian movement. There are many benefits of Cluster Development, which are sever and utility lines need to be provide less and also need of less infrastructure facilities.

## II. NEED OF THE STUDY

Due to available employment facility cities becoming overcrowded, but people are getting less infrastructure facilities due to increasing population.

- To improve the quality of living standard in each and every area of the city.
- People should get equal infrastructure facilities.
- Need to strengthen social infrastructure.
- To control the migration in particular developed areas.

## III. OBJECTIVE OF THE STUDY

The objectives of the study are as follow:

- To study cluster development Policies and Guidelines.
- To analyze the existing scenario of Ramwadi area.
- To analyze available physical infrastructure and need of development.
- To identify the issues involved in physical infrastructure.
- To prepare planning proposal for physical infrastructure within the Ramwadi area

#### IV. OBJECTIVE OF THE STUDY

Scope of this study is as follow:

- The study area is limited to Ramwadi area.
- This study pays particular attention on physical infrastructure.
- Main purpose of the study is physical planning and management of physical infrastructure.

#### V. STUDY AREA

Study area is in Nashik city of Ramwadi Area, which is located in Maharashtra state. Ramwadi area belongs to khandesh and northern Maharashtra region. It belongs to Nashik Division. Ramwadi is an old area of Nashik, which is still un-developed area near Bank of River Godavari. People are facing lack of infrastructure facilities and problems during flood. A house does not have parking areas and sewage treatment facilities and area also having very narrow roads.



**FIGURE 1: Study Area Map**

#### VI. SCHEMES OF CLUSTER DEVELOPMENT

##### 6.1 Smart City Mission

Launched on June 25, 2015

This ambitious program by the Indian Government aims at building 100 Smart Cities across India with focus on planned urbanization and sustainable development as a support system for the neighboring cities. It also involves the development of high-quality infrastructure with provision of basic amenities, education, health services, IT accessibility, digitization, e-governance, sustainable development, safety and security.

##### 6.2 Swachh Bharat Mission (SBM)

Launched on October 2, 2014, The Swachh Bharat Mission is the government's nationwide flagship program with the objective of universal sanitation coverage in urban areas.

##### 6.3 Pradhan Mantri Awas Yojana (PMAY)

The scheme was launched on June 25, 2015

For providing 20 million affordable homes for the urban poor including slum dwellers by March 2022.

##### 6.4 Jawaharlal Nehru National Urban Renewal Mission.(JNNURM)

Launched in 2005,

Jawaharlal Nehru National Urban Renewal Mission was a city-modernization scheme with an investment of over \$20 billion over seven years. The scheme was designed to raise investment in urban infrastructure, build better civic amenities, ensure universal access to basic utilities as well as create affordable homes for the urban poor, slum dwellers and people of economically weaker sections.

## VII. GENERAL POLICY OF CLUSTER DEVELOPMENT

- Cluster Development is considering the key to the well organized development for Mumbai. The basic scheme of the cluster redevelopment means instead of redevelopment individual building several old building are jointly taken up for the group redevelopment form by developer and conveyed to the state government.
- Governments accepted the scheme and modify DCR and increase FSI to 4 for minimum 4000sq.m to develop. This facility was extended to legal buildings which are in dilapidated condition and hazardous condition.
- Road should be minimum 9.00m long.
- State's amended policy has diluted certain terms and conditions of old encourage more cluster development projects to be undertaken by the developers. Previously it was only for island city, now covers suburbs.
- New scheme developed in the developer acquires consent for 70% of land .State government intervene to acquire the rest 30% min carpet area of redeveloped flat is 30 Sq ft , age of building more than 30 years. Dilapidated declared buildings qualify for cluster development more than 3 years 10% more carpet area.
- Maharashtra to revise cluster housing policy old dilapidated building & other complexes. Minister for housing and slum development.
- New policy aims 40-50 clusters. Building older than 30 years and having at least 10,000 sq.m. Land can be brought down to make way for new buildings if at least 70% of the residence to do so.
- Maharashtra Housing Policy [Housing for All]  
Major factor for boosting realty development in Mumbai suburbs.
- Brihan Mumbai Municipal Co-operation (BMC). Announced the Maharashtra government's new housing policy. Which emphasizes on Redevelopment and cluster development (Redeveloping entire locality instead of single building)
- Non-Buildable Plots can be developed resulting in more open spaces.
- Cluster development help in easing the pressure on the island city's infrastructure as in future.
- Focuses on other key factors, such as access to mass transportation and connectivity to employment offering locations.

## VIII. CONCLUSION

Concept of cluster development is to develop good physical & social environment, Smart specialization strategy by finding critical determinants. Cluster Development plays an important role in enhancing and creating building learning environment and creates smart condition within the city. Proposal is divide urban spaces on the basis of cluster by analyzing the area provide smart infrastructure facility. Basic purpose is to fulfill the requirement and needs of residential development to develop old dilapidated structure which is of no old very dangerous to live in.

## IX. ACKNOWLEDGEMENTS

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# Development of Noise Absorbing Composite Materials Using Agro Waste Product

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**Abstract**— Increasing use of electrical and mechanical appliances at home and industries has created a concern for noise pollution created by them. Urbanization and heavy growth of construction work in every neighborhood further emphasize the need of new technologies for noise reduction. Noise created by different machines can be controlled either by suppressing the noise generating factors or by using the noise proofing materials which help to reduce the acoustic wave's energy by blocking or absorption. At present the focus, is to develop a cheap, renewable and biodegradable sound proofing material with the help of jute fibre which if a non-abrasive porous, good insulator, hygroscopic and combustible material for automobile, home appliances and architecture application

**Keywords**— Cheap, Renewable, Biodegradable, Jute.

## I. INTRODUCTION

Noise is nuisances caused in the outside world due to various reasons, involving machines, transportation systems, engines, aircraft, etc. Noise pollution has great adverse influences on the environment, human health and economy. How to reduce the damages caused by the noise pollution has become an important issue. Therefore, to avoid this unwanted noise various types of acoustic panels are nowadays used. Generally panels are made of synthetic porous and fibrous materials as they serve as good acoustic insulators absorbing most sound whereas dense, hard, impenetrable materials reflect most sound. The products such as foam, rock wool, and glass wool made from minerals are known for their toxicity and polluting effects which are harmful to human health as well as to the environment. It has been shown that their production can release more carbon dioxide into the atmosphere compared to those made from natural materials. In order to support "Green" environment campaign, Acoustic absorbers from natural materials are therefore of interest due to their biodegradability and sustainability. As an alternate, natural fibres like jute, cotton, flax, ramie, sisal, and hemp obtained from renewable resource can be used as a cheap, biodegradable and recyclable sound absorbing materials. Although composites made of jute fibre/felt with other fibres are being used for various applications in the automotive industry, construction, building sectors, furniture etc.

## II. LITERATURE REVIEW

### 1.1 Rice straw-wood particles and bamboo composite for sound absorbing wooden construction materials(2003)

From this source we got a brief information on agro materials, their properties and there capabilities of absorbing sound to a great extent. The recommended properties of the rice straw-wood particle composite boards are described, to absorb noise, preserve the temperature of indoor living spaces, and to be able to partially or completely substitute for wood particle board and insulation board in wooden construction.

### 1.2 The design of an Acoustical multi-layer coir fibres sound absorption panel. (Eur J Science Research; 2008)

This reference gives us the idea of making layers of the material to obtain multi-layer panels. Layers of rice straw, bamboo and polypropylene should be combined properly with proper readings and proper structure. This reference helped us in making structure and properly placing all the materials so that their maximum utilization can be done.

### 1.3 New low-cost insulation particle boards from mixture of all agro waste material. (Build Environment research work; 2004)

From this source we information of making low cost but an effective panel which can absorb sound and can decrease noise pollution. All the materials which we are using are waste and natural conventional materials which are available in abundance in nature. By using such materials the cost automatically decreases and making of such panels become easy and more convenient.

#### **1.4 Uses of acoustic panels in our day to day life. (BMJ quality & safety; 2005)**

From this research paper we got to know the uses of acoustic panels. Acoustic panels are designed to combat noise pollution. They are often used in noisy areas to reduce, correct and absorb noise pollution. This panels are designed in such a that they can be used in restaurants, reception hall or (more frequently) in offices giving a decent look and finish. Using such kind of the panels in auditorium will give effective results in watching movies or attending any conference.

### **III. MATERIAL AND METHOD**

#### **1.1 Design**

The dimensions of the materials are given below:

Dimension = 25cm x 30cm

Bamboo strips = 30cm x 1cm

Thickness = 0.2cm

Rice straw length = 30cm

Weight/area and dimension of composites have been set at 200g/m<sup>2</sup> and 300g/m<sup>2</sup> dimension of 25cm x 30cm .The non-woven web was rolled and cut into 25cm x 30cm rectangles. After determining the total weight of the bamboo and rice straw necessary to achieve the desired concentration. For achieving good strength agro waste concentration is divided into 3 different ratios as 30/70, 50/50 and 70/30 (Rice straw / Bamboo). For knowing good strength concentration of binding material and agro-wastes are divided into 2 ratios. i.e., 50/50 and 70/30 (Agro-waste /Polypropylene).

Bamboo strips are cut into 30cm x1cm dimension and thickness is maintained about 0.2cm. Rice straw is cleaned to remove weeds and other wastes. The rice straw length is made maintained around 30cm .These agro-wastes are sundried for 2 days to remove the moisture content in the materials. Rice straw and bamboo are laid in parallel to each on top and bottom with the layer of polypropylene web in between it. To achieve smooth surface rice straw is laid, both at top and at the bottom surface. The layered mass of agro-wastes (bamboo strips and rice straw) and polypropylene web was pressed in between two Teflon coated aluminum sheets in a pre-heated compression machine which is maintained at 170°C under desire control pressure.

After 120sec minutes PP melts and it is passed through the voids and starts binding with agro wastes. After 1200seconds cold water is turned on until the hot plates temperature decreases to 500°C and then pressure is removed. The composite is removed and it is placed in conditioning room. The procedure is followed for all ratios and the composites are tested for the study.

#### **1.2 Materials Used In Developing Panel**

The materials used in developing a noise absorption boards are as follows:

##### **1.2.1 Rice straw :**

Rice straw is a by-product produced when the harvested paddy is separated from the grains. They are thrashed either manually, using stationary threshers or combine harvesters. Each kg of rice produced results in roughly 0.7–1.4 kg of rice straw depending on varieties, cutting-height of the stubbles, and moisture content during harvest. The average rice straw produced in the world is equal to the annual rice produced. About 45% to 63% of rice straw is used for cattle feeding purpose and the remaining rice straw is dumped or it is burned in the open field.

The biochemical composition of rice straw and wheat straw is characterized by a typical composition of an agricultural-based lignocellulose residue: it contains on average 30 – 45% cellulose, 20 – 25% hemicellulose, 15 – 20 % lignin, as well as a number of minor organic compounds.

(a). The details of different inorganic compounds in rice straw

**Table**  
**Properties of Rice Straw**

SR NOS	COMPONENT	MEAN VALUE (%)	MIN VALUE (%)	MAX VALUE (%)
1	WATER CONTENT	23.9	6.8	88
2	VOLATILES	83.9	80.1	98.2
3	ASH	18	9.6	24.4
4	HHV	18824	17673	19718
5	C	48.7	43.3	60
6	H	5.92	4.94	7.01
7	O	44.2	30.8	50.4
8	N	1.05	0.57	2.11
9	S	0.14	0.07	0.23
10	CI	0.481	0.013	0.909
11	CELLULOSE	36	28.1	41
12	HEMI CELLULOSE	24	21.5	26.5
13	LIGNIN	15.6	9.9	23.3

### 1.2.2 Bamboo :

Bamboo is the naturally occurring composite material which grows abundantly in most of the tropical countries. It is considered as composite material because it consists of cellulose fibers imbedded in a lignin matrix. Cellulose fibers are aligned along the length of the bamboo provides maximum tensile strength.

It is a cheap and fast-grown resource with superior physical and mechanical properties compared to most wood species, bamboo offers great potential as an alternative to wood.

Bamboos are subfamily of grass, grown in all over the world except Europe. Currently there are 1200 species of bamboo in the world. It is divided into the two main groups i.e., woody and herbaceous group. Woody bamboo are interesting one due to its size. In Asia, bamboo grow about 40m tall. It is fastest growing plant on earth having a growth increment of 11cm per day.

The specific gravity of bamboo varies from 0.4 to 0.8 depending on its anatomical structure. The composition of bamboo is primary cellulose of 60%, hemi cellulose and lignin of 32%. Bamboo has good acoustic property due to the

presence of voids in it. It helps in mitigating water pollution due to high nitrogen consumption. It generates up to 35% of oxygen. It has good mechanical strength.

### 1.2.3 Poly propylene :

It is a non-woven thermosetting fabric material. It is used in many fields due to its property. It is called as engineering plastic. It is flexible, good resistance to fatigue. The density of PP varies between 0.895 to 0.92g / cubic cm. It is thermally resistant to all solvents. PP's melting point lies around 162degree Celsius. It is a slow degradable material. Due to its thermosetting property it is used has a binding agent in developing the composite material.

## IV. CONCLUSION

Acoustic panel is a special kind of the panel made of sound absorbing composite materials. Its job is to provide sound insulation. Between the two outer walls the sound absorbing material is inserted and the wall is porous. Thus, when the sound is passed through an acoustic panel, the intensity of sound is decreased. The loss of sound energy is balanced by producing the heat energy. Here, we are using agro waste material to make the panel economical. The maintenance of this panel is easy and is durable. The acoustic panels are also easy to install.

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## Smart Features Use on Highway

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**Abstract**—An intelligent Highway is an innovative concept for smart roads of future smart cities. It is a program of innovation that links a different way of looking at things with innovative ideas that apply the opportunities offered by new technologies in smart ways. Nowadays safety on road has become an important factor in our life because there is an increasing amount of accidents on the road and there are some places where accident occur frequently such as crossings, turns. Also, there is a big problem of traffic jams on the road. Due to heavy rain fall, there is a possibility of water overflow on the bridges and accident may occur. In hilly area there is a possibility of landslide. so, there came a need to design a system which can detect these unexpected events. So, we are designing a system that is An Intelligent Highway system with Weather Accidents Landslides and traffic which is an innovative concept to maintain safety on roads.

**Keywords**— Smart highway, Electronic tolling collection, botanical planting, RFID, PUC, HPC, LED

### I. INTRODUCTION

India has the second largest Highway network in the world with over 3 million kilometers of roads of which 60% are paved. These roads make a big contribution in India's economy. With the advancement of Technology, the most developed projects undertaken along with the real estate are the massive Road building projects. But why new roads are being built faster and faster automobiles are invited in high numbers making road safety a crucial question. Highway safety is emerging as a major social concern in the country. The statistics are mind boggling with an average mortality rate of 100000 persons died in the road accidents. According to survey from WHO, each year road traffic injuries 1 Awareness of 1.2 million men comma women comma and children around the globe and injured many more. The death toll is on the higher side for the countries where pedestrians, motorcycles and passengers are vulnerable and vehicles like the safety norms, like India. Smart highway and smart roads are term for a number of different ways technologies are incorporated into roads, for improving the operation of connected an autonomous vehicle and for monitoring the condition of roads, traffic level and speed of vehicles. Smart highway and smart road are terms for a number of different ways technologies are incorporated into roads, for improving the operation of connected and autonomous vehicles for traffic lights and street lighting, and for monitoring the condition of the road, traffic levels and the speed of vehicles. The principal idea of solar road panels is utilizing the space occupied by roads to generate electricity via photo-voltaic panels installed in place of a conventional concrete or asphalt road surface. Critics have pointed out that solar roadways would be both more expensive, and less productive than more



conventional ways of combining solar power with infrastructure, such as building shelters over roads and parking areas and putting traditional solar panels on the roofs. Roadway-powered electric vehicle system is the patent held by Howard R. Ross. It has several components. The first of which is an all-electric vehicle that would be fit with electromechanical batteries that accept a charge from the road. The road is the second component and would have strategically placed charging coils as to only charge the car when needed. These cars and roads would not require gas or solar power. The maintenance of such road is also important. The main objective of smart highway is to target the improvement of road safety, increase energy efficiency and reduce congestion for road transport. These goals will be achieved by the concrete and sustainable deployment of Cooperative Intelligent Transport Systems in 7 Pilot Sites located in 7 European cities.

## II. METHODS

### 2.1 Rumble Strips

Rumble strips, also known as sleeper lines, alert strips, audible lines, wake up call's growlers, drift lines, and drunk bumps, are a road safety feature to alert inattentive drivers of potential danger, by causing a tactile vibration and audible rumbling transmitted through the wheels into the vehicle interior. They are used for safety purpose on highways. A rumble strip is applied along the direction of travel following an edge line or centre line, to alert drivers when they drift from their lane. Rumble strips may also be installed in a series across the direction of travel, to warn drivers of a stop or slow down ahead, or of an approaching danger spot.

### 2.2 Smart Guide Rails

Also known as Safety Roller Barriers. Barriers or guard rails or longitudinal barriers or traffic barriers keep vehicles within their road way and avoid vehicles from hitting with dangerous hurdles such a boulder, sign support, trees, bridge struts, building walls and large storm drains.

### 2.3 Smart Street Lights

For the past years, environmental issues have gained a lot of attention. Various government organizations are working to create technologies which can be environment friendly or Finding newer different ways for reducing the damage done to the environment. Energy- efficiency is the motto for every new brand that is launched in the market. Amongst various problems, arises the problem of electricity consumption. We might have noticed that sometimes in vacant college campuses or on rural highways, a large number of street light are kept on even though there is no one to utilize those resources. It may also happen that the Administrator might forget to turn off the street lights during the day & result in a tremendous loss of energy. Usually, these street lights are attached with High Pressure Sodium (HPS) bulbs which consume a lot of power. HPS bulbs have a choke coil which consumes a bit of energy other than the original consumption of the power assigned to the bulb. A solution to this is to replace the HPS bulbs with Light Emitting Diodes (LEDs). LEDs consume far less power & have a long life compared to HPS bulbs. Just a mere replacement of the bulbs will contribute to a lot of energy efficiency. As a matter of fact, our proposed system doesn't stop by just replacing HPS bulbs by LEDs. Here we plan to control the street lights depending on the need of the hour. If a few IR sensors are installed to detect the vehicle & turn on the street lights sequentially according to the position & direction of the car with the help of microcontrollers. This system can be installed in places where the traffic density is low compared to the dense traffic which we find on city streets. The system can be completely automatic so the need to turn on the power supply manually is also eliminated. Implementing this system will save hours of energy daily which can be used for other purposes or can be supplied to villages where there are frequent power cuts or no power at all. Sensor based technology is the future & can be beneficial for a developing country like India to make a landmark in the world where nowadays technology is the 4th basic need of human life.

## 2.4 Smart Tolling System

As the name suggests, "Smart Highway Toll Collection System" is an automatic system which leverages the "Internet of Things" technology to identify a vehicle via a unique identification tag. When a vehicle passes through a toll booth, this RFID cards used to track & bill the vehicle owner through a payment gateway. Electronic toll collection (ETC) aims to eliminate the delay on roads by collecting tolls electronically. ETC determines whether the cars passing are enrolled in the program, alerts enforcers for those that are not, and electronically debits the accounts of registered car owners without requiring them to stop. Electronic toll collection has facilitated the concession to the private sector of the construction and operation of urban freeways. Also, it has made feasible the improvement and the practical implementation of road congestion pricing schemes in a limited number of urban areas to restrict auto travel in the most congested areas.

## 2.5 Compressible Life Saver

A compressible Life Saver is placed on the abutment wall so that if the driver is inattentive and by mistakenly crashes into the wall then there is not any kind of damage caused to the vehicle as well as driver. An energy absorbing guy trailer crash attenuator system comes in the form of two or more impressive sections comprising left and right curved, metal side panels. The row of compressible sections extends in an axial direction from a front end and terminates in a back end that is engageable with the rigid back up. When the row is impacted by a vehicle in the axial direction, the compressible sections bend outwardly and absorb energy.

## III. ANALYSIS

### 3.1 Traffic Volume Study

Traffic volume is the number of vehicles crossing a section of road per unit time at any selected period. Traffic volume is used as a quantity measure of flow; the commonly used units are vehicles per day and vehicles per hour. A complete traffic volume study may include the classified volume study by recording the volume of various types and classes of traffic, the distribution by the direction and turning movements and the distribution on different lanes per unit time. The object and uses of traffic volume studies are given below:

- i. Traffic volume is generally accepted as a true measure of the relative importance of roads and in deciding the priority for improvement and expansion,
- ii. Traffic volume study is used in planning, traffic operation and control of existing facilities and also for planning and designing the new facilities.
- iii. This study is used in the analysis of traffic patterns and trends.
- iv. Volume distribution study is used in planning one-way streets and other regulatory measure.
- v. Turning movement study is used in the design of intersection, in planning signal timings, channelization and other control devices.
- vi. Pedestrian traffic volume study is used for planning sidewalks, cross walks, subways and pedestrian signals.

There are variations in traffic flow from time to time. Hourly traffic volume varies considerably during a day; the peak hourly volume may be much higher than average hourly volume. Daily traffic volumes vary considerably in a week and there are variations with seasons. Hence if a true picture is to be obtained, the hourly traffic volume

be known along with the patterns of hourly, daily and seasonal variations. Classified traffic volume study, the traffic is classified and the volume of each class of traffic i.e. bus, car, auto-rickshaw, two wheelers, etc. is found separately. The direction of each class of traffic flow is also noted. At intersections the traffic flow in each direction of flow including turning movements are recorded.

### 3.2 Passenger Car Unit (PCU)

Different classes of vehicles such as cars, vans, buses, trucks, auto rickshaw, motor cycles, bullock carts, etc. are found to use the common roadway facilities without segregation on most of the roads in developing countries like India. The flow of traffic with unrestricted mixing of different vehicles classes on the roadways forms the heterogeneous traffic flow or the mixed traffic flow. As this mixed Traffic consist of the vehicles of different length, width, speed and acceleration. Apart from these, the driver behavior of the different vehicle classes varies considerably. Therefore, it is necessary to make all different classes vehicles in one unit of passenger cars only. It is common practice to consider the passenger car as the standard vehicle unit to convert the other vehicle classes and this unit is called Passenger Car Unit or PCU. Thus, in mixed traffic flow, the traffic volume and capacity are generally expressed

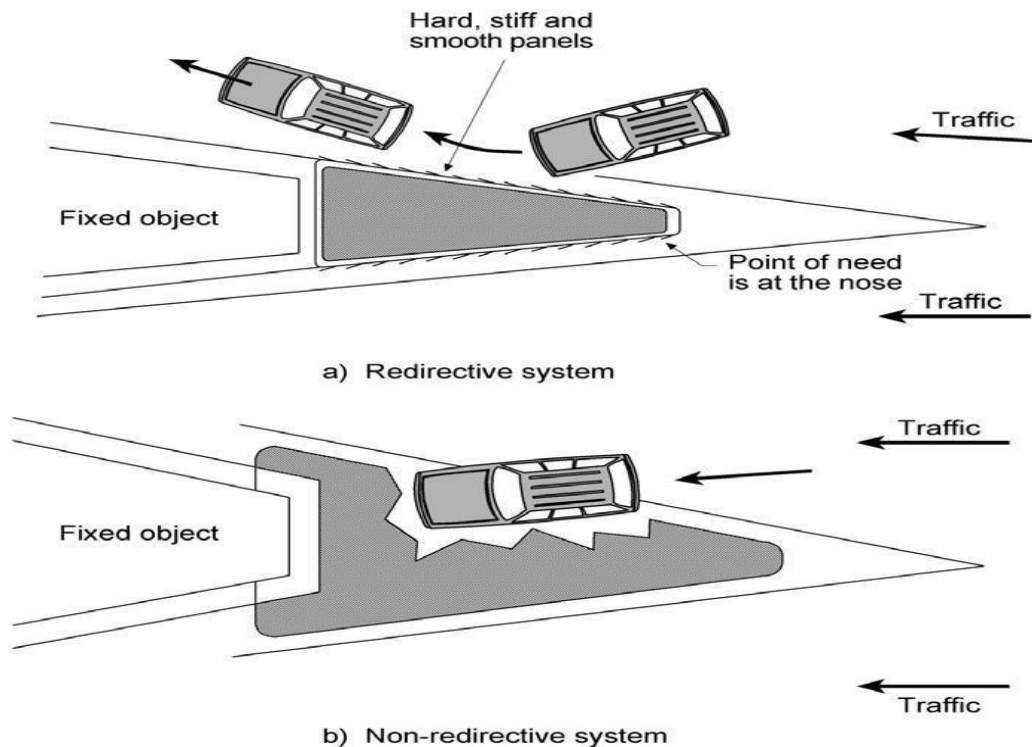


Fig no. 6

Towards Ghodbandar -

TIME	TWO WHEELER	THREE WHEELER	FOUR WHEELER	HEAVY VEHICAL	TOTAL
9-10	775 X 0.5	600 X 1.5	700 X 1	250 X 1	2237
10-11	600 X 0.5	585 X 1.5	710 X 1	220 X 1	2107
11-12	200 X 0.5	363 X 1.5	680 X 1	150 X 1	1474
12-1	454 X 0.5	225 X 1.5	650 X 1	140 X 1	1354
1-2	375 X 0.5	250 X 1.5	500 X 1	125 X 1	1188
2-3	300 X 0.5	220 X 1.5	450 X 1	100 X 1	1030
3-4	454 X 0.5	200X 1.5	550X 1	110 X 1	1187
4-5	660 X 0.5	250 X 1.5	580 X 1	150 X 1	1435
5-6	555 X 0.5	270 X 1.5	600 X 1	145 X 1	1428
6-7	665 X 0.5	400 X 1.5	650 X 1	140 X 1	1723
7-8	475 X 0.5	550 X 1.5	720 X 1	150 X 1	1933

### CONCLUSION

Road traffic & accidents have become a major concern nowadays. The main concern of our project is to minimize accidents and ensure safe traffic movements. And to make a safe highway by adding some of the safety features so that the accidents can be avoided and to save electric energy.

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## Planning and Design of Sanitation system and Technologies

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**Abstract**— *A it is estimated that at least two billion people have lacking sanitation. The now days in water and sanitation services for millions of peri-urban residents is strongly anti-poor and represents a big challenge for the 21st century. By virtue of its cost and water requirement, we would dispute that conventional sewerage is an implicitly anti-poor technology. This will give results low-cost sanitation technologies that have been developed by engineers from around the world, and seeks to provide evidence that there is such a thing as a pro-poor technology.*

**Keywords**— *Water closet, Quantity, Sanitation system, sewage, sanitation*

### I. INTRODUCTION

#### 1.1 General

In general, sanitation also includes the safe management of solid waste and animal waste. Insufficient sanitation is a major cause of infectious diseases such as cholera, typhoid and world-wide. It also contributes to developing properly and impaired cognitive function and impacts on well-being through school attendance, anxiety and safety with lifelong consequences, especially for women and girls. Improving sanitation in houses, health and schools underpins progress on a wide range of health and economic development issues including universal health coverage and combatting antimicrobial resistance. It is currently estimated that 1.1 billion people in the world lack access to enhanced water supplies and 2.6 billion people lack adequate sanitation. It is currently estimated that 1.1 billion people in the world lack access to improved water supplies and 2.6 billion people lack adequate sanitation. The global health burden associated with these conditions is staggering, with an estimated 4000 – 6000 children dying each day from diseases connected with lack of access to safe drinking water, inadequate sanitation and poor hygiene.

### II. LITERATURE REVIEW

LeChevallier et al. (2013) [1] has studied that microbial contamination in parts of the distribution system might also play a role in risks of endemic illness at the house tap based on a postal survey of 423 subjects.

Storey et al. (2003) [2] has studied that biofilms in distribution systems may supply a favorable environment for some bacterial pathogens especially opportunistic pathogens which cause. Studies by Payment et al. (1991, 1997) give suggestion that the distribution system may have contributed to gastrointestinal illness rates observed in study households which drank tap water compared to study households which drank tap water, with additional treatment, or bottled water. A latest study conducted in Wales and northwest England between 2001 and 2002 found a very strong association ( $p < 0.001$ ) between self-reported diarrhea and low water pressure disease primarily in people with weak or immature immune.

Renkevich et al. (1998) [3] has studied that Aging allocation systems may be particularly vulnerable to contamination problems. A latest report by the American Water Works Association (AWWA 2001) and the white paper by the American Water Works



Service Company, Inc. (AWWSC 2002) things that point out that the maximum of water distribution system pipes in the United States are reaching the end of their expected lifespan in the next 30 years. Analysis of main at one large mid-western water usage which kept careful records of their management of the distribution system documented a increase in the yearly number of important breaks from 1970 There is increasing endorse that the water industry is beginning a new era where it must make substantial investments in pipe repair and pipe replacement. Cost approximate for drinking water infrastructure replacement range from approximate \$4 to \$6 billion per year (AWWSC 2002). Latest investment in water structures in the United States has not been adequate to meet current water demands. It will be an even greater challenge for public and private water resort to generate the necessary excess revenue to implement these critical pipe replacement programs. debatable with water quality in the distribution system are especially deep in middle income and developing countries where there are inadequate resources to maintain the distribution system infrastructure and disinfectant residual. Many systems have critical and high leakage. In 1991, an international survey of water loss as a percentage of water supplied reported that in industrialized develop countries water loss ranged from 8% to 24%. However in middle income or newly industrialized countries, water loss ranged from 15% to 24%, and in developing countries, water loss was approximated at between 25% and 45% (WHO 2001). common power outages contribute to less or negative pressure in the pipes which allows contaminated water. For sanitation it is required to reuse water which is grey water.

Howard et al. (2003)[4] has studied that quantity of Adequate water for ingestion and food preparation is necessary for human health. Approximation of minimum daily water intake range from 1.8 to 5 liters per capita per day.

Gleick (1996); Howard et al. (2003)[5] has studied that water is requirement for hygiene. The amount of water use with distance from the water source and climate. Where people have to walk farther than 1 kilometer or spend more than 30 minutes for total water collection time, per capita water use drops to between 5 and 10 liters per day. At this level of service, sufficient hygiene is not possible. When there is a household water connection, per capita water use for basic needs increased to between 60 and 100 liters per day or more if used for gardening and for cultivation of flowers etc.

Esrey et al. (1991)[6] has studied that sanitation system and hygiene in 1977, Bradley looked that many "waterborne" diseases are actually "water-washed" diseases due to less quantity of water quantities of water available for washing hands, food, laundry, and cooking utensils (Bradley 1977). This contain providing household connections or closer public standpipes and setting up hand washing stations, and communal bathing and laundry facilities. The modern review of the impact of water, sanitation and hygiene was intervention of Esrey et al. (1991).

Fewtrell et al. (2004)[7] has studied that a more latest review and reanalysis of the impact of water supply and hygiene interventions had result that water supply interventions in developing countries were associated with a 24% decrease in diarrheal disease and hygiene interventions were associated with 42% reduction in diarrhea morbidity.

Siwi et al. (2004)[8] has studied that Water is required for food production. By far, the biggest global demand on freshwater resources is for agriculture. The International Water Management Institute approximate that over 70% of the world's developed water supplies are used for irrigation of crops agriculture (Seckler et al. 1998) (Siwi et al. 2004). However water requirements for food production vary regionally area by area by type of diet and need for irrigation. Gleick said the average daily water intake to produce a particular diet in California, with high meat consumption and heavy water irrigation needs, to be 5908 liters. This example illustrates the big range in water consumption used for food production. water for food production is also one place where there is the greatest potential for increased efficiency to maximize the "nutrition per drop".

Gleick et al. (2003)[9] has studied that global water use has increase dramatically in the past 50 years due to population growth and the demands of irrigated agriculture. There is growing recognition that increasing water scarcity threatens agricultural production, human health and political stability in many parts of the world. Current water use rates are not sustainable.

Several major rivers in the western United States and in Asia are now.

Gleick et al. (2003); Postel (2000)[10] has described that a study by the IWMI examined water supply and demand in 118 countries from 1990 to 2025 and differentiate countries into categories of water scarcity based on estimated percent increase and the projected water get out in 2025 as a percent of the "Annual Water Resources" of a country. (Seckler et al. 1998). The countries in the most difficult category are those with "physical water scarcity", This category contains 17 countries, mainly in the Middle East and North Africa, with about 8% of the world's population. The IWMI might says that many of these

countries will need to divert water from irrigation in order to meet domestic and industrial water needs and consequently will require to import more food (Seckler et al. 1998). Large parts of India and China fall into this category, and the capacity of these countries to develop extra water supplies, increase the efficiency of their water use and accordingly manage their water resources is seen to be a key determinant of global food security in the 21st century

Seckler et al. 1998 [11] another 24 countries were differentiated with “economic water scarcity” and theoretically have sufficient water sources to get their needs. However these countries will need double their water development projects and do not have the necessary financial resources for this. In addition to the impact on human health and food production, water scarcity leads to intense political pressures and is not stable. In his old water day message hygiene, agriculture and industry is a critical challenge for the near future. Different strategies will be required for the range of climatic, economic and cultural settings affected by conservation.

### III. Methodology

1 To identify sewage water quantity

Average person uses around 135 liters of water for living purposes in a day. Out of the above quantity around 80 % of water is waste water.

$[80/100] \times 135 = 108$  liters of waste water

2 Planning and Design and Costing of WC and Bathroom

Quantity estimation costing of material by Detail and approximate method.

3 Planning and Design septic Tank for Khanivade village

4 Design sewer line and WC with help of software application

5 Design and installing sewage treatment with wetland techniques plant for Khanivade village

6 Reuse treated sewage effluent for agriculture and sewage cultivation

3.3 Test To Be Performed

☐ PH test – The test for the PH value of the sample are 6.5-8.5. The value of PH was calculated with the help of digital PH meter.

☐ Color test – Done with the help of naked eye which helped to know the decomposition of waste

☐ Odor test and BOD COD – Perform by smelling the waste and know the state of the waste , BOD and COD test

### IV. CONCLUSION

2.6 billion people in the world facing lack of proper sanitation system and the safe disposal of human excreta. In the past, government agencies have built sanitation infrastructure, but sanitation on technical are now concentrating on helping people to enhance their own sanitation and to change their behavior. That’s why we are planning and design sanitation system for khanivade village with proper sewer line and small sewage treatment plant using wetland techniques and we also estimate its cost and quantity, we are reusing this water for agriculture and other some uses this techniques will save water.

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# GIS aided Urban Planning for preparation of Micro-Level Plan of Channenahalli Village, Bengaluru.

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**Abstract**— We all know the fact that the surface of earth is spherical and not a plane, and thus in the field of Town Planning we observe errors in an actual plan or map of a region when it comes to its implementation. For smaller areas such as a plot or a small township where the land can be considered to be flat the level of errors observed is less or the accuracy rate is high compared with the larger areas such as a development plan or structural plan or regional plan or even Town Planning Schemes. Remote Sensing & GIS were initially recognized as supporting tools for planning, monitoring, and managing the appropriate utilization of the earth resources. However, due to their multidisciplinary applications and integration with numerous other scientific and technological fields, in the recent years they have become a distinct field of study.

In this paper we are going to learn about how GIS and remote sensing helps in the preparation of a map with respect to actual ground co- ordinates and various uses of the same in the field of Urban Planning with an actual work done on field under the guidance of experts in Directorate of Urban Land Transport, Urban Development Department, Government of Karnataka.

**Keywords**— ArcGIS, Geographic Information System, Geo-referencing, Microlevel Plan, Remote Sensing

## I. INTRODUCTION

Atal Mission for Rejuvenation and Urban Transformation (AMRUT) which was launched by Government of India, four years ago by hon. Prime Minister of India Mr. Narendra Modi on 24<sup>th</sup> June 2015 which aims to provide every household access to water supply and better sewerage conditions along with increasing the amenity value of cities by developing greenery and promoting non- motorized transport opportunities also made an attempt to implement a reform of formulation of GIS-based Master/Development Plans for 500 AMRUT Cities, which has been approved as a 100% centrally funded sub scheme with budget outlay of Rs. 515.00 crores. Based on the concept of actual geo-referenced maps for developing an area with a new concept against traditional Town Planning Scheme Model for implementation of Development Plan, the Government of Karnataka under the Urban Development Department – Directorate of Urban Land Transport conducted an internship program for 8 weeks from 8<sup>th</sup> July 2019 at DULT office, (BMTC, TTMC “B” Block, 4<sup>th</sup> Floor, K.H. Road, Shanthinagar, Bangalore – 560027) and during the internship program, various projects were allotted to various interns in groups and one of those project was “Microlevel Planning” which was allotted to me, Miss. Gireeja Sarangdhar and my two other colleagues namely Mrs. Ruchika Tater from R.V. College of Architecture, Bangalore and Miss. Sushmita Paul from University of Mumbai mentored by Ms. Ann Jacob, Urban Planner.

The main focus of the allotted project was to find alternatives to land development models for faster implementation and also to work on a method or a pilot project which can be utilized as a reference for further development. Even today plans are made by traditionally doing surveys using a total station and various other survey equipment which requires an ample amount of resources and time frames, so as interns we were asked to develop a method for reducing this preliminary time frames and thus we thought of making use of GIS for the preparation of the maps and plans. This paper however would help us understand, how GIS platform can be used for the purpose of Urban Planning.

## II. AIM OF STUDY

“The main aim of the study is to make use of Geographic Information System (GIS) for preparation of plans and maps.”

Under the guidance of Mr. Prashob Raj, GIS expert at DULT Bangalore, with the help of Google Earth Pro, ArcGIS and Q-GIS software, the process of formation of map was undertaken which is illustrated further.

### III. OBJECTIVE OF STUDY

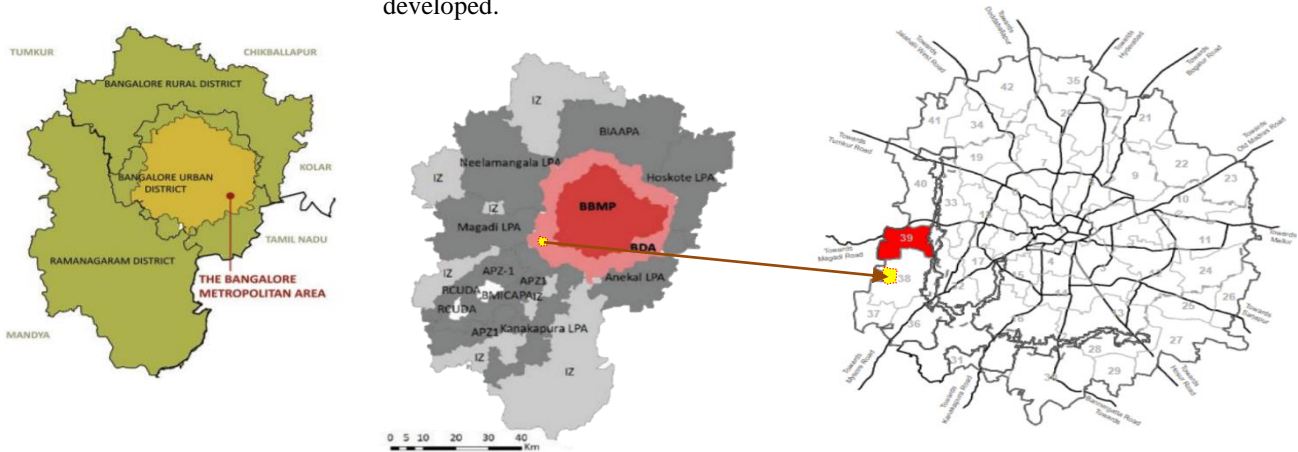
The main objective is to obtain base map and existing land use map within the internship period of 8 weeks and also suggest or propose a microlevel plan for the study area.

### IV. PROBLEM STATEMENT

Bangalore has vast land available for expansion on all the sides and thus the rate of urbanization increases manifold. With faster urbanization, illegal construction practices are observed on major scale and also according to the Section 15- Sub section 2 of the Karnataka Town & Country Planning Act,1961 "If the Planning Authority does not communicate its decision to the applicant within three months from the date of such acknowledgment, such certificate shall be deemed to have been granted to the applicant." And thus haphazard growth continues leading to many problems such as unconnected circulation pattern, lack of supply of basic amenities and ill management of resources. Since Prevention is better than cure, the Government of Karnataka thought of undertaking the project of Microlevel Planning with the help of Student Interns to find a possible solution.

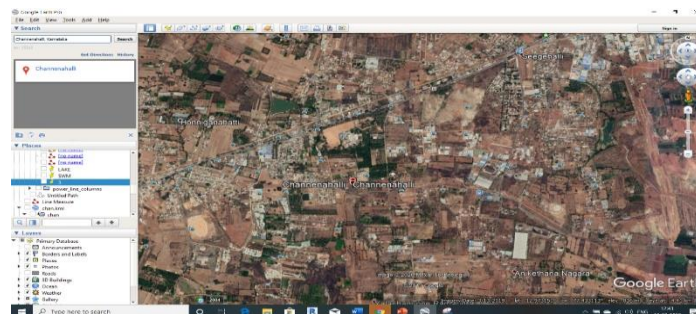
### V. METHOD

To plan the future, the base of present is a must, and thus existing conditions were mapped on GIS Software as base map. But before that, to perform the work, a site was to be chosen and thus the village Channenahalli was chosen because the main reason was it lied within the boundary of BDA (Bangalore Development Authority) so all the DCPR would be applicable to that region ensuring ease of work and also being in the jurisdiction of BDA boundary it still had a scope for improvement as it is not yet developed.



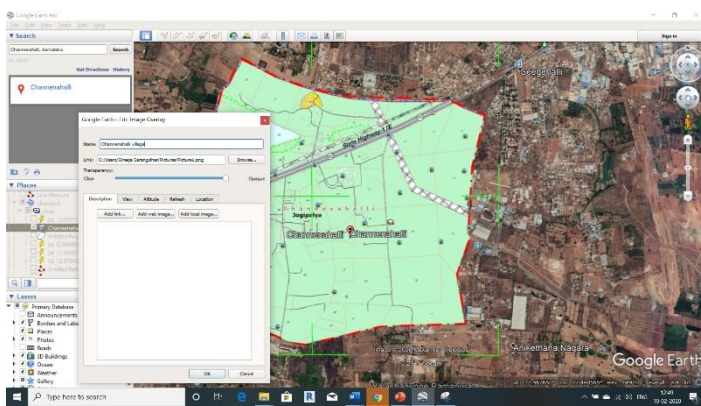
**FIGURE 1: Location of Channenahalli Village**

After selection of site, the boundary of the study area was delineated on Google Earth Pro by overlaying the image onto the software and creating a .kml file using the line tool.

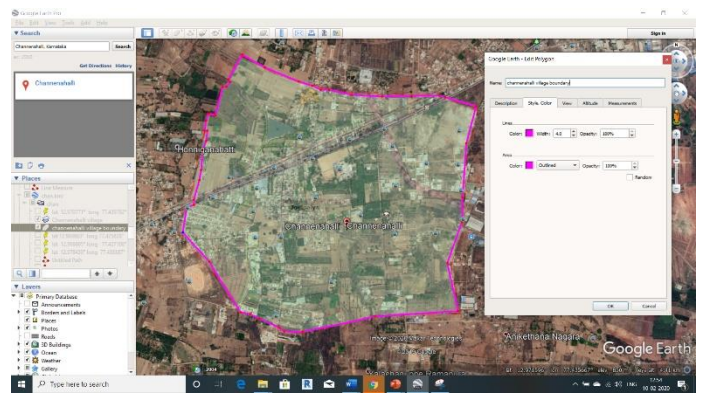


**FIGURE 2: Finding Location of Channenahalli Village on Google Earth Pro**

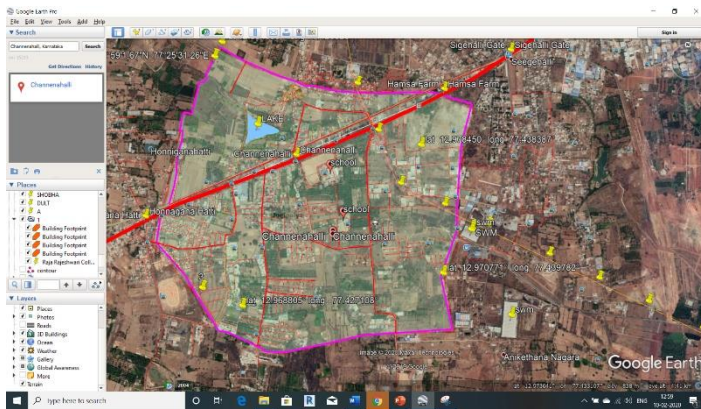




**FIGURE 3: Overlaying Image of channenahalli village**

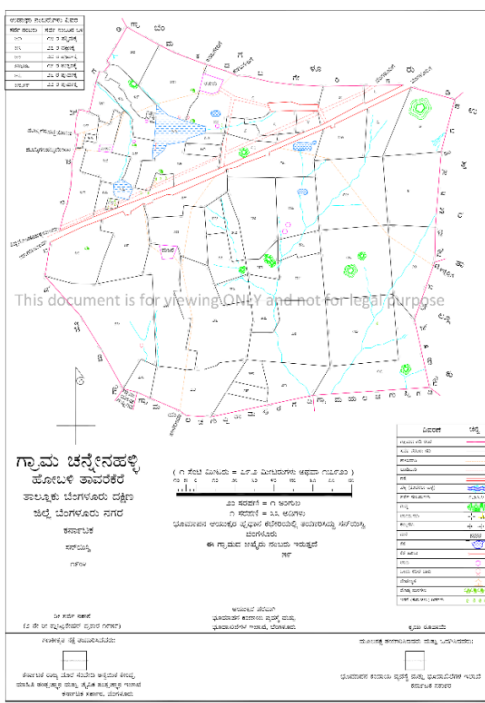


**FIGURE 4: Delineating Boundary of Study area**

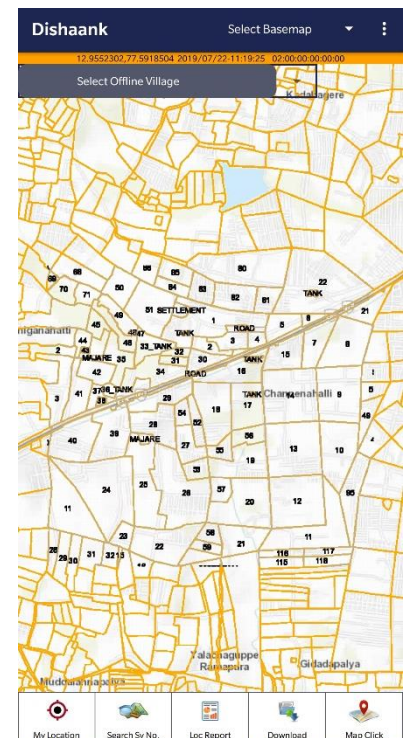


**FIGURE 5: Mapping various existing features of Village**

At first the village was searched on the database by entering the name, later using the image overlay tool, the image of the Proposed Landuse map 2015 of village was overlaid to obtain the boundaries and by mere visual observations the existing features such as building footprint, internal roads, major roads, water bodies, electric lines, etc were marked and then saved as .kml files and then transferred on ArcGIS to obtain a Base map. It was also necessary to understand the ownership and structure of each individual plot within the boundary and for that purpose the village map of Channenahalli village was georectified and georeferenced to get the shapefile of the plots within the boundary.



**FIGURE 6: Digitalization of Village Map**





Similarly, various other maps such as current road network, proposed road network, building footprints, tree cover, reserved areas, etc were created to understand the region.



**FIGURE 7 : Existing unorganized roads**



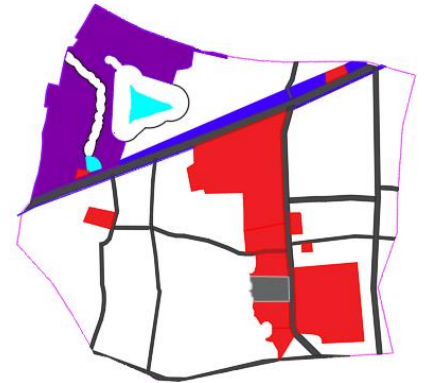
**FIGURE 8 : Existing Building Footprints**



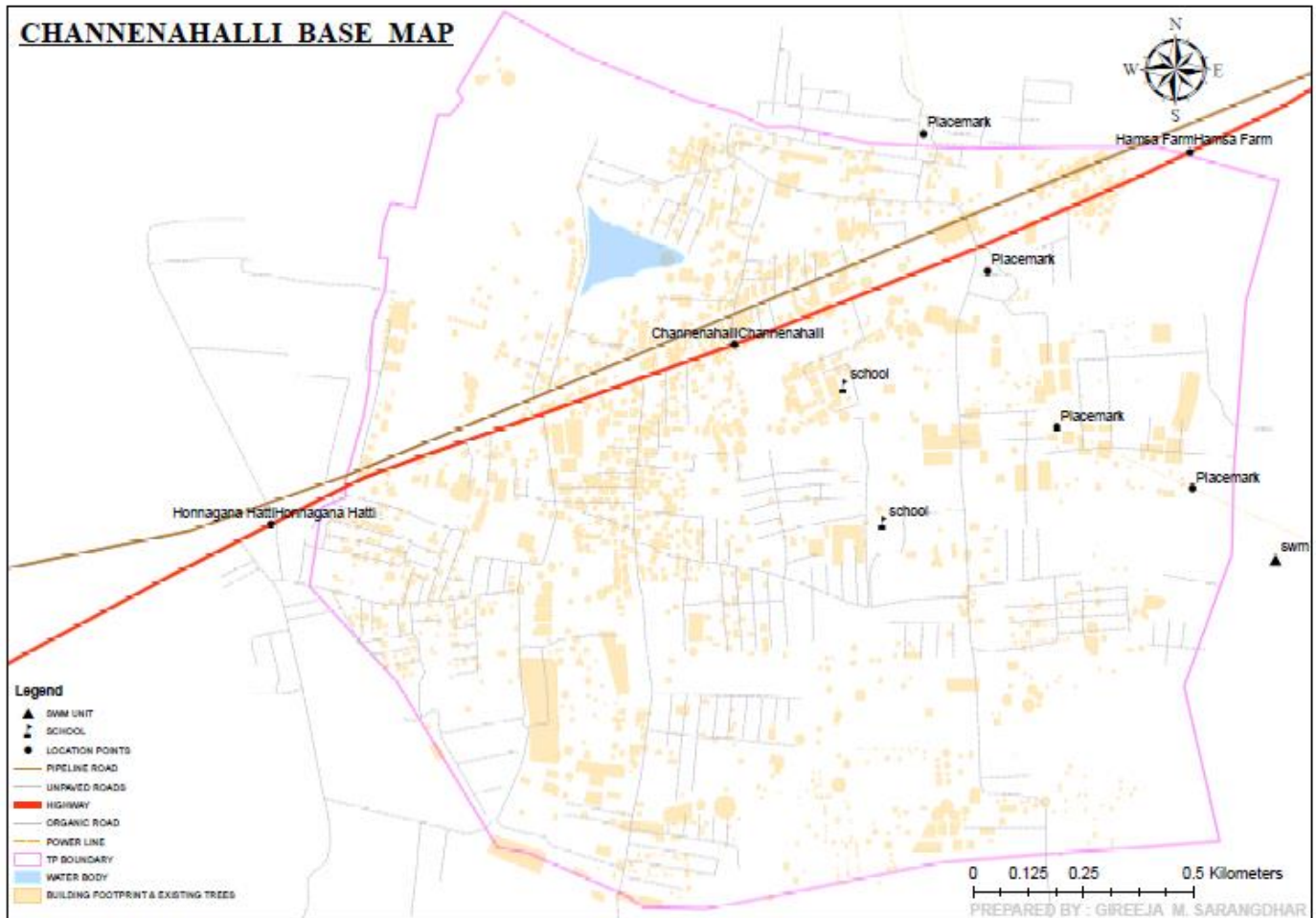
**FIGURE 9 : Existing Trees**



**FIGURE 11 : Compilation of Data obtained by Remote Sensing & GIS**



**FIGURE 10 : Proposed DP reservations**



**FIGURE 12: Base Map of Channenahalli village prepared by author**

## VI. CONCLUSION

On an average, if we compare the time required by the SPA Special Planning Authority or government of any state to carry out survey and prepare maps it takes more than 9 months and that to publish a preliminary scheme the time frame is 12 months according to act but even this deadline is extended by permissions and also it takes ample manpower to conduct physical surveys and also huge resources to be invested. Even after that we observe errors on that plan because of human mistakes, negligence or any other cause. However remotely sensing the elements through software eventually reduces the timeframe as observed in this work. The data being actually georeferenced, it is accurate to maximum possible extent which will then fasten the pace of implementation. Also it can be concluded that the desired objective of obtaining maps is achieved in stipulated time period of 8 weeks.

### ACKNOWLEDGEMENTS

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## Study on Properties of Photocatalytic Concrete

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**Abstract**— Environmental pollution is a significant risk factor for a number of pollution related disease and health conditions living organisms. Self-cleaning concrete having a technique to reduce the air contaminants such as NO<sub>x</sub>, SO<sub>2</sub>, CO<sub>2</sub> and VOC'S from vehicular traffic on streets, any industrial activity and the urban environment. Photocatalytic materials are used in Ordinary Portland Cement conventional concrete for urban buildings and road pavements to reduce air pollution. The primary photocatalytic material is Titanium dioxide (TiO<sub>2</sub>) is white coloured powder. TiO<sub>2</sub> is activated by the energy from the sun light or UV lamps and it decompose the external pollutants on the surface of the concrete, which is removed by wind and rain action. The presence or removals of pollutants are monitored by the laboratory tests. The workability and compressive strength of the self-cleaning concrete is also tested. As a result, it reduces the air pollution (also smog) and causes to self-cleaning active in this project different parameters like workability, compressive strength and durability and photocatalytic effect of TiO<sub>2</sub> were studied. Grade of concrete used is M40, W/C ratio is 0.45, TiO<sub>2</sub> + OPC After 28 day of curing all samples were tested with NO<sub>x</sub> gas and observations of the reduction in the gas was measured between different time intervals. Titanium Dioxide (TiO<sub>2</sub>) was added in the percentage of 0 to 5% to find the optimum dosage of TiO<sub>2</sub> for maximum workability, compressive strength and durability of photocatalytic and self-cleaning concrete.

**Keywords**— photocatalytic concrete, self-cleaning concrete, Titanium dioxide.

### I. INTRODUCTION

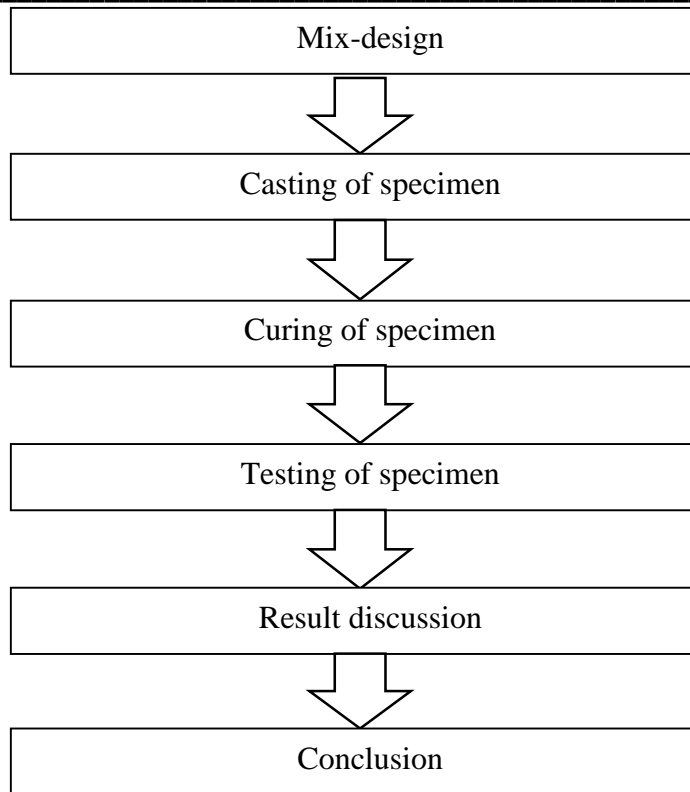
Air pollution is an environmental problem that Cause significant negative health implications for humans as well as other living organisms. Major primary pollutants that are produced by human activity include the nitrogen oxides (NO<sub>x</sub>), Sulphur dioxide and volatile organic compounds (VOCs). which are emitted from combustion at high temperatures. When photocatalytic materials absorb ultraviolet radiations from the sun, hydroxyl radicals and superoxide anions are created that have the ability to react with pollutant molecules such as NO<sub>x</sub>, SO<sub>x</sub>, thus converting to less harmful substances.

Heterogeneous photo catalysis has been intensively studied in recent decades because it only requires photonic energy to activate the chemical conversion contrasting with conventional catalysis which needs heat for thermo-activation.

The major applications of TiO<sub>2</sub> based photocatalytic building materials include environmental pollution remediation, self-cleaning, air cleaning and self-disinfecting. The advantage of using solar light and rainwater as driving force has opened up a new domain for environmentally friendly building materials.

### II. METHODOLOGY

Cement and fine aggregate material selected for use in the present study were characterized in accordance with the IS code. Physical and mechanical properties of the materials were observed to ensure that there was no interference in the quality of the produced concrete.



### III. MATERIAL AND METHOD

#### 3.1 MATERIALS USED

- Cement (PPC)
- Basalt aggregates
- Fine Aggregate (Sand)
- Titanium Oxide (TiO<sub>2</sub>)
- Brass Powder (Cu)
- Nitric Acid (HNO<sub>3</sub>)
- Water

#### 2.2 Test Performed

##### Test on aggregate -

- Specific gravity on aggregate.
- Water absorption on aggregate.
- Sieve analysis of coarse and fine aggregate.
- Silt test on fine aggregate(sand).

#### Test on Cement –

- Consistency Test
- Initial and Final Setting Time
- Specific Gravity Test.

#### IV. TEST RESULT (MATERIAL)

Sr.No	Properties	Test Result
1	Initial setting time of cement	30 mins
2	Final setting time of cement	600 mins
3	Specific gravity of fine aggregate	2.57
4	specific gravity of coarse aggregate	2.75
5	Water Absorption on Aggregate	2.50%
6	Silt Content Test	3.651%
7	Normal consistency of cement	25-30%

#### V. CONCLUSION

- Workability of the fresh concrete was not affected significantly by 1% TiO<sub>2</sub>. However, the workability was decreased with further increase in TiO<sub>2</sub> percentage.
- Self-cleaning concrete helps to make pollution free environment and helps to reduce global warming by its huge amount of application

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# Waste Management In Viva Institute of Technology Using Various Techniques

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**Abstract**—The growth in intake of students, constants change in consumption pattern and social behavior has increased the generation of waste management in VIT campus. Though waste management is a worldwide phenomenon, the improper management of waste management causes hazards to the inhabitants. The problem of waste management is prevailing in the academic environment of the VIT campus also. Consequently, there is need for improve planning and implementation of effective waste management systems for sustainable environmental scenario of the campus. It requires detailed information on the quantity and character of waste management generated and their physical and chemical properties. This present study is to investigate the problems and prospects of waste management in the campus. The investigation includes the methods of practices associated with sources, quantity generated, collection, reuse, recycle, storage of waste in the VIT campus. In this work, it is intended to collect the data using a questionnaire, field visits, and interaction with inhabitants. This work will evolve an appropriate waste management strategy based on the principles of reuse and recycle. This work will be a feasibility study for a waste management system for the campus.

**Keywords**— Organic, Plastic, Recycle, Reuse, Waste Management.

## I. INTRODUCTION

VIT is providing technical education for graduate students in engineering. Instead of all these advance technology in educational fields it faces severe environmental concerns which needs to be resolved. At the start of the 20th century the industrial companies saw the increment in consumers. The earth itself became more polluted with the generation of non-biodegradable waste. The increase in population and urbanization was also responsible for increase in waste. Solid waste is no longer desired material which is generated from household, industries, agriculture and commercial .The introduction of the paper should explain the nature of difficulty, multiple work, aim , and the contribution of the paper.

Tetra pack cartons are primarily made from papers. 75% of tetra pack carton is made from paperboard, 20% of polyethylene and 5% of aluminium . Tetra pack cartons are fully recyclable. The paperboard is recycled into panel boards, roof sheets and so on. Waste management and recycling collection can help to conserve our planet natural beauty which can be flawed by thoughtless disposal of waste and senseless littering. It is also blight for those who live in areas where waste collection recycling is not managed effectively and responsibly.

## II. OBJECTIVES

2.1 For proper waste management is to protect the environment and for the health and safety of the population. To reduce quantity of waste of 3 R's.

2.2 Identifying the barriers for reducing plastic waste and here by stimulating prevention and recycling of plastic waste. Diverting plastic waste from residual waste going to incineration and landfill.

2.3 To reduce high rate of plastic pollution and reprocessing the materials into functional and useful products. This approach helps to conserve resources and divert plastic from destination such as oceans.

2.4 To reduce bio degradable waste and to produce as a soil conditioner. It is used in garden horticulture, urban agriculture and organic farming.

2.5 To transform biodegradable organic matter into biologically stable material thereby reducing the original volume of the waste.

2.6 To produce a product that can be used to support a plant growth and as a soil amendment as fertilizer and soil conditioner.

### III. MATERIAL AND METHOD

For proper waste management segregation of waste is required as per their physical and chemical properties. Composting can be done various methods like aerobic composting, anaerobic composting, vermicomposting. Organic waste generated in college campus we are adopting aerobic organic composting, which is mainly dependent on the amount of oxygen. Some factors are important while composting such as temperature, moisture content, carbon- nitrogen ratio.



**Fig.3.1: Composting materials**



**Fig.3.2: Composting pot**

Plastic bottles, plastic wrappers, and other plastic material can be recycled by different methods such as making plastic beads, for making plastic pavers blocks recycle of plastic material into another material, etc. We are reusing this waste plastic bottles for casting concrete cubes. For making this cubes plastic bottles are filled with other plastic material, and these bottles are placed in concrete mold and after that concrete mix is poured into the mold, M25 grade of concrete mix is used for making cubes, using this plastic waste generated in college campus reduce the amount of concrete per m<sup>3</sup>.



**Fig.3.3 :segregation of plastic waste**



**Fig.3.4: bottle filling with plastic**



**Fig.3.5: plastic filled bottles**

**Table 3.1 : Materials used for casting cubes :-**

Sr. No.	Ingredients	SSD mix (per m <sup>3</sup> ) in kg	Batch (for 9 cubes)
01.	Cement	299	13.455
02.	Fly ash	84	3.780.
03.	10 mm aggregate	470	21.167
04.	20mm aggregate	610	27.093
05	Sand	853	36.658
06.	Water	161	9.717
07.	Admixture	4.21	0.172

TM 25 (NORMAL)									
NORMAL									
M3						DATE		4   10   19	
Mgrl.	S&O MIX	CORRECTED	BATCH	MIX CORRECTION					
C/M	299	299	13.455						
F/A	84	84	3.700						
ALKO	0	0	0.000	WATER ABSORPTION		MOISTURE CONTENT		REMARKS	
10mm	479	470	21.167	10 MM	1.80	10 MM	0.000		
20mm	610	602	27.093	20 MM	1.30	20 MM	0.000		
C/SAND	853	815	36.658	C/S	4.50	C/SAND	0.000		
R/SAND	0	0	0.000	R/S	0.000	R/SAND	0.000		
WAT	161	216	9.717	WAT (-)	54.937	WATER (+)	0.000		
ADMS	4.21	4.21	0.172	WATER ABSORPTION		MOISTURE CONTENT			
Rt 1	0	0	0	CORRECTION		CORRECTION			
DENSITY KG/M3									
	2490	2490	112.04	10 MM	8.622	8.622	10 MM	0	
				20 MM	7.93	-7.93	20 MM	0	
	Admix Dose	1.2%	C/S	38.385	-38.385	R/SAND	0		
	Retar.Dose	0.000%	R/S	0	0	C/SAND	0		
	TOTAL W/A	54.937	-54.937	TOTAL M/C	0				
OBSERVATIONS									
SUMP IN MM FLOW IN MM Mix Observation :- Mix is Homogeneous & Cohesive. C/A/F is ok									
Mix is Pumpable:									
CLIFE STRENGTH N/mm <sup>2</sup>									
7 days Strength								DATE	11   10   19
10 min	150			Sr.No.	Wt(gm)	Load (KN)	Comp.St./N/(mm <sup>2</sup> )	Avg.St.	% of TMS
50 min	120			1	1610.00	550	24.44		
90 min	90			2	2560.00	570	25.33	25.04	79.23%
120 min	0			3	8529.00	570	25.33		
150 min				14 days Strength				DATE	18   10   19
180min				Sr.No.	Wt (gm)	Load (KN)	Comp.St./N/(mm <sup>2</sup> )	Avg.St.	% of TMS
				1	8510.00	650	28.89		
				2	8635.00	680	30.22	29.78	94.23%
				3	8600.00	680	30.22		
MIX DETAILS									
C/M	299	Opc S3	ACC	ASHTCH	1	8510.00	650	28.89	
F/A	84			3	8600.00	680	30.22		
ALKO	0			28 days Strength				DATE	1   11   19
WAT	161			ACFL	1	8522.00	800	35.56	
Admix	4.21			2	8615.00	770	34.22	34.81	110.17%
Retar	0.00			3	8500.00	780	34.67		
W/A	0.42								
rck	25								
TMS	31.60								


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**Fig. 3.6 Result of standard cube**

CONCRETE REPLACING BY PLASTIC BOTTLES FILLED WITH PLASTIC											
		0.05% M3		MIX CORRECTION		DATE		4/10/19			
Ingrd.	SSD MIX	CORRECTED	BATCH								
CLM	299	299	13.455								
F/A	84	84	3.750	WATER ABSORPTION			MOISTURE CONTENT			REMARK	
ALKD	0	0	0.000								
13mm	479	470	21.157	10 M/M			1.50			0.000	
20mm	610	602	29.093	20 M/M			1.30			0.000	
C/SAND	853	853	36.858	C/S			4.80			0.000	
R/SAND	0	0	0.000	R/S			0.000			0.000	
WAT	161	216	9.717	WAT./L			54.937			WATER(+) 0.000	
ADM	4.21	4.21	0.172	WATER ABSORPTION						MOISTURE CONTENT	
RLT	0	0	0	CORRECTION						CORRECTION	
DENSITY KG/M3											
2490	2490	112.04	30 MM	8.622	-8.622	30 MM				0	
			20 MM	7.93	-7.93	20 MM				0	
Admin Dose			1.2%	C/S	38.385	-38.385	R/SAND				0
Retar Dose			0.00%	R/S	0	0	C/SAND				0
TOTAL W/A			54.937	54.937	TOTAL M/C						0
OBSERVATIONS											
SLUMP IN MM			FLOW IN MM			Mix Observation :- Mix is Homogeneous & Cohesive. CA/A is ok					
Initial	180		Mix is Pumpable.								
30 min	150		CUBE STRENGTH N/mm2								
60 min	120		7 days Strength								
90 min	90		DATE 11/10/19								
120 min	0		Avg. St.								
150 min	0		% of TMS								
180 min	0										
			Sr.No.			Wt (gm)			Comp.St.(N/mm2)		
			1			7910.10			20.44		
			2			8105.00			19.36		
			3			8015.00			18.22		
						14 days Strength			DATE 18/10/19		
			Sr.No.			Wt (gm)			Comp.St.(N/mm2)		
			1			8145.00			23.11		
			2			8080.00			24.00		
			3			8210.00			24.89		
						28 days Strength			DATE 1/11/19		
			Sr.No.			Wt (gm)			Comp.St.(N/mm2)		
			1			8010.00			29.33		
			2			8025.00			28.89		
			3			7910.00			28.00		
						MIX DETAILS			DATE 24.00		
CLM	299	OPCS3	ACC							75.95%	
F/A	84		ASHLOH								
ALKO	0										
WAT	161										
Retar.	4.21		ADOL	1	8010.00	660	29.33				
W/c	0.40			2	8025.00	650	28.89				
fck	25			3	7910.00	630	28.00				
IMS	31.60										
AMEYA CONCRETECH PVT.LTD.											
For AMEYA CONCRETECH PVT. LTD. Checked by  QA/QC IN CHARGE											
Prepared By											

**Fig. 3.7 Result of cube filled with plastic**

[illegible]

**Fig.3.8 Result of cube bottle filled with sand**

#### IV. CONCLUSION

The hierarchical process of waste management including reusing and recycling of waste management to avoid the consumption of new materials and fresh water. Understanding the nature and type of waste generated in college campus, reuse, recycle, composting process would be suitable to overcome from the problem of waste management.

## ACKNOWLEDGEMENTS

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## Impact of Rural Development

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**Abstract**— Government of India has undertaken many policies for rural development since Independence. Despite of this the villages have not achieved desirable progress. Low economic development and non-developed infrastructure affects overall progress of rural area. Present scenario shows that only implementing government policies and packages is not enough for development. To obtain desirable change in rural area participation of components, their approach attitude and beliefs are very important. By providing good infrastructure, giving good connectivity and better facilities, quality of life in rural area can be raised. Raised living standards will result in optimization in approach and attitude of rural people and will change their belief and help them achieve sustainability.

*This paper is an attempt to understand intervention of development of infrastructure in rural progress. It emphasize participation of people in growth module.*

**Keywords**— *Connectivity, Growth module, Infrastructure, Rural Development, Urban Planning*

### I. INTRODUCTION

According to report of UN's department of economic and social affairs 3.4 billion is the rural population of world which is around 45% of total global population. Out of this rural population 90% lives in Asia and Africa. If we consider for our Country India according to 2011 census 68.84% of total population lives in Rural area which is 833 million. These numbers and ratio shows how crucial is rural development for human progress.

What is rural sector or which place can be defined as rural area?

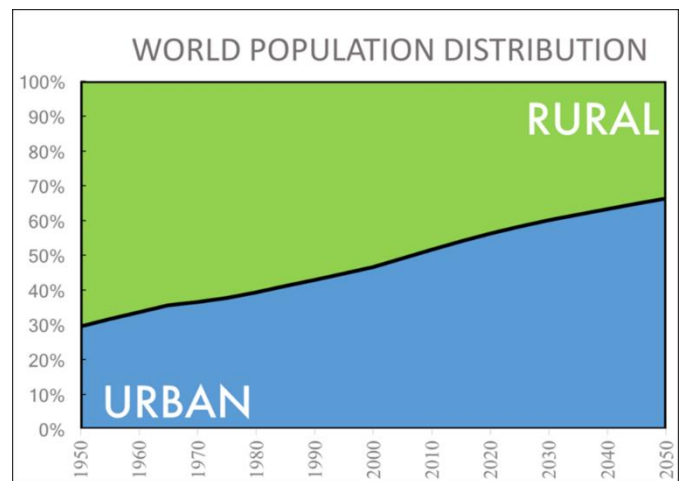
The "rural sector" means any place as per the "latest census" which meets the following criteria,

- A population of less than 5,000
- Density of population less than 400 per sq km and
- More than "25 per cent of the male working population" is engaged in agricultural pursuits.

As Father of the Nation Mahatma Gandhi said many years ago, still holds true that real India lives in villages and to achieve complete development of the country develop villages. it is for these villagers that we need to make sure we build a system that delivers basic social infrastructure in an effective manner. Government of India has undertaken many policies for rural development since Independence. Despite of this the villages

have not achieved desirable progress. Low economic

development and non-developed infrastructure affects overall progress of rural area. Present scenario shows that only implementing government policies and packages is not enough for development. To obtain desirable change in rural area participation of components, their approach, attitude and beliefs are very important. By providing good infrastructure, giving good connectivity and better facilities, quality of life in rural area can be raised. Raised living standards will result in optimization in approach and attitude of rural people and will change their belief and help them achieve sustainability.



**FIGURE 1: World Population Distribution**



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## **II. AIM OF STUDY**

To find solution to stop rural to urban migration and elevate standard of living in rural areas.

## **III. OBJECTIVE OF STUDY**

- To study present conditions of village.
- To study villages having developed infrastructure.
- To compare socio economic conditions and living standards of villages having developed and non-developed infrastructure.
- To provide suggestion for rural development. It should contain your work and project.

## **IV. SCOPE & LIMITATION OF STUDY**

- The study includes analysis of impact of developed infrastructure on socio economic factors in rural area.
- The study includes survey of population by age, gender, literacy and employment or income level and income source.
- Study of potential of the region shall be done.
- A general module is to be proposed

## **V. CURRENT SCENARIO**

India is a welfare state according to Constitution. Providing basic facilities to the people is one of the important responsibilities of a democratic country like India. But Current Scenario in rural infrastructure is not satisfactory.

Even though we are in a golden era of information technology and faster communication rural areas lack for basic amenities and infrastructure. People choose to live in urban areas than in rural. They get attracted to developed infrastructure and amenities in cities. This cause absence of skilled labor or human resource in rural area which results in less productivity followed by less economic progress. Also less participation of the components gives less out puts of government policies for rural development. There is lack of awareness about government subsidies, policies and funds available for rural development.

## **VI. RURAL DEVELOPMENT IN INDIA**

It is the process of improving the quality of life and economic well-being of people living in rural areas, often relatively isolated and sparsely populated areas. Rural development aims at finding ways to improve rural lives with participation of rural people themselves, so as to meet the required needs of rural communities.

Rural development is a comprehensive term. It essentially focuses on action for the development of areas outside the mainstream urban economic system. we should think of what type of rural development is needed because modernization of village leads to urbanization and village environment disappears.

Rural development is a topic that is pretty easy to understand but hard to implement. It focuses upon the upliftment and development of the sections of rural economies, that experience grave poverty issues and effectively aims at developing their productivity. It also emphasizes the need to address various pressing issues of village economies that hinder growth and improve these areas. Some areas that need urgent attention for Rural Development in India are:

- Public health and sanitation
- Literacy
- Female empowerment
- Enforcement of law and order
- Land reforms
- Infrastructure development like irrigation, electricity, etc.
- Availability of credit
- Eradication of poverty

## VII. LITERATURE STUDY

**TABLE 1**  
**COMPARISON BETWEEN OBJECTIVES & CONCLUSIONS**

Sr. No	Paper Name/ Title	Author	Objective	Conclusion
01.	Rural Development In India – A Way Forward	Dr. S. Vijay Kumar  October 2018	Improving the living standards of the rural people by providing food, shelter, clothing, employment and education.  Increasing the productivity in rural areas and to reduce poverty	Apart from strengthening the agricultural sector, rural entrepreneurship plays a vital role in the economic development of India, particularly in the rural economy. It helps in generating employment opportunities in the rural areas with low capital, raising the real income of the people
02.	The Impact of Rural Development Programmes on the Indian Economy	G. Vijay Bhaskar  PGT Economics,Telangana State Model School,Nidmanoor, NalgondaDistrict  October 2017	Preparation of plans for economic and social development, and implementation of schemes.	<ul style="list-style-type: none"> <li>- The programmes were not given due publicity in villages.</li> <li>- The infrastructure required for proper implementation of various schemes under these programmes was found to be inadequate.</li> <li>- The attitude of local leaders and administration was found to be totally indifferent.</li> <li>- Even the design of these programmes was found to be poor. This resulted in the fact that these programmes did not trickle down to the actual beneficiaries.</li> </ul>
03.	Reconceptualizing Participation for Sustainable Rural Development	Cees Leeuwis	<p>Development through Organized participatory development efforts.</p> <p>Formulate negotiation theory that may form a more appropriate basis for organizing participatory development efforts, as it provides a better language for dealing with the conflicts that emerge within participatory processes.</p>	<p>Effective negotiation is impossible without a properly facilitated learning process. Furthermore, a negotiation approach towards participation requires new roles, tasks, skills and social status for facilitators of participatory processes.</p>
04	The Dimensions of Indian Rural Development: Issues and Challenges	Ashish Mathur  Asso. Prof., DMS, Lachoo Memorial College of Science and Technology	<p>The basic aim of the paper is to analyze the conditions of rural economy and study the issues and challenges of the villages.</p> <p>The paper aims to frame a</p>	<p>The economic development of the rural environment can be by the government through the establishment, development, maintenance and optimization of long term mutually</p>

		Jodhpur, Rajasthan	strategic framework for the development of the rural economy to create a better tomorrow for India.	valuable relationships between the business and macroeconomic environmental variables.
05	Development of Rural Road Infrastructure in India	Dr. Pradeepta Kumar Samanta Assistant Professor in Finance National Institute of Construction Management and Research (NICMAR)	To achieve rural development by providing good connectivity.	Improving rural roads reduces transport cost and stimulates marketing. This results in increased production and productivity, crop diversification and increased profitability. A main bottleneck for local economic development is often a limited and poor quality rural road network.
06	Role of rural infrastructural development in alleviating poverty in Ghana: A case of Jukwa, Central Region	K. Adu-Boahen , K.B. Antwi , E.A. Mensah , G. Atampugre, A. Osman , K.N. Osei , A.O. Adu-Boahen	This project aimed to support government's effort to reduce poverty and increase the quality of life of the rural poor.	The study revealed that certain key infrastructure like portable water, good roads, vibrant markets, public places of convenience were inadequate to support the people in their urge of reducing rural poverty and achieving the millennium development goals as established by the United Nations and ratified and endorsed by Ghana.
07	The Impact of Infrastructure Development on Rural Communities: A Literature Review	InchamManggat, Rajwani Zain and ZakiyahJamaluddin	Study of impact of infrastructure development in the rural areas is not only focused on the physical development but at the same time, concerns the efforts in improving the quality of life of the rural communities.	The infrastructure development in the rural areas requires collaboration and integration between all related parties especially the development planner and the community social workers.
08	Infrastructure and Development in Rural India	<u>Madhusudan Ghosh</u>	Study aims to find why despite several public initiatives for infrastructure development in rural India, facilities continue to be poor and progress has been mostly unsatisfactory with differential performance across states.	The study concludes the relative importance of various infrastructures, suggest that the government should prioritise good administration and additional investments in electricity, roads, irrigation, housing and telecommunications to enhance overall well-being.

09	Impact of skill India on rural youth-perspective	B Anbuthambi and N Chandrasekaran	To improve employment  Reduce poverty  Provide livelihood opportunities  Enhance productivity  Promote environmentally sustainable development.	The opportunity for India largely lies with skilling the youth. There is need to align the effort of government with industry to enable to meet skilled power by 2020.
10	Sustainable solid waste management in rural area	Rashmi Shah, U.S. Sharma and Abhay Tiwari	To dispose uncontrolled solid waste and achieve good public health.	Vermicomposting represents better approach for solid organic waste and also provide income source for rural women.

#### Book review:

Title: Target three billion- PURA: Innovative solution towards sustainable development.

Author: APJ Abdul Kalam and Srijan Pal Sing

Review: the book recommends sustainable and inclusive development system called

PURA- Providing Urban amenities in Rural Area- to uplift the rural poor not by subsidizing but by entrepreneurship. Also rural urban migration can be reduced due to PURA.

The authors have travelled around world and have noted their experiences about rural development and evaluated it on basis of life values in book.

### VIII. CONCLUSION

By providing good infrastructure, giving good connectivity and better facilities, quality of life in rural area can be raised. Raised living standards will result in optimization in approach and attitude of rural people and will change their belief and help them achieve sustainability.

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# **SECTION B**

# **COMPUTER**

## Online Signature Verification System

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**Abstract**—Signature is related to biometric that identifies a person by his/her behavioural characteristics. We will propose an online system for verification purpose. Verification of signatures (dynamic) online use signatures to detect pressure sensitive tablets to extract dynamic characteristics of a signature addition to its form. The purpose of the project is to develop an authentication system based on personal signatures. Verification of signatures is subject of significant research in the field of biometrics authentication. In this project the signatures are captured using a digital pen and tablet. Audit system online signatures based on the vision which the pen tip of the signatory is properly traced in real time. The data acquisition of the system consists of main equipment such as an electronic tablet that is connected to computer through the universal serial port (USB). Online signature data is obtained while the individual is signing on the tablet using the special pen. The signature will be characterized as pen strokes having x-y co-ordinates. The data will be then stored in the database of number of signatures in txt,file form. Finally, the input signature is classified as genuine or a forgery by comparing it with the database records. In this, the method of Support Vector Machine (SVM) is focused to verify and match signatures of the user individuals [2].

**Keywords**— Digitizing tablet, Pen-tip strokes, Signature database records, Support Vector Machine (SVM), Universal Serial Bus.

### I. INTRODUCTION

Humans recognize each other according to the characteristics they observe around them like, we recognize others by their face and voice. Things like keys or card are more likely to get stolen and disclosed. To get a more reliable verification, we should use something that truly characterizes the person in a unique way. Biometrics is an automatic method of identity verification that is based on the principle of measurable physiological or behavioral characteristics such as a signature (or any other characteristics as well). These features should not be duplicate, but unfortunately it is often possible to make a copy that is accepted as a template by the biometric system [5].

Each one of us have special characteristics which makes us unique and these characteristics are important in recognizing and authenticating individuals. Biometrics has been most commonly used nowadays in physical access controller applications. Biometric features are used to provide an enhanced level of security and identity. Signatures are the most common thing to confirm a person's identity. In this letter, the signature is verified using and is based on Support Vector Machine (SVM). Support vector machine is an innovative training machine for pattern recognition that generates its solution (decision function A) as a support vector, a subset of training data.

Apart from providing very good results for various pattern recognition, it also is a good method for signature recognition and verification. SVM Typically fixed-feature features apply to data sets containing vectors, and not to problems related to time series of variable lengths, such as sign online signature recognition [2].

SVM is mainly used in classification and representation problems.

In classification it involves estimation of the decision function, 'f' using a set of training data with the labels that will correctly classify unseen test examples.

On the other hand, the use of contraction is a predictor of actual value actions performed in a similar way of model recognition [1]



### 1.1 IDENTIFICATION

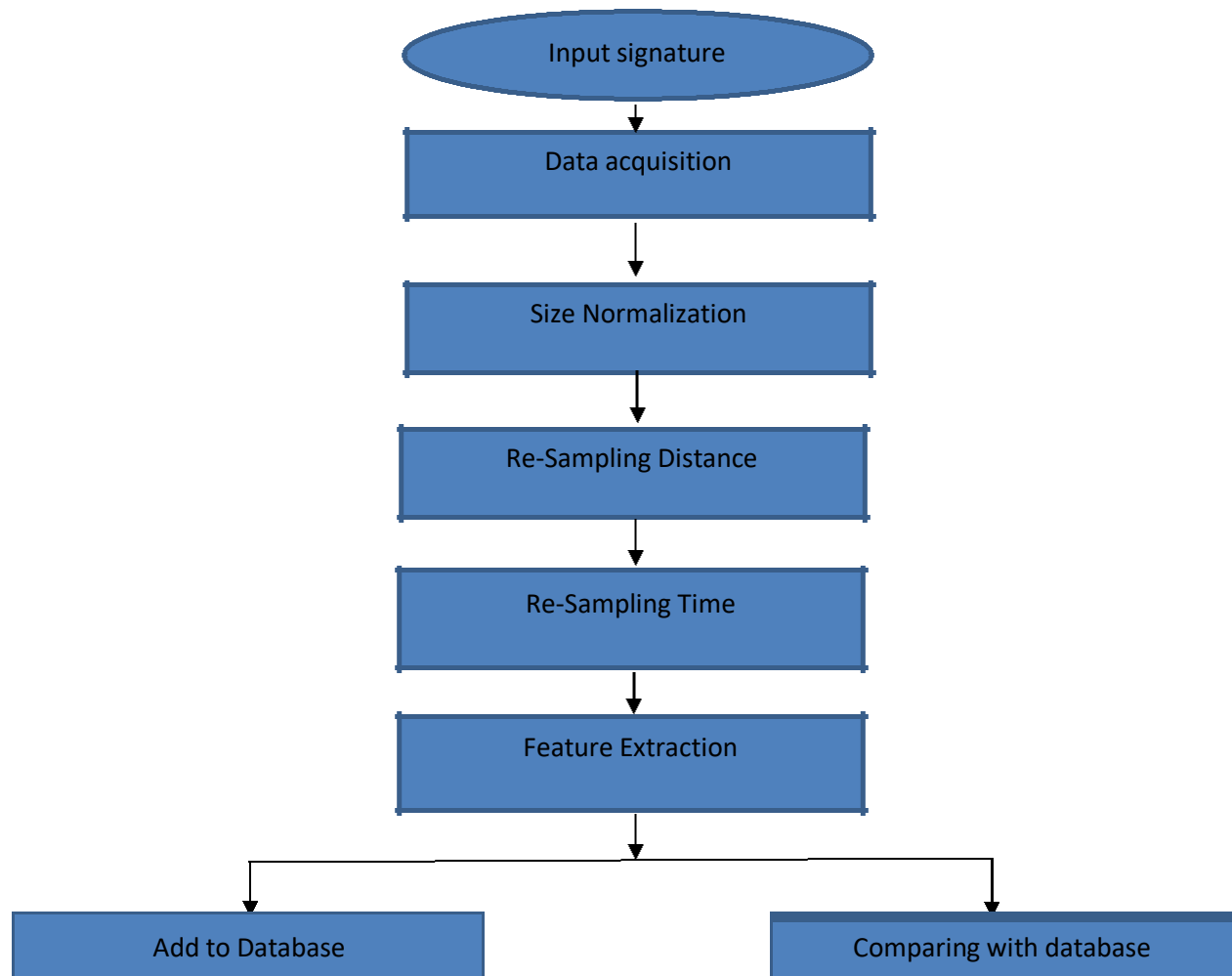
Person is identified based on only biometric characteristics. Biometric stored in the database is compared by the computer with the signed signature on tablet to check whether it matches each other using matching algorithm.

### 1.2 VERIFICATION

Identity of a particular person is either confirmed and verified or rejected, when the person claims to be already enrolled in the system, through. The biometric information from this person is compared with his information already stored in the database.

## II. METHOD

Here we will describe the methodology of the project such as data capture, data capture, data acquisition, size normalization, feature extraction and matching image.



**FIGURE 1: Block Diagram Showing Methodology Process.**

### **III. MATERIAL AND METHOD**

#### **3.1.:Hardwares to be used:**

##### **3.1.1.:Digitizing tablet:**

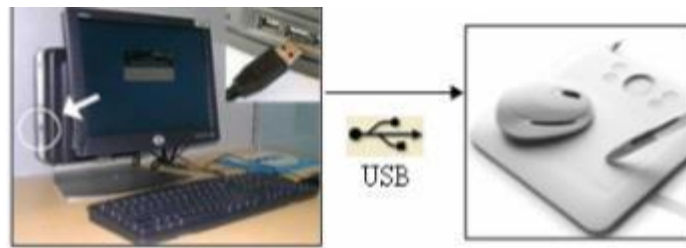
We implemented a tablet based online signature verification system. The system consists of a low cost tablet with a special pen. The input online signature data obtained in real time are through this digitizing tablet, while the signature is being written using the special pen. This includes a data collection process in which real-time entries from digitalization tablets and special processing pens are read into the process [4]. Signatures taken from different users are stored in a unique database called as Signature database. The digitizing tablet is sending the real time inputs to the CPU for further processing and storage. Finally, the input signature is classified as genuine or forgery by comparing. We collected different sample of signatures from 3 users. We observed that the system was suit for signature verification.

##### **3.1.2.:Pen For Signature points tracing purpose:**

The input signature using this pen will be read in terms of x-y coordinate. While the user is signing, different points will be traced along the whole signature from start to end point. Tracing the points correctly will enable us to know the points of the pen such as pen-up points and pen down points. This data will be stored in the database which is very important for matching and verifying purpose. The main pen-down point would be the first point which indicates the ending of the signature [3].

##### **3.1.3.:Universal Serial bus(USB):**

As mentioned earlier, will need a USB to connect the digitizing tablet to the computer via USB port in the computer [1].



**FIGURE 2: USB connection of the Tablet with computer.**

##### **3.2.:Software to be used.:**

##### **Matlab 2018b:**

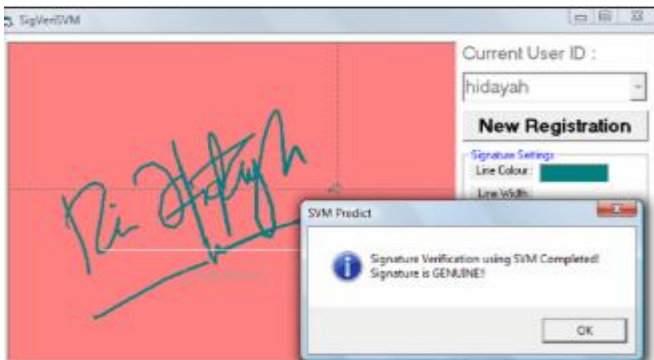
This software will be used for Feature Extraction Process. Determining a subset of the initial features such as similarities, corner points, size, shape, etc is called Feature selection or extraction. The Selected Features are expected to contain the useful information from the input signature data, so that the desired task can be performed by using this reduced representation instead of the complete initial data[1]. Support Vector Machine(SVM) is a supervised algorithm prevailing in MATLAB used for biometric classification. It acts as a classifier to recognize signature which is a biometric attribute that validates person's identity[2].

## IV. EXPERIMENT ANALYSIS AND RESULTS

An experiment is carried out to determine whether the software used is accurate or not, so as to prove that the objectives of this project have been achieved. This experiment involves two sections, which are software validation to prove its effectiveness in different and an analysis from a population of 3 registered users (our project group).

### 4.1: Software Validation:

Software validation will be carried out to show the effectiveness of this software in verifying signatures. It is very important to consider other main aspects before a signature is verified as genuine signature. Thus, a validation is to be made to test the results obtained through this software[5].



**FIGURE 3: Signature Sample verified as “Genuine”**



**FIGURE 4: Signature Sample verified as “Forgery”**

Basically, the verification process performed is based on three aspects: the orientation of the signature at coordinates x and y, the change in pressure applied when signing the signature, and the time used to sign the signature [6]. Above is Figure 3 displays signatures that match the criteria required for a signature to be verified as a genuine signature.

For the orientation year, it is taken as X-coordinate and Y-coordinate as reference. Generally, a user's signature has the same orientation whenever he or she signs it. If the user largely signs in an incorrect orientation, such as the changes in X coordinate and Y coordinate, the signature is verified as a counterfeit signature. This is shown in FIG. 4 given above. It shows that the signatures orientation is varied, making it the root cause of that signature being verified as forgery [7].

Now for the pressure aspect, a signature will be verified as forgery if the pressure applied from the pen towards the digitizing tablet is very much different from the genuine signatures that have been trained for purpose. If the user stops while signing again and again and applies altogether weird or different pressure then surely it will be verify it as forgery. The higher values will show high pressure and vice versa.

#### 4.2. 'FAR' and 'FRR' analysis:

Apart from that, there also are two quantities used to characterize the performance of the signature verification algorithm. False Rejection Rate (FRR) is defined as the percentage of genuine signatures that are incorrectly rejected as forgery. False Acceptance Rate (FAR) is defined as the percentage of forgery or counterfeit signatures incorrectly verified by the software as genuine signature [8].

$$\text{FRR} = (\text{Total number of genuine signatures tested} / \text{Total number of genuine signatures rejected}) * 100$$
$$\text{FAR} = (\text{Total number of counterfeit signatures accepted} / \text{Total number of counterfeit signatures rejected}) * 100$$

If the results show great accuracy, then the proposed system will be accurate enough for the signature verification in real time. The FRR and FAR have to be as low as possible for achieve the accuracy of signature verification at 100%. The low rate of FRR and FAR showed that this program software has the ability to verify signatures in the acceptable accuracy range [9].

### V. CONCLUSION

The project is basically about developing an online signature verification system that uses Support Vector Machine to verify whether the written signature is genuine or forgery.

In verifying signatures, the signatures are processed through the given software and this software will have the capability to decide whether it will accept the signature or not. Thus, the ability of this software is to check the signatures of individuals (users or individuals) already signed in the software in the database and stored there. Verifying signatures has to be accurate and reliable so that we can maintain the high quality of the software. Therefore, the error rate used to measure the accuracy and reliability of this software has to be as low as possible. Thus, the FAR and FRR has to be low making the system highly accurate and if possible error must be 0%, which will show that it has a perfect accuracy[10]. Through its many applications to this program in our daily life, especially with regard to financial transactions, verifying online signatures has a potentially significant place in biometric technology

The application of automatic online signature verification will become increasingly accepted in the real world and will make lives easier [12].

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# Multicurrency Calculator with Fake Currency Detection Using Image Processing

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**Abstract**— It is not easy for people to recognize currencies from different countries. Our aim is to help people solve this problem. However, currency recognition systems which are based on image analysis entirely are not sufficient. Our proposed system is based on image processing and it helps to make the process automatic and robust. Color as well as shape information are used in our algorithm. There are approximately 50 currencies all over the world and each of them look totally different. For example the size of the paper is different, the same as the color and pattern. The staffs who work for the money exchanging have to distinguish different types of currencies and that is a difficult job. They have to recall the symbol of each currency. This may cause some problems (e.g. wrong recognition), so they need an efficient and accurate system to help their work. The aim of our system is to help people who need to recognize different currencies, and work with convenience and efficiency.

**Keywords**— color, currencies, image, recognition, shape

## I. INTRODUCTION

Automatic recognition of fake Indian currency note is significant in many applications such as automated goods seller machine and automated goods tellers machine. This system is used to detect the correct Indian currency note. The system consists of eight steps consisting of image acquisition, grey scale conversion, edge detection, feature extraction, image segmentation, comparisons of images and output. Automatic machines are more helpful in banks because banks faces the problem of counterfeit currency notes or destroyed notes. Therefore involving machine makes note recognition process organized and precise.

Automatic machine is more important to discover fake currency note in every country. This system is designed to check the Indian currency note of 100, 500 and 2000 rupees. The system will display currency is original or fake and its currency denomination. It is very important to grow automated system to get feature and recognize Indian currency note in various areas such as banking, ATM machine, shopping mall, Bus station and railway station.

We put forward a system for automated currency recognition using image processing techniques. The proposed method can be used to recognize both the country or origin as well as the denomination or value of a given banknote. Only paper currencies have been considered. This method works by first identifying the country of origin using certain assumed areas of interest, and then take out the denomination value using characteristics such as size, color, or text on the note, depending on how much the notes within the same country vary. We have considered 5 of the most traded currencies and their denominations. Our system is able to accurately and quickly identify these test notes.



**TABLE 1**  
**COMPARISON BETWEEN MAIN METHOD**

Sr.No.	Title	Publication and Year	Work Done
1	Automatic Recognition of Fake Indian Currency Note.	IEEE 2016	Principal component Analysis is used for recognition.
2	Design and Implementation of Paper Currency Recognition with Fake Currency Detection.	IEEE 2016	Symmetrical mask is used to consider specific signs of paper currency. LBP is used as texture analysis technique.
3	Feature Fusion for Fake Indian Currency Detection.	IEEE 2017	Mean square error was computed between the security features of real and fake currency.
4	Currency Recognition System Using Image Processing.	IEEE 2017	Segmentation of note and template matching is used for classification.
5	Fake currency detection using image processing.	ICSET 2017	The results are shown in a GUI made in MATLAB which shows extracted features like security thread and serial number.
6	Fake Indian Paper Currency Identification System.	IJARCSSE 2016	Time series data and Fourier power spectra are used.
7	Image Based Currency Recognition System.	IJPAM 2017	Image analysis and image processing techniques are used.
8	Currency Recognition System Using Image Processing.	IRJET 2017	Gaussian function in hidden layer and output layer in the place of sigmoid function are used for the recognition of known features and rejection of unknown patterns.
9	An Intelligent Paper Currency Recognition System.	ICCMIT 2015	Co-relation between images is used using radial basis function network.
10	Paper Currency Recognition System.	IJETTCS 2016	Texture feature is used. Gray level co-occurrence matrix and LBP operator is used.
11	Identification of Paper Currency Techniques.	IJSTE 2016	Pre-processing and feature extraction technique are used.
12	Fake Indian Currency Detection.	IJPAM 2018	Techniques such as Intagelio printing, optically variable link, identification mark, latent picture are used to detect fake currency.

Above is the table for Literature survey. 12 papers have been studied by us which includes 6 papers of fake currency detection and 6 papers of denomination of currency or its origin. Each paper shows different ways of detection and denomination of currencies respectively. Various different methods like Segmentation, Image Processing, Texture Feature, LBP, Intagelio Printing etc. are used as pre-processing for the currencies.

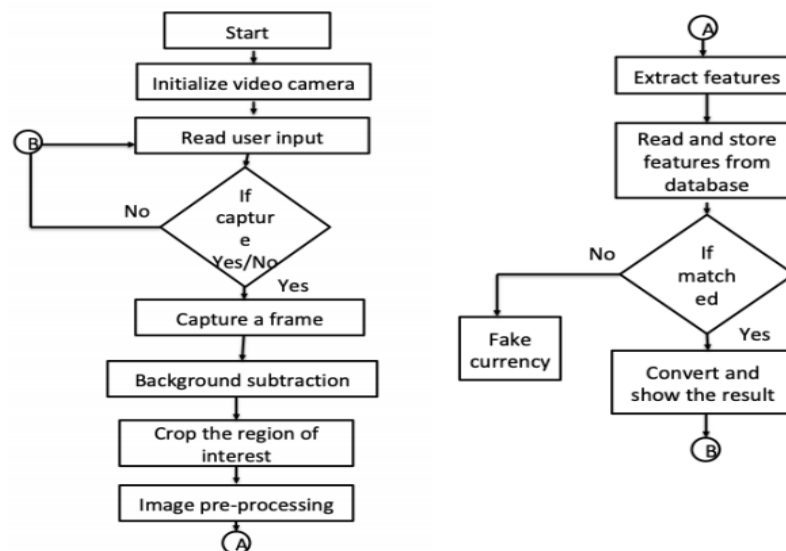
## II. METHODOLOGY

The Proposed system consists of basic pre-processing steps for image to determine whether the currency is fake or original. Basic Morphological Operations such as Grey Scale Conversion, Feature Extraction, Extracting the Region Of Interest are used. Disk Method is applied to the image in which the pixels are converted accordingly in circular or rectangular shapes. Noise is removed and converted into Black and White. In disk method, dark becomes darker and light becomes lighter. These are the few methods used for pre-processing of the image. I. Pre-processing The simplest way to get the data without over- fitting and under fitting is to pre-process the dataset. The main aim behind the data pre-processing is that to add a value to the base value which is the data-set generated. The main advantage of data pre-processing is to get a better training-set. The method that we use in our experiments (AFCRS) it requires an input image shape of 64x 64 x 3, where 3 refers to the R, G, B (red, green, blue) components of a colored image and the image must be 64 x 64 pixels in size. We then apply the following three types of image preprocessing for the original datasets, and we also choose our first filter beginning with 64.

a) Image Re-scaling we'd like to re-scale the image to form the model knowledge in a perfect format so the coaching is improved, particular, and faster. we've re-scaling think about keras. to use this issue, we'd like to import the library from keras pre- process as "Image Data Generator". If the re-scaling issue is none or zero, no re-scaling is applied, or we have a tendency to multiply the info by the worth provided. this is often done when applying all alternative transformations. For our model AFCRS, we have a tendency to use a re-scaling issue as: rescale=1/255 for each coaching and testing data-sets.

b) Image cutting we want to snip the image for improve and correct knowledge .We even have shear vary consider keras. this is often to be foreign from the keras pre-processing library. For our model AFCRS, we tend to use a cutting vary as short range=0.2. in most of cases Shear vary could be a Shear angle in counter-clockwise direction in degrees, that is additionally referred to as shear intensity. 19

c)Perspective Transformations Applied perspective transformations on coaching knowledge to rivet the vary of zoom range=0.2 to induce the correct results by learning in associate degree correct manner. Zoom vary could be a float or lower, higher vary for random zoom. this is often additionally done by mercantilism a library from keras pre-processing.



## IV. RESULT

1. Grey scale conversion:

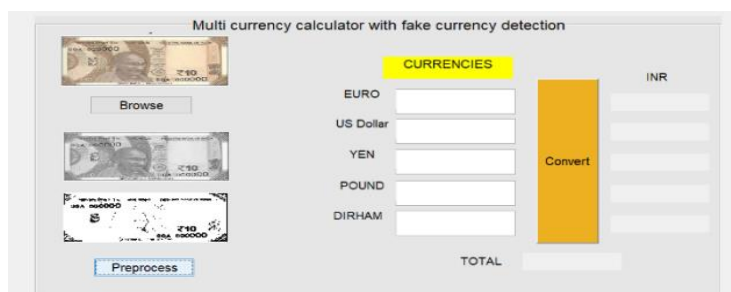


**FIGURE 1: Conversion of 2000/- Rupee Note**

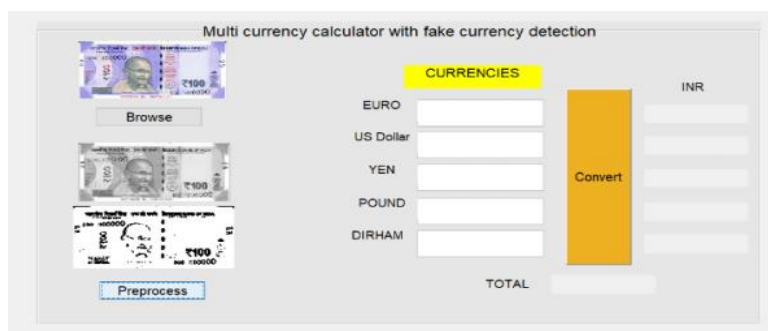
2. Finding the region of interest:



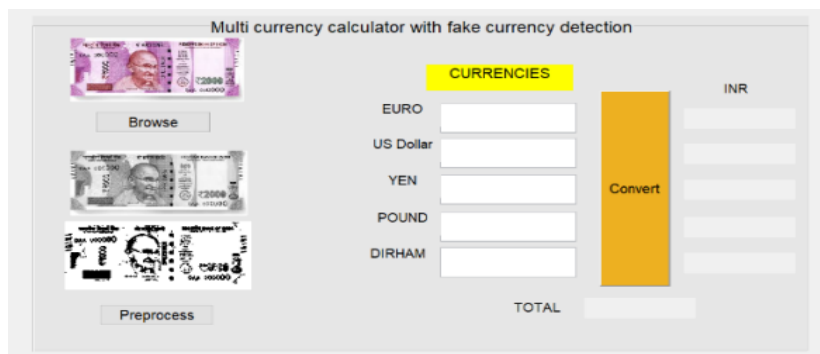
**FIGURE 2: ROI of 2000/- Rupee Note**



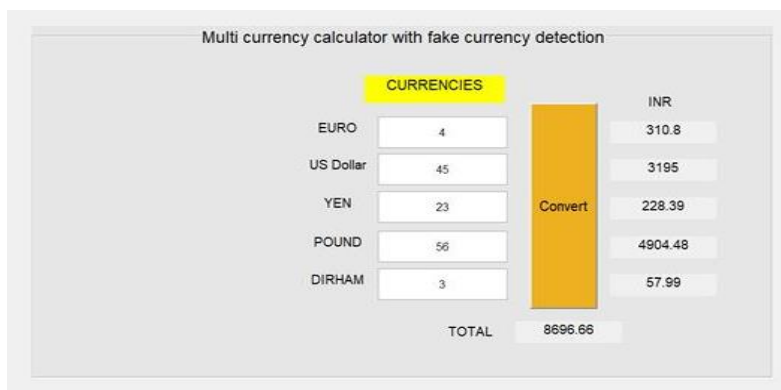
**FIGURE 3: GUI for Pre-processing of 10/- Rupee Note with the Calculation of Overseas Currencies into INR**



**FIGURE 4: GUI for Pre-processing of 100/- Rupee Note with the Calculation of Overseas Currencies into INR**



**FIGURE 5: GUI for Pre-processing of 2000/- Rupee Note with the Calculation of Overseas Currencies into INR**



**FIGURE 4: Example of Conversion of Overseas Currencies into INR**

The above result shows some of the pre-processing steps such as Gray-scale conversion and obtaining the Region of Interest. Also, conversion of different values of different currencies to Indian Rupees has been done. The proposed system uses different valued currency notes such as 10, 100 and 2000 rupees.

## V. CONCLUSION

Thus, the proposed system till now concludes the GUI which shows the conversion of different overseas currencies into Indian (INR) rupees. Here, the overseas currencies used are: Euro, Dirham, Pounds, Yen and US Dollar. The current values of the currencies have been stored in the database/program to convert it into Indian Rupees accordingly.

Also, different valued notes of rupees 10, 100 and 2000 are used as for the detection of fake currency or original currency. The pre-processing steps such as grey scale conversion and region of interest are shown. The region of interest is found based on the parameters such as security thread. Hence till now, we conclude with the GUI and the pre-processing steps i.e. grey scale conversion and finding the region of interest.

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# An Analysis of Drought Detection and Monitoring Techniques

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**Abstract**— India is very diverse country in terms of climatic conditions and also agricultural productions. The varied climatic conditions lead to different natural hazards experienced by people such as floods, droughts, storms, etc. which differs from region to region. A drought is an event of prolonged shortages in the water supply, whether atmospheric, surface water or groundwater. It is necessary to accurately study onset and duration of drought to understand this natural hazard and reduce its effects on people and livestock. Many researchers in the past have done analysis and observations on monitoring and predicting drought using remote sensing, statistical analysis, deep learning and machine learning techniques such as Deep Belief Networks, Artificial Neural Networks, Support Vector Machines and Linear Regression. This paper aims to do a comparative analysis of several research techniques used for drought prediction and monitoring techniques.

**Keywords**— Drought, prediction, SPI, deep learning, machine learning.

## I. INTRODUCTION

Droughts are prolonged period of deficient rainfall leading to shortages of water in a region. Droughts are declared when the total rainfall received in a region is less than 50% of average rainfall. Hence, it is necessary to predict such a natural hazard which affects 42% of the country's land area and affects 300 million people in India. In India, drought is categorized into three types of drought-meteorological drought, hydrological drought and agricultural drought. The effects of drought can be reduced to a certain limit if it is predicted prior to the occurrence of drought. Drought indices are the numerical depictions of the drought severity based on the inputs provided such as climatological and meteorological inputs. There are several drought indices available and no single index is applicable to all kinds of drought. The selection of index is dependent on the climatic conditions that trigger drought in a region, basin or location and if the same climatic conditions are inputs for calculation of indices as well. For the climatic conditions of Maharashtra, Standard Precipitation Index (SPI) and Normalized Difference Vegetation Index (NDVI) are mainly used for drought assessment. This paper focuses on various techniques such as Empirical Mode Decomposition [10], Deep Belief Networks [7], Recurrent Neural Network [5], Support Vector Regression [7], Artificial Neural Network [14] and long – short term memory [4][11].

## II. LITERATURE SURVEY

N. A. Agana, et. al. [7] have proposed a hybrid predictive model based on denoised empirical mode decomposition (EMD) and deep belief networks (DBN) across the Colorado river. It first decomposes the data into several intrinsic mode functions (IMFs) and reconstructs original data using only pertinent IMFs. Then, the model applies Detrended Fluctuation analysis (DFA) to individual IMFs to establish a threshold value. Then, it identified the inapplicable IMFs and repressed it. The model was used for prediction of different time scale drought indices using Standardized Streamflow Index (SSI) as drought index. The model uses DBN that has 2 stacked RBM layers, where feature activation of one layer is used as a training data for next RBM layer. EMD is the signal preprocessing algorithm used here for data decomposition. This model was compared with conventional regression models such as SVR and MLP and it provides better prediction and better accuracy as compared to them. This paper showed that the DBN along with EMD algorithm outperforms conventional models such as SVR and MLP in terms of efficiency and accuracy. The 12 month SPI for one month time lead forecast errors of EMD-DBN of values for different stations ranges from RMSE 0.006 to 0.01, MAE 0.004 to 0.008 and NSE 0.99.



H. Moghari, et. al. [8] have developed a forecasting model using Recursive Multi-layer perceptron (RMLP) and Recursive Support Vector Regression (RSVR) optimized using Imperialist Competitive Algorithm (ICA) for Gorganrood basin in Iran. The developed model was compared with a conventional model, Autoregressive Integrated Moving Averages (ARIMA). The model uses SPI with 1-6-month lead times. The paper also suggests that the increase in lead time leads to decrease in accuracy, however, increase in SPI scales provided better accuracy. For SPI-24 timescale and one lead time forecasting; R, RMSE, and, MSE values for ARIMA model was 0.90, 0.484, and 0.322 while, for ICA-RMLP was 0.967, 0.277, and 0.188, respectively and for ICA-RSVR were 0.969, 0.278, and 0.186, respectively. This paper suggests that this model can be used for practical drought warning systems. It concluded that the efficiency and accuracy of RMLP and RSVR via ICA performs much better than ARIMA model.

J.A. Le, et. al. [5] have proposed a RNN model to explore the relation between the wetness and dryness in the region of California due to El Nino. They considered the Palmer Z Index (PZI) as drought index. The RNN layer comprises of 2 fully connected recurrent layers with 40 nodes per layer and ReLu activation function, 14 input nodes and 2 output nodes. To predict into several months in future, the output is connected to 12 element prefixes allowing it to predict several months in advance. The model uses backpropagation through time algorithm. The model provided insights that the drought in southern California will continue even after winters there during El Nino season 2015-16. The correlation coefficient for one to three month timescale ranges from 0.434 to 0.610.

F. Zambrano, et. al. [9] proposed a model for early agricultural drought warning system. This study was done to check whether variation in agricultural produce can be easily assessed by NDVI. The predictions were performed with 1-6-month lead time. The models used were optimal linear regression and Multilayer feed forward neural network. The study area is Chile because of its variation in cropping patterns and climatic conditions. Both the models OLR and DL models showed that  $zcNDVI^t$  was effective for predicting  $zcNDVI^s$ . However, for the northern region, the OLR model provided slightly accurate results and for the southern region, DL gave better results. The study proves that OLR and DL can accurately predict productivity anomalies ( $zcNDVI$ ). Prediction accuracy measure of  $RMSE_{cv}$  values are 0.21(OLR) and 0.20(DL) and  $R_{cv}^2$  0.95(OLR) and 0.96(DL).

Y. Tian, et. al. [10] proposed a SVR model based system to predict agricultural drought in the Xiangjiang River basin of China. In addition to this, they did a study that aims to provide a relation between soil moisture and drought. The study suggests SPEI with timescale 6 to know about soil moisture conditions for the selected study area and SPEI-6 with one month time lag was used to build the model. Along with drought indices, additional element called WPSH i.e. Western Specific Subtropical High and El Nino Oscillations were used to increase the accuracy of the prediction model. The study showed that the SVR model was more accurate for one month lead time prediction than three months lead time predictions. Prediction accuracy measures for one, two and three timescale are as follows MSE (training) - 0.223 to 0.303, MAPE (testing) - 0.218 to 0.335, RMSE (training) - 0.289 to 0.382, RMSE (testing) - 0.275 to 0.429, NSE (training) - 0.813 to 0.893 and NSE (testing)- 0.723 to 0.886.

A. G. Salman, et. al. [11] proposed weather forecasting model using a combination of LSTMs and ARIMA models. The ARIMA model was used with the assumption that the time series data are generated using linear processes and LSTM was used because of its ability to adjust and improve the networks itself. Hence, a combination of these two models are used, along with Adam algorithm. The study shows that merged model gave a lower RMSE value than the ARIMA model. Performance evaluation accuracy measure for LSTM were 0.00007 to 0.00009 RMSE and for ARIMA were 0.948.

B. M. Dodamani, et. al. [3] suggested multiple linear regression models for drought modelling in the Krishna basin, with variables SPI and NDVI for one model and NDVI and sunspots for other model and output being current NDVI. They found out that the latter model, with NDVI and Sunspot as variables, has higher correlation with drought. It also suggested that predicted values of NDVI for the month of July, has much influence on the cropping patterns of the selected study area. The study proved that solar activity influences drought occurrence. The study also found out significant correlation between the current NDVI and SPI of various time lags. SPI 3 and 6 are highly correlated to vegetation cover. The coefficient of determination  $R^2$  was 92.49% (Assured rainfall zone) and  $R^2$  – 86.17% (Scarcity zone).

N. Laptev, et. al. [4] proposed a LSTM based model for predicting the number of completed trips during holidays. The system uses autoencoder and stacked LSTM. The autoencoder itself extracts a feature vector from the input, the feature vector is concatenated with new input and fed to stacked LSTM network for prediction. This combination of LSTM networks increased the accuracy up

to 14%. The study showed that Vanilla LSTMs are not so efficient in terms of time series prediction. It also suggested that better results can be achieved by normalizing every mini batches of dataset and de-trending the data. Forecasting errors were SMAPE (mean) - 26.66 and SMAPE (median) - 22.62.

A. Chavdekar, et. al. [2] analyzed the history of droughts for the state of Maharashtra. The drought index used for was SPI. The state of Maharashtra was divided into four subdivisions i.e. Madhya Maharashtra, Vidarbha, Marathwada and Konkan and Goa. The SPI was computed using gamma distribution. The study suggested that precipitation is the regulating factor for droughts in the Central parts of Maharashtra. The paper showed that Madhya Maharashtra and Marathwada are most drought prone sub-divisions of Maharashtra. It also concluded that years 1877, 1899, 1905, 1911, 1918, 1920, 1951, 1972, 1986, 1987, 2002, 2008 and 2012 reported most drought-prone conditions.

C.S. Murthy, et. al. [6] analyzed the spatial and temporal domain analysis of meteorological drought using SPI index. The study specifically focused on studying the uniqueness of the 2002 of drought by analyzing the widespread Area Under Dryness (AUD). The study analyzed drought for each month and computed AUD for each month for categorizing it into different drought categories. The study measured drought frequency by the number of years a grid experienced dryness ( $SPI < -1$ ) and drought persistence was measured by the duration of drought over a period of time using Drought Persistence Score (DPS). The study showed different aspects of drought climatology in India.

O. Aiyelokun, et. al. [14] proposed an ANN model for determining the drought possibility, frequency, persistence and severity. The area of study is Ijube-Ode, Southwest Nigeria. The frequency was computed using SPI for 3, 6, 9, 12 months' timescale. The study found a decreasing trend only for the month of April in 3 month timescale which indicated a possibility of drought. Hence, drought analysis was done for 3 step timescale for the month of April. The study also compared 2 Artificial Neural Networks and concluded that for this model, network with 1 hidden layer outperformed network with 2 hidden layer. The study suggested to compute SPI values for different timescales for better understanding of drought events. Forecasting accuracy was RMSE – 0.971.

### III. ANALYSIS

The following table is the summary of various research papers on Drought prediction and analysis methods using Deep Learning techniques.

**TABLE 1**  
**ANALYSIS TABLE**

Sr. No.	Title of paper	Techniques used	Datasets used	Performance Measure
1.	Time-series extreme event forecasting with Neural Networks at Uber [4]	LSTM	Own dataset created.	SMAPE (mean) - 26.66 SMAPE (median) - 22.62
2.	EMD-Based Predictive Deep Belief Network for Time Series Prediction: An Application to Drought Forecasting [7]	Empirical Mode Decomposition (EMD) and Deep Belief Networks (DBN)	Colorado River Basin Natural Flow and Salt Data	RMSE - 0.006 to 0.01 MAE - 0.004 to 0.008 NSE - 0.99
3.	Drought forecasting using data-driven methods and an evolutionary algorithm [8]	Imperialist Competitive Algorithm-Recursive Multi-layer Perceptron (ICA-RMLP) and Imperialist Competitive Algorithm-Recursive Support Vector	Not mentioned.	R (ICA-RLMP) - 0.967 RMSE (ICA-RLMP) - 0.484 MSE (ICA-RLMP) - 0.322  R (ICA-RSVR) - 0.969 RMSE (ICA- RSVR) - 0.278 MSE (ICA- RSVR) - 0.186

		Regression (ICA-RSVR)		
4.	Application of recurrent neural networks for drought projections in California [5]	Recurrent Neural Network (RNN)	Global Historical Climatology Network (GHCN) nClimDiv data set	R - 0.610 to 0.434
Sr. No.	Title of paper	Techniques used	Datasets used	Performance Measure
5.	Historical Drought Analysis of Maharashtra State by Using SPI Index [2]	Gamma Distribution	India Meteorological Department (IMD)	–
6.	Agricultural Drought Modeling Using Remote Sensing [3]	Multiple Regression Model	Earthexplorer	R <sup>2</sup> – 92.49% (Assured rainfall zone) R <sup>2</sup> – 86.17% (Scarcity zone)
7.	Agricultural drought prediction using climate indices based on Support Vector Regression in Xiangjiang River basin [10]	Support Vector Regression (SVR)	Climate Prediction Centre (CPC) and National Oceanic and Atmospheric Administration (NOAA)	MSE (training) - 0.223 to 0.303 MAPE (testing) - 0.218 to 0.335 RMSE (training) - 0.289 to 0.382 RMSE (testing) - 0.275 to 0.429 NSE (training) - 0.813 to 0.893 NSE (testing)- 0.723 to 0.886
8.	Weather Forecasting Using Merged Long Short-Term Memory Model (LSTM) and Autoregressive Integrated Moving Average (ARIMA) Model [11]	LSTM and ARIMA	Weather Underground	RMSE – 0.00007 to 0.00009
9.	Spatiotemporal Analysis of Meteorological Drought Variability in the Indian Region Using Standardized Precipitation Index [6]	Pearson III Distribution	India Meteorological Department (IMD) and National Climatic Data Centre (NCDC)	–
10.	Reducing Vulnerability to Climate Variability: Forecasting Droughts in Vidarbha Region of Maharashtra, Western India [13]	DST (Decision support Tool)	Not mentioned	–
11.	Assessment and monitoring of Agricultural Droughts in Maharashtra using meteorological	–	India Meteorological Department (IMD)	–

	and remote sensing based indices [1]			
12.	Prediction of drought-induced reduction of agricultural productivity in Chile from MODIS, rainfall estimates, and climate oscillation indices [9].	Optimal linear regression (OLR) and multi-layer feedforward neural network (DL)	Moderate Resolution Imaging Spectroradiometer (MODIS) sensor	RMSE - 0.21 (OLR) R <sup>2</sup> – 0.95 (OLR) RMSE - 0.20 (DL) R <sup>2</sup> – 0.96 (DL)
13.	Artificial Neural Network-Based Crop Yield Prediction Using NDVI, SPI, VCI Feature Vectors [15]	EBPNN	International Research Institute for Climate and Society	RMSE reduced by 62.39% Relative error reduced by 33% Testing time decreased by 38.2%
14.	An artificial intelligence based drought predictions in part of the tropics [14]	ANN	Nigeria Meteorological Agency (NIMET)	RMSE – 0.971

#### Abbreviations:

**SMAPE:** Symmetric Mean Absolute Percentage Error, **MAE:** Mean Absolute Error, **RMSE:** Root Mean Squared Error, **NSE:** Nash–Sutcliffe model efficiency coefficient, **MAPE:** Mean Absolute Percentage Error, **R:** Correlation Coefficient, **R<sup>2</sup>:** Coefficient of Determination

The various models used for drought prediction and modelling are summarized in the above analysis table. From the table it can be seen that LSTM presents better results as compared to other approaches.

#### IV. CONCLUSION

Due to the overwhelming impact of drought over climate as well as on agriculture, predictions for both – meteorological and agricultural drought have been done. The need for developing such a system was the onset and prevalence of drought every year during summer in the Central region of Maharashtra, increasing suicide rates among farmers, influence on the health of humans and livestock and lack of enough attention from ministries and governing bodies. The variables SPI and NDVI are found efficient for the prediction of drought. In this paper, various statistical techniques and deep learning techniques have been studied and analyzed. It is evident from the studied papers that the deep learning models provide more accuracy than the statistical models.

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# An Analysis of Anomalous Behaviour Detection Techniques

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**Abstract**—Anomalous behaviour is any harmful behaviour which is different from the normal behaviour in a particular situation or a place. As anomalous behaviour causes harm to people directly or indirectly, therefore detecting such abnormal behaviour automatically is very crucial for the welfare of society. For instance, normal behaviour in ATM would be to withdraw money and anomalous behaviour might include robberies, fighting etc. which is harmful to the people. Many research have been done on anomalous behaviour detection which were based on IoT, Machine Learning and Deep learning-based techniques such as Multiple Instance Learning, Random Forest Classification and Convolution Neural Network with or without LSTM. This paper analyses various techniques that are used to detect anomalous behaviour.

**Keywords**—Anomalous Behaviour, Deep Learning, IOT, Machine Learning, Surveillance.

## I. INTRODUCTION

Anomalous behaviour is any behaviour that can be held as inconsistent within the community standards. Anomalous behaviour is usually considered as abnormal behaviour when it is atypical or not ordinary, consists of inappropriate or indecent behaviour and results in an undesirable outcome. It also results in impairment in one's individual functioning. Such behaviour is described as deviance which violates the social and ethical norms. Anomalous behaviour can be classified into various categories like arson, assault, burglary, fighting, gunpoint, kidnapping, murder, shooting, rape, etc. Any behaviour which is not normal comes under anomaly. Thus it is crucial to detect such behaviour and classify it accordingly. This can be accomplished either using normal behaviour and then distinguishing it from abnormal behaviour or by directly classifying abnormal behaviour in the above mentioned classes. This paper focuses on various techniques like Multiple instance learning [1], Random Forest classification [4], Gaussian Mixture Model [9], Support Vector Machine [10], CNN [3] [5] [11], CNN with LSTM [6] [7] [12] and IOT based techniques using arduino, temperature sensors [2] and ARM controller [8] to detect human activities which includes normal as well as anomalous behaviour.

## II. LITERATURE STUDY

W. Sultani, C. Chen and M. Shah [1] have proposed a model based on MIL i.e Multiple instance learning by treating normal and anomalous videos as bags and short segment in each video as an instance in a bag. Anomaly often occurs only for short time therefore video is divided into multiple temporal video segments in video bags. Features for every 16-frame video clip are computed followed by l2 normalization. To obtain features for a video segment, this system takes an average of all 16-frame clip features within that segment. After extracting features from video segments fully connected neural network is trained by utilizing novel ranking loss function which computes the ranking loss between the highest scored instances in positive bags and the negative bags. Dataset having 13 different types of anomalies is used. Proposed method provides successful detection of anomalies and able to achieve 75.41% accuracy. It also generates false alarms because of flying insects in front of camera and also failed to identify normal group activities like people watching relay race on street etc.



Jacintha .V,J. Nagarajan, K .Thanga[2] have proposed IOT based system for ATM security which have several layers of protection against physical as well as electronic theft. Proposed system is based on embedded arduino for ATM security which takes input from various sensors placed in ATM cells. Various sensors like temperature sensors, GSM modem, vibration sensors, relay, tilt sensors are used to get input data for arduino. When any of the sensor exceeds threshold value alarm sound is decoded and alerts are sent through the mail and GSM modem makes a call to security authority. SQL servers and local disk array are used to store all types of alarms generated by the system. When sensor exceeds the normal value mail is sent, relay turns on, chloroform is switched automatically, allows call through GSM modem etc. System is having acceptable accuracy and do not require continuous human monitoring. System is not that efficient because it does not work on temporal data and may generate false alarms. The future scope can be use of thermal sensors to detect number of persons inside the ATM cell.

A. Khaleghi, M Moin[3] have proposed Deep learning based system for anomaly detection. Architecture of this system has two main phases which are called train network and detection classifier. First phase aims for feature extraction and it consists of five components with deep structure. Second phase is detection phase consists of five deep neural network classifiers and reconstruction network. The main contribution of this paper is the use of deep learning techniques in all phases of anomaly detection. The first step before starting extracting and learning features is to estimate and remove the background. Next step is feature extraction and learning component and output of these phase is detected objects. Third step is motion extraction which performs feature extraction based on moving objects in scene of video patch. Last step is reconstruction network which reconstructs scene. In the detection component, learned features which are generated in the train network are given to a classifier with two classes of normal and abnormal to detect anomaly in video. To evaluate proposed method UCSD dataset is used which is one of the most standard datasets related to the anomaly detection and proposed method shows 15% to 20% increase in accuracy with respect to DOC model proposed in paper[13]. This dataset is related to the pedestrian walkway surveillance camera. Any objects other than people are identified as anomaly, such as bicycle or car but apart from that no other anomaly has been classified by this system.

V. Tripathi, A. Mittal, D. Gangodkar, V. Kanth[4] have proposed a system for detecting abnormal events at ATM installations. In process of proposed model videos. Firstly video is divided into frames. Preprocessing is performed on every N number of successive frames to combine information of all N frames into one frame. Newly generated frame then contains high amount of useful data and sequence information. After this processing HOG (feature descriptor) is applied to extract useful information and dataset is created. Then this dataset is fed into random forest classifier along with training dataset. Classifier generates model from training dataset and predict most likely class for every testing instance. Researchers have made their own dataset which simulates ATM working with frame size 320 \* 240 and 25 fps frame rate. Second and third datasets are CAVIAR and HMDB-51 and got 75.38% accuracy for CAVIAR dataset and 50.84% accuracy for HMDB-51 dataset. Proposed system is restricted to work only for video, aspects like object selection, structural variation, audio based recognition can be focused.

P. Singh and V. Pankajakshan[5] have proposed deep learning based technique for anomaly detection in Surveillance videos. In this paper, system is presented for detecting anomalies using general features that are automatically extracted from video data. Layered convolutional neural network is used for feature extraction and then convolutional Long Short-term Memory stack is used to construct the future motion sequence. After this, a stack of transpose CNN is used to construct the future video sequence from this predicted motion sequence. These steps together capture the spatio-temporal patterns present in the input videos. For anomaly detection, after predicting the output video sequence from an input video sequence, an error is computed between the two, which is thresholded to determine if the input video sequence is anomalous or not. UCSDPed1 and UCSDPed2 datasets are used to obtain experimental results. Proposed technique was able to achieve 74.8% accuracy for UCSDPed1 and 80.2% accuracy for UCSDPed2. A key advantage of the proposed approach is that the feature extraction process does not contain any hand-crafted features. Another advantage is that it does not have any dataset specific parameters.

N. Shree , R. Sah and S. Gowda[6] have proposed a system to detect and notify about real time suspicious activities in indoor scenarios. Proposed framework is designed to detect indoor violence like stabbing, thrashing or any activity involving physical force. A person being attacked by a knife is the main concern of the project. Framework starts in first phase by background

subtraction and blob(human individual) detection followed by object identification. If the number of individuals in the scenario is more than one then only program enters in the second phase where edge detection and tracking is done. By processing every block of the frame object detection module returns positive if three conditions are satisfied that are 1. Hand mould and gesture 2. Presence of Sharp object affirmation and 3. Link between the hand and object to meet the appropriate conditions. If scene is insecure then program goes to third phase which is notification. By evaluating the algorithm real time videos it was clear that algorithm works efficiently in bright areas with 73% accuracy, whereas works moderately in less sharpen areas with 67% accuracy when experimented against the real time videos captured from different locations.

R. Ionescu, S. Smeureanu, B. Alex, M. Popescu[7] have proposed a framework that requires no training for abnormal event detection. This approach is completely unsupervised because it cannot build a model in advance and then find derivations in new data. Window sliding algorithm is applied for each window. Then model considers first  $n$  frames as normal and last  $n$  frames as abnormal but this hypothesis must be true. So for that both motion and appearance features are extracted from the frames and binary classifier is trained with high regularization to distinguish between the labeled frames. Then accuracy is retained from the classifier and this process is repeated with eliminating some of the best features. This process is called unmasking. Abnormal events correspond to high accuracy while normal events correspond to low accuracy. By this method abnormal events are detected in the window. Model has achieved 68% accuracy on UCSD ped1 data set and 82.2% accuracy on UCSD ped2 data set. Empirical results indicated that given approach gives better performance than the base unsupervised method.

A. Kande, P. Reddy[8] have proposed a methodology to detect abnormal event at ATM system by using image processing based on IOT technologies. A system is built for a structure where objects are moving with respect to fixed background. First foreground extraction technique is used to obtain clear outline of people. Then a fixed size of window is used to record the MHI. MHI stands for Motion History Image. It is a binary image where pixel intensity is a function of recency in motion. Brighter (whiter) the pixels have greater the recency. As an object moves it leaves behind more recent movements and according to the image motion is represented. Once MHI is obtained, features are extracted from it using Hu moments function. Dimensionality reduction is done with the help of principal components analysis (PCA) for improving the efficiency in computation. Furthermore, this system makes use of support vector machine to predict the most likely class and the result is displayed. This methodology uses their own created dataset and got 72% accuracy for single normal, 69.89% accuracy for multiple normal and 70% accuracy for multiple abnormal.

R. Leyva, V. Sanchez and Chang-Tsun Li[9] presented an online framework for video anomaly detection. As big data continues to grow exponentially and surveillance videos are one of the main contributors, there was a need of developing automatic video surveillance methods to capture intelligently. In proposed work binary features are generated from data which is used to create dictionaries then Gaussian Mixture model is used to detect abnormal events. Features are computed from two motion sources: the back-ground and temporal gradients. In given model, the temporal gradients and background of frames are calculated. Interest points are detected by using the FAST detector. Binary encoding then generates binary features, which are used to create dictionaries. GMMs are used to model all binary features and those obtained by computing the foreground occupancy. An inference mechanism that uses GMM votes detects abnormal events. UCSD ped1 and UCSD ped2 datasets are used for evaluation and efficiency is shown in terms of Equal Error Rate which is got to be 25.34/21.2 which is much lower than the optimal.

Arpitha K, Honnaraju B[10] have proposed a vision based anomaly detection method for ATMs. Most ATMs are open 24 hours and their zones are spread everywhere in the city. Due to low manual security of ATMs they are more basic danger of being burgled. In the initial stage, video frames are converted into gray scale images and these gray scale images are used for feature extraction. In this paper methodology is explained in two main parts, the first is feature extraction and second classification. Scale Invariant Feature transformation (SIFT) and Gabor filter are used for feature extraction. Texture analysis is done by Gabor filter, which means that it analyses whether there is any specific frequency content in image in particular directions in localized area throughout the point or region of analysis. Dataset used for evaluation by the researchers was created by them. Support vector machine (SVM) is used in recognition and classification stage. SVM classifier, classifies the data into two classes according to its features. Using SVM classifier researchers have obtained low accuracy for complex data.

A. Mathew, J. Mathew, M. Govind and A. Mooppan[11] have presented transfer learning approach for intrusion detection. In this paper helmet detection is done by deep convolutional neural networks. ATM visitors who have worn helmets makes it painful to identify the person if an abnormal activity happens, thus helmet detection in ATM were crucial. Deep convolutional network with transfer learning found to be the best way to tackle this detection problem to achieve state of the art performance with minimum computational requirement. Real time processing takes much less time than offline processing so which provides faster results. Google's inception v3 model which is trained on 1.28 million images with 100 classes from Imagenet LSVRC 2014 is used in this paper and this knowledge is transferred and used on ATM surveillance dataset of 4719 images with two classes that are helmet or without helmet. Accuracy of 95.3% was achieved in testing phase but proposed network was found to be harder to train due to vanishing gradient and degradation problems.

X. Cai, F. Hu, L. Ding [12] have proposed deep learning based model to detect abnormal behaviour in examination hall. Because of increase in examinations and people paying more attention to the fairness and order of examination it is necessary to detect abnormal behaviour efficiently. In this paper 3D CNN model is used to detect abnormal behaviour from examination surveillance video. In this model Farneback's algorithm is used to extract optical flow, and then it is transformed into "flow images". 3D CNN model take these images as an input. Proposed CNN model has 2 convolution layers, 2 pooling layers and 2 fully connected layers. if any of the sub-region samples is classified into positive then there is an abnormality in test video clip and that video is stored. Model is evaluated on their own dataset and compared with motion blob [14], template matching [15] and skin+SVM[16]. It is seen that the proposed model achieves superior performance to current methods with accuracy of 89.8%. Accuracy of model can be further increased with good camera angles and quality of test videos.

### III. ANALYSIS

The Table given below is a summary of research papers on anomaly detection. It states the different techniques used for anomalous behaviour detection. The accuracy varies as per the system used.

**TABLE 1**  
**ANALYSIS TABLE**

Sr. No.	Paper Name	Technique Used	Data Set	Accuracy
01.	Real-world Anomaly Detection in Surveillance videos.[1]	Multiple Instance Learning(MIL)	UCF-Crime dataset	75%
02.	An IOT Based ATM Surveillance System. [2]	Arduino and Temperature sensor, GSM modem, vibration sensor, Relay, Tilt sensors	--	Acceptable performance
03.	Improved Anomaly Detection in Surveillance Videos Based on A Deep Learning Method [3]	Convolution Neural Network (CNN)	Public UCSD dataset.	15% to 20% accuracy over DOC model[13]
04.	Real time security framework for detecting abnormal events at ATM installations[4]	Random forest classification.	CAVIAR, HMDB 51	CAVIAR 75.83%, HMDB-51 50.84%

05.	A Deep Learning Based Technique for Anomaly Detection in Surveillance Videos[5]	Convolutional Neural Network along with ConvLSTM2D	UCSD Ped1 and UCSD Ped2	74.8% for UCSD Ped1 and 80.2% for UCSD Ped2
06.	Surveillance video based robust detection and notification of real time suspicious activities in indoor scenarios[6]	Convolutional Neural network	Own Real time data set	73% in bright areas and 67% in less sharpen areas
07.	Unmasking the abnormal events in video[7]	Linear classifier	UCSD ped1, UCSD ped2	68% - UCSD ped1 and 82.2% - UCSD ped2
08.	To detect abnormal event at ATM System by using image processing based on IOT technologies[8]	ARM controller based embedded system to process real time data collected using the vibration sensor.	Own dataset created.	72% for Single normal, 69.89% for multiple normal and 70% for multiple abnormal
09.	Fast detection of abnormal events in videos with binary features[9]	Binary Features are generated from data which are used to create dictionaries then Gaussian Mixture Model is used to detect Abnormal events.	UCSD ped1 and UCSD ped2	Shown in terms of Equal Error Rate(EER) 25.34/21.2
10.	Vision Based Anomaly Detection System for ATM[10]	Support Vector Machine	Own dataset created.	Low Accuracy
11.	An Improved Transfer Learning Approach for Intrusion Detection[11]	Transfer Learning with Google's inception model (CNN)	Own dataset created.	95.8%
12.	Detecting Abnormal Behavior in Examination Surveillance Video with 3D Convolutional Neural Networks[12]	Convolutional Neural Networks(CNN)	Own dataset created.	89.8%

The various algorithms used for anomaly detection are analyzed in the above table. It includes the IOT, Machine Learning, and Deep Learning based techniques. From the analysis table above it can be seen that CNN gives better result and the accuracy of which can be further increased by LSTM due to temporal processing by LSTM.

#### IV. CONCLUSION

With the increase in anomalous activities around the world it is very much necessary to detect such behaviours while they are happening. Various Machine Learning, Deep Learning and IOT based techniques are used to classify human behaviour as anomalous or non anomalous among which deep learning approaches such as CNN, CNN with LSTM have proved to be more accurate in classification. In this paper different machine learning, deep learning and IOT based techniques have been analysed and studied. Here, loads of surveillance videos have been used as dataset. From studying papers it is apparent that CNN along with LSTM yields better results and accuracy because of temporal data processing by LSTM.

#### ACKNOWLEDGEMENTS

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# Vehicle Overload detection using Image Processing

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**Abstract**—This paper focused on prevention and damage of roads vehicle and road accidents. In paper we first capture the moving vehicle side view from that we extract tires using image processing. After that we compare shape of tire in our database if vehicle will overloaded it will capture vehicle registration number. As we know roads play a very important role majorly in transportation and to maintain these transportation smooth roads need to be in good condition but now a days we can see the condition of our roads. Damages of roads caused by moving heavy vehicles in overload due to this road gets damage and sometimes bridges get collapse another problem is that in overloaded vehicle some time break failed.

**Keywords**—Accidents, Damage, Road, Transportation, Vehicle

## I. INTRODUCTION

Overloaded vehicles are becoming the major causes of unwanted accidents. Because overload can reduce the driver's efficiency to break and steering and it can be one of the causes of accident. Due to unnecessary stress on the engine increase the chances of tire failure and it reduces the vehicle's stability. It damages the national road and it is an illegal activity. Due to overload penalty can be charged. According to Road Traffic Act (1998). The police will impound driver's license and also the registration number plate itself. The govt. has brought in a very high penalty system for full vehicles plying on the national highways. The overloading penalties vary from two-to-ten times the counting on toll looking on the additional weight that a truck is carrying. The new rules came into result recently. The sooner rules concerned charging ten times the toll fee regardless of the extent of excess load that a truck was carrying. Full vehicles area unit asked to pay fines as a result of they have an inclination to break the roads and also are unsafe, as they topple sometimes and become a security hazard. In line with the new rules, for carrying further load of 0 to 20% over the whole permissible weight, vehicles can have to be compelled to pay doubly the toll fee. For carrying 20 to 40% excess load over permissible limit, the penalty becomes fourfold the toll charges that a truck driver is meant to pay. For carrying 40% to 60% further weight, the toll charges that a truck driver can have to be compelled to pay is sixtimes, whereas for carrying 60 to 80% excess load, the penalty is eight times the toll charges. For carrying any further weight over 80%, the toll fee becomes ten times.

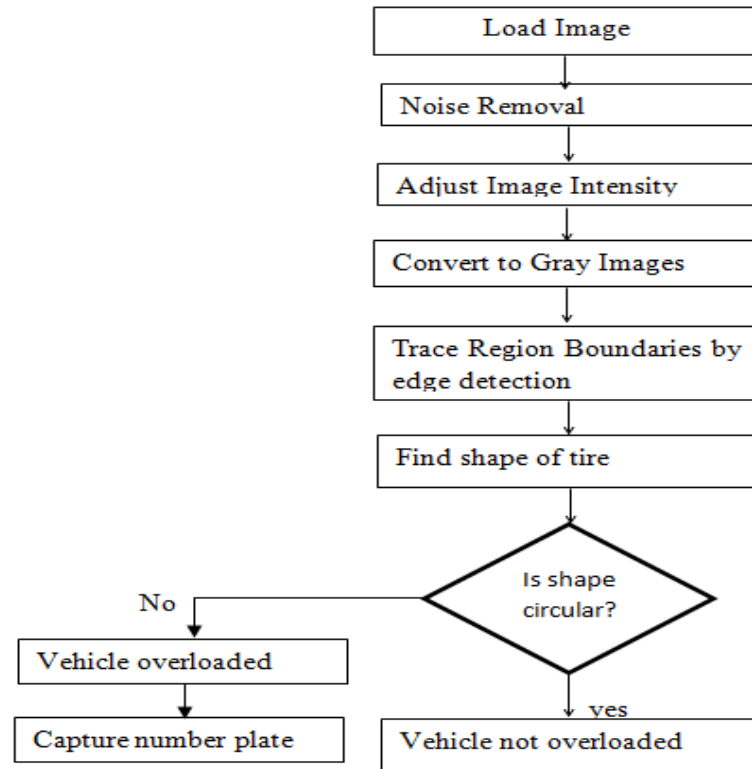
## II. FLOWCHART

In Fig.1 shows in this paper how to camera capture image and desired frame will be removed from the entire video. After extraction of the frame, all process takes place.

As seen from the literature survey, high computational speed and cheaper equipment are the main reasons for image processing detection algorithms are famous. The good portion of the proposed system is the software model which makes use of various image processing technologies which are implemented in MATLAB 2019 and databases. The proposed system can be classified into following parts as shown below,

- i. Capturing of the vehicle's image.
- ii. Noise removal.

- iii. Adjust Intensity.
- iv. RGB to Gray.
- v. Detection of shape of tire depending on condition following stage occur.
- vi. Detection and Recognition of the license plate in the vehicle's image using image processing.



**FIGURE 1: Flow of processes**

### III. MATERIAL AND METHOD

#### 3.1 CAMERA

A camera that streams an image, video in real-time through a computer to a network sort of web. The sort of camera required in our paper may be a high-resolution high-speed camera. There's a requirement to use a camera within the proposed paper to detect the vehicle moving on the road. Capture a picture by setting a particular frame and reserve it to the database.

#### 3.2 MATLAB

The name MATLAB means Matrix Laboratory. MATLAB was written originally to provide quick access to matrix software developed by the LINPACK (linear system package) and EISPACK (Eigen system package) papers. MATLAB is an integrated technical computing environment that mixes numeric computation, advanced graphics, visualization and a high level programming language. In proposed paper MATLAB software to used implement code. It are often wont to perform image segmentation, image enhancement, noise reduction, geometric transformations image registration and Three D image processing operations. MATLAB provides a comprehensive set of reference-standard algorithms and workflow applications for image processing, analysis, visualization and algorithm development. Proposed paper is based on software, therefore need use MATLAB software. In the proposed paper find

out the shape of the vehicle using MATLAB functions. In Proposed Paper captures vehicle images using Web Cam. This captures the image is load in MATLAB and to read this image use imread() function. For detection of tire shape in an image use imfindcircles() functions.eg: [centers,radii,metric] = imfindcircles(A,Range) also returns a column vector, metric, containing the magnitudes of the accumulator array peaks for each circle (in descending order). The rows of centers and radii correspond to the rows of metric. Using viscircles detect circular shape of tyre.eg. viscircles(centers,radii) draws circles with specified centers and radii onto the current axes.

### 3.3 RGB2GRAY

This is used to convert 2-D colorful image into gray scale image. Also set the value of threshold as show are syntax given below,

```
I=rgb2gray(RGB)
newmap=rgb2gray(map)
```

### HOUGH TRANSFORM

The Hough Transform (HT) is a robust method for finding lines in images that was developed by Paul Hough. Perform accumulation on the accumulator array using the binary edge image. Find peak values in the accumulator array. Verify that the peaks found correspond to legitimate lines, rather than noise.

### CANNY EDGE

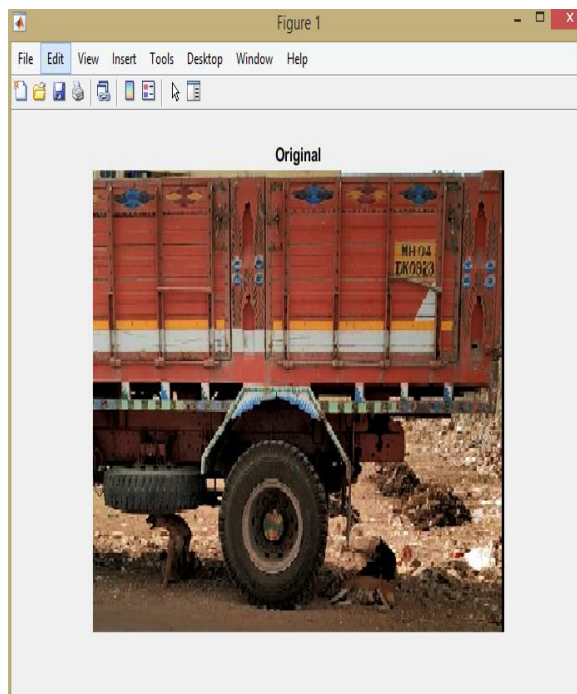
Canny edge in method that find edges present in image and it provides high accuracy and uses less memory space and also gives highly localized output.

**TABLE 1**

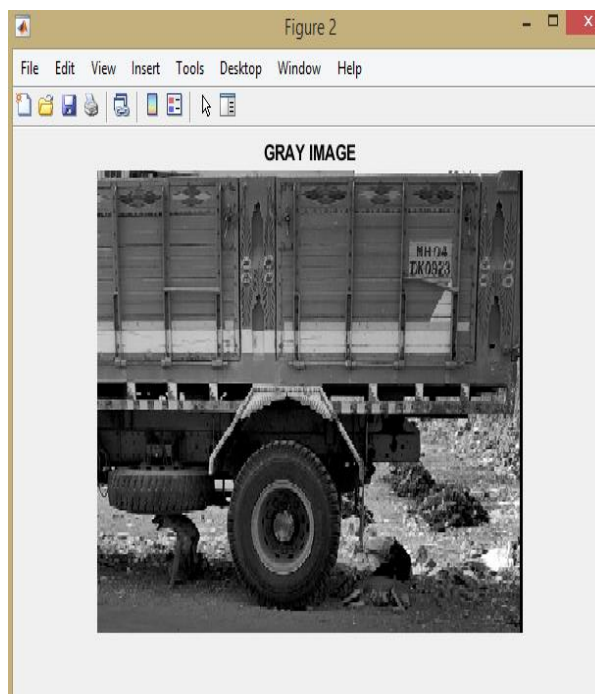
Sr. No	Title of the paper	Advantages	Disadvantages
1	Vehicle Target Area and Tire Detection Image Processing Technique(IEEE) <sup>[4]</sup>	Perfect target	Moving target capture not possible
2	A New Algorithm for Shape Detection(IEEE) <sup>[13]</sup>	Shape of the Tire	Accuracy is less
3	Application of Edge Detection for Vehicle Detection in Traffic Surveillance System	It is an optimal edge detection technique as it provides good detection	It need high pixel images
4	Canny edge detection algorithm[2]	Low error rate, Good Localization and detects each pixels	High response time
5	Shape Template Based Side View Car Detection Algorithm	Segmentation Algorithm, Hypothesis Generation, Hypothesis Verification	Multiple circle detected in Hough transform

### COMPARISON BETWEEN DIFFERENT TECHNIQUES IN IMAGE PROCESSING

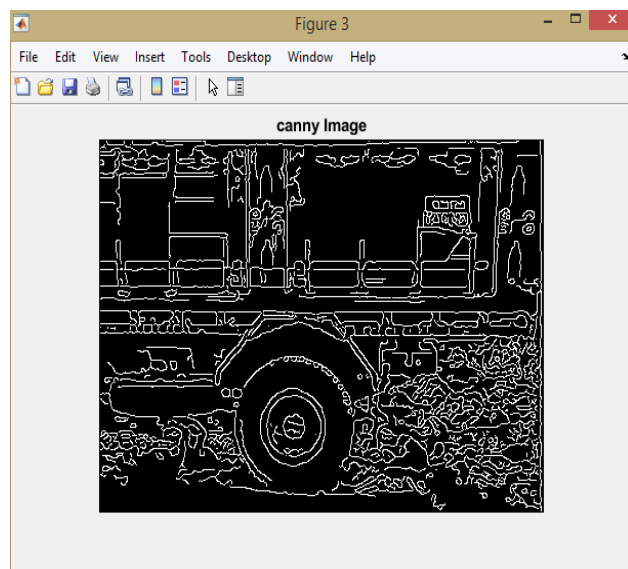
#### IV. RESULT



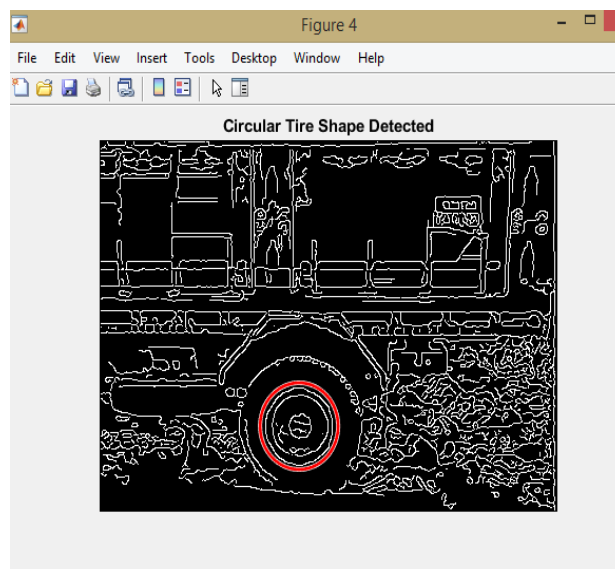
**FIGURE 2 : ORIGINAL IMAGE**



**FIGURE 3 : GRAY SCALE IMAGE**



**FIGURE 4 : CANNY EDGE DETECTION**



**FIGURE 5 : NOT OVERLOADED VEHICLE**

In fig.2 removing desired image from real time in proper orientation also after that it is converted in gray scale image as shown in fig.3 because maximum operation are perform in gray only.

After that using canny edge detection all the edges are detected it is shown in fig.4 from all the edges now it is very easy to get any shape present in any images. In fig.5 circular shape of tire is detected that means vehicle is under over weight.

## V. CONCLUSION

It analyze overloaded vehicle by capturing vehicle images. The system does not need any special hardware kit like arduino etc. Proposed project is based on software. MATLAB software needed to implement this project. Through the literature survey it has been observed that improved canny edge detection technique will be used for the project. As of now, Detection of circular tire has been achieved by using MATLAB's functions from picture of vehicles. A reduction in overloaded trucks is conducive to a reduction in crashes. There are still issues and challenges for this technology and application which require more research and development work. As the proposed project uses toll camera, no extra cost for installation will be needed. It provides 24\*7 availability on detection. The proposed project is expected to capture overloaded vehicle and detect illegal transportation.

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## CNC Based Engraving Machine

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**Abstract**— There are different types of CNC machines used in industry. They are used for various purposes like cutting of wood in specific shape and design. In this project, we are trying to make a CNC machine that will engrave wood with the design given to it by the Computer. It would move along the wood with the laser and will engrave design which is given to it. the LASER will turn ON and OFF accordingly and the design will be engraved on the wooden plate given, laser will be controlled by servo motor. In the computer we have used Inkscape software for converting normal images into gray scale image, and then we will convert into g-code and then the program will be given to Arduino UNO and which will result in movement of vertically and horizontally placed motors by the Arduino UNO and the given image will be engraved on the given wooden plate/object.

**Keywords**— Arduino UNO, Gray-scale image, G-code, Inkscape Software, LASER.

### I. INTRODUCTION

Engraving is an art of making a design on a surface by piercing grooves into it with tools. Due to errors made by human, while designing with the help of burin, it results damage of piece of object on which etching is to be done. One of the solution to solve this problem is, to engrave with the help of CNC (Computerized Numerical Control) machines using Laser. CNC based engraver machine will help to increase automation, and help to engrave the complex design with much accuracy at less time. The main intention of this project is to reduce a large scale engraving machines into a portable engraving machines that are comparatively at much lower cost than the heavy engraving machines and it also engrave designs more accurate than humans.

#### 1.1 Need

A more effective, easier and accurate way for engraving a given design on wooden/metal plate. This process requires an image, Inkscape software and CNC based machine. These three components when we put all together and step-by-step procedure is followed, an accurate and effective design will be engraved on the given plate/object, there is no need of complex machines. An image can be engraved at low cost and with more accurately with this machine.

### II. LITERATURE SURVEY

This paper helps to understand the design and fabrication of a Laser based computer numerically-controlled, CNC machine which uses a graphical-user interface (GUI) and Arduino micro controller to produce a pulse-width modulation in order to run the stepper motors which will be used in this work. This Paper focuses on the design of a high speed engraving machine, which is based on embedded system, was described in this paper. ARM (Advanced Risk Machines) and FPGA (Field Programmable Gate Array) were considered as the most beneficial component in hardware, as well as the real-time multi-task operating system c/os are used in this software system. This Paper enlightens about the Intelligent manufacturing which uses information technology as its core of traditional manufacturing revolution. CNC machining is a general manufacturing method. To make it efficient, and to cut down the cost, also to ensure quality effectively, researchers on CNC machining have focused on virtual machine tool, cloud manufacturing, wireless manufacturing. This Paper discusses During machining operations, user safety is a big factor need to consider. The more the interaction of the user with the machine, the more the user is prone to accident due to mechanical or

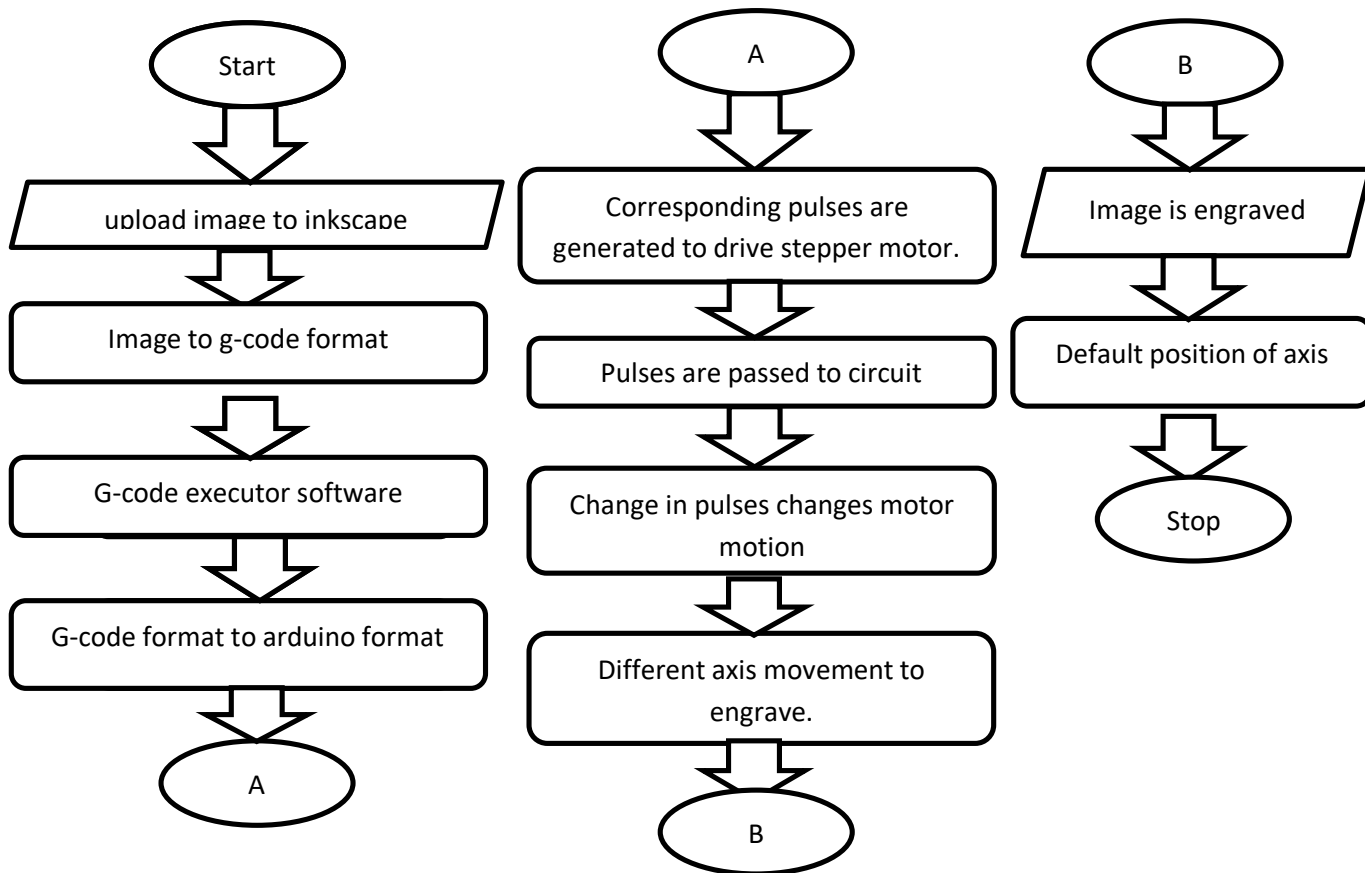


tool failures. As in CNC systems, particularly in milling and router machines, user interaction are more seen during manual tools change operations. This study focuses on the design and development of an automatic tool changer for the computer numerically controlled (CNC) router machine of the Metals Industry Research and Development Centre (MIRDC). This Paper focuses on Computerized Numerical Control (CNC) as one of the development of automation machining technology that can support the demand for a product that has a complex shape, high accuracy and can work on objects that can't be done with conventional machining. The method of wood-working CNC machine building are done by the designing process to determine the dimensions of the machine, decide the calculation to determine the motor needs and specifications. This paper contains the information of a CNC milling machine firmware development for PCB manufacturing, using an Arduino UNO board to control, with a USB connectivity between the machine and regular PC. The firm wares will allow PCB manufacturers to build their own machines in less time and with less cost, and use them using regular PCs. With the help of engraving technology, engraving systems based on digital image processing technique has been accepted by market fast moulding and low cost and it will be used in advertising, mould etc. In this study the advantage of four thresholds algorithm is given by analysing problems of traditional canny edge detection algorithm.

### III. MATERIAL AND METHODS

#### 3.1 Process Overview

The main process and working of this project is engrave designs given to it. In this process the cnc machine concept is basically used to engrave complex design using computer/laptop and arduino the basic flowchart of this project is given below. The main process starts from the pc/laptop. The pc or laptop is installed with software that converts image into gcode named inkscape, the input image is given to the software that we have to engrave on wooden piece. the image is converted into g-code using inkscape software. The image give to it is converted to black & white and the borders are considered for engraving. The G-code format is further proceeded to the g code executor, the g code executor is used to execute the g code and further it is transferred to the arduino the arduino is connected to the main hardware of this project. It correspondingly send signals to the servo motor and it controls the moment of the axis there is a small circuit between the arduino and the hardware that is consist of L293D it controls the motion of the axis while engraving. The engraving is done by laser it is also controlled buy a servo motor. the laser turns on and off according to the G code given. The design is engraved on the wooden pieces. The engraving is depended on the servo motor that controls the vertical and horizontal movement and the laser as well. Once the design or image is engraved on the wooden piece the axis returns to its initial position the wooden pieces is engraved using simple cnc concept at lower cost. The process ends and the motor get to the initial position and the engraving is completed the g code ones runs completely the image is engraved on the wood. We can engrave any image using this G code the image is easily converted to black & white format and the g coder is used to convert it into g code and execute it on arduino and to control motors and laser collectively to engrave the image. Once all the motor and laser reach their initial position. The laser is the main component of this project it engrave the given design or image according to input given to it.



**FIGURE 1 Flowchart of Project**

#### IV. RESULT & DISCUSSION

The image will get engraved on the wooden piece. The engraved image is engraved using g code we have tried a similar method to engrave at lesser cost and the engraving will be done. The axis are controlled by the g code and the method of g-code that is used in most of the cnc machines is used in it. The machine engraves images with details that are given using G-code. The motor works with coordination with each other and as well as with the laser to engrave the design given to it. Basically we can say we have tried to make a machine that can engrave images on a wooden piece at lower cost as well as easy to change the image whichever we have to engrave on the wooden piece. We can easily change the image which we have to engrave on the wooden piece. The vertical and horizontal motors as well as engraving lasers, are also controlled by the servo motor according to the command given in g-code. The inkscape software and g-code executor are the two main software components of this project. The inkscape software converts image to gray scale image and the g-code executor helps to execute image into g-code and further connecting it to arduino. The arduino controls the movement of the servo motor using L293D IC. The servo motor controls movement of Laser as well. All the collective movements of the vertical and horizontal plane and the laser helps in engraving the image on the wooden piece.

## V. CONCLUSION

This paper is about to build a CNC machine based on Arduino which will engrave an design on a wooden plate. This machine is user friendly and can be made at low cost. So an design can be engraved easily and with much perfections, without using costly machines. The machine has very simple mechanism that can be easily afforded. The main intention of making is to bring the costing of CNC machine at lower cost. Even the software used in the project are easily available on internet.

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# A Novel Approach to Reconstruct Visual Data from Brain Using Conditional GAN

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**Abstract**— this approach elucidates the extraction of visual data from the human brain using several decoding techniques and deep learning algorithms. The seen or imagined images are recorded using fMRI pattern construction and an optional Generative Adversarial Networks (GAN) used to reconstruct the images from the predicted pattern. A CGAN (Conditional GAN), an improved version of GAN is presented along-with a Classifier, which improves the output of the whole system, thus obtaining a better output resemblance with the original image. The classifier is a pre-trained model of deep neural network, and the generated images mirror the stimulated images (both natural images and artificial shapes). The method successfully generalized the reconstruction to artificial shapes and natural images, indicating the model indeed 'reconstructs' or 'generates' images, and not simply throws an arbitrary result, thus proving that the deep neural network effectively rendered semantically meaningful details to reconstructions by restricting reconstructed pictures to be just like natural pictures.

**Keywords**— CGANs, DNN, fMRI, GANs, visual imagery.

## I. INTRODUCTION

Humans were always fascinated by the idea of mapping brains to interfaces and the recent advancements in neuroscience and engineering have made this idea a reality. Brain-computer interfaces (BCI) can now allow the brain to connect, communicate and control various machines just by thinking [6]. A BCI collects brain signals, interprets them and returns the command to a connected machine. Machines are improved progressively in a way in which they are able to understand a given situation and take actions accordingly using "Machine Vision" [16]. A Human vision is how a person sees and interprets data. Similarly, Machine Vision stands for the technology by which a machine sees (using a camera) and analyzes the given data in a much more efficient, accurate and precise manner. Machine Vision has already been used extensively and is one of the key features of Industry 4.0.

fMRI (Functional Magnetic Resonance Imaging) [9] is a medical technique generally used to detect abnormalities in the human brain, but its application can be further extended when it is coupled with BCI. This technique calculates brain activity by detecting the blood flow through the brain. It works such as that a higher blood flow through a certain region of the brain indicates neural activity in that region. The changes in blood flows are captured by the machine, this data can be further evaluated by using neural networks, thereby giving us a depiction of human thoughts.

General Adversarial Networks or GANs are the new and extraordinary state-of-the-art models used to generate or synthesize any type of data. They are a strong class of neural networks that follow the unsupervised learning approach. GANs are made up of a system of two adversarial neural network models that compete with each other and are able to analyze and work on refining the result. Since they have the power to generate new data, it can help to decode and have clear visual imaging of the brain's cortical activity. And thus, it enhances traditional neural networks.

This paper proposes an architecture comprising of conditional General Adversarial Networks or CGANs along with a proposed model for decoding visual imagery of the brain's cortical region through a decoder type of neural network. This decoder converts

fMRI perceiving brain scans to a visual image representation pattern. And this structure is amalgamated with CGAN, which has both adversarial feedback from its Discriminator network as well as classifier feedback from an additional classifier which makes the generation process by Generator converge faster, giving clearer output of what human brain imagines or sees.

## II. PREVIOUS WORK

Tomoyasu Horikawa and Yukiyasu Kamitani used a Deep Neural Network (DNN) model to extract features for objects while dreaming taken by the decoded FMRI data collected by the brain during dreaming [1]. The decoders were trained with brain activity and labeled with the feature values of the images from multiple DNN layers. Decoded features were then compared with the features of each category calculated from a very large image database. Barbara Tversky explained how thoughts when visualized into words require various perspectives to put [2]. These may be on a particular language or how its written on a page, the way it's depicted, the proximity between the words, etc. She also explained how visual expressions of the meanings plays an important role in language gesture, and by patterns created by the people around them in detail. Yoichi Miyawaki, Hajime Uchida et al. reconstructed visual images by combining local base images of multiple scales [3]. These images were decoded from FMRI activity and relevant voxels were selected. 2100 possible states were accurately reconstructed on a single volume basis by measuring brain activity. The results suggested that their approach provides an effective means to read complex visceral states while discovering information representation in multivoxel patterns.

Yaxing Wang, Chenshen Wu, et al. [4] explained how they made GANs work with a limited amount of dataset. They stated that by studying domain adaptation and applied it to image generation with GANs. They examined the aspects the domain adaptation with the initialization of GANs. They also explained how using pre-trained networks can lessen the convergence time and help improve the quality of images. By drawing conclusions, they also mentioned how density is more important than diversity and how it affects the model overall. Tim Salimans, Ian Goodfellow, Wojciech Zaremba, Vicki Cheung, Alec Radford and Xi Chen presented new technical features and training methods that they applied to GANs framework [5], achieving tremendous results in semi-supervised classification on MNIST, CIFAR-10 and SVHN. They also presented ImageNet samples with unique resolution and presented that their methods assist the model to learn features of ImageNet classes.

## III. PROPOSED METHODOLOGY

A brain-computer interface (BCI) [6] is an interface that links an external device with the brain. In a BCI system, the signal travels from the brain to the device that helps us to record the electrochemical impulses. It works by recognizing specific energy/frequency patterns in the brain. A BCI interface can be invasive (implanted into the brain by neurosurgery), Non-invasive (electrical activity recorded by the electrodes placed on the scalp) or Semi-invasive (devices are inserted into the skull on top of the human brain). Non-invasive interfaces are the safest and are cheaper as compared to the other techniques. However, they can be used to capture only "weaker" human brain signals due to the obstruction of the skull. The most commonly used Non-invasive BCIs are EEG (Electro-encephalography) [7], MEG (Magneto-encephalography) [8] and fMRI (Functional Magnetic Resonance Imaging) [9].

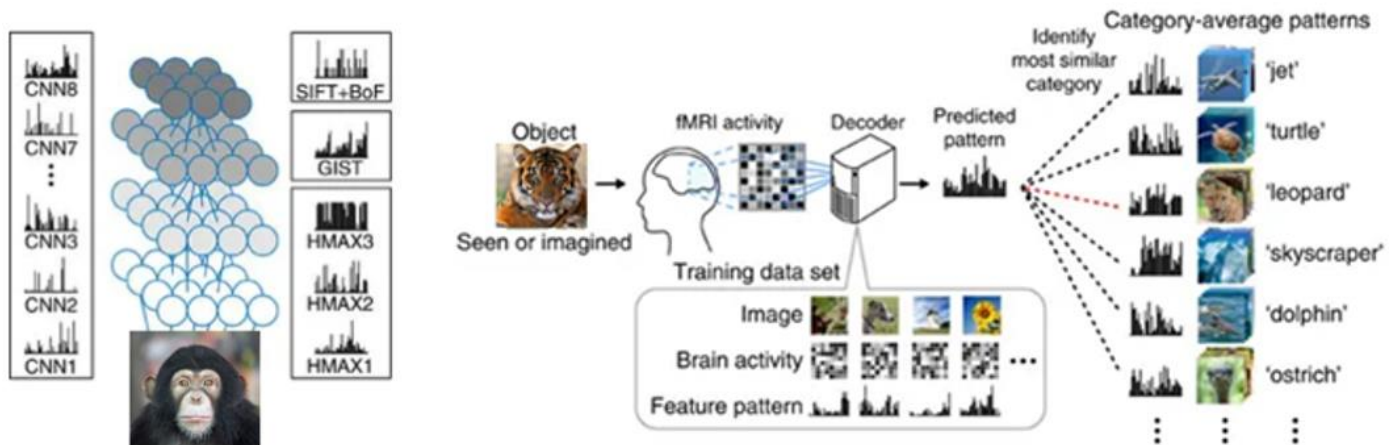
In EEG, electrical activities are recorded using small metal discs (electrodes) which are attached to the scalp. The cells in the brain communicate via electrical impulses. While MEG maps brain activity by recording magnetic fields produced by electrical currents occurring in the brain by using very sensitive magnetometers. An fMRI measures brain activity by observing changes associated with blood flow where cerebral blood flow and neuronal activation are coupled. When a specific region of the brain is in use, blood flow to that area also increases.

Our research is focused on the reconstruction of the imagery data or visual data, that the test subject sees or imagines. We propose a way to achieve that using the technique of fMRI, as fMRI is non-invasive and safe, it is practically easier to implement. In order to obtain the visual data of what the test subject sees or imagines, we need to access the Occipital Lobe and the Parietal Lobe of the Cerebrum in the brain, occipital lobe performs the function of managing the visual perception, depth perception, and reading, while parietal lobe functions in processing sensory information and interpreting visual data, both located in the largest part of the brain that is the Cerebrum in the prosencephalon.

### A. DECODING VISUAL FEATURES WITH FMRI

Signifying homology between human-machine vision and its brain-based data retrieval, [10] put forth a decoding approach for arbitrary objects seen or imagined by a human brain. They proved that the visual features can be estimated from fMRI patterns, considering those derived from a deep convolutional neural network or DCNN.

Initially, strong associations between visual features' complexity and hierarchical visual cortical regions were proved by computing models for the prediction of visual features of seen objects from multiple brain regions. They represented an object image by retrieving features from object images by 13 visual-type layers like CNN1-8 [11], HMAX1-3 [12-14], GIST [12] & SIFT+BOF [13]. Then, the regressor model or the decoder was trained for the prediction of vectors of visual features of seen or imagined objects. Next, seeing or imagining an object not used for training, the decoder predicted its visual features. Finally, the predicted pattern was compared with the most similar patterns in an annotated image dataset -ImageNet [14].



**FIGURE : Visual Image Decoder**

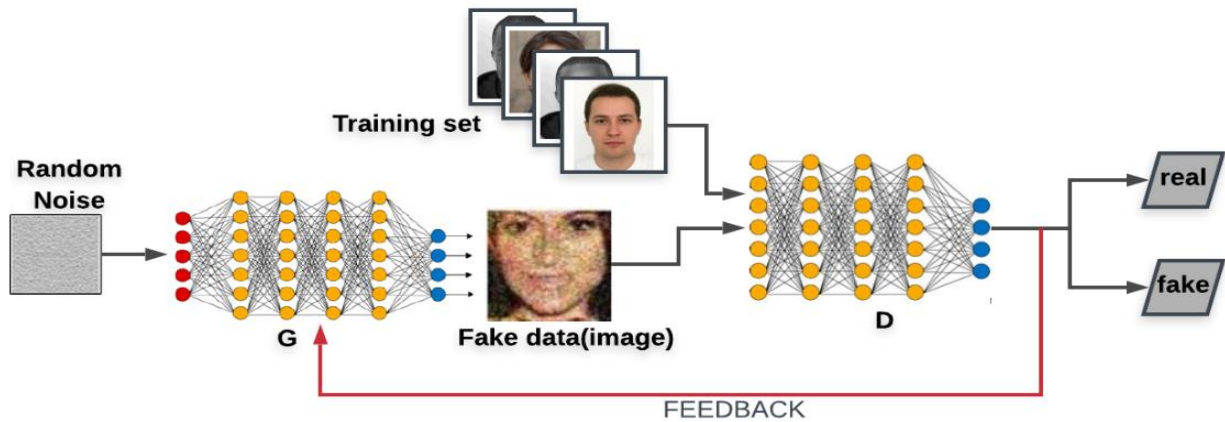
The entire workflow of the proposed system hinges on how accurate the decoder is. Moreover, the image features produced here by the decoder were not that much limpid.

### IV. 3.2 GANS

Introduced by Ian Goodfellow [15] in 2014, General Adversarial Networks (GAN) are the most interesting and advanced phenomena in the last 10 years in deep learning. These networks are capable of generating media, either replica or a brand new one.

GANs comprise two neural networks, one's the Generator which synthesizes new data instances and secondly, the Discriminator evaluating them to review whether the generated one belongs to actual data or not. Discriminator tries it all to distinguish real data from fake created one. The generator tries to improve based on generated data's feedback given by the Discriminator. This goes on and on till the generator becomes a skilled counterfeiter. Thus, generators and discriminators compete against each other, ultimately refining each other's performance.

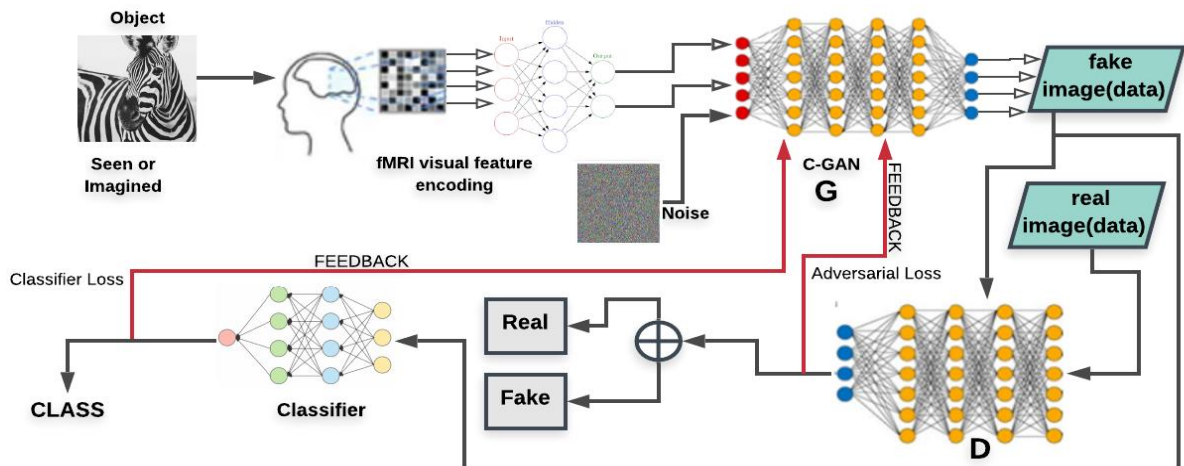




**FIGURE : Generative Adversarial Network (GAN) where G - Generator D - Discriminator**

Combining the Generative adversarial networks with Section 3.1 methodology, a clearer image with enhanced details can be fabricated from the visual features produced by the fMRI pattern. Normal GANs can't produce much lucid generated images. So, considering conditional GANs, they have a certain condition imposing on the production of data by generator G. CGANs give a slight edge over GANs by predicting the class of required image. Thus, the generator G knows the specific training path rather than going off the way, thus producing classified oriented output.

#### A. PROPOSED MODEL (CGAN + DECODED VISUAL IMAGERY)



**FIGURE : Conditional GAN combined with Visual Image Decoder**

Here, initially, any object or image is considered to be seen or imagined by the human test subject. Then from fMRI scans, visual features of the image are encoded by a deep CNN model (encoder). Just like section 3.1's fMRI encoded image pattern is generated. This is fed to the Generator (G) of a Conditional GAN or CGAN. The Generator uses random noise as an input. The

discriminator (D) is supplied with the image generated by G as well as the real image and accordingly, it tries to distinguish between real and fake. The D tries hard to discriminate G's synthesized image and thus providing an adversarial feedback to G.

Additionally, we propose an extra classifier model that will enhance the CGANs generated data. This classifier is pre-trained with ImageNet [17] dataset and thus on feeding the fake image, it'll match its features within the dataset and output the correct predicted class of fake image. Thus, a classifier-loss type of feedback (by the classifier) is sent to G of CGAN. This will help G to move in a correct predicting direction while synthesizing the image. Thus, G receives feedback not only from D, but also from the Classifier. So, both adversarial and non-adversarial feedbacks help the model to converge faster than the traditional GANs.

Moreover, the performance of GANs can be ameliorated by many enhancements over GANs using tuning as follows,

- i. Minibatch Discrimination - Here real images and generated images are fed to the discriminator in different batches to resolve the issue of images getting similar when the model collapses.
- ii. Historical Averaging - In this technique, a track of the model parameters for the last 't' models is recorded and maintained. Also, the average of the model is updated.
- iii. Experience Replay - The model can sometimes tend to become too greedy in defeating what the generator is currently generating, Experience Replay maintains the most recent generated images only, that is then fed to the discriminator, hence preventing overfitting of the discriminator for a particular instance of the generator
- iv. Using Labels - Adding labels in the latent space can help accelerate the training of the GAN.
- v. Virtual Batch Normalization - This can be regarded as the de facto standard in many deep networks. The mean and variance of the batch normalization is derived from the current minibatch.

## V. CONCLUSION AND FUTURE SCOPE

This work proposes how we create visual images that were imagined or seen by humans, using CGANs and fMRI technology. The CGANs, an additional enhanced model over GAN, were given a pre-trained classifier to predict the class of the fake image. An extra classifier and its feedback helped to improve the accuracy of the generator network in lesser iteration which would have taken much more time using only GANs. Some limitations of generative adversarial networks include the high computational power needed for training and also the high amount of data required. Also, variational autoencoders are an option to these adversarial networks since they converge faster, but don't have a diverse scope like GANs. Moreover, implementing variations of GANS like pa-GANS, task-GANS can help GANS to improve its synthesizing.

The proposed model can be used to identify a psychopath easily by his behavior. This model can also be used for providing specific treatments to psychopaths. In BCIs, EEG has excellent temporal resolution but poor spatial resolution, whereas fMRI has high spatial resolution and low temporal resolution. Recent advances in hardware sensing have made it possible to simultaneously capture EEG and fMRI signals, but refined signal processing and machine learning approaches are still needed to optimally integrate these two modalities to achieve both high temporal resolution and high spatial resolution. Then, brain stimulation techniques like transcranial magnetic stimulation (TMS) can be better used to treat brain disorders. The rapid development of BCIs also raises ethical concerns. Both structural and functional brain signals are related to mental states and traits, which could potentially be used to reveal sensitive private information [6]. So, ethics and regulations are also very important to the healthy development of BCIs. Using fMRI and deep image reconstruction techniques one can extract information from a subject that is unwilling to share. Writers can create stories imagining anywhere, anytime. Images can be created or shared by just imagining also various augmented reality and virtual reality concepts can be enhanced using basic brain computing applications.

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# Self-Driving Car Using Raspberry Pi and Arduino with Neural Networks

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**Abstract**— Today technology has advanced to an extent that it would seem science fiction in the past. Self-driving has been a hot topic since the concept of AI has emerged, because of the complexity of the problem, seemingly endless applications, and capital gain. Although this concept has been looked at and many solutions came across, they weren't accurate. The accident-scenarios Self-driving cars might face are the key examples. The main purpose of this study is to find the issues and suggest possible solutions regarding the implementation of Self-driving cars on roads whilst keeping in mind the Accident avoiding algorithms. A Self-driving car is fairly in its infancy today, but once implemented this can revolutionize our traffic management and transport system, moreover it'll reduce the number of accidents and also aid the disabled to drive. This paper tries to solve them using some basic electronics. A Raspberry-Pi along with sensors and a camera are used to solve the problem. A path will be given to the car so that it will traverse along the path while detecting obstacles, responding to signals thus following traffic rules and reach its destination with zero or no casualties. OpenCV along with Haar cascade classifier is used for object detection and classification of pre-trained images and necessary actions will be taken to execute them.

**Keywords**— Autonomous car, Haar Cascade, Neural Networks, OpenCV, pygame, traffic congestion.

## I. INTRODUCTION

### 1.1 PROBLEM STATEMENT

There has been an insurmountable rise in the amounts of accidents taking place daily, and the problem of traffic congestion has been badly overlooked in many cities and urban centers.

### 1.2 OVERVIEW

There seems to be a monumental waste of time, energy and human potential due to the fact that traffic congestion has increased drastically, also the number of accidents taking place has peaked. So, there has to be a solution that needs to be designed in order to deal with this issue, whilst taking into consideration the challenges that could be faced by that system, also the ethical dilemma that could arise due to controversial or maybe anodyne discussions among the experts. For many years, the solution to this problem was simple, build new roads or expand existing ones. It worked surprisingly well for a few cities when hundreds of historical buildings were torn down to create transportation-friendly boulevards. But in urban cities, there is no space for any significant further expansion of the network, since the habitat is too dense, real estate too expensive and public finances too fragile. Other major reasons for traffic congestion could be the none availability of parking space, which leads the drivers parking their cars along the side of the roads, thus rendering less driving space.

As we progress towards a fully autonomous future, technology becomes more and more advanced and mature. What was once seen as Science-fiction, is now becoming a reality. As technology advanced, the concept of Driverless or autonomous cars surfaced. Driverless vehicles have the potential to revolutionize transportation networks [12] and radically transform urban design strategies. This concept of Driverless cars [9] has existed since the days of automobile development, this [13] idea of Self Driving cars can be thought of as another force in the nature that has the potential to make the urban traffic mesmerizing. If we

think about it, the current generation of driverless cars is just trying to earn its way into a traffic grid made by and for humans. They're trying to learn traffic rules, which is relatively simple, and are trying to cope up with human unpredictability, which is more challenging. Due to software and algorithmic innovation, there have been advances in machine learning that improve the ability to perceive the world, new tracking and planning algorithms allow for better, safer and smoother driving, and the software structure simulates and analyses vast amounts of data in data centers, have all been key contributors towards making self-driving cars a reality. Although software and hardware advances have also played a critical role, they are being implemented, still, there hasn't been any up-gradation in terms of intelligence besides the quality of components used in them. Self-driving cars must be fully ready to perform safely and reliably for use in real life. Applying the technologies based on simulation directly on the real world makes it difficult to run vehicles itself in an actual road environment.

Keeping in mind the impact it will have on our day-to-day lives, it'll drastically reduce the number of accidents, as humans being termed as monkey drivers with slow reaction time and short attention spans fail to react quickly to any certain situation. Traffic congestion like city-sized gridlock cascades happen due to uncoordinated driving at the intersection. Even on highways with no intersections, due to unplanned braking or slowing down of certain vehicles, it renders the formation of a phantom intersection on the highway. Only if the drivers were able to coordinate properly and drive with equal speeds and accelerations, easy driving could be achieved. On multi-lane highways, the cars that cross through lanes cause gridlocks, which again results in congestion that could last hours. Tailgating a term used by experts refers to the drivers that drive too close to cars in front of them, the drivers should have a rule of maintaining the same distance from the car ahead as from the car behind at all times.

Though wishing that everyone lives in a proper manner and that would make the world a better place is a terrible idea, what we need is a Structurally Systematized Solution, which is what exactly self-driving cars are, having an interconnected network of cars, it'll be possible to achieve a vast increase in the throughput. Also, in cities such as Mumbai, Bangalore, Delhi and Chennai, traffic congestion is an everyday scenario. With non-standard roads, lack of proper parking facilities and a broken traffic system, cities like these are a nightmare for self-driving car's progress. Despite these major concerns, it would be foolish to reap the benefits of this inevitable technology. While the respective authorities are taking measures like building flyovers, more roads, the issue is still likely to be persistent in the future given the increasing population of cars and humans. To make an autonomous car at low cost in a very high-risk environment is going to be challenging. In this project, we try to implement such a car using Raspberry-Pi 4B, an Arduino UNO Board with some sensors in a limited price range and yet try to yield the safest and most efficacious outcome possible.

## II. PREVIOUS WORK

Johann Borenstein and Yoram Koren, designed and built a mobile robot system, that can accomplish various tasks for the physically disabled. It is basically a nursing robot that acts as a constant 24\*7 support to a bedridden individual, it has few ultrasonic range finder sensors attached to it, so as to avoid colliding with the obstacles like table, wall, any medical unit etc. Ivan Culjak, David Abram et al [1] introduced and made a reader familiar with OpenCV (Open Source Computer Vision) basics without having to read through the lengthy reference manuals and books. OpenCV is an open-source library for image and video analysis, originally introduced by Intel. Sander Soo [2] focused purely on what object detection is and how the Haar-cascade classifier is used for object classification and recognition. The further parts highlighted the actual work carried out by the researchers to detect and count cars, with the use of advanced background algorithms and various filtering techniques the cars were detected with the least error. Jeremy Straub [3] published a paper that focuses on the testing of a self-driving car through a computer simulation. The performance of self-driving vehicles is evaluated using the simulation testing system that generates random scenarios under randomly, manually and genetically modified algorithms. The efficiency of this testing approach is taken into consideration from numerous perspectives. Finally, the paper discusses the technical difficulties and the important role of automated testing process and how automated testing fits within the roadmap to a wide-scale technology application.

Gurjashan Singh, Mohammad Dawud et al. [4] presented a driverless car that is built using Raspberry Pi board as the processing chip, an HD camera along with an Ultrasonic sensor that is used to provide the car with the visual and distance measurement information of the vicinity of the vehicle, and the objects around it. This autonomous car is designed in a manner that is capable



of reaching the given destination with no casualties or any errors using the implementation of algorithms like lane detection and obstacle avoidance. Aditya Kumar Jain [6] proposed a working model of self driving car capable of driving from one location to another also on different terrains which may be straight or curved. A camera was mounted on top along with the raspberry pi on the car which sends images from the real world to the Convolutional Neural Network which predicts one result. This result is then sent to the controller via the Arduino and as a result the car moves in the direction desired with any human interference. [5]T. Banerjee, S. Bose et al. published a paper in which a unique controller design of a driverless car is described that is powered by green energy, has collision protection algorithms and sensors and uses GSM guided destination assistance, and a GPS module to accurately track the location, to map its source and destination. Also, an audio-based navigation guidance was provided. Sana Urooj, Irum Feroz et al. presents an overview of a systematic literature survey conducted on research reports that concerns self-driving cars or autonomous cars based on different perspectives like decision making and its ethics, responsibilities of these cars, potential drawbacks or harm that could be possessed to the passenger by using self-driving cars, people's perspective about them and challenges faced by them. And thus, they present their own views and ideas on it and also suggest some ways or a different approach at this issue.

### III. MATERIAL AND METHOD

#### 3.1 COMPONENTS USED

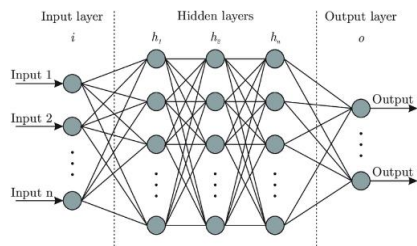
##### 3.1.1 HARDWARE

The hardware part includes Raspberry Pi, an Arduino UNO, BO Motors, L293D motor driver IC and a Camera Module. The raspberry bi can be termed as a mini computer that can be plugged into a computer monitor or a TV, it has onboard RAM and ROM with built-in Wi-Fi module, and can be programmed using languages like Python, R and Scratch. An Arduino Uno is a development board that has an 8bit microcontroller ATmega328P and a flash memory of 32K. Even this board can be programmed to carry out certain tasks. The BO motors are simple voltage driven DC motors capable of handling 500gm force/cm torque, and are used as driving units for the prototype car, it has a speed of 200 rpm. The L293D is a motor driver IC it is also referred to as a Dual H bridge IC that has 16 pins and is designed to provide DC voltages to two motors at a time. The Camera module used here is a USB webcam or a Pi-Camera, this is the main data capturing unit of the entire architecture, that sends the captured/recorded images and video feed to the system for further processing. An Arena was built as a replica of the human city that has roads, intersections, buildings, traffic lights, other vehicles, etc.

##### 3.1.2 SOFTWARE

##### 3.1.2.1 NEURAL NETWORKS

Neural networks [7][10] are modelled loosely on the human brain, it is a means of doing machine learning, wherein a computer perform tasks by learning from the given dataset of the training examples. It is a series of algorithms that aim to recognize fundamental relationships within the dataset and it tries to mimic the way a human brain operates. Most of the neural networks (Fig 1) are organized in layers and are feed-forwards type where it sends data to other nodes in only one direction. Neural networks are designed to be able to adapt to changing input; so, the network can generate the best possible result without needing to redesign the output criteria.



**FIGURE 1: Neural Network**

##### 3.1.2.2 OBJECT DETECTION USING HAAR CASCADE CLASSIFIER

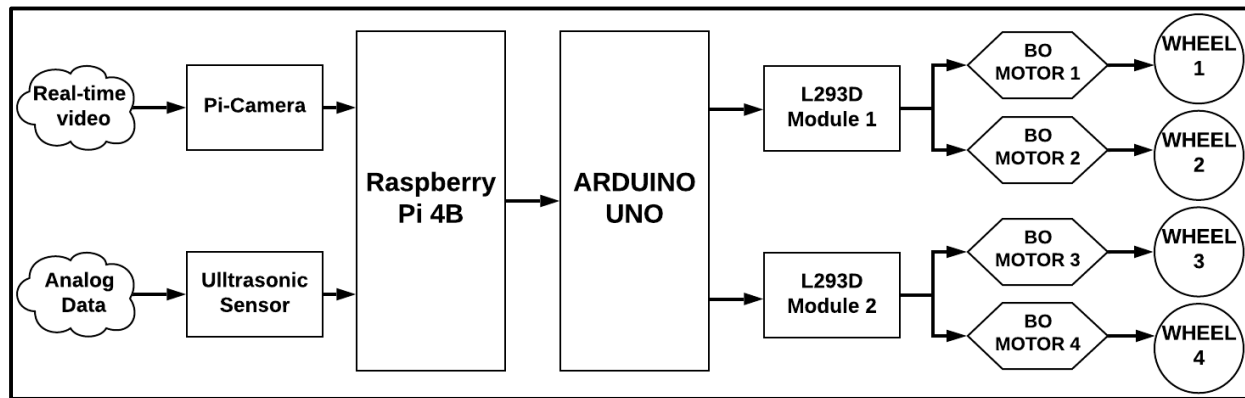


A Haar feature based cascade classifier was fed with an image dataset to train the model, in order for it to be capable enough to identify the given image and categorize it accordingly. Haar cascade classifier [12] uses several feature extraction techniques to significantly distinguish an object within few seconds, its accuracy is totally dependent on the amount of training dataset and the hyperparameter tuning.

### 3.1.2.3 OBSTACLE AVOIDANCE USING ULTRASONIC SENSOR AND ARDUINO

An ultrasonic range finding sensor is used to avoid collision of the car with the obstacles in its path. An Arduino code written in Arduino IDE is flashed on the Arduino UNO board that helps facilitate this task of obstacle avoidance and safe navigation [11].

## 3.2 PROPOSED METHODOLOGY



**FIGURE 2: Block Diagram**

We tried to achieve the simplest design possible. Four BO motors were attached to the chassis. The BO Motors will be connected to IC L293D that is a Motor driver IC which will provide the motors with the necessary supply needed. Also, the Arduino is connected to the raspberry Pi via the serial Port. The raspberry Pi will be mounted on the top along with the Arduino. The car's BO Motors will be connected with the Arduino. The Pi-Camera will be connected to the Raspberry Pi. Lastly ultrasonic sensor is connected to the Raspberry Pi.

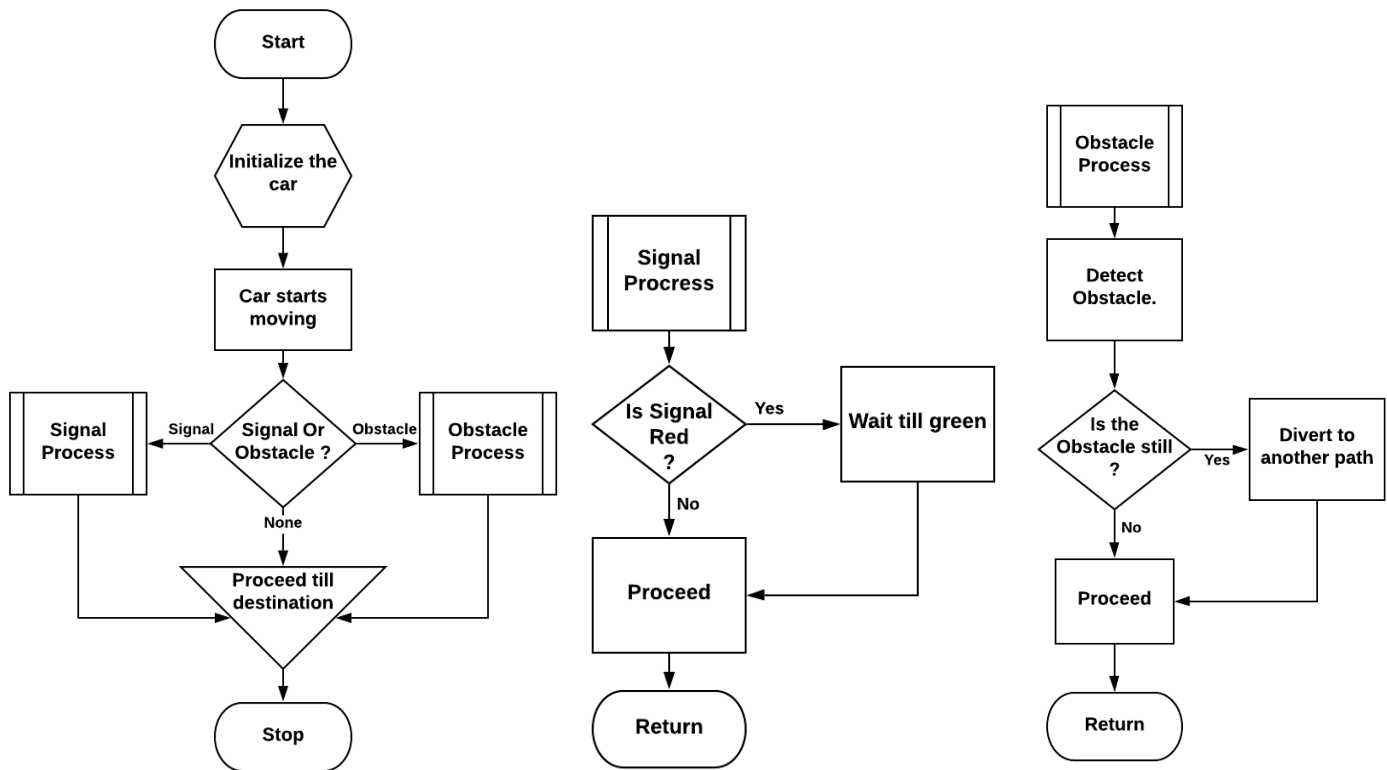
### 3.2.1 TRAINING

The car was first trained on the premade arena and then tested on the arena. The Raspberry pi was loaded with the program to train the car. Here the Raspberry Pi and Arduino weren't connected with each other. Arduino was connected with the PC and was flashed with the cars control program, this program had instructions to drive the car. Now the computer ran the program designed to control the car with the keyboard using pygame [8] library. The raspberry pi connected with pi camera took images as the keyboard buttons were pressed, these images were sent on the local machine where a server was built using socket library, the Raspberry pi acted as a client. When enough data was collected, the data was given to the neural network to train. The data collected was typically optimized for the set of feature networks of the respective arena. The Pi Camera calibration was done to calibrate the pi camera so that it works at its best condition, multiple chess board images were taken using the camera at various angles and put them into the folder. Then, a program to calibrate the pi camera was run. It returned the camera matrix which was to be entered into driving program. This matrix was used for distance measurement by the car while it's self-driving and for efficient steering and navigation.

### 3.2.2 TESTING

When the model's training was finished, it was tested on an arena. While testing, the raspberry pi will be connected to the Arduino via the serial port and rest of the connection will be the same. Now Arduino will be flashed with the program to control the car and raspberry pi will execute the code to run the model. When the Neural Network model is called, it will return a predicted output of the path. This output will be sent to the Arduino via the serial port. Then with the functions built

for every movement for effective navigation, the Arduino will react to it accordingly. After observing its driving accuracy, stop sign and traffic light detection accuracy, tweaks to be made were noted.



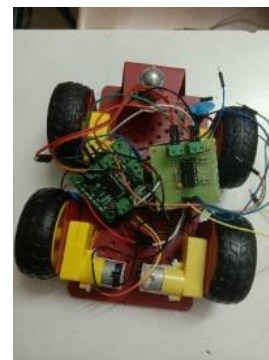
**FIGURE 3: Flowchart of the entire system**

#### IV. RESULTS AND DISCUSSIONS

We present a partial result obtained by performing for the self-driving car project. A stop sign detection algorithm was executed and the obtained snippet (Figure 4) shows the detection of the stop sign. Figure 5 shows the chassis built from various components. The components used are 4 BO Motors connected to two L293D Motor driver modules, two each, and BO Wheels connected to BO Motors. Here power is given through two 9V batteries connected in parallel to the Motor driver modules. The modules are connected to the Raspberry Pi 4. The cars then operate according to as it is programmed.



**FIGURE 4: STOP Sign Detection**



**FIGURE 5: Chassis built Car**

## V. CONCLUSION

In the proposed approach, a method to make a self-driving robot car is presented with different hardware components and their assembly are clearly described. A novel method to determine the uneven, marked or unmarked road edges including some objects is explained in detail relying upon neural networks and computer vision. Using ultrasonic sensor, distance between other vehicles or obstacles is derived. The algorithm proposed has been successfully implemented on a small autonomous car. The autonomous car would surely prove out to be a boon in the automation industry and would be preferred over many traditional techniques. As they won't require any drivers, accidents caused by the carelessness of the drivers carrying goods, would be reduced and would ensure better logistic flow. The human driver has a lesser response time and fails in cognitive decision making at times of chaos and disorder, the self-driving cars won't face such problems. If the cities become totally driverless, we won't even need traffic rule lanes or speed limits. And when all the cars are driverless and connected, everything will be predictable with quick reflexes. They can take any rational initiative that can speed them up or the cars around them. So instead of rigid traffic rules, flow will be regulated by a mesh of dynamic and constantly self-improving algorithms. Hence, due to greater autonomous nature and efficiency, an autonomous car of this nature can be practical and is highly beneficial for better regulation in the goods and people mover's section.

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## A brief survey of Machine Translation Systems

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**Abstract**— The use of machine translation has given a huge boost in the field of natural language processing. Machine translation is used to convert a text or speech from one language to another. The earlier stages has seen various types of machine translations which include Statistical Machine Translation (SMT), Rule-based Machine Translation (RBMT) and Hybrid Machine Translation. These types are based on the large volumes of bilingual text, grammatical analysis of source language and combination of both. One of the best type of machine translation Neural Machine Translation (NMT) uses an artificial neural network to predict the likelihood of a sequence of words. In this survey analysis of different approaches of machine translation has been carried out. The analysis of BLEU score is also carried out of these approaches. The survey includes translation on English, Hindi, Myanmar and Punjabi languages. Syntax, Hybrid, ConceptNet and Statistical machine translation approaches have been analyzed in the survey.

**Keywords**— Natural language processing, Neural machine translation (NMT)

### I. INTRODUCTION

India being a multilingual country, after every 50 kilometers the spoken language changes. Therefore, there is no single universal language. There are 23 official languages in India. Nearly 50% of Indian population speaks Hindi [1]. Being such a diverse country, it becomes extremely difficult for people to learn all the languages. Doing the manual translation in such scenarios become time consuming and costly. Hence, there is a need for having translation system in place to address such issues.

Till now the algorithms used for machine translation are Rule-based Machine Translation (RBMT), Statistical Machine Translation (SMT), and Neural machine translation. RBMT relies on countless built-in linguistic rules and millions of bilingual dictionaries for each language pair. The technique uses the complex rule sets and then transfers the grammatical structure of the source language into the target language. RBMT systems are built on gigantic dictionaries and sophisticated linguistic rules. SMT utilizes statistical translation models generated from the analysis of monolingual and bilingual training data. The translation is selected from the training data using algorithms to select the most frequently occurring words or phrases. SMT technology relies on bilingual corpora such as translation memories and glossaries to train it to learn language pattern and uses monolingual data to improve its fluency. NMT is a type of machine translation that depends on neural network models (based on the human brain) to develop statistical models for the purpose of translation. The primary benefit of NMT is that it provides a single system that can be trained to decipher the source and target text [2].

### II. LITERATURE SURVEY

S. Saini, et. al. [3] have proposed a combined approach of eight completely different design combos of NMT (Neural Machine Translation) for English to Hindi translation and compared its results with standard computational linguistics techniques. From this experiment it absolutely was discovered that NMT needs terribly less quantity of knowledge size for coaching. The kind of neural networks utilized in NMT is Recurrent Neural Networks (RNN). There was increasing impact whereas victimisation RNN, results were conjointly inaccurate. Thus, to beat the shortcomings of the RNNs, the employment of Long- and Short-Term Memory (LSTM) models for secret writing and coding was done. Once the dataset was pre-processed, the supply and target files were fed into the encoder layer to organize the vectors from the sentences.

P. Vijayalakshmi, et. al. [4] have proposed a S2ST system for travel expressions which might perform translation between English and Hindi and is predicated on applied Statistical Machine Translation approach. During this system speech recognition is meted out mistreatment HMM based mostly acoustic models at word level. The transition between each language happens with the assistance of 3 major modules particularly, speech recognition, computational linguistics and speech synthesis. ASR system is employed that is liable for changing speech signal in language A to corresponding text in same language. ASR system uses HMM to coach the system. Once, the text is obtained the Machine Translation (MT) system comes into image. Here a applied Statistical Machine Translation (SMT) supported Bayesian criteria is employed. This SMT performs the task of changing the text in language A into text in language B. The results of the SMT produces translation for every word within the target language.

P. Kumar, et. al. [5] have proposed a system that aims at translating text from English to Hindi using stepwise procedure. Firstly, the English sentences are stored in file. These sentences are passed to the syntax analyzer for checking their correctness and grouping. The grouping is done on the basis that some words like places; names which do not require translation. These groups are passed to synthesizer. Synthesizer contains Hindi dictionary, encyclopedia and web mining. Hindi dictionary gives the Hindi meaning of English sentence. If any English word which is not in Hindi dictionary are searched into the encyclopedia. If any word which is not in both will be searched through web. The words which are not present in all three are marked as a wrong word. The syntax matcher takes the Hindi words of the respective English word from synthesizer and replaces that English word with Hindi word.

O. Dhariya, et. al. [6] have proposed a system that has been implemented in a sequence of four primary steps: Segmentation, Translation, POS, Tagging and Rearrangement. Segmentation is performed through first finding all possible sub-parts in the sentence belong to parallel Hindi-English database. Later, the remaining components of the sentence would be broken into words. At the top of this stage, output would have set of phrases, straightforward sentences and words. per POS, proper name denotes a selected name used for a personal person, place, or organization. Tagging is that the method to spot the linguistic properties of every individual matter unit. The parallel Hindi-English lexicon contains the tag of every English word. Depending upon the assigned tag, the system finds the proper grammatical structure for the sentence and rearranges the words to construct a grammatically correct sentence. All the segments whether words or partial simple sentences are translated individually. Depending upon the assigned tags to the words, a matching grammar rule is selected for the given input.

N. Raju, et. al. [7] have proposed a system in which a corpus for Statistical Machine Translation system by using the parallel text of Telugu and English languages was developed. In the initial phase, the data is prepared by tokenizing the corpus, Filtering out long sentences and lower casing the corpus. Statistical machine translation mainly consists of Language Model, Translation Model and decoder. The Language Model will determine the probability for the target language. This is most important in SMT because it can achieve the adequacy and fluency for the translated text. It will survive two purposes that is word order and word choice. In word order, it specifies which word would precede the sequence of words. In Word choice, there will be set of words for a translated word from which a single should be selected. Here the probability is decomposed by using Markov chain rule. In word choice, probabilities are calculated for words instead of sentences because no translation model is capable for calculating the probabilities in sentence level. In this a TM called Phrase Based Translation Model is used, it divides a sentence into smaller number of phrases and then each phrase is translated one at a time. Decoder is used to maximize the probability of translation. Here the word for translation is chosen by using maximum likelihood. In the search space it finds the best probability of all possible translations. It finds the most probable translation. It makes use of heuristic search to find the best translation. Thus, the input to the system is a Telugu sentence and the output will be English sentence.

Y. Ghadage, et. al. [8] have proposed a system that is divided into two phases i.e. training and testing. First in training phase speech utterances of each sentence is recorded. Speech signal is preprocessed and segmented into words. For each word acoustic features are extracted using MFCC method. Such features for each word forming feature vector is stored for reference. In testing phase the



speech utterance to be tested is preprocessed, segmented into words and features are extracted for each word. These features are compared with the reference feature vector stored during training phase. This is done by using combination of SVM and Minimum Distance Classifier. The word having minimum difference is given as recognized word. The system is trained with the training database and the recorded speech utterances stored in test database are used to test the system. Minimum distance classifier and support vector machine techniques are used for classification purpose. The trained speech samples are saved as reference models into database. After that each segmented speech sample of test speech signal is passed over reference models and minimum distance is computed. Each word recognition is done by using minimum distance and SVM model. The whole system is implemented and tested in MATLAB software.

M. Faisullah, et. al. [9] have proposed a system where overall work describes regarding speech to speech translation (S2ST) system for English to Hindi over Bluetooth network and more it'll be extended to mobile network. This work is completed by keeping in mind regarding 3 modules, that is, Automatic Speech Translation (ATR), Machine Translation (MT) and Text To Speech (Speech Synthesizer) modules. ATR captures the speech from mobile devices and converts it into text and it uses Bluetooth network for causing. Along with these 3 modules, one more featured module is added for playing translation operation, that is, Bluetooth module. Speech to Speech Translation contains chiefly 3 modules that square measure, Automatic Speech Recognition Module (ASR), artificial intelligence Module (MT) and Text To Speech (TTS) Module. ASR module captures the voice or speech from the mobile device through speaker and identifies the language spoken by the user and converts the speech into text and so the text send to next module. Machine Translation module consists of library for each language and once text is received by this module, it converts the text of 1 language to a different as per user selection and so it sends the translated text to last module.

A. Kaur, et. al. [10] have proposed a system which is started by the pre-processing stage that is a collection of operations, applied on input file so it will become processable for translation engine. Filtering is another major task performed during this part. In filtering, bound special expressions area unit detected and marked like replacement multiple spaces, collocations etc., within the input text. After that, tokenizer split a stream of characters into purposeful units referred to as tokens. The tokenizer takes the generated text as input. Individual words or tokens area unit extracted and processed to generate its equivalent tokens within the target language. The tokenizer, victimization area as delimiter, takes tokens one by one from the text and provides it to translation engine till the complete input text is processed. the interpretation engine is that the elementary part of MT system. It extracts token created by the tokenizer as input and generates the translated token within the target language. These translated tokens area unit concatenated one once another employing a area as delimiter. Then this generated text is passed to the post process part. Post-processing is that the last part of this MT system.

M. Bansal, et. al. [11] have proposed a system where pre-processing of English sentences is done using tokenization, true-casing and cleaning method. It converts the uppercase letters into lowercase letters and reduces length of those sentences which have length more than specified length. Moses tool is used for translating. While translating sentences from English to Hindi some unknown words are left. The extraction of those words is followed by source and target language words enrichment with common-sense knowledge (i.e. ConceptNet). This common sense data is translated using rule-based machine translation system. The translator maps the source word with target language words. The output generated by Rule-based machine translation is then combined with previously generated sentence.

Y. ShweSin, et. al. [12] have proposed a system where a large-scale parallel corpus was created initially. In this corpus, the bilingual sentences from Text Books, on-line Speaking category and native News, as well as BTEC corpus and angular position Corpus, was ready. Preprocessing consists of tokenizing and truecasing. For Word-level Neural artificial intelligence system, Moses's tokenization script was used and UCSY NLP word segmenter to phase English sentences and Asian country sentences severally. Quality analysis metrics such as BLEU (Bilingual analysis Understudy) was used that could be a script from Moses. blue cheese measures the exactness of associate MT system computed through the comparison of the system's output and a group of ideally correct and frequently human-generated reference translations. it absolutely was seen that solely the performance of character-level neural machine translation was higher than the Word level neural artificial intelligence system. The performance of Character level neural artificial intelligence system improves up to two BLEU over Word level neural artificial intelligence system. Character level



neural artificial intelligence system is capable of achieving compared to baseline systems. As a human translator, character level NMT has an impression in learning a much better translation.

P. Salunkhe, et. al. [13] have proposed a system that consists of Parallel Multi-Engines that method applied statistical and rule-based translation for same input document and turn out a optimized result by playacting applied math over rule based that provide fluent language sense outputs. Mapper algorithmic program is been employed in rule based mostly Translation, with Agriculture corpus, medical and touristy corpus for applied math analysis. Sanskrit wordnet has been enforced to boost lexicon and incorporate higher translation result. Current System has been projected for text Document which might be extended to speech and voice. Comparative analysis for purpose read in one dimension of solely restricted set of Queries is finished with Google Translator. Holding hybrid approach as higher methodology. a scientific survey of solely ten key articles employed in analysis has been done. This analysis article is extension of the previous analysis surveys and partial implementations.

S. Singh, et. al. [14] have proposed a system in which the process of translation is carried out through some stages: Preprocessor will provide an interface for the MT System to the web. This module will collect the input text from the web server which is in the form of HTTP request coming from the user. The preprocessing involves segmentation of the sentences, tokenization and POS tagging of the input. This leads to English rule formation for the sentence. If rule is matched with the rules of database, then corresponding Hindi is retrieved to the user. If rule is not matched then we go for the generation of Hindi rules on the basis of English rule formed and that Hindi rule is reordered to get Hindi. The whole focus in the process of machine translation is on the Target language rule generation and on the pattern of how it is aligned. This arrangement of Hindi in its SOV form is known as reordering. Formation of reordering rules has been manually done. These rules lead to the understanding of pattern of Target language formation, on the basis of which probability of occurring of subject-object, object-verb and subject-verb pairs together was obtained. The output accuracy may vary according to the length of the sentences.

### III. ANALYSIS

The analysis of different machine translation approaches and techniques has been discussed in the following table. The BLEU score and accuracy of some papers is shown to get the overview of the technique or the approach.

**TABLE 1: ANALYSIS OF MACHINE TRANSLATION SYSTEMS**

Sr. No.	Title	Techniques used	Real Time System	BLEU score/Accuracy	Limitations
1.	Neural Machine Translation for English to Hindi [3]	Neural Machine Translation (NMT)	Yes	18.21(BLEU)	Fine-tuning of long and rare sentences using smaller data sets is not done.
2.	Hindi-English Speech-to-Speech Translation System for Travel Expressions [4]	Automatic Speech Translation, Machine Translation and Text To Speech.	Yes	-	In this system, the speech recognition is carried out using HMM based acoustic models at the word level.
3.	Syntax Directed Translator for English to Hindi Language [5]	Syntax Directed Translation.	No	60-70%	Accuracy can be increased.

4.	A hybrid approach for hindi-english machine translation [6]	Combined approach of PSMT, EBMT and RBMT is proposed to develop a novel hybrid data driven MT system.	Yes	83-90%	Currently it is not giving the good result on complex and multiple combine sentences it can be extended to be able to perform well for those sentences too.
5.	Statistical Machine Translation System for Indian Languages [7]	Statistical Machine Translation (SMT).	No	-	The results can be better if the size of the corpus is larger.
6.	Speech to Text Conversion for Multilingual Languages [8]	Mel-Frequency Cepstral Coefficient (MFCC), Support Vector Machine (SVM)	No	-	Evaluation techniques can be used for better accuracy of the system.
7.	Multilingual Speech to Speech Translation System in Bluetooth Environment [9]	Automatic Speech Translation, Machine Translation and Text to Speech.	Yes	-	The communication for translation totally depends on the availability of the Bluetooth environment
8.	A Web Based Punjabi to Hindi Statistical Machine Translation System [10]	Machine Translation using SMT.	No	87-97%	It is a one-way Translation System and can be implemented in reverse mode.
9.	Improvement of English-Hindi Machine Translation using ConceptNet [11]	ConceptNet	No	27.09 (BLEU)	Accuracy can be increased.
10.	Large Scale Myanmar to English Neural Machine Translation System [12]	Neural Machine Translation.	No	Word Level 21.88(BLEU)  Character Level 23.92(BLEU)	It can be seen that the performance of character-level neural machine translation is better than the Word level neural machine translation system.
11.	Hybrid Machine Translation for English to Marathi [13]	Hybrid: Statistical translation, Rule based translation	No	-	At times system may generate translation with synonymous words and reference translation do not contain them so system evaluation for automated translation fall in value which is bug.
12.	Syntax Based Machine Translation using Blended Methodology [14]	Syntax based translation	No	58.85%	For better accuracy the system needs a smaller number of words.

#### IV. CONCLUSIONS

In this paper detailed study of several machine translation approaches and their techniques with respect to the BLEU scores has been done. This will help one to decide which approach to choose while translating from English to any Indian language. The accuracy of the model is measured with BLEU score stating how good the model is. With recent developments in Neural networks for Machine Translation one can create a model with faster speed and better accuracy. This can help in having a real time translation system with better translation quality. As digital literacy has been improving in rural areas, the cloud based translation model can also be deployed with NMT which can then deter the language barriers among people in India by having a real time speech to speech translation system.

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## System for Fingerprint Image Analysis

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**Abstract**— As we know the fingerprint is unique of every living objects. It is quite difficult to find out the prints. Usually the Forensics use Fine powder and duct tapes to identify the prints of living object. As powder is exceptionally muddled, so such molecule can cause loss of information after that examination the information is coordinated with the system. The proposed system consists of an embedded device in which it consists of ultra light light to glow the fingerprints details. After that we can detect the fingerprint, analysis and it will checks on the database, and it will return the output after matching. For matching and analysis of the Fingerprint, we will be using the Algorithm for matching.

**Keywords**—Fingerprint Identification, Image Processing, Machine learning, Open Cv, ultraviolet light.

### I. INTRODUCTION

The Embedded system is designed to do a specific task, design engineers and can advance to decrease the size and cost of item and increment the unwavering quality and performance[5]. The Embedded systems are generally found in consumer, automotive, medical, industry and military applications. As this isn't insignificant to accomplish, we will try a bit by bit approach, moving from straightforward recognition to more complex Fingerprint recognition. The system will be tried utilizing different kinds of tests. Simple tests are introduced to check parts of the system. At last a last test with pictures of real criminal fingerprints picture will show the activities of the total. The proposed system we are implementing the embedded device is to identify the criminal fingerprint by using the ultraviolet lights to identify the unique finger impression of the criminal[6]. By applying the different procedures the images are transformed into suitable format to match the fingerprint details.

### II. LITERATURE REVIEW

Pavithra. R and K.V. Suresh[1]. In this paper they present a crime scene fingerprint identification system using deep machine learning with Convolutional Neural Network. Pictures are gained from crime scene using various strategies ranging from exactness photography to complex physical and substance handling methods and saved as the database. The images collected from the crime scene are usually incomplete and hence difficult to understand. Appropriate enhancement methods are required for pre processing the fingerprint images. Minutiae techniques are extracted from fingerprint images. The features of pre-processed data are fed into the CNN as input to train and test the network.

Samet Taspinar, Husrev T. Sencar, Sevinc Bayram and Nasir Memon[2]. In this paper the work present another new methodology that improves the efficiency of pairwise camera fingerprint matching and incorporates group testing to make the search more effective. Specifically we mutually leverage the individual qualities of composite fingerprints. Fingerprint processes in a novel way and plan two strategies that are better than existing methodologies. The outcomes show that under very high-performance requirements, where the probability to identify is close to one. the proposed search methods are 2 to 8 times faster than the normal search methods.

Pablo David Gutiérrez, Miguel Lastra, Francisco Herrera, and José Manuel Benítez[3]. we present a GPU fingerprint unique matching system dependent on MCC. The many core focus processing system hardware platforms offers an opportunity to enhance

the unique fingerprint matching. Data structure, calculation and memory move, the system that keeps its exactness and arrives at a precise speed contrast with a reference consecutive CPU execution. A rigorous experimental examination over capture fingerprint databases shows the capability of our system. The results open up a totally different field of conceivable outcomes for real time unique fingerprint identification in large databases.

Chenhao Lin and Ajay Kumar[4]. A new way to deal with precisely coordinating such unique mark pictures. Robust thin plate spline is made to increase the model flexible fingerprint distortions using splines. In order to correct such distortions on the contact based fingerprints, RTPS based generalized fingerprint distortion correction model is proposed. The usage of DCM brings the accurate alignment of key minutiae features observed on the contactless and contact-based fingerprints. Further improvement in such cross matching performance is investigated by incorporating minutiae related ridges. We also develop a new database of 1800 contactless 2 Dimensional fingerprints and the corresponding contact-based fingerprints acquired from 300 clients which is made publicly accessible for further research. The results in this paper, using two publicly available databases, validate our approach and achieve outcoming results for matching contactless 2Dimensional and contact based unique fingerprint images.

Turki Aljrees, Daming Shi, David Windridge, William Wong[5]. In this paper, a modified k-mean algorithm is proposed. The data point has been allocated to its suitable class or cluster more remarkably. The Modified k-mean algorithm reduces the complex nature of the numerical computation, thereby retaining the effectiveness of applying the k-mean algorithm. The experiments show that the modified K-means algorithm leads to a better way of observing the data to identify groups and their similarities and dissimilarities in the criminal dataset as a specific domain.

Mouad.M.H.Ali, Vivek H. Mahale, Pravin Yannawar, And A. T. Gaikwad[6]. In this paper the fingerprint databases used are FVC2000 and FVC2002 Databases, we see that the FVC2002 database performs better results compared with FVC2000 database. The recognition system evaluates with two factors FAR and FRR. In this system the result of FAR is 0.0154 and FRR is 0.0137 with Accuracy equal to 98.55%.

Richa Jani and Navneet Agrawal[7]. This paper proffers the score level of fusion with feature extraction that can be espoused to consolidate the scores attained by fingerprint and vein and new approach fusion with alignment that are credible and the integration strategic that can be espoused to overlapped the features attained by fingerprint and vein. Fusion techniques include processing biometric modalities successively until an adequate match is obtained.

HAO GUO[8]. In this paper a novel method of fingerprint matching, which is based on embedded Hidden Markov Model (HMM) that is used for modeling the fingerprint's orientation field, is described in this paper. The accurate and robust fingerprint matching can be achieved by matching embedded Hidden Markov Model parameters which were built after the processing of extracting features from a fingerprint, forming the samples of observation vectors and training the embedded Hidden Markov Model parameters.

C. Worawong, W. Phutdhawong, and S. Jirasirisak[9]. In this paper the development of fluorescence chemicals in the detection of latent fingerprints on a nonporous surface has been studied. The properties of aromatic chemicals, anthracene and naphthalene have been examined. UV light at a wavelength of 365 nm was used as a detector. The fingerprint development was evaluated by counting the resulting minutiae using automated fingerprint identification system (AFIS). The results showed good sensitivities only for anthracene. The effect of temperature on the fingerprints appearance was also studied. The latent fingerprint which was developed by anthracene was no longer observable at temperatures above 100°C.

Stefan Kiltz, Mario Hildebrandt, Jana Dittmann, and Claus Vielhauer[10]. In this article we review and summarise the current state of the art of applicable sensing and pre-processing techniques and identify challenges: the need for the integration of different process models, the determination of sensor parameters, the choice of sensor types for different surfaces, the challenge posed by non-planar surfaces, the influence of dust and dirt, the age detection and separation of overlapping fingerprints and the ongoing extension of an existing benchmarking scheme. Beside single-sensor tuning and multi-sensor fusion approaches for quality improvement of 3D scan data for localisation, acquisition and analysis of fingerprint traces,

Naja M I and Rajesh R[11]. In this paper the performance of a minutiae extraction algorithm relies heavily on the quality of the input fingerprint images. Here introducing a fast fingerprint enhancement algorithm, which can adaptively improve the clarity of ridge and valley structures of fingerprint images based on the estimated local ridge orientation and frequency and evaluated the

performance of the image enhancement algorithm using the goodness index of the extracted minutiae and the accuracy of an online fingerprint verification system.

Xiang Ming, Wu Xiaopei and Hua Quanping[12]. In this paper a new thinning algorithm based on the centroid of the block is presented. The new algorithm checks the 9\*9 local neighborhoods around the pixel to find out the centroid pixel of the block, and other pixels are removed. The process is performed iteratively until less than ten pixels are deleted in one loop. To ensure the ridge is one pixel wide, a post-processing loop is designed and the pixels are deleted from the image if they satisfy some conditions. Experimental results are used to compare this new algorithm to other algorithms and their relative performances are assessed. The new algorithm is fast than other algorithms and the ridges are one pixel wide after thinning.

Damir Demirović, Emir Skejić, Amira Šerifović-Trbalić[13]. In this paper image processing algorithms were evaluated, which are capable of executing in parallel manner on several platforms CPU and GPU. All algorithms were tested in TensorFlow, which is a novel framework for deep learning, but also for image processing. Relative speedups compared to CPU were given for all algorithms. TensorFlow GPU implementation can outperform multi-core CPUs for tested algorithms, obtained speedups range from 3.6 to 15 times.

S.SELVARANI M.C.A.,M.Phil, S.JEBA PRIYA M.C.A.,M.Phil, R.SMEETA MARY M.C.A.,M.Phil[14]. Fingerprint alteration refers to the deliberate alteration of the fingerprint pattern by a person for masking his/her identity. This paper presents a new method for identifying and detecting altered fingerprints based on fingerprint orientation field reliability. The main contributions of this paper are compiling case studies of incidents where individuals were found to have altered their fingerprints, analysis by investigating the impact of fingerprint alteration on the accuracy of a commercial fingerprint matcher, classifying the alterations into three major categories and suggesting possible countermeasures, developing a technique to automatically detect altered fingerprints based on analyzing orientation field. Experimental results show the feasibility of the proposed approach in detecting altered fingerprints and highlight the need to further pursue this problem.

Abinandhan Chandrasekaran, Dr. Bhavani Thuraisingham[15]. The proposed algorithm requires no explicit alignment of the two to-be compared fingerprint images and also tolerates distortions caused by spurious minutiae points. The algorithm is also capable of comparing and producing matching scores between two images obtained from two different kinds of sensors, hence is sensor interoperable and also reduces the FNMR in cases where there is very little overlap region between the base and the input image. We conducted evaluations on the FVC-2000 datasets and have summarized the results in the concluding section.

**Table 1. Analysis Table**

Sr No	Title Name	Techniques	Advantage	Disadvantage
1	Fingerprint Image Identification For Crime Detection.[1]	Convolutional Neural Network (CNN) as input to train and test the network.	Using Cnn classifier, improved fingerprint identification accuracy.	It requires a large amount of dataset.
2	Fast Camera Fingerprint Matching In Very Large Databases.[2]	The composite-digest search tree approach is approximately 2 times faster than CFST and LSFD.	Fingerprint digest ideas speed up the task of source camera identification with no performance drop.	The increase in the number of fingerprints, the share of each fingerprint in the composite will decrease and the match decision will become less reliable.
3	A High Performance Fingerprint Matching	minutia cylinder-code (MCC) is used for	In this paper, we present a GPU(Graphics	Discarded minutiae more sensitive to errors and deformations and therefore



	System For Large Databases Based On Gpu.[3]	matching the large database	Processing Units) fingerprint matching system based on MCC(Minutia Cylinder Code).	less reliable.
4	Matching Contactless And Contact-based Conventional Fingerprint Images For Biometrics Identification.[4]	In order to correct such deformations on the contact-based fingerprints, RTPS-based generalized fingerprint deformation correction model (DCM) is proposed.	The fingerprint scale correction algorithm described in previous section results in better alignment between the contactless and contact-based fingerprint images.	Improvement in the accuracy for such matching.
5	Criminal Pattern Identification Based On Modified K-means Clustering.[5]	k-mean algorithm is proposed.	We can quickly identify how many k-mean clusters are needed to initialize the centroid point that will lead to better clustering.	Time consuming.
6	Fingerprint Recognition For Person Identification And Verification Based On Minutiae Matching.[6]	Minutiae extractor methods to extract ridge ending and ridge bifurcation from thinning.	Accuracy is equal to Previous system.	Large dataset required
7	Biometric Security Using FingerPrint Recognition.[7]	Fusion techniques include processing biometric modalities successively.	By using sensors the extraction is easily done.	Comparatively complex to design.
8	A Hidden Markov Model Fingerprint Matching approach..[8]	Hidden Markov Model (HMM)	The performance is good and robust.	Sensitive to the noise and distortions of a fingerprint image.
9	The Study of Fluorescent Chemicals for Fingerprint Development.[9]	The fingerprint development was evaluated by counting the resulting minutiae using automated fingerprint identification system (AFIS).	The prints developed by Anthracene display greater clarity than those developed using Naphthalene on every surface in this study.	Fingerprints did not appear to give useful results under any of the selected light sources.

10	Challenges In Contact-less Latent Fingerprint Processing In Crime Scenes. [10]	Using new contact-less acquisition sensors enables a more detailed investigation of a trace	Increased significantly recently to overcome disadvantages of traditional dactyloscopic techniques.	The contact-less acquisition, dust and dirt can degrade and in rare cases enhance (semi-) automated processes.
11	Fingerprint Image Enhancement: Algorithm and Performance Evaluation.[11]	minutiae extraction technique	Improve the clarity of ridge and valley structures based on the local ridge orientation and ridge frequency estimated from the inputted image.	Corrupted fingerprint images and they are extremely harmful to minutiae extraction.
12	A Fast Thinning Algorithm for Fingerprint Image.[12]	Thinning Algorithm checks the 9*9 local neighborhoods around the pixel to find out the centroid pixel of the block, and other pixels are removed.	An effective thinning algorithm should reduce ridges to one pixel thickness and has high speed.	Algorithm turns out to be not the perfect algorithm for thinning because it does not work on all images.
13	Performance of some image processing algorithms in TensorFlow.[13]	All algorithms were tested in TensorFlow, which is a novel framework for deep learning, but also for image processing.	The performance of tensorflow is good	From the experiments we cannot expect significant improvements for GPU using CUDA
14	Automatic Identification and Detection of Altered Fingerprints.[14]	A new method for identifying and detecting altered fingerprints based on fingerprint orientation field reliability.	A set of features are rst extracted from the ridge orientation eld of an input fingerprints and then a fuzzy classifier is used to classify it	The lack of public databases containing altered fingerprints has further research on this topic.
15	Fingerprint Matching Algorithm Based on Tree Comparison using Ratios of Relational Distances.[15]	fingerprint image enhancement based on STFT (Short Time Fourier Transform) analysis to improve the overall clarity of a fingerprint image and also provides it in a binary format.	The algorithm considers only those points that feature in the Candidate Common Point List to create the tree.	It requires a bulky database to matching.

### III. MATERIAL AND METHOD

The images collected from the crime scene are usually incomplete and hence difficult to categorize. Suitable enhancement methods are required for pre-processing the fingerprint images. It also requires high-end hardware to train the images. It has additionally been demonstrated that this camera unique mark is difficult to expel or produce and endures a large number of activities performed on the picture, for example, such as blurring, scaling, compression, noise, etc.



Figure: normal Image taken



Figure: Filter Apply Image

The fingerprints shown in the crime scene are obtained from the crime spot are converted into digital image form and these images are formed as dataset[1]. After the image acquisition the pre-processing method was done, for image pre-processing analysis and it will check on the database[3], and it will return the output after matching.

The ultimate goal of Fingerprint recognition is to be able to recognize a Criminal no matter what the circumstances (surface, condition, temperature, etc.). As this can be not unimportant to attain, we are going to attempt a step by step approach, moving from straightforward shape acknowledgment to more complex Unique mark recognition. The framework will be tried utilizing distinctive sorts of tests. Basic tests are presented to check parts of the framework. In the end a final test with pictures of actual criminal fingerprints image will show the workings of the complete system[2]. All of the work portrayed has been actualized and tried in Python. The made versatile frameworks are tried as completely as conceivable. Due to the imperatives of computational control and time in some cases tests have been less broad in arranging to create ways for testing more varieties.

### IV. CONCLUSION

We trained an Embedded system model at a portable platform and applied the trained model into an Embedded System. As a baseline, we have our system model trained by Raspberry pi 3 flow. What does the future hold for Fingerprint Identification Given sufficient entrepreneurial originators and adequate inquire about and advancement dollars, Fingerprint Detection can become a most valuable tool for future applications. Fingerprint Detection is a very difficult task considering the diversities that exist in ordinary penmanship. However, progress is being made to make it vast and accomplish it at more advanced level. The Fingerprint Detection using Embedded System can be enhanced in various kinds of ways such as Training and Detection speeds can be expanded more prominent and more prominent by making it more user-friendly. Many applications exist where it would be desirable to detect multiple objects.

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# Understanding Smart Cities: An Integrative Structure

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**Abstract**— Making a city "smart" is rising as a system to alleviate the issues created by the urban populace development and quick urbanization. However little scholastic research has sparingly talked about the wonder. To close the crevice in the writing about brilliant urban communities and in light of the expanding utilization of the idea, this paper proposes a structure to comprehend the idea of smart cities. In light of the investigation of a wide and broad cluster of writing from different disciplinary regions we distinguish eight basic variables of smart city activities: Management and organization, technology, governance, policy context, individuals and groups, economy, manufactured framework, and natural environment. These variables shape the premise of an integrative system that can be used to look at how neighborhood governments are imagining shrewd city activities. The system recommends headings and plans for brilliant city research and frameworks down to earth suggestions for government experts.

**Keywords**— ICT, MoUD, smart cities, urbanization, ULBs.

## I. INTRODUCTION

The greater part of the total populace now lives in urban regions. This move from a basically rustic to a basically urban populace is anticipated to proceed for the following couple of decades (see <http://www.unfpa.org>). Such huge and complex assemblages of individuals definitely have a tendency to turn into untidy and cluttered spots [1]. Urban communities, megacities, create new sorts of issues. Trouble in squander administration, shortage of assets, air contamination, human wellbeing concerns, activity blockages, and lacking, breaking down and maturing frameworks are among the more essential specialized, physical, and material issues. Another arrangement of issues are more social and authoritative in nature as opposed to specialized, physical or material. Issues of these sorts are related with different and various partners, abnormal amounts of reliance, contending targets and qualities, and social and political many-sided quality. In this sense, city issues wind up noticeably insidious and tangled. Guaranteeing reasonable conditions inside the setting of such fast urban populace development around the world requires a more profound comprehension of the savvy city idea. The direness around these difficulties is activating numerous urban communities around the globe to discover more intelligent approaches to oversee them. These urban communities are progressively depicted with the mark shrewd city. One approach to conceptualize a keen city is as a symbol of a practical furthermore, decent city. Despite the fact that there is an expansion in recurrence of utilization of the expression "shrewd city", there is as yet not an unmistakable and steady comprehension of the idea among professionals and the scholarly community. Just a set number of considers explored and started to deliberately consider questions identified with this new urban wonder of brilliant urban communities. This paper endeavors to begin filling this crevice by distinguishing vital patterns and recommending research plans about urban areas as they contribute in better approaches to wind up "savvy." By investigating a broad exhibit of writing from different fields, for example, e-government, data science, urban examinations, and open organization, we recognize and talk about challenges, achievement variables, and effects of government-driven activities to that make a city savvy. We distinguish eight center parts of keen city activities, and propose an incorporated calculated system to direct future "keen city" thinks about.

## II. THE DEFINITION OF A SMART CITY

A splendid city uses Information and Communication Technology (ICT) to redesign its sensibility, work ability and supportability. In slightest complex terms, there are three segments to that occupation: assembling, passing on and "crunching." Initial, an intelligent city accumulates information about itself through sensors, distinctive devices and existing structures. Next, it gives that data using wired or remote frameworks. Third, it "crunches" (explores) that data to appreciate what's happening now

and what's presumably going to happen next. Social affair data. Splendid contraptions are brilliantly arranged all through the city to measure and screen conditions. For instance, canny meters can gauge power, gas and water usage.

### III. UNDERSTANDING SMART CITIES

Urbanization has fundamentally extended over the span of late years. In 1951, the urban population in India was 62 million people, 17% of the total population. By 2011, the urban population was 377 million, or 31%. By 2025, 42.5% of the population will be urban [2]. Even though the percentage of the population living in urban areas is quite small compared to developed countries, their presence is causing a lot of problems: unemployment and underemployment, and shortage of basic amenities like water supply, sanitation, sewerage, and electricity [3]. Fig. 1 shows reasons for migration by people of India. The main problem is housing. Cities have very large slum populations. Mumbai has almost 50% of the population living in slums. Kolkata has 32% of the population living in slums. Uber urban zones with a colossal number of inhabitants are no additionally exceptional. This centralization of masses inside urban regions speaks to different challenges similar to both city organization and society's lives. Subsequently, "more sharp" courses of action are vital to better address creating essentials in urban conditions. Smart urban groups have ensured a central position in the improvement inspiration of governments, ask about affiliations, and advancement traders, posing unique and troublesome challenges similarly as issue zone, expansion, and significance. From an examination perspective, astute urban zones are normally interdisciplinary: they require examination and joint effort over a couple of controls, crossing from money related issues to human sciences, from authoritative issues to structure organization. Specifically, researchers are adequately looking for after advances in information and correspondence propels. This interest has a trademark fixation around Web progresses. This one of a kind issue depicts a game plan of research tries addressing the bleeding edge in the field, including supervising and translating information from web based systems administration, imperativeness establishments, structures, and other sensor systems.

### IV. SMART CITY CHALLENGES AND SOLUTIONS

Research on brilliant urban areas has additionally been pushed forward by the constantly expanding accessibility of information identified with the urban condition. Open challenges incorporate how to speak to and reason on the spatial, transient, and relevant angles of this information, and additionally the expanding request for hunt and investigation capability [4][5]. Dealing with the life cycle of city information requires de-noising, cleaning, anonymization, and security assurance. Coordinating heterogeneous wellsprings of urban information including sensors and web-based social networking calls for encourage investigation of combination, elucidation, lifting, collection, investigation, what's more, connection techniques [6]. City frameworks are progressively pervasive and pervasive[7]: this infers a requirement for propels what's more, enhancements in programming building and benefit arranged structures, together with adaptable preparing of disseminated, organized, dynamic, or heterogeneous city information.

Having perceived that urban areas are the motors of development and are drawing a million people each moment from rustic regions, the Government has presented the Smart City Challenge', giving over the onus of arranged urbanization to the states [8]. In the way to deal with the Smart Cities Mission [9], the goal is to advance urban communities that give center framework and offer personal satisfaction to natives, a perfect and maintainable condition and use of "smart" arrangements. Those states that measure up to the rules and name urban communities could get financing of ₹100 crore for each year per city for the following five years. The subsidizing is a brilliant possibility for states to revive their urban territories yet the Smart Cities Mission still has its own particular difficulties to confront. Here are the main challenges [10]:

1. Retrofitting existing inheritance city foundation to make it keen: There are various inactive issues to consider while investigating a shrewd city methodology. The most imperative is to decide the current city's feeble regions that need most extreme thought, e.g. 100-per-cent dispersion of water supply and sanitation. The incorporation of some time ago secluded heritage frameworks to accomplish citywide efficiencies can be a huge test.



2. Financing savvy urban communities: The High Power Expert Committee (HPEC) on Investment Estimates in Urban Infrastructure has evaluated a for per capita investment cost (PCIC) of ₹43,386 for a 20-year time frame [9]. Utilizing a normal figure of 1 million individuals in each of the 100 smart urban areas, the aggregate gauge of speculation prerequisites for the savvy city comes to ₹7 lakh crore more than 20 years (with a yearly heightening of 10 for each per cent from 2009-20 to 2014-15). This converts into a yearly prerequisite of ₹35,000 crore [11]. One needs to perceive how these activities will be financed as the greater part of venture need would travel through entire private speculation or through PPPs (Public-Private Partnership).

3. Accessibility of end-all strategy or city advancement design: Most of our urban communities don't have ground breaking strategies or a city advancement design, which is the way to keen city arranging and execution and embodies every one of the a city needs to enhance and give better chances to its residents [12]. Unfortunately 70-80 for each per cent of Indian urban communities don't have one.

4. Financial supportability of ULBs (Urban Local Bodies): Most ULBs are not monetarily self-feasible and tax levels settled by the ULBs for giving administrations regularly don't reflect the cost of providing the same. Regardless of the possibility that extra ventures are recuperated in a staged way, insufficient cost recuperation will prompt proceeded with money related misfortunes.

5. Specialized requirements of ULBs: Most ULBs have restricted specialized ability to guarantee opportune and savvy execution and resulting operations and upkeep inferable from constrained enlistment over various years alongside powerlessness of the ULBs to pull in best of ability at showcase aggressive pay rates.

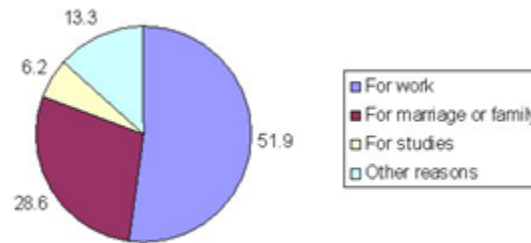
6. Three-level administration: Successful execution of smart city arrangements needs powerful flat and vertical coordination between different foundations giving different city courtesies and also viable coordination between central government (MoUD), state government and nearby government organizations on different issues identified with financing and sharing of best practices and administration conveyance forms.

7. Giving clearances in an opportune way: For convenient fruition of the venture, all clearances should utilize online procedures and be cleared in a period bound way. An administrative body ought to be set up for every single utility administration so that a level playing field is made accessible to the private part and duties are set in a way that adjusts money related manageability with quality.

8. Managing a multivendor domain: Another real test in the Indian smart city space is that (for the most part) programming framework in urban areas contains segments provided by various merchants. Consequently, the capacity to deal with complex blends of savvy city arrangements created by numerous innovation merchants turns out to be exceptionally critical.

9. Limit building program: Building limit with respect to 100 smart urban communities is not a simple undertaking and most aggressive activities are postponed inferable from absence of value labor, both at the inside and state levels. As far as assets, just around 5 for each per cent of the central allocation might be apportioned for limit building programs that emphasis on preparing, logical research, information trade and a rich database.

10. Unwavering quality of utility administrations: For any brilliant city on the planet, the attention is on dependability of utility administrations, regardless of whether it is electricity, water, telephone or broadband administrations. Brilliant urban communities ought to have all-inclusive access to electricity 24×7; this is unrealistic with the current supply and circulation framework. Urban communities need to move towards sustainable sources and concentrate on green structures and green transport to diminish the requirement for power.



**FIGURE 1: Reasons for migration**



**FIGURE 2: Smart solutions**

## V. CONCLUSION

The smart urban communities' idea has picked up a considerable measure of consideration of late and it will in all likelihood keep on doing so later on. Urban communities are distributing brilliant plans, related gatherings are slanting and an ever increasing number of books are being composed regarding the matter. Savvy advances can give answers for urban areas by helping them spare cash, diminish carbon emanations and oversee activity streams. Be that as it may, the many-sided quality of the motivation is frustrating its encouraging. It includes countless (neighborhood specialists, subjects, innovation organizations and scholastics) each having their own vision of what a smart city ought to be; the vast majority of the civil argument gets stalled on attempting to comprehend what "smart" means instead of concentrating on how it can enable urban communities to meet their objectives. Additionally, since the market for brilliant advances is generally new, it needs new plans of action and methods for working which are yet to be produced and executed.

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## Blind Travelling Assistant

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**Abstract**— In today's world the human population is increasing day by day. In that the count of the visually impaired people is also increasing. Traveling is a major task for visually impaired people. They usually take help from other people to reach a particular location. It is not always easy to seek help from unknown people. So to overcome this problem a system is proposed here for Traveling Assistant for the Blind. In this system the user will be specified with the different paths that can be chosen. The user can book a cab for himself/herself or even find out the nearest railway stations, and the timings also the time taken to reach that particular location. Basically the system act as a guide for the blind people to travel any new and unknown places. The system works on GPS (Global Positioning System) by using the source location of the user. For voice it uses the text to speech. The system would help in making with audio and visually impaired to be more self-sufficient. Thus easing their life.

**Keywords**— Basic4Android, Cab System, GPS (Global Positioning System), Speech to Text, Text to Speech.

### I. INTRODUCTION

The most difficult task for any blind or visually impaired person is to travel to any location. Traveling is a major issue for visually impaired people. They sometimes need to take help from other people to reach a particular location. It is not always easy to seek help from unknown people. So to overcome this problem a system is proposed here for traveling assistant for the blind. In this system the user will be guided to how he/she can reach their desired destination without seeking help. The user just needs to open the application and the current location of the user will be detected using GPS (Global Positioning System) [6]. Once the location is detected the user will give a voice command as to which place the user wants to reach. This will be done using the mobile phone mic and further all communication between the user and system will take place similarly. Once the user specifies the destination the system will specified with the different paths that can be chosen. The user can book a cab for himself/herself or even find out the nearest railway stations, and the timings also the time taken to reach that particular location. Basically the system act as a guide for the blind people to travel any new and unknown places. The system works on GPS by using the source location of user. For voice it uses the text to speech. The system would help in making with audio and visually impaired to be more self- sufficient [1].

### II. LITERATURE REVIEW

An electronic based travel aid for the blind is presented in the paper. It consists of the two features a mobile and a remote assistant module. The device is capable of receiving and dispatching text message, handling phone calls and browsing a contact book. Text message, menu, contact book and so on are read by a speech synthesizer which was developed from scratch. The focus of the project is supporting the visually impaired in outdoor environment. The terminal shows the location of blind traveler on the map and the video sequence captured by the camera. The operator guides the blind with the path to the destination provided by the blind. The system comprises two interlinked terminals a mobile of the blind user and a terminal of the remote assistant. The mobile terminal is equipped with a small device housing a camera, headset and a GPS receiver [1].

In this paper it has use the GPS and the GSM module [2]. The only thing to be done with this device is to enter the destination through mobile application which gives user to get the desired path between source location and destination location. The novel interface for the disturbance and the free navigation is proposed to support the navigation system which is easy to handle and the aim in a less disturbing and obtrusive way using the turning algorithm. The android based Personal Travelling Assistant (PTA) basically on touch without encountering any disturbances. The PTA frees the user from requiring their eyes in the navigation system. This device is designed to provide a way of navigating without interaction with any handheld devices. It has been found that vibrotactile communication is very useful effect in improving situational awareness and navigations.

In this paper it monitors people on the move, evaluates their position against the path and alerts caretakers or coaches when unexpected events when unexpected event occur. The smart phone is only used for GPS location. It is used to provide a path. Text message or notification will be send to the coach or caretakers whenever an unexpected situation occurs to allow them to take the appropriate action and resolve the situation. This is composed of the applications that monitors people on the move, evaluates their position against the expected path and alters caretakers or coaches when the user gets in to emergence or in any unconditional situations [3].

In this paper a hybrid model is been developed for high-quality, concatenation based text-to-speech convertor [4]. The speech signal is submitted to analysis and decomposed into a proportioned component with a maximum frequency, plus a noise component. The proportioned component is sum of the sinusoids with frequencies multiple of the pitch. The hybrid model enables and work independent and the continuous control of the duration and pitch of the converted speech. The hybrid text to speech model gives the better performance. The hybrid model proposed in operates pitch synchronously. It separates the speech signals into proportioned components and a noise component and uses a fixed maximum frequency for the harmonic component. The model handles continuous and independent duration and pitch modifications [5].

In this paper the author has explained the Google Maps API and A-GPS (Assisted Global Positioning System). This provides the highest accuracy in positioning in a location based service. In this paper the mobile navigation is used on the basis of Google map browses the query, bus line search, the local position on your phone. Assisted GPS is a system where an outside source such as the assistance which serve and the reference network that help the GPS receiver to perform the specific tasks that is required [6]. In this system the Google Maps API allows users to embed Google Maps in their own Web pages. The development of mobile communication and the popularity of mobile phone users, mobile phone has become one of the main means of obtaining information. This makes it possible it possible to combine the mobile communication technology and google map and GPS.

The author has introduced to information completeness of a navigation system and the broadcasting timings. This paper consists of the use of information completeness and broadcasting time to influence the performance with respect to the walking time required, any missed routes. This was introduced to solve the problem of blind people as it's difficult for them to navigate in a new surroundings. The broadcasting timing at 7 meters requires more time and attention for a blond person, were as the 5 meters is more easy and helpful for broadcasting time. It has explained the new broadcasting pattern of voice information regarding the surrounding area in a very efficient way. Therefore, there are different types of navigation systems for blind is been available in the market, which of them have meet with little success by the in-tended users so far. There is been lack of adoption of this devices because of the cost, usability and performance. However, most of existing GPS navigation systems with blindness people use navigation information is designed for common people [7].

In this paper the author has introduced to a mobile system architecture for blind people. Recently, developing of the Intelligent Electronic Travelling Aid has been came closer to the disable, especially the blinds however, several issues have been brought or came when using it in the real-world, such as non-visual presentation, real-time interaction, and easy-to-use mobile equipment. There a four major units which are voice, speech recognition, GPS and image processing service. These system work on web service interaction. For straight line detections they have used the Hough Transform to reduce the lower and average response time. Radio-Frequency Identification (RFID) which provides the location and the information of location to users. GPRS (General Packet Radio Service) networks is used to calculate the shortest path towards the destination [8]. This uses voice commands to guide the

blind person and will send a voice stream to Microsoft Speech API (MS API) server for speech recognition. Two operations are performed namely Sonar Thread and Beep Thread.

In this paper the author has proposed a blind adaptive beam which is forming algorithm for Global Positioning System (GPS) which combines the cyclic adaptive beam forming (CAB) algorithm with division technique. As it is compare with CAB algorithms and the new algorithm that can be generated and highly gain towards the satellite directions and forms the null in the direction of jammers by constrain including the weight vector and control vector of the CAB algorithm to the orthogonal space of the steering vectors of jammers. The algorithm has the advantages that there is not any requirement of knowledge of the transmitting signals and the locations of the satellite, fast converting speed, and low estimation complexity. The Cab algorithm and Novel algorithm is used. Simulation results are provided to demonstrate the performance of proposed algorithm. The GPS is the satellite-based navigation system which could provide the position, velocity and precise time for users. It is been widely applied and use in both civilian and military fields. While the interferences are strong enough compared with GPS signal, the receiver is unable to recover the navigation information conveyed in GPS signals [9].

**TABLE 1**

**Analysis Table:**

Sr.No.	Paper Name	Advantages	Disadvantages
1	Mobile Travel AID for Blind [1].	The device has the two features the mobile phone and the remote assistant module.  The device is capable of receiving and dispatching text messages.	Costly  Another issue is a camera with is (horizontal 30 degree) which is not sufficient for better guiding.
2	Android Based Personal Travelling Assistant using Turning Algorithm [2].	It uses the GPS and GSM module.  It provides the specified path between the source and destination	The major problem is that the user has to use his continuously to judge the map.
3	Viamigo: A Digital Travel Assistant for People with Intellectual Disabilities [3].	It provides path and sends the alert text message or notification in unexpected situation.	Support communication between the coach and the end user  Make more robust.
4	Design and Implementation of Text To Speech Conversion for Impaired People [4].	It converts text into speech using the Natural Language processing.  And then using digital signal processing (DSP) technology to convert this processed text into synthesized speech.	Make text to speech technology more accessible to a wider range.



5	A Hybrid Model for Text to Speech Synthesis [5].	In this paper a hybrid model developed for high-quality, concatenation based text-to-speech synthesis.	To increase the range of the text to speech accuracy.
6	The Study and Implementation of Mobile GPS Navigation System Based on Google Maps [6].	Basic Google map and query.  In this paper the author has explained the Google Maps API and Assisted global positioning system (A-GPS).	To improve the end user and system navigation.
7	The Design and Evaluation of an Auditory Navigation System for Blind [7].	WLAN security, WEP, WPA	Indecipherable under limited computation capability.
8	A New Mobile Phone System Architecture for the Navigational Travelling Blind [8].	Voice  Speech Recognition  GPS  Image Processing	RFID can be replaced with google maps as it's more precise
9	A Novel Blind GPS Anti-Jamming Algorithm Based on Subspace Technique [9].	In this paper the author has proposed a blind adaptive beam forming algorithm for Global Positioning System (GPS) is proposed, which combines the cyclic adaptive beam forming (CAB) algorithm with subspace technique.	To improve the blind adaptive algorithm.
10	Using GPS and Google Maps for Mapping Digital Land Certificates [10].	Information regarding the google maps, many features for manipulating maps and adding content to the map.	Precision of this application is still the problem.

### III. CONCLUSION

The blind people face major problems while traveling from one place to another and it's not always possible to ask for help, so to solve this problem a system is proposed to help blind and visually impaired people travel to their desired destination. This system will guide the user to reach their destination by communicating through audio commands. The user's location will be detected once the user access the system. The location will be detected using the GPS. Then the system will ask the user for destination where the user wants to reach, and once the destination is provided the system will calculate the distance from the source location to destination location and provide path to reach there. The system will also give information regarding the time and distance from

their present location and according suggest a cab or railway route. The system provides all the details with the audio messages and the user responds back with a voice command. The user can select any option either a cab or railway according to his/her preference and the system will guide them further. The cab system will allow booking of cabs with the voice commands and also the minimum time required to reach the destination.

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# Detecting Alive Human Using Robot for Rescue Operation

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**Abstract**— In the current technological world, the technologies are evolving day by day. These developments make human life easier and more enthusiastic. The new high-speed technologies & growing computer capacity provides advancement in the field of control theory. In the modern world, there are continuous development of the skyscraper buildings & dwellings which increases the risk of losing life by natural calamities and manmade disasters. During earthquakes, landslides, and building collapse, a lot of times, humans are trapped under debris and it becomes impossible to detect their presence by the rescue team. Sometimes, it is impossible to reach certain locations in calamity affected zone. Many models have been proposed for detection of human's presence under the debris in affected zone. This paper analyzes various models developed to find the alive human being during natural calamities.

**Keywords**— *Alive Human Detection, Microcontroller, Natural Calamities, PIR Sensor, Web Camera.*

## I. INTRODUCTION

In current era, natural calamities like Earthquakes, building collapse or manmade disasters often occur and they cannot be stopped. They produce a devastating effect and find no difference among human and material. Hence, many a times humans are buried under the detritus and it becomes impossible to detect their presence. Detection by rescue workers becomes time consuming and due to the vast area, that gets affected it becomes more difficult. Almost all the proposed models were developed using a microcontroller and some set of sensors which commonly includes PIR sensor, Ultrasonic sensor and IR sensor. PIR technology analyzes its environment and looks for a change in present heat signatures. The Ultrasonic sensor and IR sensor are used for proper navigation of the robot in the affected zone.

## II. LITERATURE STUDY

Zia Uddin, et. al. [1] has developed a robot which is able to find a live human being with the help of PIR sensor from deep point of the disaster area. It uses a Joystick & RF technology to control robot and work with the control point. Ultrasonic sensor is placed for detecting obstacle for navigation of robot and has a gas sensor to detect gas leak in the affected area. IP Camera is integrated to analyze the conditions which will assist human detection with the highest chance of success in such a situation. The first level includes a PIR sensor that detect human presence by radiated infrared wave & second level is IP camera that confirms the presence of humans in the affected area. Because of the two levels human detection system the system is reliable for rescue missions. The microcontroller is programmed using the C language and ARDUINO IDE. The system provides good results and it is cost effective. Since it has joystick mechanism, hence it is handy to use.

Murulidhara T C, et. al. [2] proposed the design and implementation of an Unmanned Vehicle using ARM7 microcontroller along with web camera, pulse sensor and temperature sensor to detect the affected human beings in disaster environment. IR sensor is included in the model to avoid obstacles in its navigation path. The vehicle navigates through the debris automatically to check the presence of human life. As soon as it detects the presence of human, it checks the accident person's pulse rate, body temperature

and sends these data along with GPS location information to the base station through ZigBee Transceiver. ZigBee is used to send & receive data between robot and control unit. The base station receives the longitudinal and latitudinal location of affected humans through ZigBee Transceiver and display this information on monitor to speed-up the rescue operation. The hardware design consists of low cost, easily available & reliable components.

Rahu Krishna K, et. al. [3] has developed an autonomous robotic vehicle that moves in the earthquake prone area and helps in identifying alive people. It has sensors that detects the presence of the human being and indicates the presence to user. As stay the human body emits thermal radiation, which is received & manipulated with the aid of PIR sensor to detect human presence. Once the human located, it immediately gives and audio & visual alerts to the authorities. The PIR sensor is assembled on a robot which can operate in the areas which are prone to earthquakes. The robot has a 3-wheel geared driver & DC motors attached for forward, reverse, left & right actions. The controlling device of the system is a Microcontroller to which RF receiver, PIR sensor & DC motors are connected. The remote control has control buttons interfaced to RF transmitter. Whenever a button pressed, the data related to that button transmitted through RF transmitter to microcontroller. The microcontroller processes this data and acts accordingly and sends required control signals to the robot's motor drivers. PIR sensor is interfaced to the microcontroller which continuously monitors human presence and indicates to the controller. The controller alerts through buzzer if human presence is detected.

Sabyasachi Bhowmick, et. al. [4] designed a simple Robot that detect the human with a new way. System has an inputs that are a PIR sensor, Ultrasonic Sensor, IR sensor. Ultrasonic sensors & IR sensor used for navigation of the Robot. PIR Sensor is used for searching human presence. RF transmitter is used to send the information of human presence & is received the information through the receiver circuit. Next receiver immediately generates output which turns the buzzer/alarm and it displays ON. A program is written and executed for the purpose of using AVR Microcontroller. Two DC motors are connected with wheels, & one castor wheel is connected to help the robot in navigation. 9V battery was connected as power source. While testing the robot, many obstacles were placed in the path and the ROBOT detected those obstacles successfully and the Ultrasonic Sensor was able to detect its path every time. At the second part when a human was in the range of 4 ft. of the PIR Sensor, PIR sensor make a robot stopped and started analyzing the output and turning the RF transmitter ON. On the other hand, the RF receiver received the transmitted signal showing an output to the LCD as 'Human Detected'.

Saravana Kumar K, et. al. [5] proposed a robot which is used to detect human to overcome robbery and to enhance security measures. The robot has receiver side and the transmitter side. The transmitter is of ATMEGA328 microcontroller PIR sensor takes a input of microcontroller, and an Obstacle sensor. The outputs are displayed on RF transmitter & L293D motor drive module that is connected to DC motor. The DC motor is there to move the robot in left, right and forward and backward directions. PIR sensor is used to detect presence of human. The PIR sensor has limited range up to 12ft and has an angle of rotation 180 degree. At receiver end has of ATMEGA328 microcontroller. Its input & output are buzzer and a RF receiver. After reviving the signal by the RF receiver, it notifies the Arduino. Arduino sends a signal to the buzzer, which makes the buzzer to sound continuous beeps. This beeping shows that there is a human to the rescue team. This system is capable of detecting the presence of human in the range of 10-12ft successfully.

M.Brem Kumar, et. al. [6] proposed a system that uses camera module and ultrasonic sensors that analyses the conditions to find the presence of human. The proposed model is used to detect human and uses a low- cost camera that helps of to video the scene as needed. Additionally, other sensors include temperature, fire and metal detector works as bomb sensor to detect the presence of bomb in war field & in rescue operations. As soon as it detects a sign of a living human, the ultrasonic sensor triggers the camera to stream live scene. The video is then displayed on the screen. This approach needs a relatively small number of data to be acquired & processed during the whole operation. Like this, the real-time cost of processing and data transmission is considerably reduced. This system has the potential to achieve high performance in detecting alive humans in affected environments quickly and cost

effectively. The detection depending on multiple factors such as the body position and the light intensity of the scene. Results show that the system provides an efficient way to track human motion in devastated environment.

Mr. S.P Vijayaragavan, et. al. [7] has developed an autonomous robots that moves within the affected earthquake prone areas which helps in identifying the humans. The system is developed using Embedded Microcontroller PIC16F877A, ZigBee Transmitter and Receivers, PIR sensor and also other supporting components. The benefits of using PIC16F877A is that it provides maximum clock frequency up to 20MHz and faster than other controllers. ZigBee transceiver is used to transmit and receive data between robot and therefore the control unit. Passive Infrared (PIR) sensor is used to detect alive human. As live physical body emits thermal heat Radiation which is captured by PIR sensor to identify alive humans. They also developed an on screen application to manage the robot using Visual basic. The system is safe for the user due to use of robotics and no manual work. The user just has got to control the robot and do necessary action as soon as user receives the positive signal from the system.

Mohit Bais, et. al. [8] discussed a new approach for detection of alive human beings in natural calamities and man-made disasters using a specific set of sensors, ATMEGA16 Microcontroller, GSM technology and PLC systems. The proposed alive human being detection system is developed using a specific set of sensors which includes PIR, temperature, vibration, IR, Ultrasonic detector, Bluetooth module HC05 transmitter & receivers. They all together give the information about the presence of a living human body in calamity affected zone. PIR and IR sensors are used to detect the presence of humans. Obstacle sensors detect the obstacle & the analog signals are received by AVR microcontroller. AVR is programmed to send the human presence information to remote control place using the GSM modem. Signals from PIR sensors are transmitted to the microcontroller which will digitize the signal and transmit it to the RF Transceiver Bluetooth module. RF transceiver is used to transmit and receive data between robot and the control unit.

Shwetha R, et. al. [9] aims to develop a cost-effective robot, which works using AVR microcontroller, PIR sensor, IR sensor etc. The system is employed in areas where rescue is required. The robot senses the body heat temperature using PIR sensor and alarm which indicates the signal when it detects alive physical body, then message is shipped through SMS through GSM technology to enable operation. PIR sensor is directly connected to the digital pins which is operating at 5V DC. The motion is to be detected by checking for a sudden change within the affected area. Obstacle sensors are used to detect the obstacle and is used to send the analog signals to AVR Microcontroller. AVR controller is programmed to navigate and manage the robot automatically counting on obstacle detected. PIR sensor detects the human at affected area which are alive and signal is given to AVR microcontroller. AVR is programmed to send the alive human presence information to remote place using the GSM Modem. The system is remote controlled & designed for limited range. RF frequency range is 434 MHz and remote controlling is meant for limited distance.

Geetha Bharathi, et. al. [10] developed a mobile controlled robotic vehicle which moves in the disaster-prone area & it detects alive human presence in such devastating environments and helps to identify the live people and rescue operations. In this project Passive Infrared (PIR) sensor has been used. The system consists of a Robot section and Control section. Robot section consists of a movable unit, which has Bluetooth module, GPS Receiver, an LCD display, PIR sensor mount on it and a microcontroller ATMEGA-328. Control unit consists of a manual control using a remote to control the movement of the robot and a PC interfaced with the robot section using Bluetooth to get the output of GPS receiver. i.e. to find the exact location of the human. Initially, the Robocar navigates in an open field and PIR sensor checks for the alive human. If result is yes, then the GPS shows the exact location of the human in the PC screen that is in the Control section, with the rescuers. This Robot has camera, so as to record and display data when sensor triggers it. As soon as it detects human in its range, the message "Human Detected" is shown on the LED screen.

Shuddha Chowdhury, et. al. [11] developed a Robot model, which roams around the war field, any disaster affected area to detect the presence of alive human in that calamity zone. The robot is designed with full 360-degree movement to move into the war filed, earth quake affected area, to find out the Alive or Survived Human beings. They used 8-bit microcontroller AT89S52, PIR (Passive Infrared) sensor and IR sensor as highlight components and they are configured with other components. PIR Sensor is sensitive to heat or rather the infrared light that is emitted by warm or hot objects like humans. The most often use of the PIR sensor is as an

area sensor, which detects someone moving in the front yard. The logic of PIR sensor is that it must detect significant change of the normal level of heat in the field of its view. The model consists of an IR based human radiation sensor, which picks up signals from human body radiations and gives a signal output. The human body radiates infrared waves with wavelengths of around 8-12 micrometers. Whenever a human being comes under the vicinity of the system, the IR system gives the signal. The robot also has a wireless RF transmitter which sends the message to the remote location whenever it finds any alive human.

Krashna V. Panpaliya, et. al. [12] proposed a robotic system for military zone to detect alive human body. The system has a specific sensors PIR sensor, IR sensor, Heartbeat sensor etc. In addition, has a wireless camera module. PIR sensor is a motion sensor that detects the motion of the human with the thermal temperature of the environment. It has two modes where robotic system is working i.e. it has a manually operated mode and user controllable mode. System operates on manual mode in which all the used sensors are capable for automatic action, in user controllable mode user, gives the signal to the system that uses RF module, and control it manually. The operations that the system perform is on embedded PIC microcontroller and ZigBee transmitter and receiver. The battery backup is week, due to which they have to use a solar panel. In addition, the system is on GSM technology by using image processor. In camera module, web camera is used and it is used on the robot. By having a camera, the video is transmitted to the receiver and it will transmit the video coverage of the paths that is to be taken. This system works perfectly fine and it can take actions automatically or can be controlled manually.

Asha Gupta, et. al.[13] discussed a new methodology for detection of alive human beings in natural or man-made disasters using some specific set of sensors which includes ATMEGA16 Microcontroller, GSM technology and PLC systems. PIR sensor is there to detect the presence of human. PIR sensor helps to detect the human presence by detecting the thermal radiations emitted by human body. The PIR sensor has a limited range upto 12ft & it can rotate upto 180 degrees. The motive of the system is to develop wireless robot that can be operated via desktop using ZigBee transceiver & it is able to navigate in the disaster environment & try to find human being who need help. Victims may be trapped under debris or in voids, making it difficult to find them and determine their state of health. That's why it is important to select a set of different sensors that are complementary and are able to operate in these conditions. The system also uses WPL soft which is a software for PLC (Programmable logic controller), PROTEUS which is a best simulation software for various designs with microcontroller, BASCOM which is a very powerful and easy to use compiler for the AVR series of micro controllers which are developed by Atmel. It is very much important to choose a set of different sensors which are complementary and are able to operate in the provided conditions.

Midhat Noor Kiyani, et. al. [14] proposed a model which is able to take two maps i.e. localize map and the global map. Using these maps, it generates a shortest path. The proposed system is given a map of the arena to localize itself & plan the path. Map of the area is given to robot before the start of its search and rescue operation. Two maps are used by the robot i.e. primary map and secondary map. Primary map is given in the form of a matrix in which a node represents each block. It can also do obstacle removing from its path. By using this, they map the position of walls and outer rims, and color of the floor of the affected area. The paper involves the robot design which is can localize self in the familiar environment but the not known location. A technique of comparison of primary and secondary matrices was applied for localization, and modified version of Dijkstra technique was implemented for shortest path determination. The robot is able to search for the objects & move them to their respective final destination point in the known environment. As the robot needs to go through the rough terrains and unlevelled surfaces in the real-time event, it must be light as well as small enough even to go through the narrow places.

A. Shobika et. al.[15] proposed a human detection quad-copter which is able to detect alive human being in debris so that timely help can be provided to the victims. The proposed system comprises of Passive Infrared sensor (PIR) that provides the information about the presence of alive human being. Radio Frequency (RF) Technology is used to control the quad-copter. ATMEGA8A microcontroller gives an alerting message for the rescuer of the affected sites, so that they can give proper rescue to the victims. In disaster environment, it is great help to rescuers in detection of alive humans in the proper time. The system is user-friendly, semi-autonomous, economical & efficient. The system is a quad-copter that fly in a disastrous environment and helps in identifying the alive people and rescue operations. A PIR sensor is used, it emits infrared radiations for the detection of humans. Alive human



body emits thermal radiations which is received & manipulated by PIR sensor for detection of humans. Once human is located, it immediately gives audio alert to the rescuer, so that help can be provided to the live person very fast. This PIR sensor is placed on a moving each direction quad-copter which can fly in the earthquake prone areas.

### III. ANALYSIS

The Table given below is a summary of research papers on assisting visually challenged. It states the different techniques used for assisting sightless and also highlights their advantages and disadvantages.

**ANALYSIS TABLE**

Sr. No.	Paper Name	Technique Used	Advantages	Disadvantages
01.	Search and Rescue System for Alive Human Detection by Semi-autonomous Mobile Rescue Robot.[1]	Arduino, PIR sensor, Ultrasonic sensor, RF technology, Camera module.	The robot is controlled using joystick mechanism which is handy to control. It is 2 level detection system and cost effective.	PIR sensor can detect humans only if he is somewhat visible. The sensor has the rotation range of 180 degree.
02.	Unmanned Vehicle to Detect Alive Human During Calamity.[2]	ARM 7 controller, IR sensor, Viola Jones algorithm.	The vehicle sends the Longitudinal & Latitudinal information about location of affected human with his/her pulse rate, body temperature.	This implementation requires a computer system to get the desired output.
03.	Wireless Human Detection Robot [3]	PIR sensor, RF transmitter and receiver, three-wheeler robot.	The system proposes a wireless robot which can be mobilized. The system can monitor the environment in real time.	The system is cost ineffective due to use of expensive components in the controller.
04.	An Approach to Design a Simple Human Detecting Robot for Cost Effective Home Security System as well as Various Rescue Missions [4]	ATMEGA-32, PIR sensor, Ultrasonic sensor, RF transmitter and receiver, LCD.	It can detect human in any environment irrespective it is day or night.	The system is unable to detect humans in debris.
05.	Human Detection Robot using PIR Sensors Device. [5]	ATMEGA328 microcontroller, PIR sensor, RF Transmitter and receiver.	PIR sensor helps to detect the human presence by detecting the heat.	The accuracy of the system reduces in open channel due to PIR sensor.
06.	Alive Human Body Detection system using an Autonomous Mobile Rescue Robot.[6]	Ultrasonic sensor, Temperature sensor, Fire sensor, Bomb sensor, RF module.	The system requires small amount of data to be acquired for processing purpose.	The system has cost, size and environment related difficulties.
07.	Live Human Detecting Robot for Earthquake Rescue Operation.[7]	Microcontroller PIC16F877A, ZigBee Transmitter and Receivers, PIR sensor.	The System is safe even for the user because of the use of robotics and no manual	Battery backup and cost are the major issues with the proposed

			work.	system.
08.	Alive Human Detection Robot.[8]	P89V51RD2BN Microcontroller, PIR sensor, IR sensor, PLC logical programming.	The system is developed using specific set of sensors, ATMEGA microcontroller etc. The system uses transceiver which is Reliable and accurate.	Battery backup for camera module is weak. The cost of using high range sensors may be high.
09.	Automatic and Manual controlled Alive Human Detection Robot during disaster management.[9]	PIR sensor, IR sensor, AVR microcontroller GSM technology.	The system uses GSM technology to get the live location of affected human.	The system does not provide the exact position of human in the debris or buildings.
10.	Alive Human Detection in Disaster zones using manually controlled robots.[10]	Microcontroller ATMEGA-328, PIR sensor, GPS module, Bluetooth module.	The proposed system uses PIR sensor for human detection. It is cost effective than existing system.	It requires a computer system to be installed at disaster prone area.
11.	A Proposal of User Friendly Alive Human Detection Robot to Tackle Crisis Situation.[11]	Microcontroller AT89S52, PIR sensor and IR sensor.	The robot has 360° rotation mechanism. The use of IR sensor with PIR sensor increases accuracy of the system.	The system is unable to provide the location of human because there is no GPS module in it.
12.	Detection of Alive Human body in Military area.[12]	PIC micro-controller, PIR sensor, RF module, GSM technology.	The system can perform the actions automatically or can be controlled by any user.	The system is designed for limited distance only. The battery backup is in-efficient.
13.	Live Human Detection Robot.[13]	ATMEGA16 microcontroller, PIR Sensor, Ultrasonic Sensor.	PIR sensor helps to detect the human presence by detecting the thermal radiations emitted by human body.	The accuracy of the system reduces when temperature is high in surroundings.
14.	A Prototype of Search and Rescue Robot.[14]	Dijkstra's Algorithm, Map-matching Algorithm, Route Planning.	The robot was easily able to localize itself in the known environment when its image matrix is given.	The model is not robust that is it can't be used in the non-ideal actual operations. The major difficulty in the rescue robot is the robot's design.

15.	Human Detection System Using Drone for Earthquake Rescue Operation.[15]	ATMEGA8A microcontroller, PIR sensor, Brushless DC motor, RF transmitter and receiver.	The system is user friendly, economical, semi-autonomous and efficient for human detection. Since the system is a quad-copter, it is easy for navigation.	As the system's main component is PIR sensor, it may fail in changing environment conditions.
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#### IV. CONCLUSION

In the modern era, we lose a lot of lives due to natural calamities or manmade disasters. The rescue team apply a lot of efforts to reduce the devastating effect of the calamity. To help the rescue team in searching the buried people inside the debris, various models were developed. These models are most commonly a robot and are consists of a microcontroller and some set of sensors. The objective of all the proposed models are more or like identical having different set of features. The model gives a considerable amount of accuracy. In the paper, we studied & analyzed various models that have been advanced to discover the human's presence underneath detritus. The growing technology will come up with more reliable models having more features and better accuracy.

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# An Automation of Traffic Management System for Better Efficiency and Emergency Services

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**Abstract**— The problem of traffic congestion has effectually increased in India. With the increase in growth in private vehicle ownership and automobile sector, the growth of road networks of India is slow compared to other countries, resulting into various loopholes such as Traffic Congestion, Losses faced by transport agencies and most importantly the emergency vehicles can't reach their destination on time as vehicles get stuck in traffic which turns out to be matter of life and death in some cases [13]. The major reason for traffic congestion problem in India is that the current traffic management system uses static timers to manage the traffic flow across the country. Also there is no appropriate system to clear traffic for emergency services like Ambulance, Fire Brigade, etc. The system proposed in the following paper makes the timer dynamic which analyses the congestion at each lane and assigns appropriate system. The emergency services will get the top priority when they arrive at a particular junction, thus clearing the traffic prior to the arrival of emergency vehicles. Results illustrate that the proposed system can work more efficiently and effectively compared to the current traffic management system.

**Keywords**— *Dynamic timer; Emergency vehicles; Scheduling.*

## I. INTRODUCTION

India is one of the country which have second largest road network in the world. Out of total length of 5 to 6 million km of road network, maximum area is covered by national highways. Major cities like Mumbai, Delhi, Kolkata and Bengaluru are facing a huge and critical problem of traffic [14]. People are getting stucked in traffic. Traffic is the major reason why people are getting delayed in reaching their destinations. Emergency vehicles like Ambulance, Fire Brigade are unable to reach their spot on time because of irregular management of traffic [9]. It can be a problem of life and death in some cases. People may lose their life because of this. One of the major reasons why India is facing the problem of traffic congestion is because of the usage of static timers at the signals. So for reducing traffic congestion this paper focuses on various ideas which are Dynamic timer, Priority to emergency vehicles and communication between 2 signals.

## II. LITERATURE SURVEY

Shaif Choudhury, et.al[1] has suggested a vehicle detection system and traffic monitoring systems. They had used parallel processing to store and process videos more quickly. They had used OpenCV and a python wrapper named cv2. They demonstrate a way to detect vehicles using Haar cascades to implement the system. A machine-based learning methodology involving both positive and negative data set for training purposes. Algorithm extracts feature from these images. The framework combines several features into cascade, i.e. a order of tests on the image or on particular regions of interest, organized into several phases, each based on results of one or more different Haar features Detection of occlusion of vehicles using a generalized deformable model for an Automated Traffic Surveillance System. When the object goes through all classifier stages it becomes remembered. Researchers also worked on some of the featured based approaches, such as Automation of Traffic Flow

Measurement Using Video Images, A Trainable Framework for Object Detection in Images and Video Sequences, Vehicle classification system based on a local feature algorithm using model images from CG.

Elkerdawi,et.al[2] proposed this system. This model captures the real time framework that detects and tracks vehicle from a stationary camera. The system consists of three main stages. First using haar-like features, vehicles are defined. In the following process, an adaptive appearance based model is built to keep the detected vehicles continuously tracked. This model is also used to combine the identification and tracking results in the third phase of the data association. For detection it uses Adaboost cascade classifier and tracking is done using compressed features and naïve bayes classifier. They used two main parameters for experiments, For detection Haar detection scale percentage parameter is set to 1.3 and thus balancing real-time and high true positive accuracy detection and search window is set to 15. For Tracking, on given target location, the search window is relatively proportional to the target size. Positive samples generation are 4-pixels around the target. Negative samples' inner radii is set to 10 pixels around the object while the outer radii is 1.5 multiples the search window. They proposed a simple and robust framework that uses haar like features and Adaboost cascade classifier generating a general rule that learns vehicles appearance.

A. Khan, et. al. [3] have proposed a framework is created to control and screen the blockage of traffic. The primary inspiration is to identify the nearness and nonappearance of vehicles out and about utilizing factual methodology incorporated with traditional picture preparing procedures. For this reason, they have build up a "Probability Based Vehicle Detection (PBVD)" calculation based Vehicle Detection System (VDS) incorporated with present - handling subsystems on structure a total traffic control framework. The framework has the capacity to get vehicle measurements during controlling traffic. Reenactments are performed by creating total model traffic design. Correlation is finished utilizing the outcome obtained from model framework and preparing a continuous video of traffic scene. Stimulation results show the viability of the proposed plan.

J.Chung, et. al. [4] have proposed existing approaches to check vehicles from a street picture have relied on both hand-made element designing and rule-based calculations. These require numerous predefined limits to recognize and follow vehicles. This paper gives an administered learning procedure that requires no such element designing. A profound convolutional neural system was formulated to check the quantity of vehicles on a street portion dependent on video pictures. The present procedure doesn't view an individual vehicle as an article to be identified independently; rather, it all in all tallies the quantity of vehicles as a human would. The test outcomes show that the proposed procedure beats existing plans. For the most part, it is hard to represent how a CNN can tally the quantity of vehicles precisely. Be that as it may, channels were relied upon to extract the highlights of a picture, objects were perceived by the highlights, and the items were then tallied through the last completely associated layer.

Quanlong,et.al[5] proposed PLQF Scheduling Algorithm. The algorithm considers both the queue length and incoming traffic also. This algorithm considers current traffic density plus the incoming traffic and then calculates the overall vehicle count for each lane. The lane which has highest density will be given the first priority. Accordingly timer will be decided for each lane. The PLQF algorithm is designed to achieve minimal Cell Loss Ratio(CLR)when the incoming traffic is bursty. The main idea behind PLQF is to provide the scheduler with the information regarding incoming traffic. The resource is allocated to the user with the highest probability of overflowing in the near future, based on that information.

Irunokhai,et.al[6] Modified Scheduling Algorithm (Round Robin) for Vehicle Traffic Control System. This algorithm is specially designed for a time allocation system such as the scheduling of traffic light signal at road junction for the route of vehicles. The algorithm integrates assignment of priority for emergency vehicle arrival. Java programming language with Any Logic Java based simulator was used in implementation. The design of the vehicle under the scheduling of the round robin algorithm in the control of the vehicle traffic, the traffic control barricade and the priority assignment for emergency vehicles arrival at the road junction. When non-emergency vehicles are on the traffic, the traffic control system schedule each road based on the traffic density on each lane but whenever there is arrival of emergency vehicle, priority is giving to the road where the emergency vehicle is approaching from and the traffic control barricade shuts down all other alternate roads. Sensors are used to sense the siren sound of the emergency vehicle which confirms their arrival at traffic junction.



Younes,et.al[7] proposes an ITLC ( Intelligent Traffic Light Control) algorithm. This algorithm considers the constant traffic highlights of each traffic stream that proposes to go across the street convergence of intrigue, while booking the time periods of each traffic light. The communications of Vehicular Ad-hoc Networks technology i.e. VANETs enable the utilization of real-time traffic characteristics of all surrounding flows. This algorithm aims to minimize the queuing delay at each intersection by using the length of the jam in front of the traffic light as an input. Each traffic light tries to solve the detected jams with the traffic light scheduling algorithm.

B.Younes,et.al[8] This algorithm also uses VANET technology to gather the realtime traffic characteristics of each competing traffic flow at isolated traffic light road connections. These traffic highlights are considered while setting the sequence of phases and the time of each phase in the traffic light timing cycle. In ITLC, the most dense traffic flow is scheduled to cross the signalized intersection first. Moreover, the time of each phase is set based on the location and speed of the last vehicle that is expected to cross the signalized intersection during the scheduled phase. Wireless sensor networks (WSN) have been also used for dynamic traffic management of signalized road intersections. They implemented a dynamic traffic light scheduling algorithm. This algorithm schedules the opposing flows at any signalized connection, to allow the more compressed traffic flows to cross the intersection first. The allocated time for each phase is set based on the traffic sharing over its traffic flows.

Deshmukh,et.al[9] This system creates an android application in which emergency vehicle will enter its source and destination information. This data will be shared to Traffic Control Room via Application server thus helping to clear traffic on that road before arrival of emergency vehicle. Location of vehicle will be tracked through GPS system. The working is based on two important modules The GPS system and application server. There could be certain decisions that the software needs to take based on the situation of the signal lights. In this paper the proposed system is very efficient as it makes the use of data send by location provider which is almost very efficient. The android application not only focuses on traffic light controlling but also sends message to the hospital and the concerned doctor so that the arrangements are ready at the hospital. The hospital will assign priorities to the patient, to assign priority the information is to be given by the staff with the ambulance.

R.Devi et.al[10] proposed this model. The model works on the principle of altering traffic signal delay based on the number of cars that travel through an allocated road segment. In four sides of a four-lane highway, there are four sensors that count the number of cars passing through the sensor-isolated area. Here, system uses traffic control system replacement IR sensors to build a density based traffic signal network. The IR sensor detects the vehicle and sends the microcontroller the information. The microcontroller counts the number of vehicles and gives LED the blinking time depending on the vehicle distance.

Nellore et.al[11]proposed a way to deal with plan crisis vehicles in rush hour gridlock. The methodology consolidates the estimation of the separation between the crisis vehicle and a convergence utilizing visual detecting strategies, vehicle tallying and time delicate ready transmission inside the sensor arrange. The separation between the crisis vehicle and the crossing point is determined for examination utilizing Euclidean separation, Manhattan separation and Canberra separation procedures. The deliberate data like vehicle check, separation and speed are helpful for a traffic the board focus to oversee crisis traffic proficiently. The size of the system or the quantity of hubs shows its effect on the normal start to finish delay. The start to finish postpone increments with the hub number. Remote Sensor Networks (WSNs) consider installed sensors to be interconnected for watching and controlling shopper and mechanical activities .The application of Vehicular Sensor Networks or foundation WSNs have been demonstrated to be promising answers for observing and the board of traffic. WSNs are adaptable regarding and vitality proficiency and information assortment type, e.g., video.

N.B.Soni[12] provide their review on IOT devices which are useful in traffic management system. They wrote about different methods of traffic management which are Video Data Analysis, Adaptive Traffic Control System (ATCS), Wireless Sensor Network. They provide information about some sensors which are Inductive loop Detector which is works on the principle of electromagnetic induction. A load cell is a type of transducer that converts the force applied into electrical signals. IR sensor or infrared sensor contains two packages Transmitter and receiver. Radio frequency identification(RFID) as it uses radio waves for object identification. Applications of RFID are Automatic collection of toll charges, Parking Guidance, Automatic vehicle speed detection.

### III. ANALYSIS

The following table is the summary of various research papers on Traffic Analysis and different techniques of vehicle detection and scheduling.

**TABLE 1**  
**ANALYSIS TABLE**

Sr. No.	Title of paper	Techniques used	Datasets used	Accuracy/ Efficiency
1.	Vehicle Detection and Counting using Haar Feature-based Classifier.[1]	Moving object detection technique and fast vehicle detection and counting using Background subtraction technique	Real time data capture by CCTV camera in Kolkata city of India	Experimental results show that the accuracy of counting vehicles is above 90%.
2.	Real-Time Vehicle Detection and Tracking Using Haar-Like Features and Compressive Tracking.[2]	Vehicle detection	Real time data	The framework achieves 93% accuracy and overall average running time of 0.2017 seconds.
3.	Modeling, Design and Analysis of Intelligent Traffic Control System Based on Integrated Statistical Image Processing Techniques.[3]	A Probability Based Vehicle Detection (PBVD) algorithm. The method for counting and classifying vehicles.	Not Mentioned	The final results are satisfactory and show that the system can cope with a noisy environment.
4.	Image-Based Learning to Measure Traffic Density Using a Deep Convolutional Neural Network[4]	Convolutional Neural Networks.(CNN)	Snapshots from video streaming.	Acceptable Accuracy.
5.	Improving the Network Performance using Prediction based Longest Queue First (PLQF) Scheduling Algorithm.[5]	Prediction based Longest Queue First algorithm Asynchronous transfer mode	Not Applicable	Achieve minimal Cell Loss Ratio(CLR) when the Incoming traffic is burst .
6.	Vehicle Traffic Control System Using modified smart optimized Round robin scheduling algorithm.[6]	A Java programming language with Any Logic Java based simulator. Programmable Logic Control(PLC)	Real time data	Reduced vehicles ' overall and average waiting time by 11.61 percent, although with a 13.52 percent decrease as the arrival of emergency vehicles increased.
7.	An Intelligent Traffic Light Scheduling Algorithm	Isolated Traffic Light Intersection	Not Mentioned	ITLC decreases the delay by 25%.

	Through VANETs[7]			
8.	An efficient dynamic traffic light scheduling algorithm considering emergency vehicles for intelligent transportation system.[8]	Fuzzy Logic, Genetic algorithm and Oldest Job First algorithm	Real time data	Enhance Traffic light scheduling algorithm (ETLSA) decreases the waiting delay time of the emergency vehicles by 50% compared to the ITLC algorithm, and by 60% compared to the OAF algorithm.
9.	IOT based Traffic Signal control for reducing time delay of an Emergency Vehicle using GPS. [9]	GPS system, Raspberry pi	Not Applicable	The proposed system is very efficient as it makes the use of data send by location provider which is almost very efficient.
10.	Density Based Traffic Signal System Using Arduino Uno. [10]	IR sensors are used to calculate the density of traffic, Arduino Uno that serves as the microcontroller.	Not Applicable	Acceptable accuracy
11.	Traffic Management for Emergency Vehicle Priority Based on Visual Sensing	MAC protocol, VANET	real-time video feed from the cameras	The suggested PE-MAC achieves lower end-to-end latency compared with the schemes under consideration.
12.	A Review of IoT devices for Traffic Management System	Video Data Analysis Adaptive Traffic Control System (ATCS) Wireless Sensor Network:	Not Applicable	This devices provide good efficiency for projects

#### IV. CONCLUSION

Previously there are many drawbacks in traffic management system like static timer, problems with emergency vehicles, improper scheduling etc. This research introduces deep learning techniques alongside image processing. It introduce proper scheduling algorithm for measuring traffic density accurately and thus allotting timer based on density of each lane. It will make traffic scene dynamic. It will be able to clear the traffic prior to the arrival of emergency vehicles. Reduces the unnecessary wait during the congestion.

#### ACKNOWLEDGEMENTS

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## Data Encryption Algorithm – A Comparative Study

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**Abstract**— Data security is one of the important aspects of today's developing world as a huge amount of data is being digitally transmitted every day. It refers to the process of protecting data from unauthorized access and alteration of data throughout its lifecycle. Threats on the digital data are increasing day by day out of which data confidentiality is most affected among all security goals. Various encryption algorithms are available for securing data authentication and providing better data confidentiality. These algorithms can be combined with each other for better results. In this paper, a comparative study of various encryption algorithms is discussed to get better data authentication and data confidentiality. A comparison of different computational and statistical parameters of the encryption algorithms is studied.

**Keywords** — Algorithm, Authentication, Confidentiality, Data, Digital Transmission, Encryption.

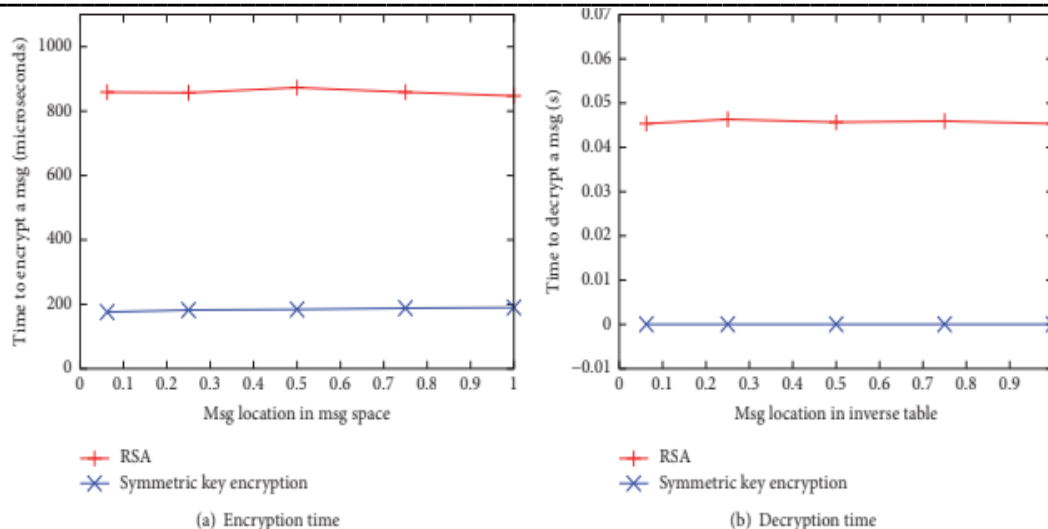
### I. INTRODUCTION

In today's world with fast-growing technology, almost every work has been digitized[2]. There are various electronic systems that carry out these works online, and all of them deal with a large amount of data[13]. Data is considered valuable, and people are often quite sensitive to how their personal information is being handled. Due to the value of data and the impact it has on people, there is a massive demand for data security.

Data security, also known as information security are protective cyber privacy mechanisms that are used to prevent computers, databases and websites where there are large number of crucial data from unauthorized users[14]. The system can be made much more difficult target for attackers by increasing the security measures that protect the assets, which in turn, will reduce the chances of a system becoming a victim[15]. In this paper, various techniques were studied and compared which are used for providing better data security in digital communication.

### II. LITERATURE SURVEY

W. Yin, et.al [1] have proposed a design and implemented the honey encryption mechanisms and have demonstrated its different applications. It also includes evaluation of the performance of the proposed mechanism, design and implementation which address some of the drawbacks of the proposed mechanism. The paper showed a graph (figure 1) for the encryption and decryption required by RSA and symmetric key from which it was observed that the time required for encryption for RSA is four times higher than that required for the symmetric key encryption mechanism whereas the decryption time required by symmetric key encryption mechanism is 46 microseconds while that of RSA is 0.045s. An enhancement is introduced to address the overhead issue faced in Honey Encryption.



A. M. Abdullah [2] has provided an overview of the AES algorithm and explained some of its important features such as security, cost and implementation characteristics. The Advanced Encryption Standard (AES) algorithm is one of the powerful symmetric block cipher algorithms that has its own structure for encrypting and decrypting sensitive data. The paper also includes the demonstration of some previous researches that have been done on AES and comparison of it to other algorithms, where the results obtained from researches show that AES has the ability to provide better data security compared to DES, 3DES, Blowfish, etc.

K.S.M. Moe, et.al[3] has proposed an innovative honeyword generation approach that decreases the storage problem, typo safety problem and also reduces the other drawbacks of existing honeyword generation techniques such as old password management problems. The important aspect of the proposed technique was less time complexity, which was determined in the paper using a table (table 1) and graph. The paper showed that the honey generation method is an effective way for encryption and decryption and has time complexity much less than AES.

**TABLE 1**  
**TIME COMPLEXITY FOR LENGTH OF PASSWORD[3]**

Length of password (in characters)	Time complexity (second)
7	3.050004
8	3.100004
9	3.140004
10	3.18005

R. Chatterjee, et.al [4] have proposed Natural Language Encoder (NLE) which is a new type of secure encoding scheme. The proposed system helps construct vaults which when decrypted using a wrong password will generate plausible looking decoy passwords. Existing tools from natural language processing were used for constructing NLEs. The paper demonstrated an attack and supporting analysis to show that the existing conventional password-based encryption (PBE) methods are vulnerable to various attacks, thus introduced NLE to overcome these drawbacks of traditional PBE.

E. Mok, et.al [5] has proposed a scheme by appending an additional security mechanism to the encrypted data called as extended Honey Encryption (XHE). The Honey encryption algorithm generates similar bogus data, in which the attack is difficult to determine whether the guessed is correct or not. Therefore, this helps to increase the password guessing complexity and cracking attacks.

M. Zhao, et.al [6] have shown a comparison between four single homomorphic encryption algorithms in the cloud environment. The paper also showed the performance evaluation of fully homomorphic encryption and 5 kinds of fully homomorphic encryption algorithms encapsulate the research situation and its application in a cloud environment.



Piyush [7] has researched a paper that concentrates on honey encryption, the proposed technique that converts its defensive action into both detections (tracing the hacker) and deflection action by generating a special type of fake key. It will also show how the victims will be notified about the attack along with other users who also have the probability of being attacked. The paper has successfully explained the basic concepts of honey encryption and how it can be made more powerful and effective. It also showed some real-world applications their proposed system along with its complete working.

B. Patel, et.al [8] have proposed a ranked based voting system that focuses on ballot casting and tallying using Paillier homomorphic and Elgamal homomorphic encryption schemes and also have compared the results of both the encryption schemes.

N. Patel, et.al [9] have proposed a homomorphic cryptosystems which is used for preserving data security, their properties, and categories. The paper also includes applications of proposed system in the field of cloud computing, private information retrieval, and data aggregation in a wireless sensor network for privacy preservation.

E. O. Abiodun, et.al [10] the purpose of the research was to discourage the eavesdroppers by using the decoy based decryption model to strengthen the current encryption measures, from stealing encrypted message by confounding his resources and time. The proposed model is leveraged from decoys, deception, and artificial intelligence. The proposed work concept was well supported by implementing an instant messaging application. The result showed that the following model will help reduce brute-force attacks on encrypted data and strengthens state-of-the-art encryption schemes.

Jyun-Neng.Ji, et.al [11] proposed an approach on fully homomorphic encryption (FHE) that allows to perform mathematical computations directly on encrypted data for ensuring the security of cloud computing. The paper explored and well explained the concept of aggregate plaintext for reducing the computational complexity of encrypted data while showing that how existing systems lack by using bit-level encryption for encryption, and also the paper proposes an efficient scheme, commonly used for sorting and searching in cloud computing to handle the comparison and swap operation. Experimental results showed that the size of required FHE data can be reduced by using this proposed scheme. For 32-bit data comparison, the proposed one can operate 2.3 times faster and achieve about 52 times a reduction in the required FHE data size as well as the transmission bandwidth to the cloud in comparison to the related.

MS. Akshatha, et.al [12] have proposed that an efficient search method needs to be used in order to search data over the encrypted cloud. While having a large number of data users, and documents on the cloud, it is essential to give multi-keywords in the search query to get documents only relevant to these keywords in a ranked order.

## 1.1 ANALYSIS

The following table is a summary of various research papers on data security using various encryption techniques.

**TABLE 2**  
**ANALYSIS TABLE**

Sr.No	Title of paper	Techniques used	Computational and Statistical performance
1.	Protecting private data by honey encryption.[1]	DTE method is used	181microseconds
2.	Advanced Encryption Standards (AES) Algorithm to Encrypt and Decrypt Data. [2]	Advanced Encryption Standards (AES) is used.	4 secs
3.	Improved Hashing and Honey-Based Stronger Password Prevention Against Brute Force Attack.[3]	Honeyword generation technique is used	3 secs
4.	Cracking-Resistant Password Vaults using Natural Language Encoders.[4]	Natural Language Encoder (NLE) is used.	Around 1 sec for large vaults.
5.	Implementing the Honey Encryption for Securing Public Cloud Data Storage.[5]	Extended Honey Encryption (XHE) technique is used.	NA

6.	Homomorphic Encryption Technology for Cloud Computing.[6]	Homomorphic encryption is used.	NA
7.	Advanced Honey Encryption: An escapeless trap for intruders.[7]	The techniques that convert its defensive action into both detection (tracing the hacker) and deflection action with the help of the generation of a special type of fake key.	2 secs
8.	Efficient Ballot Casting in ranked Based Voting System Using Homomorphic Encryption.[8]	Paillier homomorphic and Elgamal homomorphic encryption is used.	Paillier cryptosystem takes less time for an increased number of votes.
9.	Homomorphic Cryptography and Its Application in Various Domains.[9]	Fully homomorphic and partially homomorphic encryption is used.	FHE preserves more privacy than PHE.
10.	Fully Homomorphic Encryption for Ring LWE and Security for Key Dependent Message.[10]	Ring LWE technique is used.	NA
11.	Efficient Comparison and Swap of Fully Homomorphic Encrypted Data.[11]	The FHE method is used.	0.59 secs.
12.	Cloud Data Encryption Using RSA, Enabling Multi-Keyword Ranked Search and Achieving Privacy Requirements.[12]	RSA algorithm is used.	NA

NA- Not Available

### III. CONCLUSION

Due to the fast-growing internet world, data security becomes the most important aspect. There are various algorithms that are used to provide data security by using high data confidentiality and enhanced user authentication techniques. In this paper, various techniques used for data security have been studied and analyzed such as the AES encryption algorithm, RSA encryption algorithm, Honey encryption algorithm, and Homomorphic encryption algorithm. The Honey encryption algorithm and Homomorphic encryption algorithm are found efficient for data security. Two or more such encryption techniques can be combined to obtain much higher data security.

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## Comparative Study for Fruit Ripeness Classification

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**Abstract**— In recent years, computer vision-based technology is used to acquire, to process, to analyse and to understand digital images, so as to extract necessary information from Images. It has been more efficiently used in various areas including agricultural fields. From the study on various types of techniques provided by the authors for fruit ripeness prediction have shown lower accuracy rate, hence the rate of incorrect predictions are maximum. As strawberries are not only a seasonal fruit but also a cash crop, finding manual experts for classification is a challenging and a costly process. Manual classification is time consuming and economically high, also results in discrete opinions. In this survey, analysis of different approaches to determine the maturity level of strawberry fruit has been carried out. Different approaches have been used for classification of strawberry fruit, also accuracy of each approach is stated respectively.

**Keywords**— Classification, Computer vision, Neural Network, Image Processing

### I. INTRODUCTION

Agriculture forms the major part of India's economy. Due to this fact, an enormous amount of money is spent by the government for utilization of new advanced technologies to prevent destruction and improve the yield of the crops and soil. Flavour and aroma of the fruit are determined by the maturity level of the fruit. This is typically more difficult in case of strawberry as it is a delicate crop. As the amount of strawberry fruits harvested is in large quantities, manually distinguishing them is a difficult job. Therefore, there must be a method to determine the ripeness level of the harvested Strawberry fruit. Selective grading of strawberries is important, so that adequate ripe strawberries reach the vendor or fruit market is required, hence there is an increased need to supply quality Strawberry fruits within a small period of time.

### II. LITERATURE SURVEY

K. Raut, et. al. [1] describes the assessment of fruit maturity using digital image processing and ANN. The computer vision-based technology consisted of a Charged Coupled Device camera for image acquisition process and MATLAB software for image analysis. They had done the assessment on the cherry and strawberry fruit, to determine the maturity level of the fruit and initially RGB input was taken, later it will get separated into R and G channel which later get converted into R and G mask. Different feature vectors were obtained. The image categorization was done into four stages that are pre - mature, early-mature, mature and over- mature fruit. The classification of 24 samples of strawberry and 17 samples of cherry was trained using b-black propagation algorithm. After training those feature testing was done and the last decision was taken for maturity. The accuracy of the system for classifying strawberries is 60% and for cherries it is 63%.

A. Krizhevsky, et. al. [2], in the field of image recognition, deep learning methods have been shown to display significant performance improvements compared to shallow learning. As deep learning is represented as a hierarchy of features that is pixel, edges, modules of object, object, group of objects. The architecture built consisted of 8 learned layers, 5 convolutional and 3 fully connected. They showed deep convolutional neural networks has been the most successful algorithm for image recognition in the field compared to deep Boltzmann machines, convolutional deep belief networks. The dataset named ImageNet provides 15

million labeled images which are of high resolution and belong to roughly 22,000 categories. The images were taken from the internet and were labeled by human labelers using a crowd-sourcing tool named Amazon's Mechanical Turk.

F. Ertam, et. al. [3] proposed a paper describing that as per the proposed system, Convolutional Neural Network (CNN) and SoftMax classifier are used as deep learning artificial neural network. In dataset, there are 60,000 figures for training and 10,000 figures for the test. Each picture consists of 28x28 pixels. It has been observed that the best accuracy is achieved when the ReLu activation function is selected. With the use of ReLu activation function for data classification, 98.43% classification accuracy is obtained on the test data. The increase in the number of iterations showed an increase in the accuracy values, but the total classification time is also increased.

P. Raj Gokul, et. al. [4] proposed a paper describing a method for image processing technique to estimate the volume and maturity of sweet lime. Maturity is determined with the RGB color coding based on RG ratio. Images are processed and their RGB value is determined. B component is set to zero. The ratio between the R and G value is computed for a variety of sweet lime fruits. The RG ratio threshold for ripe fruit and unripe lime is fixed. Hence, can be categorized by maturity level. Maturity of sweet lime is not always dependent on its surface color as there is a probability of lime to be ripe from inside and not show its color outside but for strawberry fruit surface color represents ripeness.

Qingmei Xiao, Wendi Niu, Hong Zhang, et. al. [6] have proposed a system to predict maturity of the tomato based on the surface color. The paper concludes that the surface color of the tomato depicts the maturity level of the fruit. The system used is based on fuzzy theory which is used widely. One of its subclasses of fuzzy theory is fuzzy recognition. The process starts by detecting a single tomato through boundary detection. Maturity level determination is based on the hue values and red areas which are derived from the signal tomato image. The system extracts two features for tomato maturity level recognition, which is red areas and hue of the tomato fruit. Initially the membership functions of the two fuzzy features is defined according to the expert in this area. Hence, five maturity recognition classes based on every feature is calculated. They have calculated all possible recognition class membership functions and have selected the class having the maximum membership. The selected class is the one which was recognized.

Aviso, M. J. A., Cabao-an, A. M. S., Niverba, N. A. P., & Anacan, R. M. [7], have proposed a system to identify the age of the tomato fruit using Image processing. The system uses Image Processing in LabVIEW, to detect the dominant color of the tomato ranging from Green, Orange, and Red and provide the age of the tomato to determine whether it is the correct age for picking. The system is developed as a segregation system to analyse the tomatoes based on color image analysis. The process starts by providing an input image and converting from RGB to HSV, through testing determining the class. The system proposed is limited only to the surface color of the tomato to determine the maturity, but the maturity might be influenced by weather conditions too.

Rupanagudi, S. R., Ranjani, B. S., Nagaraj, P., & Bhat, V. G. [8], have designed a cost effective system to determine the maturity level of tomato using the image processing technique. The system set up consists of a camera placed 46 cm away from the tomato to be graded. The images of tomatoes are captured using the camera and given as input to the system. Through training using a ripe tomato database, the chroma value of a perfect ripe tomato is determined. This value determined is used as a threshold for the tomato grading system. The captured image is converted to determine its chroma component of the captured tomato image. Output image pixels are made white while rest is black. the count of white pixels determines the maturity level of tomato.

Mehra, T., Kumar, V., & Gupta, P. [9], tells us about how a diseased or rotten tomato can be identified using K means clustering algorithm and image segmentation. A "RGB" image is converted to "LAB" image so as to distinguish between background and the green tomatoes. The average color is determined for each sample in the "AB" area.

Shamim Ibne Shahid, Md. Shahjahan [10], tells about an approach for image classification by convolutional neural network. To classify images of simpler visual objects taken into consideration only the colour component and size. Convolutional neural network takes into consideration many features at each layer during training and provides us high accurate image classification.

Ruchita R. Mhaski, P.B. Chopade, M.P. Dale [11], have proposed a method for determining the ripeness of tomatoes and this method is implemented using Raspberry Pi. The proposed method classifies the tomato into 3 classes using a color detection algorithm. The original RGB image is converted into HSV image. The red, yellow and green mask area is taken into consideration and each colour pixels are counted. The higher count of the pixels will determine the class of the tomato fruit.

Nikolas Lamb, Mooi Choo Chuah [12], have proposed a fast, precise, highly efficient and affordable system using Neural Network for Detection of Strawberry fruit. This system is used to detect strawberries for mass harvesting. A live video is given as input, individual frames will be augmented with depth information to provide location of each strawberry. Predicted boundary boxes will be used to generate a path for the robot arm. This system will enable robots to replace hand picking, thereby improving agricultural efficiency and reducing crop damage.

Diana Carolina, C. P., & Deivis David, N. T. [13], have proposed a system using image processing to determine the maturity level of oranges. Through image processing can identify fruit characteristics in order to optimize selection processes and reduce the time for the classification of fruit. The process starts by capturing digital image and preprocessing the image into binary and grayscale, followed by erosion and dilation to improve the accuracy. The input image RGB features are extracted for classification by ripeness. By using the histogram the amount color is obtained according to the RGB space. The classification takes place according to the amount of colour or histogram.

### III. ANALYSIS

The following table is a summary of various research papers on fruit maturity classification.

**TABLE 1**  
**ANALYSIS TABLE**

Sr. No.	Paper Name	Summary	Advantages	Technique Used
01.	Assessment of Fruit Maturity using Digital Image Processing [1]	Analysis of color is an important consideration when determining the efficiency of fruit.	Real time dataset was used to train the neural network and more are used for testing.	Image processing using MATLAB
02.	ImageNet Classification with Deep Convolutional Neural Networks [2]	As deep learning is represented as a hierarchy of features that is pixel, edges, object, group of objects.	The paper shows that deep convolutional neural networks has been most successful algorithm for image recognition in the field compared to deep boltzmann machines, convolutional deep belief networks	Deep Convolutional Neural Networks
03.	Data Classification with Deep Learning using Tensorflow[3]	In the dataset there are 60,000 figures for training and 10,000 figures for the test. Each picture consists of 28x28 pixels. It has been observed that the best accuracy is achieved when the ReLu activation is used.	With the use of ReLu activation function for data classification, 98.43% classification accuracy is obtained on the test data.	Deep Learning using TensorFlow



04.	Estimation of volume and maturity of sweet lime fruit using image processing algorithm [4]	The RG ratio threshold for ripe fruit and unripe lime is fixed. Hence, can be categorized by maturity level. The fruit surface color has an affinitive relationship with the internal quality and reflects its maturity.[5].	Maturity is determined with the RGB color coding based on RG ratio.	Image Processing algorithm
05.	Predicting Fruit Maturity Stage Dynamically Based on Fuzzy Recognition and Color Feature.[6]	Tomato is the most investigated member of fleshy fruit regarding fruit development and ripening.	It is a non destructive method for determining the maturity level of tomato.	Signal Image Acquisition, Red Area and Hue Abstraction.
06.	A Cost Effective Tomato Maturity Grading System using Image Processing for Farmers.[7]	The paper proposes an inexpensive setup utilized for performing the tomato grading process.	The proposed algorithm is less complicated and more processor friendly. Hence accurate and faster classification.	Segmentation along with a simple algorithm to count the total number of white pixels, which determined the maturity level of tomato.
07.	Age factor Identification of Tomato Using Labview via Image Processing.[8]	Tomatoes are one of the most cultivated vegetables worldwide and are extensively grown as secondary crops especially in rice and corn based farming systems.	It is non-invasive which can lessen the damage to the tomato when inspecting for its ripeness or maturity.	Image Processing, RGB to HSV color that is Hue Saturation formatting.
08.	Maturity and Disease Detection in Tomato using Computer Vision.[9]	As fruits are perishable and their intake is in fresh stage, of many existing fruit disorders, immaturity and ripening are common ones.	Using neural networks, it is easy to work on the database having more information about large varieties of tomato.	Image acquisition, Pre-processing Detection and Segmentation (Thresholding), K-Means Clustering Algorithm
09.	A New Approach to Image Classification by Convolutional Neural Network.[10]	Comparing various methods for image classification by considering color components as the basic feature.	The Convolutional Neural Network predicted the image classification with accuracy of 94%.	Convolutional Neural Network
10.	Determination of Ripeness and Grading of Tomato using Image Analysis on Raspberry Pi.[11]	Color detecting algorithms are used for ripeness determination. This algorithm is implemented in Raspberry Pi to make it independent.	Detects the defects in tomato and classify them in defective class. The result analysis is able to accurately determine the ripeness of tomatoes.	Convert RGB to HSV image of tomato. Creating a red mask to determine the redness of tomato. Cluster to category using K-Means clustering.
11.	A Strawberry Detection Using Convolutional Neural Network.[12]	As agricultural automation becomes more feasible, due in part to lighter and more robust computer vision algorithms, produced	The system is fast, precise and affordable for high efficiency, increases speed and precision.	Convolutional Neural Network, Image Input Compression, Color Masking, Image Tiling, Network

		detection has emerged as an essential part of the production.		Compression.
12.	Classification of Oranges by Maturity, Using Image Processing Techniques.[13]	The Computer vision systems for quality evaluation of food had great acceptance in the food industry, increased demand for objectivity, consistency and efficiency.	Through image processing can identify fruit characteristics in order to optimize selection processes and reduce the time for the classification of fruit.	Color uniform background using CCD (Charge Coupled Device), Image Processing, Image Segmentation and HSV color formats.

#### IV. CONCLUSION

In this paper a detailed study of several maturity determination approaches is done. The study consists of a few papers which discuss the techniques for strawberry fruit ripeness detection, along with its accuracy. While some explain the techniques which have been used to determine the fruit ripeness, apart from strawberry. This will help one to decide which approach to choose while determining the maturity level of Strawberry fruit. With recent developments in neural networks for Fruit Ripeness Detection, one can create a model with faster speed and better accuracy. This can be helpful in having a real time fruit maturity detection system with better classification quality. An automatic vision based maturity detection model will help to reduce the numbers of laborers required during peak season and discrete opinion produced.

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## Netra-A Step towards Assisting Sightless

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**Abstract**— *In the growing world visually impede people faces many problems in their daily life. In the world of rapidly increasing technology advancement in assistance for disabled people is also expanding. Visually disabled people face problems in detecting any obstacles or identifying the object and lifting them, many researches have been done to solve this problem faced by them which were based on IoT, Machine Learning and Deep Learning. This paper analyses various techniques used to assist the sightless.*

**Keywords**—*Deep learning, IOT, Machine Learning, Visually Impede People.*

### I. INTRODUCTION

Visually challenged people face many problems in their daily life such as obstacle detection, object recognition, handling the objects and many more problems are faced. In the world of rapidly increasing technology many advancements have been done in assisting blind that help them in facing their problems, and also expanding. This paper focuses on various techniques used to assist the sightless, techniques such as use of ultrasonic sensor for object detection [1] [6] [8], Multi sensor fusion based obstacle algorithm [2], PCA and SIFT algorithm [11] [3], Use of CNN algorithm and eSpeak [4], CNNdroid for object detection [5], Human recognition [7], Use of GPS module [8], Object recognition using SIFT features-based and SURF features based [10], Use of Duplex Radio-Frequency Camera [12].

### II. LITERATURE STUDY

Rohit A, et.al [1] have proposed a system that detect obstacles in front of the sightless and provide a beep sound to avoid collision. The proposed system is embedded with wearable glasses, ultrasonic sensors. The ultrasonic sensors are used to detect obstacles and to avoid collision a beep sound is provided to the sightless. The obstacles can be detected only if it is in the range of 300cm the proposed system does not detect the obstacles that is more than 300cm away, a central processing unit comprising of Arduino NANO which takes the information from the sensor about the obstacle distance and processes the information according to the coding done and sends the output through the buzzer, power supply is given to the central unit which distributes the power to different components. The ultrasonic sensors are used because ultrasound has a strong point, the energy consumption of slow wave propagating in the medium relatively far distance. Therefore, often it is used to measure the distance over a big length. At the same time, ultrasound for the object in the dark, dust, smoke, electromagnetic interference, toxic and other harsh environments have a certain ability to adapt, with a wide range of applications. The proposed system explains about ultrasonic sensors to detect obstacles in front of the user and navigate them toward the destination.

Jinqiang B, et.al [2] have proposed IOT based system for Blind people which consist of Depth Sensor for processing the depth of the objects, Ultrasonic sensor for calculating the distance, embedded CPU for processing The taken snapshot are processed with the corresponding algorithm and the guidance is provided as if the obstacles in front of the user then the system say Attention, obstacles in front of you and beep, using earphones incorporated in system. This system is fast enough for the detection and display of obstacles. Since the ultrasonic sensor can detect obstacles in the range of 0.03 m to 4.25 m, and within scanning field of 15°. Experimental results of this proposed system ensures that guiding glass can improve the travelling experience of visually impaired people. The system uses the depth image and the ultrasonic sensor to solve the problems of small and transparent object and to avoid obstacles

Diwakar A, et.al [3] have proposed the concept of the eye glass containing the camera for taking a snapshot of the blind surrounding. The taken snapshot is processed with the corresponding algorithm and a relevant text document of that image is retrieved. And the text document is converted to an audio file and sounded at the earphone. The algorithm used for image processing are Principal component analysis (PCA) for human face, Scale Invariant Feature Transformation (SIFT) for object and Optical Character Recognition (OCR) for text, there are multiple objects in the surrounding so after taking the snapshot the priority is given to the nearest obstruction and processed and sounded as output since that has the urgent use to be known to blind. The system provides an audio feedback to the user using text to speech, which help them to travel in outdoor environment

Nishajith A, et. al. [4] have proposed a system which is a Smart Cap and it is based on TensorFlow and text to speech synthesizer software. With a single object detection model, it is possible to classify multiple classes present within an image and also it can specify the exact position of the image (if monitor provided) with a bounding box framing the object. The system is able to detect objects which come under 90 various classes. The working of the system starts by suitably powering the Raspberry Pi processor. Thus, the web camera interfaced through one of the USB ports of pi is initialized. Real time video is captured using the NoIR camera which in turn is converted to a set of frames using python command. Pre trained object detection model 'ssd\_mobilenet\_v1\_coco' offered by TensorFlow which is used to detect various objects present within the image. By using the text to speech converter software, eSpeak, the text documents like class label, scores etc are converted to voice output. The earphones connected to the audio jack of raspberry pi provides voice description corresponding to the objects present in the image. The system will be really helpful for the blind people in their navigation. The object detection can be developed to count the number of objects in a scene. The COCO model is used to train the SSD mobilenet which can detect only 90 classes of objects. The number of objects can be increased by training the model by ourselves. In the proposed system face detection can also be incorporated so that the blind person can easily identify his/her family members and friends. The proposed system explains implementation of Raspberry pi and TensorFlow to detect objects using the COCO model.

Milios A, et. al. [5] have proposed an Android Application which provide assistance to visually impaired people by providing full sets of features like light detection, color detection, object recognition, and banknote recognition. For Object detection they have created database for object classification and recognition, for banknotes they have used CraftAR SDK for android for faster recognition of banknotes at specified positions, for color detection they have used OpenCV library for RGB color of the area where user touches on the screen the area is analyzed and output is produced. To develop the Application Android Studio IDE is used which is written in java programming language with following api's PHP and MySQL for the database, OpenCV for android, CraftAr SDK library, CNNdriod. The System has a user-friendly interface customized for blind people, where the detection results are read out loud so that the user can clearly hear them. Results showed that the application correctly detected objects, banknotes, and light levels. The system classifies the image captured and determines the class of an object using CNN algorithm.

Sujith B, et. al. [6] have proposed a smart assistive technology named Indriya, for guiding the visually impaired. The device features complete audio assistance for easy navigation, through simple button clicks. It can also detect obstacles ahead up to three meters and can differentiate between objects and humans with guaranteed 80% accuracy. The scan button in the device is used to scan for obstacles ahead. In the event of an obstacle detection, appropriate voice feedback is given to the user, mentioning the nature of obstacle (human/solid objects) and the approximate distance to them. The difference in heterogeneity and attenuation in the reflected wave is the key feature which has been used to differentiate human beings from other objects. The system also includes an android app name "Indriya App" is used to set the emergency phone numbers, and is responsible for informing location and time as voice feedback to the user. The main purpose was making the device smaller and lower in cost, by minimizing the no. of sensors used. Android and IoT support make Indriya a smart and handy device, which help them navigate independently and securely.

Joe Louis Paul I, et. al. [7] have proposed a system that helps visually impaired people in assisting them in reaching their destination which the help of audio guidance provided via earphones, the system also help them in human recognition. The face detection and recognition module uses the camera to capture the images of the face of the person in front of the user and store them in the SD card, the storage card within the microcontroller. The camera is fixed on the shirt collar of the user. The web camera has three lights that automatically switch on in the dark. It also has 16 special effects and 10 background frames. For efficiency purposes, the camera captures 20 images of the face and these are stored along with the person's name. This is manually done before the device can be put into practical use. If the same person comes in front of the user again then the camera captures the image and compares it with the previously stored images and if a match is found, the corresponding name of the person is read out. The image



capture and processing are done with the help of OpenCV software. The system is limited to only a few destinations. However, there is scope for extending it to more locations as well as integrate it with Google Maps for better performance of GPS.

Sathya Narayanan E, et. al. [8] have proposed a system for visually challenging that helps them in detection of obstacles and avoiding them the system uses multiple ultrasonic sensors that also help in detection of the pit on the road and guide the user accordingly. The system also includes a GPS module that senses the current location of the user and the Wi-Fi Module transmits the current location to the cloud, where the user navigation history can be tracked. The guidance to the user is done using Text to speech converter module. The text to speech module intimates the user of obstacles at different heights and distances and can convey information in multiple languages. The system has an inbuilt headphone socket. The information can be provided to the user via stereophonic headphones. The system also helps the deaf one by providing a vibrator circuit that helps the deafblind people to walk through the obstacles safely. Different intensities of vibration indicate obstacles at different distances. The intensity of vibration increases as the user moves close to the obstacle.

K. Laubhan, et. al. [9] have proposed a system that consists of five ultrasonic sensors which continuously trigger serially and are positioned as left, right and front. The ultrasonic sensors detect the obstacles and compare them with the threshold. If the threshold value is crossed, then the user gets information about the position of the obstacle via the Bluetooth headset. The entire processing is done with raspberry pi. It is tested on aluminum, Plastic, and Paper and has tested that the obstacle has been detected ahead or at the sides. It selects the audio based on the ultrasonic sensor which has detected the obstacle. It successfully contributes to elimination of the walking sticks and detects if any object is present in the surrounding of the blind person using the ultrasonic sensors positioned at five different directions hence the direction of object is also known. Though it detects the position of the object, it is unable to identify which object is present before him. The system should also be able to detect which type of object is present before the user for safe and effective navigation.

Hanen Jabnoun, et. al. [10] have proposed a system that helps visually challenged people in object recognition with the help of video analysis and interpretation. The system eliminates the use of ultrasonic sensors for object detection instead of that systems exploit a single camera to capture images of the scene in front of the user. Various features are then extracted from those images and objects in the scene are recognized by comparing these features with those of known objects. SIFT features-based and SURF features based is used to extract the features from the image captured by the camera. The system uses a sensor that calculates the distance between the camera and the obstacle. The system is completely based on analysis of the frame captured to increase the processing speed. The first frame in the video will be matched with objects stored in the database by computing the keypoints and extracting features then making the matching between key points. The second and the rest frames will be matched first with previous frames, for example frame at time  $t$  will be matched with frame at time  $t-1$ , thus it can predict if they are the same or not. If both frames are the same, we have not to identify the object because we did it for the first one which will increase the time processing.

Hanen Jabnoun, et. al. [11] have proposed a system that performs object recognition for blind using SIFT feature extraction algorithm. The system is based on keypoints extraction and matching in video. A comparison between query frame and database objects is made to detect objects in each frame. For each object detected an audio file containing the information about it is activated. Hence object detection and identification are simultaneously addressed. The steps of feature extraction and addressing is processed as follow:

- (I) Obtain the set of key-points of objects. A) Select a large set of images of daily objects. B) Extract the SIFT feature points of all the images within the set and obtain the SIFT descriptor for each feature point extracted from each image.
- (II) Obtain the keypoints descriptor for the first video frame. A) Extract SIFT feature points of the given image. B) Acquire SIFT descriptor for each feature point. C) Match the frame key-points with those of the objects and identify detected objects.
- (III) For the next frame. A) If it contains the same objects they will not be detected. B) New objects will be detected and identified. Another method will be used in this step to identify similar and dissimilar frames for further treatments. For each object detected in video a video file is launched to notify the blind about the identity of objects.



Do-Hoon Kim, et. al. [12] have proposed a system helps visually challenged people in obstacle recognition, the system uses ultrasonic sensors for calculating distance but instead of using existing web camera for capturing image the system uses Duplex Radio-Frequency Camera for better data transport and receiving color data of the image. Front of barriers is judged using DRFC. Also, with a system that recognizes color. If some color that is not saved is detected, the system sends a warning signal. They can aware distance to the obstacle through a period of vibration. The system also includes GPS and PDA. GPS receiver receives the clock information and the latitude and longitude of satellites and calculates the present position. The GPS receiver sends this information to the PDA. The navigation map and database in PDA guide the information like current position, and environment to blind person in real time. Basically, the output information is the text style. So, the text is converted into the voice sound by TTS (Text to Speech) in PDA for blind people to understand.

### III. ANALYSIS

The Table 1 given below is a summary of research papers on assisting visually challenged. It states the different techniques used for assisting sightless and also highlights their advantages and disadvantages.

**TABLE 1**  
**ANALYSIS TABLE**

Sr. No.	Paper Name	Technique Used	Advantages	Disadvantages
01.	Low cost ultrasonic Smart glasses for blind.[1]	Uses ultrasonic to detect the distance. User is informed according to distance.	Navigate the user about the obstacle within 3 meters.	Only provide navigation. No object detection
02.	Only provide navigation. No object detection. [2]	Multi sensor fusion based obstacle algorithm is used.	Efficient in complicated indoor environment	It does not detect and classify the type of object
03.	HOT GLASS: Human Face, Object & Textual recognition for visually challenged people [3]	PCA and SIFT algorithm is used to detect the human face and object.	Recognize a person. Recognizes text.	It cannot detect the obstacle.
04.	SMART CAP – wearable visual guidance system for blind [4]	It uses CNN algorithm to detect the object. It uses eSpeak to convert the detected object text	Uses CNN. Detect 90 objects	Do not identify the person's face. No navigation provided
05.	Intelligent Eye: A Mobile Application for Assisting Blind People [5]	Colorino Talking Color Identifier is a standalone device that is used to recognize colors and detect light. Object is detected using CNNDroid	It detects object, Color, light, Bank note recognition	Pedestrian guide. Reading Barcodes.

06.	Indriya - A Smart Guidance System for the Visually Impaired [6]	Use of ultrasonic sensors for object detection and help in navigation using smartphone	With accuracy of 80% differentiate whether the detected object is human or not.	Can only detect the obstacle up to three meters.
07.	Smart Eye for Visually Impaired-An aid to help the blind people [7]	GPS for navigation, OpenCv software for human face recognition	The entire features of the system can be used offline	Scope of navigation from one point to another is limited due as it customizes only for a few locations.
08.	IoT Based Smart Walking Cane for Typhlotic with Voice Assistance [8]	Multiple sensors for object detection and GPS module for determining current location of user.	The organized pattern of sensors allows you to detect the pits on the road. The system also provides a vibrator circuit so that it can be used by deafblind people.	Unable to detect the obstacles hanging at a height of 150 cm from the ground
09.	A Wearable Portable Electronic Travel Aid for Blind [6]	It just uses the ultrasonic sensor and Raspberry Pi 3 module and Bluetooth module to detect the object	No walking stick is used. Wireless Bluetooth for audio guidance	Does not classify the object ahead i.e. either living or non-living.
10.	Object recognition for blind people based on features extraction [10]	SIFT and SURF algorithm	Use of both this algorithm increases the processing speed. Eliminate the drawback of ultrasonic sensors of small object detection	SIFT takes more processing time than SURF.
11.	Object Detection and Identification for Blind People in Video Scene [11]	SIFTs key points extraction and features matching for object identification	Processing speed is fast.	System does not guide the user to reach the object, it just informs the surrounding.
12.	Obstacle Recognition System using Ultrasonic Sensor and Duplex Radio-Frequency Camera for the Visually Impaired Person [12]	Use of Duplex Radio-Frequency Camera (DRFC)	Use of DRFC increases data transport speed and helps in extracting color data of image captured.	Using the system in a populated place is difficult according to experiment.

#### IV. CONCLUSION

The growing world and technology help visually challenged people in making their life comfortable. Various techniques are used for helping visually challenged people to live up on their own without being dependent on others to help them. This paper tells

about various techniques used for assisting sightless such as use of ultrasonic sensors, Duplex Radio-Frequency Camera for object detection. CNN, SIFT, SURF algorithm for feature extraction and object recognition. Use of ultrasonic sensors for detection of obstacles and for distance calculation. The growing technology will come up with more exciting features that will make the life of visually challenged people easier.

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## Vegetables and Fruits Estimation Prediction

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**Abstract**— The Agriculture is the major source of food for the population of the world. Farmers suffer from natural calamities, weather issues etc. This lead to huge financial loss for the farmers. If the crops prediction made available to farmers before actual farming process begins then it will be helpful. The idea behind this system proposed is to predict price for vegetables and fruits on the basis of past few months data. The process of predicting prices uses data with their analysis, statistics and machine learning techniques to create a model for preventing the loss bear by farmers and the wholesale buyers. Taking few parameters into consideration like vegetables and fruits prices, diesel prices and demand and supply which affect the prices. The datasets will be trained by using different regression techniques according to the parameters mentioned above. Due to the complexity of price prediction the system uses data mining techniques accordingly.

**Keywords**— Data mining, fruit price, prediction, vegetable price.

### I. INTRODUCTION

Prediction is the study of abstraction from data and is the major topic of machine learning and statistics, and more generally of data mining. Prediction is the investigation of deliberation from information and is the significant theme of AI and insights, and all the more by and large of information mining. AI and factual techniques are utilized in taking care of the "data over-burden" that displays the advanced age [14]. AI is the utilization of man-made consciousness, simultaneously the measurements has made significant advances because of the accessibility of current processing. The point of the two fields is the forecast of information.

Vegetables and fruits price changes fast and unstable which makes great impact in our daily life. Vegetables and fruits price has attributes such as high nonlinear and high noise. Farmers suffer from natural calamities like drought, flood, rainfall, changes in the price of diesel which affects the crops. This leads to the huge financial loss for the farmers which leads to number of suicides. So, it is hard to predict the vegetable and fruits price [2]. Predicting the price of crops yield can help the farmers and government organizations to make the proper planning. Regression and classification techniques can be used to develop an innovative model to predict the market price of respective commodity.

The system will be predicting the prices of vegetables and fruits on the basis of past few months datasets. The two main methods of machine learning are regression and classification. Regression is used when to seek a predicted arithmetical quantity. Classification is used to predict a category. Parameters are the nodes a data scientist gets to turn when setting up an algorithm. They are numbers that affect the algorithm's behavior, such as error tolerance or number of iterations, or options between variants of how the algorithm behaves.

The training time and accuracy of the algorithm can sometimes be precise to get just the right settings [15]. Typically, algorithms with large numbers of parameters require the most trial and error to find a good combination. Parameters considered are vegetables and fruits prices, diesel prices and demand and supply. The datasets will be trained by using different regression and classification techniques according to the parameters mentioned above.

The data preparation involves analysis of collected time series data and identification of the required features to carry out the research work efficiently [13]. Time series analysis consists of methods that are used for analyzing data in order to extract

meaningful statistics and attributes of the data. Time series forecasting is the use of a model to predict future data values based on previous data values.

## II. LITERATURE SURVEY

N. Hemageetha et. al. [1] It is very difficult to predict the price of the vegetable, so making use of the prediction technique like neural networks the price is predicted. Weekly data is used for prediction because it has very less noise. The price of the tomato data are taken for construction of prediction model and evaluation of the model. Past week by week cost of tomato are taken for reproducing the expectation model and later barely any week after week cost are taken for the model testing. The price data set is divided into two subset, they are one for network training and another for network validation. To find the weekly price prediction of the vegetables, the three layered feed forward network structure is used.

G.M.Nasira et. al. [2] The proposed system uses data mining techniques to predict the crops prices. The prices of agriculture sometimes may rise and fall which affects the prices. In the proposed system there will be the prediction of the future events. This system includes a portal in which farmers have to login their account with the username and password after which the dashboard will appear. Then the farmers have to enter the commodity name and the previous selling price of the crops and then based on the previous price the system will be able to predict the average prices of crops. Thus, the system proposed will be helpful for the farmers to predict the prices for the crops.

Yogesh Gandge et. al. [3] Prediction of crop deals with large set of datasets thus making the prediction system to give the accurate prediction for application of data mining. This paper presents the study of the various data mining techniques used for forecasting the crops. The accomplishment of any harvest yield forecast framework intensely depends on how precisely the highlights have been removed and how suitably classifiers have been utilized. Through harvest yield expectation framework better arranging and choices can be chalked out for improving the yield.

G.M.Nasira et. al. [4] In this paper, the methods and techniques used for four models are displayed for prediction of the vegetable market value, which are BP neural system model, the neural system model dependent on genetic algorithm, RBF neural system model and an incorporated forecast model dependent on the three models above. The four models are utilized to anticipate the Lentinus edodes cost for Beijing Xinfadi discount showcase. A sum of 84 records gathered somewhere in the range of 2003 and 2009 were nourished into the four models for preparing and testing. In outline, the foreseeing capacity of BP neural system model is the most noticeably awful. The neural system model dependent on hereditary calculation was commonly more precise than RBF neural system model. The incorporated forecast model has the best outcomes.

Changshou Luo, et. al. [5] Price prediction helps the farmers and furthermore Government to settle on viable choice. In view of the multifaceted nature of vegetable value forecast, utilizing the qualities of neural systems, for example, self-adjust, study and high adaptation to non-critical failure, to develop the model of Back-spread neural system to anticipate vegetable cost. A prediction model was built by applying the neural system. Toward the finish of the consequence of Back-engendering neural system shows total blunder level of month to month and week by week vegetable value expectation and examined the exactness level of the value forecast. The BP neural system prediction model of vegetable market cost is set up. We have taken three years Coimbatore showcase cost of tomato for instance and recreated the outcome utilizing MATLAB and foresee. The expectation consequences of month to month and week after week are examined in this paper. The outcome shows that neural system is one method for foreseeing the market cost of vegetable with the non-direct time arrangement. In future the Genetic algorithm based neural system will be built for cost forecast to expand the exactness rate.

Wei Minghua et. al. [6] The proposed system has used BP neural networks which gives very low prediction. The BP algorithm [6] is simple and has easy operation and can deal with only small amount data. The algorithm cannot deal with the multidimensional data because it's very complex to design the network structure and also require more processing time. So to overcome the drawbacks of the algorithm the system proposed in this paper make use of some improved methods to increase the efficiency of the algorithm. The algorithm is combined with MIV(Mean Impact Value) so that the data is processed in advance and eliminate the redundant data so that the low dimensional data is given as input to the neural network. The BP neural network is then combines with the improvements. First the input data is given to the dimension reduction by MIV method and then use variable learning rate algorithm and additional momentum for the training of network design. Finally the MATLAB programming is used to complete the agriculture price prediction. The results show that the errors of the network prediction after training is less than 10%.



Manpreet Kaur et. al. [7] The system proposed attempts to predict the prices of vegetable from variations in the price of crude oil. Price prediction helps the farmers and also Government to make effective decision. Data mining classification techniques can be used to develop an advanced model to predict the market price of respective product. The methods included is data cleaning and compliance wherein missing values were assumed by linear extrapolation. The forecasting methods used included Naïve, and regression and were compared on accuracy measured by lesser errors in the predicted values. The data for oil was observed to have an increasing pattern over time while the vegetable had a periodic high every April. The key judgements validated this higher price (April) which require inventory replenishment during December when vegetable prices are comparatively lower. The warnings which need to be highlighted are the constraints in data collection, wherein larger samples could have helped us in validating the model better. Additional variables like the seasonal rainfall or economic indicators could also have had an impact in forecasting vegetable prices.

G.M.Nasira et. al. [8] The Agricultural segment needs more help for its advancement in creating nations like India. Value forecast helps the ranchers and furthermore the Government to settle on successful choice. In view of the unpredictability of vegetable value expectation, utilizing the order method like neural systems, for example, self-develop the model of Back-spread neural system (BPNN) to anticipate vegetable cost. A forecast model was set up by applying the neural system. Toward the finish of the consequence of Back shows exactness level of the value expectation. The BP neural system forecast model of vegetable market cost is set up. The expectation consequences of week by week are talked about. The outcome shows that the bigger dataset created more precision result than the littler informational index. The outcome shows that neural system is one method for anticipating the market cost of vegetable with the non-straight time arrangement. In future the Genetic Algorithm based neural system will be developed for cost expectation to build the exactness rate.

N.Hemageetha et. al. [9] Agriculture sector is a significant one in the creating nations. In Agriculture area it is hard to anticipate the cost of the vegetable, so utilizing the expectation system like neural systems the value is anticipated. In this paper a forecast model is set up with the assistance of Adaptive neuro-fuzzy surmising framework and contrasts the outcome and different models. The outcome for the proposed expectation model is more effective and exact than other neural system models for anticipating the cost of the vegetables. Week by week information is utilized for forecast since it has extremely less commotion. To locate the week after week value expectation of the vegetables, the three layered feed forward system structure is utilized. ANFIS models is produced for value forecast of vegetable with the assistance of MATLAB. The forecast outcomes are dissected and contrasted the outcome and BP neural system expectation model and RBF model. The outcome shows that ANFIS model is superior to BP system and RBF model dependent on the exactness, preparing time and preparing speed. It demonstrated that the ANFIS model is generally proficient and exact than other neural system model at the cost expectation of the vegetable.

GUO Qiang, et. al. [10] the forecast model of value expectation was set up by applying the neural system dependent on hereditary calculation and utilizing the attributes of hereditary calculation and neural work. The finish of this framework the aftereffects of hereditary calculation and BP neural system are looked at. The outcomes show that the total blunder of expectation information is in the size of 10% in the degree that the he supreme mistake in the forecast information is in the extent of 20% and 15%. In the neural system model applied three-layer feed-forward system structure including input layer, yield layer and conceal layer. The precision of hereditary calculation dependent on neural system is higher than the BP neural system model, particularly the outright blunder of forecast information is inside the extent of 20%. The precision of hereditary calculation dependent on neural system is clearly superior to BP neural system model, which speak to the positive speculation ability of the model.

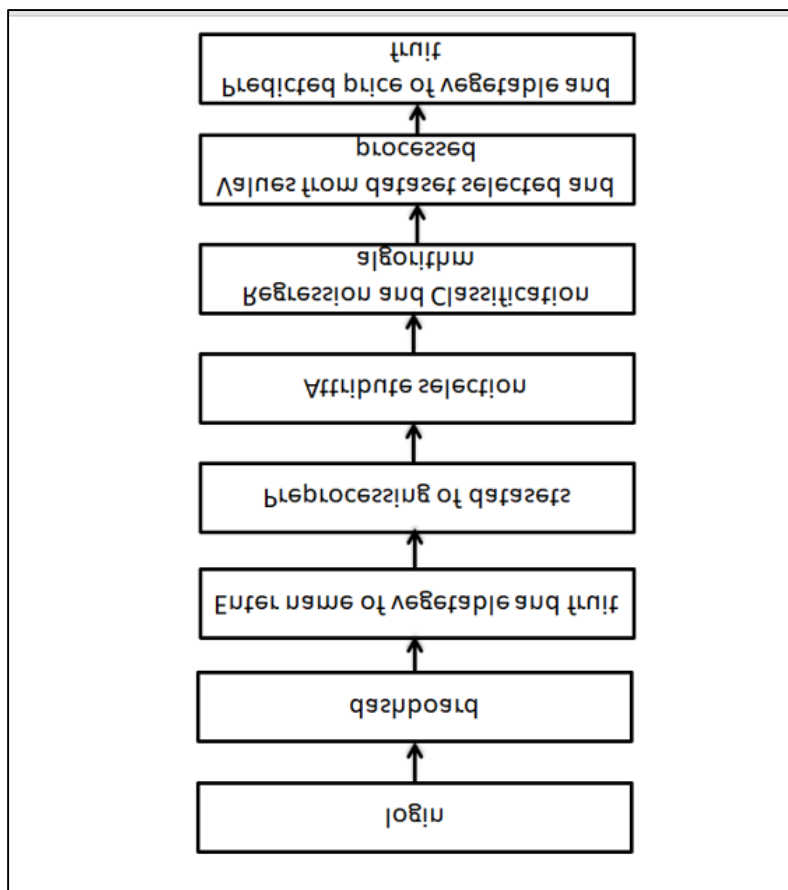
Wasiu A. Balogun, et. al. [11] The techniques for quality appraisal have picked up impulse and considerable endeavors have been made to create frameworks with respect to nature of leafy foods. This paper inspects most recent works of utilizing artificial neural system (ANN) for deciding the quality of vegetables and fruits. Backpropagation neural network (BPNN) is the most commonly used ANN architecture which is applied to real world problems because it can learn complex multidimensional mappings very easily. It is the procedure by which an ANN fine-tunes the weights allocated to the linking neurons to bring the existing output data of the neuron nearer to the likely data value



Uraiwan Inyaem [12] The researches in data mining area have been continuous increasing. Applying data mining to agriculture; for example, the prediction of rice produce for farmers is still challenging. The proposed system used the Machine Learning Techniques comparing between Decision Tree Technique and Neural Network Technique (ANN) for the prediction of rice produce for farmers. Farmers can predict volume of rice produce and selling price. It is helpful for farmers to increase their income. The model pattern is classified by machine learning techniques experiment with a dataset of farmer records. Performance measure of model pattern uses four options such as Test Options, Cross-Validation Folds 10, Split 80-20, and Use Training Set. After that, four options will be averaged for accuracy. The experimental result shows that the best technique which has highest accuracy can be helpful for farmers in real world.

### III. PROPOSED SYSTEM

This section explains about the design of the proposed system and the process between the input and output. Showing how each module interacts with each other.



**FIGURE 1: Block Diagram**

Figure 1 [3] proposed system the user details will be provided and a dashboard appears. The user will have the choice to enter the name of vegetable and fruit. The dropdown list of locations will help the user to choose the location of which the prediction is to be made. The next process is of the database where the inputs will be processed and the preprocessing of datasets will be done. The attribute will be matched and selected according to the input onto which the classification and regression will be applied. The predicted value after processing will be displayed.

#### IV. CONCLUSION

Hence, by studying different techniques and researches the proposed system will be trained to predict the prices of vegetables and fruits and accurate results will be given based on the inputs provided. The results will be more accurate. The large-scale forecasting of agricultural stock prices is a challenging problem. The key to this problem is to check the various factors that might have influence on the agricultural product prices, and to combine the factors with forecasting models. The ambiguity of real data is a challenge that cannot be avoided. The proposed system is currently under implementation. This system uses the K-Nearest Neighbor algorithm for performing classification and regression on the data that is fed input to the system, the system will then analyze and process the data and accurately predict the prices of the vegetables and fruits selected for prediction.

#### ACKNOWLEDGEMENTS

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# Survey on IOT Based Smart Cultivation: A Crop Recommendation System

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**Abstract**—Agriculture plays a very crucial role in the economy and employment, especially in India. Each year many crops get damaged due to a lack of optimal climatic conditions to support crop growth. The common problem existing among the Indian farmers is that they sometimes don't choose the right crop based on their soil and environmental conditions. They follow old farming techniques without realizing the fact that crop output is dependent on the present conditions such as present-day weather and soil conditions. Due to this, the farmers face a serious setback in productivity. Hence, the proposed system for recommending crops which will be cost effective as well as very efficient, will make use of Crop data, soil related data and environmental related data which will be collected from various sources. An optical transducer will be used to measure and detect the presence of Nitrogen (N), Phosphorus (P) and Potassium (K) of soil.

**Keywords**—Agriculture, Cloud, Crop, Environment, Farmer, IOT, ML, Sensors

## I. INTRODUCTION

[1]India is a country where agriculture and related industries are the major source of living for the people. Agriculture is a major source of economy of the country. About 50% of India's population depends on farming. Different types of crops are cultivated in various parts of India due to different climatic conditions of different parts of the country, fertilizer capacity of land, the size of the lands, different soil conditions[1]. The crop production depends on whether condition (e.g. temperature, rainfall, humidity) & soil characteristics of a particular region. Farmers sometimes may not choose the right crop for the present condition and due to this the farmer lose important production of crops. They still rely on intuition and previous knowledge for selecting crops. The proposed crop recommendation system helps in selecting right crop for a particular condition. Hence, the proposed system for recommending crops uses crop specific characteristics along with soil and environmental conditions and predicts the crop for a particular area and for a specific month using machine learning and IOT. The proposed system will give accurate suggestions for crops to be grown which will enhance the production in an agricultural field. Ensemble technique is used which combines the output of multiple learners on same data to give an accurate final prediction. [2]Various sensors are used which collect data in real time about parameters that include pH value of soil, moisture, temperature, Nitrogen Phosphorus and Potassium (NPK) levels in the soil and also the moisture level[2]. These collected values are then sent to machine learning algorithms which are trained for giving accurate crop prediction.

## II. LITERATURE REVIEW

R. Varghese et.al. [1], describes the proposed system will estimate the amount of water present in the soil in real time, detect the humidity level and temperature using different sensors. It uses cloud for predicting future conditions by applying machine learning algorithms to past data

M. Masrie et.al. [2], an optical transducer is developed to measure and to detect the presence of Nitrogen (N), Phosphorus (P) and Potassium (K) of soil. It contains three LED's and photodiode sensor as a light detector. Nutrients present in the soil absorb light from LED's and photodiode sensor convert remaining light as a reflector. The system uses Arduino Microcontroller which converts the output into the digital display. It gives output as High, Medium or Low.

Suhas et.al. [3], here the proposed system predicts the rice crop yield for a particular year for a particular area using the regression techniques. The proposed system uses a multiple linear regression model and the decision tree regression model to predict the crop yield. Various parameters like water Evapotranspiration, temperature, previous year yield etc. are used to train the machine learning model. Once the model is trained, it will predict the rice crop yield for that particular area.

Divya J et.al. [4], different types of sensors like pH sensor, temperature sensor and humidity sensor has been used to test the soil conditions. Depending on the results farmer can cultivate the suitable crop according to the soil conditions. The values which are obtained through the sensors are sent to the administrator through the Wi-Fi and through the mobile application the suitable crops are given to the farmers based on the soil conditions. Automatic irrigation system gets started, if the current soil temperature is high. Using the web camera, image is captured and it is sent to the administrator for suggesting the pesticides for the disease of the crop.

Y. Gange et.al. [13], different types of data mining methods are used for prediction of crop yield. The accuracy of the crop yield prediction depends on how accurately the features of the soil have been extracted from the large amount of dataset. Various algorithms/models have been used to predict the crop yield like Decision tree, SVM, etc. In this paper, the algorithms/models have been applied on only historical data, the improvement can be done in this field using the different types of sensors.

Z. Doshi et.al. [14], Most of the farmers follow ancestral farming patterns and norms without knowing the fact that good yield of crop depends upon the present environmental and soil conditions. This paper tries to help the Indian farmers to take the correct decision about the best crop which can be grown according to the sowing season, geographical location of the farm, soil conditions as well as environmental conditions.

M. Mokarrama et.al. [11], the system agro-ecological and climate data at upazila level. System first detects the user's location, then it selects some top upazilas and recommends some top crops which can be grown in that specific upazilas. Architecture of this system consists of four modules 1) Location detection module, 2) Data analysis and storage module, 3) Similar location detection module, 4) Recommendation generation module. Location detection module detects the location of the user. In data analysis and storage module different information and data has stored. Similar location detection module identifies top-n similar location with the help of data storage module and similarity calculation algorithm. Finally, on the basis of top-n location, top-k crops are recommended for that particular area.

D. Pudumalar et.al. [9], in agricultural field, Data mining is used for analyzing the different biotic and abiotic conditions. The problem of not choosing best crop can lead to a serious loss in productivity. This problem can be resolved using precision agriculture. Precision agriculture is a new technique of farming which uses research data of different soil parameters and suggests the right crop to the farmers. This can be used to reduce the wrong choice of a crop and can help to increase the productivity and net worth. This problem is solved by proposing a suggestion system through an ensemble technique with majority voting technique using different types of machine learning algorithms like Random tree, CHAID, K-Nearest Neighbor and Naive Bayes to recommend a crop for that specific area with high accuracy and efficiency.

S. Rahman et.al. [5], Machine learning is an emerging and challenging field in Agriculture. In this paper, the proposed system predicts soil series with land type and based on predictions the system will suggest suitable crops in that specific type of the soil. Various types of machine learning algorithms like weighted k-Nearest Neighbor (k-NN), Bagged Trees, and Gaussian kernel based Support Vector Machines (SVM) are used for classification of the soil. Experimental results show that the proposed SVM based method performs better than many existing methods.

N. Gandhi et.al. [7], Food production in India is largely dependent on the Rice yield, so it became very important to maximize the rice yield prediction in India. Machine learning techniques can be used to increase the rice yield in India which can help the farmers and other Stakeholders in better decision making in order to increase the net worth. This paper uses WEKA tool on the dataset of 27 districts of Maharashtra state, India for predictions. The proposed system used various parameters like precipitation, minimum temperature, average temperature, maximum temperature and reference crop evapotranspiration, area, production.

R. Kumar et.al. [6], Many researchers predict the yield of crop depending on the soil conditions, climatic conditions, etc. But if there is more than one option to cultivate a crop at a time for limited land resources, then selection of crop is difficult. The proposed system can be used to solve problem of selecting a right crop named Crop Selection Method (CSM) in order to increase the net yield rate of crop and subsequently it helps to increase the economic growth of the country. The proposed system uses different machine learning algorithms like Artificial Neural Network (ANN), Support Vector Machine (SVM), Gradient Boosted Decision Tree (GBDT), etc.

A. Araby et.al. [8], The Internet of Things (IoT) and cloud is going to be the future of many industries. It can also be useful in Agriculture field. The cloud computing is the home and destination of the data which adds intelligence for precision agriculture. In this paper, the proposed system uses sensing network to gather the data of crops, then fed the data into machine learning algorithm to get the output. Various sensors have been used to sense the soil conditions like humidity sensor, moisture sensor, etc.

R. Rajak et.al. [10], Because of not choosing proper crop based on their soil necessities the productivity gets affected. This issue can be resolved using precision agriculture technique. This technique is differentiated by the soil database collected from the farmer's farm, crop database provided by agricultural experts, achieving the values of parameters such as soil form soil testing lab dataset. The proposed system uses ensemble model using Support Vector Machine (SVM) and Artificial Neural Network (ANN) as learners to predict crop yield.

M. Paul et.al. [12], for some previous years, the crop yield prediction had been implemented by considering the farmer's previous experience for a particular site and a crop. But sometimes the farmers prediction could be wrong, so the productivity could be decreased. The proposed system helps for the proper selection of crops for cultivation. The system uses data mining techniques to predict the category of the soil dataset. The system make use of various types of machine learning algorithms like Naive Bayes and K-Nearest Neighbor for prediction.

### III. ANALYSIS TABLE

Sr. No.	Title	Advantages	Disadvantages	Technology Used	Accuracy
1	Soil Classification using Machine Learning Methods and Crop Suggestion Based on Soil Series[5]	The proposed system predicts soil series and provides suitable crop yield suggestion for that specific soil.	Sometimes class imbalance problem occurs	Several ML algorithms are used such as K-NN, Bagged Trees & SVM	92.93%
2	Crop Selection Method to Maximize Crop Yield Rate using Machine Learning Technique[6]	It solves crop selection problem and improve net yield rate of crops	Accuracy is not up to the mark.	Random Forest, ANN, SVM, K-NN, GBDT, Decision Tree Learning	Accuracy depends on predicted value of influenced parameters.

3	Rice Crop Yield Prediction in India using Support Vector Machines[7]	Greater crop productivity & decrease the loss due to unsuitable conditions	It's difficult for farmers to Remain productive and sustainable with changing climates.	Support vector machine (SVM) & WEKA	78.76%
4	Smart IoT Monitoring System for Agriculture with Predictive Analysis[8]	MQTT protocol is used for communication between sensors and cloud.	High cost of components.	IoT and Machine learning algorithm like SVM	99.7%
5	Crop Recommendation System for Precision Agriculture[9]	It increases productivity and acquire profit.	Less number of features are used.	Voting technique, Random tree, CHAID, K-NN & Naïve Bayes	88%
6	Crop Recommendation System to Maximize Crop Yield using Machine Learning Technique[10]	It helps farmers to increase the productivity & prevent soil degradation in cultivated land.	Size of dataset is small.	SVM, Naïve Bayes, Multi-layer Perceptron (ANN), Random forest	-
7	RSF: A recommendation system for farmers[11]	The system works with different agro-ecological and agro-climatic data, utilizing the seasonal information.	Not all sub-regions are covered.	Variety of databases such as crop growing period, thermal zone, physiographic and seasonal.	80%
8	Analysis of Soil Behavior and Prediction of Crop Yield using Data Mining Approach[12]	RapidMiner 5.3 is used which provides an integrated environment for ML, data mining and predictive analysis, etc.	The proposed system uses small dataset.	Naïve Bayes and K-Nearest Neighbor methods are used.	-

#### IV. CONCLUSION

The system makes use of Machine Learning along with IOT. Based on soil and environmental characteristics along with crop specific condition requirements, the system predicts the crop which is suitable to grown in that area. The Ensemble technique used, can combine different machine learning algorithms and produce one predictive model. The model also fetches the levels of NPK (Nitrogen, Phosphorus and Potassium) from the soil using optical transducer. If present conditions of the selected region are not suitable for a specific crop, then the system will inform the farmer about the crop specific conditions which should be met for cultivating that particular crop. The system will solve the right crop selection problem and will give maximum profit to the farmers and will also have a positive impact on the economy of the agriculture sector.

#### ACKNOWLEDGEMENTS

We would like to express a deep sense of gratitude towards our mentor for his constant encouragement and valuable suggestions. The work that we have been able to present is possible because of his timely guidance and support.



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# Survey: Search and Rescue Operation during Natural Calamities Using Unmanned Aerial Vehicle (UAV)

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**Abstract**— Natural and Manmade calamities affecting various regions causes a lot of human casualties. Disasters are unstoppable and exceptional events such as earthquakes, wildfires, floods, terrorist attacks, etc. this lead to a massive death of people being stuck or no help received on time. The recent 2019 Kerala floods resulted into a life penalty of 101 people and seven went missing. One of the main challenges faced by the search and rescue teams during a massive disastrous situation is the search of survivors and victims as early as possible and also reaching them to rescue. This system focuses on the implementation of human detection by using an unmanned aerial vehicle during disastrous conditions. This system helps in rescue operation by scanning affected area through optical and thermal cameras and detects humans. It will also provide actual location of humans via an android application. This system consists of sensor based monitoring system. As it is a drone based system, it can easily be controlled. Data communication is handled through LoRa technology which is a long range and power efficient technology. The system sends the data further to rescue teams for taking actions and investigations. This system will prove helpful for search and rescue teams and serve the purpose in large calamitous conditions.

**Keywords**— Embedded Domain System, Disaster Area Monitoring, Human Detection, Obstacle Detection, Geotagging and Location Storing, Android Application.

## I. INTRODUCTION

Natural and Manmade calamities affecting various regions, causes a lot of human casualties. Disasters such as earthquakes, wildfires, floods, terrorist attacks, etc are unstoppable and leads to a massive death of people either because of people being stuck or no help received on time. The recent 2019 Maharashtra floods has resulted into a life penalty of 56 people. The objective is implementation of human detection by using an unmanned aerial vehicle during disastrous conditions. This system helps in rescue operation by scanning affected area through optical and thermal cameras and detect humans. It will also provide actual location of humans via an android application. This system consists of sensor based monitoring system. As it is a drone based system, it can easily be controlled. The system sends the data further to rescue teams for taking actions and investigations. This system will prove helpful for search and rescue teams and serve the purpose in large calamitous conditions. The ultrasonic sensors are used to detect the obstacle coming in front of drone. If there is obstacle detected in front of the drone, then the direction of the drone changes. The wifi module is used to send the data of the location where the human is detected.

## II. LITERATURE SURVEY

A.A.Rivera et.al.[1] focuses on the implementation of the human detection and geolocation system of the human using Unmanned Aerial Vehicle. The human detection is done by the thermal and optical Imagery. Geolocation was achieved using triangulated-adjusted GPS data and integration of Google Maps. The higher accuracy reflected by the thermal sensor at night

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time proved the thermal detection works best when used during night operations. The data implies

that the optical detection works efficiently during day time. The results obtained by optical camera during day time are more accurate as compared to night time. The geolocation capability was measured by 10 meters detection radius.

S.Lee et.al.[2] focuses on human rescuers at the disaster sites. The drone has become an effective tool for searching survivors from confined space such as collapsed building or underground area. The infrared camera and LIDAR sensor are used in fusion. This paper tells that fusion of infrared camera and LIDAR sensors can assist rescuers to find victims of natural disaster in unknown environments, and the detection system is insensitive to illumination change. In this paper the infrared camera and the LIDAR sensors are used in fusion its becomes difficult to control the drone. GPS location is not used to give the location of the victim.

T.C.Mallick et.al.[3] proposed the development of unmanned aerial vehicle(UAV) which is controlled by wireless technology. This system proposed in this paper is capable to fly in different mode without complexity. It's performance, movement, orientation, motion, balance also good. This machine have facility to peer flight statistics with the aid of using powerful floor station and consumer can upload or override a assignment in real time flight condition when a task running. The overall total weight of implemented design is 1.46kg and its carrying capacity is 0.5kg. The system proposed in this paper does not focuses on the obstacle faced by UAV while flying and also on the range of the drone.

R.Tariq et.al.[4] focuses on locating and finding survivors and victims in the disastrous situation like war, tornados or earthquakes. It is very difficult for rescue team to reach certain sensitive areas due to the immense amount of debris. The system has Passive Infrared Sensors (PIR) to detect radiations generated by human body. It will work efficiently in searching people trapped under the rubble and marking their locations as well as sending alerts, so that rescue teams can come in and aid those in need of assistance. The system gathers real time data day and night in challenging conditions and without any risk to personnel. In this paper, PIR (Passive Infrared Sensors) are used which works effectively in LOS (Line of Sight) and will have problems in the corner regions. The sensitivity of the sensor is very low. The PIR sensor sense heat signatures in the room.

M.Zacharie et.al.[5] focuses on the human detection using Image Processing. But despite all of the improvements in technologies, know-how of the mechanisms of nature and the damages brought about via natural disasters, which includes earthquakes, landslides, and flooding to mention handiest a few, are nonetheless very far away. In the attempt of saving lives all through natural disasters, including earthquakes, this have a look at introduces a rapid human frame detection using picture processing from UAV digital camera. The skin coloration from a female student is first extracted in RGB then transformed to HSV. Next, beginning and ultimatemorphological operations are done eight times every to do away with all noise present in thephoto. Experimental tests were carried out each indoor and outdoor, in which the lady studentpresented an object near and some distance to the digital camera to test the detection functionality in both cases. The experiment results display that close or a ways, the digital camera can honestly detect both a human body and any a part of a human frame. The outcomes of the test prove the merit of the proposed method.

A.Rahmadhani et.al.[6] proposed development of long range and low power consuming unmanned aerial vehicle using LoRaWAN technology. Developing a long-range and energy- efficient communication system is the important topic proposed in the paper. LoRaWAN, a standard protocol for LoRa intended for wide area networking, can be used for drone delivery application. However, it is not suitable for real- time and control-heavy applications. In this paper, the limits of LoRaWAN as a secondary communication mode for drone delivery system are evaluated. The results show that LoRaWAN protocol can still be used for a semi- real-time telemetry purpose in which it can send 10-20 bytes payload regularly with minimum of 2-3 seconds interval. In terms of coverage, the system can achieve up to 8 km in an urban area as tested, using the lowest spreading factor, considering the imperfection factor from the hardware. The percentage of packet loss using this configuration is still tolerable, i.e., up to 5%. The

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LoRaWAN module used is SX1276 LoRa chipset and Arduino Uno flashed with LoRaWAN stack.

V.A.Dambal et.al.[7] LoRa technology permits long-range verbal exchange with low-power intake for the Internet-of-Things (IoT) devices inside the city and suburban environment. However, due to the fact of terrestrial structures in city and suburban environments, the hyperlink distance of LoRa transmissions can be reduced. In this paper, we document signal power measurements for the in-building and inter-building LoRa hyperlinks and provide insights on factors that have an effect on signal first-rate which include the spreading factor and antenna orientation. Subsequently, we also provide measurement outcomes in city and suburban environments while the LoRa transmitter is deployed at exceptional heights the usage of an unmanned aerial vehicle (UAV). The findings display that the UAV deployment top is vital for enhancing coverage inside the suburban surroundings and antenna orientation affects the conversation range.

L.Chen et.al.[8] air quality monitoring usually rely on statically deploying stationary monitors done by government. However, many air pollution emissions are irregular and uncertain. How to dynamically and effectively monitor air pollution emission will be an important issue for environmental protection. In this paper, we design a LoRa-based air quality monitor tied on Unmanned Aerial Vehicle. It can achieve two goals. The first is that the UAV can real-time send the sensed data back to server if it is flying to long-distance monitored target. The other is that the UAV can perform sensing task itself with minimal human intervention. They have implemented a prototype of LoRa-based air quality sensor on a UAV and a web-UI for user to configure the route of UAV and view the sensed data immediately. We believe that the prototype can be used easily to monitor the air quality with minimum human intervention.

T.Giitsidis et.al.[9] illegal migration as well as wildfires constitute not unusual conditions in southern European countries, where the mountainous terrain and thick forests make the surveillance and region of these incidents a tall task. This territory could gain from Unmanned Aerial Vehicles (UAVs) ready with optical and thermal sensors along with sophisticated photograph processing and laptop imaginative and prescient algorithms, in an effort to come across suspicious pastime or save you the spreading of a fire. Taking into account that the flight height is about to two kilometers, human and fire detection algorithms are mainly based totally on blob detection. For both processes thermal imaging is used that allows you to enhance the accuracy of the algorithms, while in the case of human recognition statistics like motion patterns in addition to shadow length and form also are considered. For fire detection a blob detector is utilized at the side of a shade based totally descriptor, implemented to thermal and optical images, respectively. Unlike fireplace, human detection is a more worrying technique ensuing in a more sophisticated and complex algorithm. The main problem of human detection originates from the excessive flight altitude.

P.B.Parappat et.al.[10] says Unmanned Aerial Vehicles are increasingly more being used for army and civilian purposes. Obstacle avoidance is an important aspect for any mobile robot including UAVs. Indoor UAVs touring through a corridor can autonomously avoid obstacles and do direction planning with LIDARs. Outdoor UAVs can discover limitations using radars. This paper proposes a new algorithm to autonomously avoid boundaries using radars and picture processing of video frames to hit upon and avoid barriers. Typically, UAVs are limited by means of on-board computational and memory constraints. This new set of rules aims to lessen the computational requirement. The overall performance of this algorithm is compared with the brute force pixel-by-pixel comparison or the MLE algorithm.

G.Hristov et.al.[11] says Forest fires are occurring at some stage in the 12 months with an increasing intensity in the summer time and autumn periods. These occasions are in particular caused by the actions of humans, but exceptional nature and environmental phenomena, like lightning moves or spontaneous combustion of dried leafs or sawdust, also can be credited for their occurrence. Regardless of the motives for the ignition of the wooded area fires, they usually cause devastating harm to each nature and humans. Forest fires also are considered as a primary contributor to the air pollution, due to the fact that during every fire big amounts of gases and particle matter are released inside the atmosphere. To combat wooded area fires, one-of-a-kind answers had been employed throughout the years. They were number one aimed toward the early detection of the fires. The simplest of

these answers is the status quo of a community of observation posts – both cheap and clean to accomplish, however additionally time-consuming for the worried people.

M.F.Ramli et.Al[12] Achieving a sturdy impediment detection system for small UAV could be very challenging. Due to size and weight constraints, very constrained detection sensors can be equipped within the gadget. Prior works targeted on a unmanned sensing device that is either digicam or variety sensors primarily based. However, those sensors have their own blessings and drawbacks in detecting the look of the obstacles. In this paper, mixture of both sensors based is proposed for a small UAV impediment detection device. A small Lidar sensor is used as the preliminary detector and queue for photograph capturing through the camera. Next, SURF set of rules is implemented to find the obstacle sizes estimation with the aid of looking the connecting feature points within the imageframe. Finally, safe avoidance route for UAV is determined through the exterior characteristic points from the estimated width of the obstacle. The proposed approach became evaluated by using undertaking experiments in real time with indoor environment.

### III. ANALYSIS TABLE

Sr. No.	Title Of Paper	Technique Used	Limitations
1	Post-disaster Rescue Facility: Human Detection and Geolocation Using Aerial Drones.	The human detection is done by thermal and optical imagery.	The range of the drone is not sufficient.
2	Drone-Assisted Disaster Management: Finding Victims via Infrared Camera and Lidar Sensor Fusion.	The infrared camera and LIDAR sensors are used in fusion for human detection.	The controlling of drone is difficult due to fusion of sensors.
3	Design & Implementation of an UAV (Drone) with Flight Data Record	Quadcopter dynamics, Arduino APM module 2.8 etc these are some components and techniques used.	The system proposed in this paper does not focuses on the obstacle faced by UAV
4	DronAID: A Smart Human Detection Drone for Rescue.	PIR sensors are used for human detection.	PIR sensors are insensitive to slow motion object.

5	Rapid Human Body Detection in Disaster Sites using Image Processing from Unmanned Aerial Vehicle(UAV) Cameras	-Optical Cameras. -Human body detection using image processing from UAV	Optical sensors are not only sufficient for human detection .
6	LoRaWAN as Secondary Telemetry Communication System for Drone Delivery	The LoRaWAN module used is SX1276 LoRa chipset and Arduino Uno flashed with LoRaWAN stack	-----
7	Improving LoRa Signal Coverage in Urban and Sub-Urban Environments with UAVs	Setup used is LoRa Tech Evaluation Kit-900 by Microchip Tech which has a bandwidth of 125 kHz and operating between 902 – 928 MHz.	-----
8	A LoRa-based Air Quality Monitor on Unmanned Aerial Vehicle for Smart City	Raspberry Pi is triggered to get the reading of PM2.5 sensor and then send the reading to backend cloud server through LoRa module.	-----
9	Human and fire detection from high altitude UAV images	-Blob detector captures optical and thermal images -GPS positioning is provided by navigational portion of UAV	The fusion of optical and thermal images is more beneficial than a separate usage of each image.
10	Obstacle avoidance by unmanned aerial vehicles using image recognition techniques	Image recognition technique is used and radar sensors for obstacle detection.	Radar sensor will not change the direction of UAV only the obstacle will be detected.



11	Emerging methods for early detection of forest fires using unmanned aerial vehicles and LoRaWAN sensor networks	LoRaWAN sensors are used for forest fire detection, environmental sensing and the long term air-quality analysis.	-----
12	Obstacle Detection Technique Using Multi Sensor Integration for Small Unmanned Aerial Vehicle	A small Lidar sensors are used as the initial detector and queue for image capturing by camera.	If detected obstacle is greater, than the avoidance distance will be much higher, which will lead to more computational time.

#### IV. CONCLUSION

This system is helpful for search and rescue teams to search human beings in less time and also keeping health of people into consideration. Our project hereby tries to solve problems faced by rescue team. This system consists of sensor based monitoring system. As it is a drone based system, it can easily be controlled. Data communication is handled through LoRa technology which is a long range and power efficient technology. The system sends the data further to rescue teams for taking actions and investigations. This system will prove helpful for search and rescue teams and serve the purpose in large calamitous condition

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## A Modern Approach For Secure E-Voting

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**Abstract**— Voting is a normal process that keeps a nation's governmental system works. Every voting system must follow the basic requirements such as authenticity of user and impartiality to achieve fair voting. Most of the existing electronic system based on system which suffer from universal authenticity and integrity issues of participants and may need improvement. In unified system, the result of voting events has always been questionable by voters. Various voting systems are available for conducting election and providing better security of votes. In this paper, comparative study of various voting systems based on blockchain technology is discussed to get secured and trustworthy results. In order to improve authenticity of voter biometric can be implemented with blockchain technology.

**Keywords** — Authenticity, Biometric, Block chain, Security, Voting.

### I. INTRODUCTION

Voting is the most important process that has to be undertaken by every individual in a responsible manner. In the democratic Country it gives right to the people of that country to choose the committee members of their choice [2]. This process should be well-mannered and without any effect to the process.

After each election there is a rumor or doubt in people and opposition parties mind that there are many frauds made by the election members in EVM or while counting the votes[6]. It is difficult for people to accept the elected candidate for that particular post. There are chances that a person cast votes under another person identity which is also a kind of fraud. In other words, each ballot should be counted anonymously, accurately and efficiently [9]. In this paper, various techniques were studied and compared which are used for providing better securities in a voting system.

### II. LITERATURE SURVEY

Hsin-Te Wu, et.al [1] have proposed voting system that is designed on the basis of blockchains to create a trustworthy voting system. In current blockchain technology, voter-related regulations are provided by smart-contracts to prevent controversies during voting processes. The current electronic voting systems employ centralized servers for data processing; centralized servers are susceptible to malicious attacks and so using the distributed architecture can reduce the risk of post-attack shutdown. Additionally, an anonymous voting system is designed with the goal of providing anonymity. The system did not include mechanisms such as ballot counting and ranking to our scheme and improve the speed of vote counting and complement electronic voting systems.

Ali Kaan Koç, et. al. [2] have proposed system that uses block chain with the smart contracts for online voting system. To provide consistency smart contracts logic is widely been used, ethereum along with the network is used. It further makes use of solidity language for Ethereum wallets or android application so that the user can vote. Android application is also been designed so that the people without an Ethereum wallet can also cast their precious vote. After completion of election, the records of votes will be stored in the Ethereum block chain network. To provide reliability and efficiency this blockchain system for voting was designed.

Budi Rahardjo, et. al. [3] have proposed a decentralized system where the complete database is owned by many users, which is done by using block chain technology. The system makes use of hash values in recording the voting results of each polling station and makes this recording system more secure. It also helps to identify nodes that can control and update data together for achieving the participants trust goals. The block chain algorithm for recording of votes result from every place of election is been researched. In non-functional tested it was found that the system implemented with Python programming language able to handle the whole process of recording the e-voting system.

David Khoury, et. al. [4] have proposed System is designed for writing both registration and voting smart contracts using Solidity language. The system provides voting data immutability along with data integrity and ensured privacy. User mobile phone numbers are used to authenticate them without the need of a third-party server. This system restricts each voter to have a single vote per valid Mobile Station International Subscriber Directory Number. Privacy-aware regarding the confidentiality of the recorded votes. The existing centralized systems facilitate voting process conducted by governments and is based on SMS polling and can be replaced by the designed system. The system offers a step towards ideal environments for such experience, since it is feasible.

Dr. Prasenjit Bhavathankar, et. al. [5] have proposed a paper in which the individuals national identity can be integrated with various blockchain applications. The individuals national identification records must contain the fundamental details regarding the individual and also the biometrics details that can be carried anywhere. Aadhar card number is used as a national identification for each individual in this system. Once the QR code is been scanned, the authorized person can see all the details of the vote entered in the system during registration. It allows individuals, machines, algorithms and organizations, to liberatingly interact and transact with each other with less friction. Also distributed cloud storage is been used to store the data.

Wei-Jr Lai, et. al. [6] have proposed an Evoting system that is effective for voters and maximize government or authority trust. Ethereum blockchain is used to store the votes and all messages which provides the transparency of election that is ensured. It ensures the voting results correctness and the individual participant Ethereum gas cost is kept affordable simultaneously. The system calculates result automatically is maintained in this system through which the voting results can be tallied without the interference of any untrusted third party. The effectiveness of our system can be justified by checking the required Ethereum gases per voter.

Shalini Shukla, et. al. [7] have proposed the application that is designed in such a manner so that the intricacies of the underlying architecture is hidden from the user. Government approved Aadhar number is used to identify each voter uniquely. Each voter gates right to vote only once for each election. To make the votes encrypted and in hash format, a public and private key are allocated to each individual. The scalability of the blockchain application depends on the secondary memory limit of the peer. The proposed framework does not tackle every one of the issues related with electronic voting, but it provides a profitable contrasting option to present, restrictive electronic voting frameworks.

Rikard Hjort, et. al. [8] have proposed a voting system using concept of blockchain and an early stage implementation of the system is done. System relies heavily on the trust of the election commission side. The electoral commission can relate voters and their choices as voters register their public keys with their IDs to the electoral commission. The electoral commission also holds the election secret key, let it able to see the message created by voters. However, election secret key leakage can cause huge damage to the election itself as it allows people to see the partial result of the election. Therefore, the voting electoral commission needs to protect the election secret key.

Mohamad H. Hassoun, et. al. [9] have proposed the system using a classification strategy called as weighted voting that observes the performance of face recognition. Instead of evaluating the local distance to merge the results of local classifiers based on rank information, weighted voting strategy is used. Simple pixel feature is an example where such strategies can be used.

Specification of how to achieve the final classifier output is given when multiple features are available. Test results are presented for the issues of face recognition on a large human face of database. The sequential classifier, though, performs similar to both combination schemes, but requires much less computation time.

Soojin Park, et. al. [10] have proposed the constituent elements of smart contract that are analyzed and expressed by ontology. And the process of negotiating the components is represented by each transaction. Finally, we construct the component represented by the ontology as XML by including the state information in the transaction. In this way, the smart contract is represented in a formal language that contains state information. It also laid the foundation for a smart contract that can be reused and verified. There are various types of block-chain networks, and the configuration of smart contracts used for each blockchain network differs.

Jon Crowcroft, et. al [11] have proposed the survey paper which include the electronic voting, however, has emerged as an alternative but still not being practiced at a large scale. The flawless method for result accumulation from the blocks is suggested in this paper. It helps to declare the results from the constituencies, polling stations, and the national result. The data accumulation, polling process effectiveness, block sealing and creation, utility of hashing algorithms and result declaration is discussed in framework by using the secured blockchain method. This system also claims to prove the data management and security challenges in blockchain providing an improved version of the electronic voting process.

Yong Yuan, et. al. [12] have proposed a paper that consist the implementation of smart contract in voting system. The characteristics of smart contracts enable contract terms to be followed within untrusted parties without any interference of a trusted authority or any central server. . The open challenges standing faced by smart contracts and the recent research progresses. The smart contracts were enabled by the blockchain operating mechanism and platforms also a research framework for it based on a novel six-layer architecture was proposed. Second, both the technical and legal challenges along with the recent research progresses, are listed. Lastly several application scenarios were presented.

Sanchay Mishra, et. al. [13] have proposed a voting system that uses block chain for data storage and cloud based storage(SAAS) to update the votes which are recorded by the EVM. The system make use of block chain which has a feature of Proof-of-Work which does not allow the rapid manipulation of data. The system stores the votes in a form of hash value and store it in a hash table so if any tampering with votes takes place it will results to break a link and detects the manipulated votes and discard them by marking as NOTA. The system can identify the point of manipulation by tallying the data of EVM with hash table. This system can also be used in such areas where no broadband internet connection are available.

Ashish Singh, et.al. [14] have proposed a e-voting system that uses a block-chain technology which solve the security issues of existing system. This system is de-centralized which store results in different locations in a form of bitcoins and the system uses encryption and hashing concept for ensuring the security. The system ensures that only registered and authenticated user can vote only one time. One's the voter cast the vote blocks is created and after completion of blockchain no one can tamper the data. The system uses Voter ID for unique identification of user. The security analysis of system shows that the system is more robust and secure against existing attacks.

Rong Wang, et. al.[15] have proposed a system is a digital certificate publishing scheme an anonymous, it achieves the separation of user registration and authorization. It has the features of anonymity and conditional traceability to realize and to protect user's identity privacy.

ChangHyung Le, Lewis Nkenyereye, et. al. [16] proposed an architectural framework which focuses on providing blockchain in IoT platform. One of the existing blockchain system which is Logchain and one M2M-based IoT platform is used. To ensure blocks integrity, an algorithm namely blind voting as a general agreement rule is used by Logchain.

### III. ANALYSIS

The following table is the summary of various research papers on data security using various encryption techniques.

**Table 1. Analysis Table**

Sr. No.	Title of paper	Techniques	Advantage	Disadvantage
1.	Towards Secure E-Voting Using Ethereum Blockchain.[1]	Smart Contract	Able to eliminate duplicate votes.	Biometric authentication is not provided
2.	Block chain Based E-Voting Recording System Design.[2]	Block chain and python pycharm	More cost efficient.	All nodes that have not been defaced because of disorder.
3.	Decentralized Voting Platform Based on Ethereum Block chain.[3]	Solidity	Provides data immutability, data integrity and clarity.	Biometric authentication is not implemented.
4.	Online Voting Application using Ethereum Blockchain.[4]	Smart contracts, Hyper ledger	Simple, scalable and reliable.	Complexity is high.
5.	DATE: A Decentralized, Anonymous, and Transparent Evoting System.[5]	Smart contract	No deposit required to invest	Time Consuming
6.	A Privacy Preserving Voting Protocol on Blockchain.[6]	Smart contracts	Low volume of data stored after encryption/decryption.	Complexity is high, therefore use is very less.
7.	A Comprehensive Integration of National Identity with Block chain Technology.[7]	Proof of work	Votes are Stored Securely.	National Identity is must.
8.	A Block chain Based Network Security Mechanism for Voting Systems.[8]	Bilinear pairing	Allows user to conduct data authentication.	Complexity is high
9.	E-Voting Using Face Detection and Recognition (FDR), One Time Password (OTP).[9]	Template Matching	High speed (Matching Image).	Accuracy is Moderate.
10.	Face Time – Deep Learning Based Face Recognition Attendance System.[10]	Deep Convolution Neural Networks(CNN)	Accuracy is high (96%).	Noise and Distance affects accuracy.
11.	A Proposal of Blockchain-based Electronic Voting System.[11]	Distributed database	Transparent System	Anonymity and Coercion less.
12.	Formal Specification Technique in Smart Contract Verification.[12]	Smart-Contract, XML	Allow verification of smart contract.	Lack to exchange data between nodes.



13.	Block Chain Based Cloud Computing Model on EVM Transactions for Secure Voting.[13]	Proof of work, SAAS	Manipulation of data is not possible.	Better networks is required for faster storing of data.
14.	SecEVS : Secure Electronic Voting System Using Blockchain Technology[14]	Blockchain	More robust and secure against existing attacks.	Huge storage of data is required.
15.	A Privacy-Aware PKI System Based on Permissioned Blockchains.[15]	NA	Reduces the cost of CA construction, operation and maintenance in traditional	Single point failure. Poor efficiency of certificate deployed.
16.	Towards a Blockchain-enabled IoT Platform using oneM2M Standards.[16]	Logchain	IoT framework that shows the feasibility of using Blockchain technologies in a standardized IoT service layer platform.	Developing of the described API that can enable blockchain in oneM2M.

**NA- Not Applicable.**

#### IV. CONCLUSION

Due to the fast development of technologies, E-voting and its security has become the most important aspect. There are various techniques which are used by many countries to cast votes. In this paper, various techniques used for E-voting based on blockchain technology but they had not used any biometric techniques for authentication. The Blockchain technology with biometrics are found efficient for E-voting and its security.

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## Analysis of Sign Language Analyzer and Translator

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**Abstract**— Human Beings interact verbally with each other to convey their thoughts, ideas and experiences with the people around them. But, this is not in the case for the Dumb and Deaf people. They have to communicate using Sign Languages and sometimes it is not possible for normal people to understand it. Dumb and Deaf people face many problems because of these disabilities as they cannot apply for Jobs. Also, if they are working it becomes quite difficult for the co-workers to coordinate. Through Sign Languages, it is possible to convey messages without acoustic sounds. Normal people are not able to understand the Sign language which gives rise to a major problem of miscommunication. To overcome this problem, we have proposed a system which aims to make dumb and deaf people communicate with normal people with less difficulty, reducing the communication gap between them. In the proposed hand gestures are captured, processed and converted into speech or text. The proposed system would use a camera to capture the hand gestures of the people with disabilities and it would display message on the screen this system will help to ease communication between normal and hearing-impaired people.

**Keywords**— Analyzer, dumb and deaf, sign language, speech, translator

### I. INTRODUCTION

Human Beings interact verbally with each other to convey their thoughts, ideas and experiences with people around them. This is not in the case for Dumb and Deaf people. They use Sign languages to communicate with people around them. But, sometimes it is not possible to convey their thoughts and this leads to miscommunication. However, people around these Dumb and Deaf people are not available to help them because of this barrier of Signs between them. Some normal humans are aware of the signs for conveying some things while some are not and this stops normal humans from helping those Dumb and Deaf People. Thus, to convey those messages properly and communicate with these Dumb and Deaf people there is a serious requirement of a system that could make these communication very much easier and smooth. A system wherein you could hold a phone in front of these Dumb and Deaf people and using the video recorder you will get the meanings/words of the signs they are making. So, these would help both for proper communication. There are some systems in the market that predicts the alphabets of the signs done. But, this system takes more time to build a word and a sentence. So, prediction of a word instead of an alphabet could make it easier and faster for communicating with these Dumb and Deaf people.

### II. LITERATURE SURVEY

V. Troung, et. al. [1] have proposed a system that can automatically detect static hand signs of alphabets in American Sign Language(ASL). The proposed system adopted the two combined concepts AdaBoost and Haar-like classifiers. In this work to increase accuracy of the system, a huge database for training process was used, and it generated great results. A data set of 28000 samples of hand sign images, 1000 images for each hand sign of positive training images in different scales, illumination, and the data set of 11100 samples of negative images was used for implementing and training the translator. Experiments show that the system can recognize all signs with a precision of 98.7%. Input of the system is a live video and output is text and speech.

A. Jayprakash, et. al. [2] have proposed a solution to the communication barrier of deaf and dumb community with the society. An android application was developed that translates the gestures using less memory and less CPU processing time. The application can be divided into two parts, adding a new gesture into the dataset and recognizing existing gestures from the dataset. The main method to identify gestures is using descriptors while the histogram matching is done in order to reduce the dataset for comparing using descriptors. The initial phase of comparison using histogram matching is done to identify the gestures. Gestures that are close to test sample. Further, only those samples that are subjected to Oriented Fast and Rotated BRIEF (Binary Robust Independent Element Features) based comparison reducing the CPU time.

A. Khaleghi, et. al. [3] have proposed a machine learning based system. The system deals with the classification of single and double handed Indian sign language recognition using machine learning algorithm with the help of MATLAB. The system was implemented on MATLAB and PC with Intel i5, 2.2GHz processor and 4GB RAM. Features were extracted from the set of images and used for training the conjugate gradient back propagation neural network (supervised learning). The images were also trained separately using K-NN technique. The single and double handed Indian Sign language is acquired and classified into English alphabets and numbers using K-NN and back propagation techniques, where PCA is used for dimensionality reduction. For, K-NN techniques with K=1, the system achieved 100% recognition rate whereas using back propagation technique the system achieved 94-96% recognition rate.

C. Zhao, et. al. [4] have proposed a system to create a vision-based application which offers sign language translation to text. The existing system aids communication between signers and non-signers. The existing system extracts temporal and spatial features from the video sequences. Inception, a CNN (Convolution Neural Network) for recognizing spatial features was used. The system then uses RNN (Recurrent Neural Network) to train on temporal features. The dataset used is a American Sign Language Dataset that consists of video sequences. In the existing system CNN and RNN are trained independently. In this system recordings are independent of each other, there is no continuation of gestures between two recordings. Problems faced by this system is with facial features and skin tones. While testing with different skin tones the model dropped accuracy if it hadn't been trained on a certain skin tone and was made to predict on it.

P. Singh, et. al. [5] have proposed two classification techniques PNN and KNN. In this system hand gestures are captured and processed with the help of MATLAB and then converted into speech and text. Following parameters are taken into consideration while capturing, extracting and pre-processing are, lighting changes, different sizes and shapes of user hand, background, skin colour, distance from the camera and the angle of position of the hand. The system uses 7Hu techniques for feature extraction and KNN classifier. To be precise, 82% accuracy is achieved by the existing system. The quality of English speech is good because of the inbuilt MATLAB function. Hindi speech is a database of records on recorded sound file. In this ".wav" audio file format is used for Hindi speech. In future work, ISL (Indian Sign language) could be converted into ASL (American Sign Language).

B. Gupta, et. al. [6] have proposed a system for Indian sign languages that recognizes static images of the signed alphabets. Indian Sign Language has single handed as well as double handed gestures. First, the signs are classified as single-handed or double-handed then for both categories two kinds of features, namely Histograms of Oriented Gradient (HOG) and Scale Invariant Feature Transform (SIFT) are extracted for a set of training images. Then, they are combined in a single matrix. Correlation is computed for these matrices and is fed to a K- Nearest Neighbour Classifier to obtain the resultant classification of the test. The dataset has 520 images for the training segment and 260 images for testing. The existing system could be further improved by including other forms of gestures such as mimics, expression and finger spelling as well.

K. Dutta, et. al. [7] have proposed a system that captures a series of images and it is processed using MATLAB and then converted to speech and text. The system was developed to translate the double handed Indian Sign Language to both text and speech. The existing system is based on eigenvalue algorithm. It employs Shi-Tomasi corner detector. Feature detection method used in this paper is Tomasi's good feature to track. In this paper, two methodologies have been implemented. One of the methodology used is based on statistical method and other is based on centroid algorithm. In statistical method, single

gesture with 10 different images were processed with proper threshold fixed. In centroid algorithm number of active fingers were calculated after forming two centric windows. Main drawback in the system is that they are position and background dependant which restricts its usage. Output text which is obtained after image and word processing is further converted to speech using text to speech synthesis.

N. Thiracitta, et. al. [8] have proposed a methodology to solve the barrier between dumb and deaf and the ordinary people using Markov Models. The system uses Argentina Sign Language that provides data as video. Pre-processing is done using edge detection and skin detection using the help of Contrast Adaptive Histogram Equalization (CLAHE) for image enhancement. Then the, features are extracted by its movement. At last, data is trained and classified using Modified Hidden Markov Model. 83% accuracy is achieved by classifying 10 signs using Gaussian Hidden Markov Model and 72% accuracy is achieved using Multinomial Hidden Markov Model. Drawbacks of this system are that the signers are using gloves, but this research is using skin recognition, making of the features aren't accurate. Future work for this system is improvement in noise reduction, dataset collection, better feature extraction, or better model to be used.

M. Taskiran, et. al. [9] presented a real-time sign language recognition system for people who aren't aware of sign languages. Sign Language used for the system is American Sign Language. In this paper, Convolution neural network model was trained by using dataset collected in 2011 by Massey University. After network training is completed, the network model and network weights are recorded for the real-time system. In the real-time system the skin colour is determined for a certain frame for hand use, and the hand gesture is determined using the convex hull algorithm, the registered neural network and network weights are used in real time to define hand gestures. Accuracy of this system is 98.05%.

D. Naglot, et. al. [10] have proposed a system using new digital sensor called "Leap Motion Controller" in which the signs are captured. LMC is a 3D non-contact motion sensor which can track and detect hands, fingers, bones and finger like objects. The existing system used Multilayer Perceptron (MLP) neural network with Back Propagation (BP) algorithm to build a classification model which takes feature set as input. Different signs are recognized using Multi-Layer Perceptron neural network. Dataset of total 520 samples (20 samples of each alphabet) is used to execute MLP. Features provided to ANN to train the system are distance between fingers tip position to palm center and distance between consecutive fingers tip position. Recognition rate of the proposed system is 96.15%.

S. Patel, et. al. [11] proposed a system in which gesture recognition and acquisition is done using camera. Initially it captures images in the plain RGB format, after that image is processed in the Skin Detection section where the algorithm of HSV-Skin Detection plays the role of detection of skin with the help of some threshold values of which are denoted by YCrCb. The next step is the blob detection algorithm where the skin detected image is processed to the grayscale image where the pixel are in the format of plain black and white pixels. Thus it further guides the algorithm into the contour detection where it accepts the gray image and if the contour area is found to be greater than 200 then it filled with white pixels. Finally the output is generated through text and speech form. The output of this system is very efficient, consistent and of high approximation of gesture processing and speech analysis.

M. Aarathi, et. al. [12] proposed a system with gesture recognition module and a Text-to-Speech synthesizer . Compared to other gestures, hand gesture plays an important role, as it expresses the user's views in less time. Flex sensor-based gesture recognition module is developed to recognize English alphabets and few words. Text-to-Speech synthesizer based on HMM is built to convert the corresponding text. The flex sensor is interfaced with the digital ports of Atmega328 microcontroller. The output from the microcontroller is the recognized text which is fed as input to the speech synthesizer. Arduino microcontroller processes the data for each particular gesture made. The system is trained for different voltage values for each letter. Gestures performed by multiple users have been tested for all the letters in ASL.

Pei Xu, [13]have proposed a real-time human-computer interaction system is designed based on hand gestures, who recognizes gestures only using one monocular camera and extends the system to the HRI(Human Robot Interaction) case.

Hand detection, gesture recognition and human-computer interaction (HCI) are the three major components of the system based on recognition and comprehends the robust control of mouse and key-board events with a higher accuracy of gesture recognition. The developed system only supports static gestures. The future work will be to investigate robust classifiers for dynamic gestures and develop a gesture-based HCI or HRI system with the support of complex motion recognition.

Joyeeta Singha, et.al. [14] have proposed a vision-based approach is used to build a dynamic hand gesture recognition system. Various challenges such as complicated background, change in illumination and occlusion make the detection and tracking of hand difficult in any vision-based approaches. To overcome such challenges, a hand detection technique is developed by combining three-frame differencing and skin filtering. Thus, a system with optimal features was selected using analysis of variance combined with incremental feature selection. These selected features were then fed as an input to the ANN, SVM and kNN model. These individual classifiers were combined to produce classifier fusion model. Fivefold cross-validation has been used to evaluate the performance of the proposed model. One-way analysis of variance test, Friedman's test and Kruskal–Wallis test have also been conducted to validate the statistical significance of the results.

Aashni Hariiaa, et. al.[15] have proposed a robust marker- less hand gesture recognition system which can efficiently track both static and dynamic hand gestures. Static gestures are those gestures which do not change for a certain duration of time and dynamic hand gestures are gestures that change within a certain time. Detection module applies different image processing techniques such as colour conversion, thresholding, finding defects etc. The image is classified using Haar cascade to detect gestures if no defects are found. When a moving closed palm gestures are recognized for 5 continuous frames, it is considered to be a dynamic swipe motion. It is used when Microsoft PowerPoint is running in the foreground, to swipe to the next slide within the presentation. The accuracy for proposed system is estimated by the number of times it correctly recognises a gesture when it is shown 10 times in succession

### III. ANALYSIS TABLE

The Table 2.1 is a summary of research papers on Sign Language Analyzer and Translator. The Table 2.1 states the different techniques used for recognition of signs . The accuracy varies as per the system used.

Table 2.1:Analysis Table

Sr. No.	Paper Name	Advantages	Accuracy
1	A Translator for American Sign language to Speech [1]	AdaBoost and Haar-like classifier	98.7%.
2	Sign language Translator for mobile platform	Oriented Fast and Rotated Brief Algorithm	70%
3	Machine Learning techniques for Indian Sign languages[3]	PCA and ANN Algorithm in MATLAB	Double handed - 90% Single handed - 90%
4	American Sign language recognition using Deep Learning and Computer vision [4]	Deep Learning - CNN and RNN	-
5	Moment based Sign language recognition Languages [5]	PNN and KNN classification techniques.	82%



6	K- Nearest Correlated Neighbour Classification for Indian Sign language Gesture Recognition using feature[6]	KNN Classification technique	Double handed - 90% Single handed - 90%
7	Double Handed Indian Sign Language to Speech Conversion using text [7]	Eigenvalue algorithm and MATLAB	-
8	The Comparison of Some Hidden Markov Models for Sign Language Recognition[8]	Gaussian Hidden Markov Model	83%
		Multinomial Hidden Markov Model	72%
9	A Real-Time System For Recognition of American Sign Language By Using Deep Learning	CNN, Skin Detection and Convolutional Neural Network	98.05%
10	Real Time Sign Language Recognition using Leap Motion Controller[10]	Leap Motion Controller and Multi-Layer Perceptron	96.15%
11	Hand-Gesture Recognition for Automated Sign Language Generation[11]	HSV model LargeBlob Detection, Flood Fill and Contour Extraction	-
12	3D-CNN-Based Fused Feature Maps and LSTM applied to Action Recognition	Hidden Markov Model,flex sensor.	99%
13	A Real-time Hand Gesture Recognition and Control for Computer Interaction System[13]	Robust control of mouse and key-board using a fuzzy logic with a higher accuracy of gesture recognition	-
14	Dynamic hand gesture recognition using vision based approach for human-computer interaction	Various challenges such as complex background, change in illumination and camera movement are removed in this system to make detection more accurate.	-
15	Hand Gesture Recognition for Human Computer Interaction[15]	A marker free gesture recognition system Detects both static and dynamic gestures	84%-94% in plain background

#### IV. CONCLUSION

The proposed system is an approach to translate sign language to text or speech. Due to the complex signs, using only normal data alone may not be optimal for translation for signs. In particular, this system reduces the communication gap between dumb and deaf people and the normal people. The steady growth of technology all over the world, it demands to have a system which will be able to translate sign languages to a spoken language. The output of the proposed system will be able

to translate words or phrases which are commonly used while having a conversation. Considering the use of CNN to translate sign language into text will yield better results and accuracy.

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# Forgery Detection of Computer Manipulated Digital Documents Using Image Processing

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**Abstract**— The recent advancement in technology in the usage of image processing tools and applications has led to increased criminal activities in fraudulent and forging documents and digitally manipulating them. The use of tools like Adobe Photoshop, GNU Gimp to create manipulated fraud documents is a major concern for the government in this digital era. It is extremely crucial to detect image forgery and manipulation done by computer in these documents. This proposed system focusses on the use of image processing techniques and algorithms along with machine learning to detect the forgery and image manipulation done in a specific government document which is used nationally on a wide scale. A Convolutional Neural Network (CNN) is being adopted to extract the features from the image of the document to analyse it further and classify it. The image of the document extracts features like brightness of pixel and the font format and the resolution of image. These features provide us with details to analyse the similarity between the digital forged images and enable us to develop an algorithm to detect and manipulation in digital images and tampering in documents.

**Keywords**— Convolutional Neural Network (CNN), digital, document, forgery, images.

## I. INTRODUCTION

India is a developing country and most of the government and professional work is done by scanning and sending picture of the documents while filling a form or applying for jobs, loans, etc. The procedure usually requires the individual to scan or click picture of his/her document and send it to the organization or government or individual. The organization once receiving the image verifies the details with the naked eye and just confirms if there is no physical tampering done to the document whose image has been sent, they do not verify whether the image has been digitally manipulated or forged using any digital manipulation tools easily available to the common users on the Internet.

Due to this there is an increase in the field of image forgery and digitally manipulating the document or the image of the document which has been scanned or picture of the document clicked. People are using tools like Photoshop, GNU Gimp to forge and digitally manipulate the document before sending it or uploading it. The forgery or image manipulation that might be done on the document is not visible to the normal naked human eye. This leads to lot of loss of the organization as well as increases the criminal activity. By using image processing along with machine learning and deep learning it is possible to detect these forgeries or digital manipulation done on these documents and images.

## II. LITERATURE SURVEY

Xintong Han, et. al. [1] has proposed a novel network using both RGB stream as well as noise stream for learning rich features of image manipulation detection. Extracting the noise features by an SRM filter layer adapted from steganalysis literatures which enables the model to capture noise inconsistency between tampered and authentic regions. Representation of rich features of the network enables it to distinguish between the different manipulation techniques. Changing the classes for manipulation classification to be splicing, removal and copy-move so as to learn distinct visual tampering artifacts and noise features for each class. The two streams featuring through a bilinear pooling layer and further incorporating spatial co-occurrence of these two

modalities. Also it achieves better performance compared to other methods with robustness of resizing and compression. Distinguishing authentic images from the manipulated is difficult.

Daniel Oliveira Dantas, et. al. [2] has proposed an adaptation of the VisionGL library to support the GPU processing of two- and three-dimensional images by OpenCL shaders. The given libraries have automatic wrapper code generator which enhances and makes it easy to implement the new shaders for the coder. A new library that processes two- and three-dimensional images by OpenCL shaders with high performance. The library present has the ability to extend and then support the new shaders. Also, annual programming of wrapper code is a mechanical task that requires a great deal of effort. Due to elimination of these steps the programmer can further focus on the shader creation and automatic generation of the code also helps in library maintenance as the generated code has no need to be maintained or debugged.

Jing Hong Duan, et. al. [3] has proposed the technology which has been widely used in many fields, especially in printing industry for security documents. Though there are many anticounterfeiting methods, Data hiding method has become the mainstream method. This paper presents a computational inexpensive method. It can hide the message while the image is halftoned, and the message can be extracted easily. Halftoning is a traditional printing technique which converts the continuous toned image into a binary image so that the image can be displayed or printed with bi level devices such as digital inkjet printer and printing machine.

Gururaj Mukarambi, et. al. [4] has proposed the trilingual script identification system in block wise for camera captured images. Local binary pattern features are used for Kannada, Hindi and English images for testing the performance of a proposed algorithm. Segmentation techniques are used to segment the image in blocks. This method is independent of thinning. Considering only clean images with controlled manner capture of the image document. There is no standard database for camera based Indian document images. Hence, database is created with digital and mobile cameras to capture 600 neat sample images from fiction and non-fiction books and general magazines of Kannada, Hindi and English languages with variation of resolutions.

Wenjun Zhang, et. al. [5] has proposed a method which implements the three image model and back propagation neural network in which the image quality assessment has a crucial role for the image processing process and these components have various different visual impact. The shortage of VA model which is based on eye tracking experiments with images under the natural viewing conditions that the data of eye tracking experiment are just for source images of the database. The Image Quality Assessment method is very complicated and difficult for it to be implemented in the image processing process which contains variety of images. It is found that edge, smooth and texture regions have different visual impact.

Dong Hyun Kim, et. al. [6] has proposed that an image manipulation might be misused by the criminals of counterfeiters for the purpose of counterfeiting. The filter that is used for acquiring the hidden features is High pass. And, it becomes easily available to apply it to various multimedia as well as image. Digital Forensics will be needed to detect such illegal purposes. This paper can be used to check whether or not the image is manipulated or not and can be applied for detection of the manipulation techniques.

Damir Demirovic, et. al. [7] has proposed image processing algorithms which are capable to execute in parallel manner on several platforms such as CPU and GPU. Signal, image and Synthetic Aperture Radar imagery algorithms are used in a daily routine. Due to huge data and complexity their processing is almost impossible in a real time. Often image processing algorithms are inherently parallel in nature, so they fit nicely into parallel architectures multicore Central Processing Unit (CPU) and Graphics Processing Unit GPUs. Parallel processing has become most dominant for high performance computing. The amount of data in signal, image and Synthetic Aperture Radar imagery processing constantly rises. The computation on the smaller data set obtain lower speedups due to the fact how TensorFlow handling computation works.

Demetrios G. Sampson, et. al. [8] has proposed a method for low bit rate for the given spatial domain block coded images in the following paper. The shape is then adjusted according to the region. Smoothing operator is being implemented in detailed areas of the image where the adaptive Gaussian filters are being employed. Gaussian kernel shape is then adjusted in according to the local

image region's characteristics. Technique such as vector quantisation is very much related to that of the original signal's characteristics.

Thumrongrat Amornraksa, et. al. [9] describes that the text in faxed document is exposed to be manipulated by any malicious person, the proposed process of text integrity verification for faxed document is proposed. There will always be some rotational and translational defects and distortions when an image is being clicked and this will definitely affect the accuracy of the text integrity verification. Pixel re-organizing techniques are used to reduce such distortions. The given following method is able to detect any change in the faxed document. The Results shows the success of the system. However, some distortions and noise from communication channel cannot be removed.

Matthias Kirchner, et. al. [10] describes that the manipulations that are done at specific region does not usually harm the authentic value of image on performing image enhancing, it is still of high interest to learn as much as possible about what exactly has happened to an image and to make wise choice based on this knowledge. While this proliferates the ambiguities in the determination of the concrete preprocessing history, especially when the JPEG quality becomes lower, it might be argued that after strong enough compression it is sufficient to know that an image has been smoothed before because typical filter characteristics are suppressed by JPEG artifacts. The SPAM features are still able to detect median filtering reliably. In fact, a low pre-compression quality can even increase the detector's performance.

Nikolaos Mitianoudis, et. al. [11] describes an image depiction to perform accurate image binarization to color representations. ICA algorithm is used in performing background subtraction. Conventional binarization techniques of gray scale documents have proved to be efficient for simple gray scale images and are not at all suitable for the unclear and complex documents. One of the most efficient methods is proposed (GPP), where the document background is estimated by an adaptive threshold which labels each pixel as either text or background. The background is estimated from the single-channel or color image, which often results to inferior background estimates.

Daljeet Kaur Kalsi, et. al. [12] describes a system that detects a copy move forgery in the images. The forgery is introduced in images by copying a particular segment of the particular image and then to put it in the same image or in the other image. One of the common growing problems in the areas of crime is the digital image forgery. Detection of the given forged image is done using the AILBP method which includes the properties of wavelet decomposition; as the proposed approach targets to find the forged region with high accuracy. In the passive approach it there is no need of any prior knowledge and thus it mainly depends on the different preprocessing steps during the manipulation of the digital images.

S.Prayla Shyry, et. al. [13] describes multiple types of picture forgery and detecting them techniques and methods have been elaborately explained. The picture and image manipulation by different means and methods have been discussed. At the beginning multiple types of attacks are categorized and the passive approach is been explained and discussed.

Zhuang Xiong, et. al. [14] describes a non-local scheme which is related and based on the 3D convolutional neural network for the image and super resolution has been proposed. The method and techniques used is been built to sharpen the non-local patches. The analysis of the method indicate in results the higher reconstruction accuracy.

Tianmei Guo, et. al. [15] describes a basic and simple model of convolutional neural network has been used to perform the image classification. The dataset of minst and cifar-10 have been used to perform the image processing in this paper, In this paper based on the neural network the different techniques and methods of the learning rate set have been analysed. The different optimization algorithm and optimal parameters have been studied.

### III. ANALYSIS

**TABLE 1: ANALYSIS OF IMAGE PROCESSING**

Sr. No.	Title of paper	Techniques/Technologies used	Datasets used	Advantages
1.	Learning Rich Features for Image Manipulation Detection.[1]	Two-Stream Faster R-CNN	Ground-Truth Tampering mask, Spliced and Copy moved images.	The method can recognize the difference in different tampering methods.
2.	Fast 2D and 3D Image Processing with OPENCL [2]	OpenCL, OpenGL	Two- and Three-Dimensional Images of One, Three (RGB) and Four (RGBA) channels	The performance of three-dimensional image processing is better than CImg and ITK libraries
3.	An Anti- Counterfeiting Method for Printed Image by Digital Halftoning Method [3]	Digital Halftoning Technique	Image sets of Monkey and Ship	This paper presented a simple and inexpensive method, which can hide the message while the image is halftoned.
4.	Script Identification from Camera Based Tri-Lingual Document [4]	K nearest neighbor (KNN),	Datasets of nearly 6000 neat block images are used	Accuracy of 96.6%, 98.00% for 128x128 block, 98.71%, 98.07% for 256x256 and 94.9%, 99.01% for 1024x1024 by using KNN and SVM respectively
5.	Full-Reference Image Quality Assessment via Region-Based Analysis [5]	Back Propagation (BP) Neural Network	Dataset contains 29 original images and 779 images that are distorted.	Performance of RBPSNR/RBSSIM is better than WPSNR/WSSIM
6.	Image Manipulation Detection using Convolutional Neural Network [6]	Convolutional Neural Network (CNN)	Nearly 200,000 images including the original images are used.	95 % accuracy was achieved



7.	Performance of some image processing algorithms in TensorFlow [7]	TensorFlow	Implementation of two input data sets for all algorithms, smaller and bigger were used.	It is observed that for the smaller data size CPU outperforms GPU .For bigger input data, GPU gave better performance
8.	Post Processing of Block Coded Images at Low Bitrates [8]	Fully Adaptive Gaussian type filter	The training set consists from five ISO/ITU-T test images.	High image detail regions, which include edges and texture
9.	Text Integrity Verification for Faxed Document Using Pixel Reorganizing Technique [9]	Support Vector Machine (SVM)	Faxed Document Images	The proposed method can detect any change in the faxed document.
10.	On Detection of Median Filtering in Digital Images [10]	Median Filtering Technique (MFT)	Database of near around 6500 never-compressed RGB images.	Detection for false positive rates was achieved as low as 1.8 %
11.	Multi-Spectral Document Image Binarization using Image Fusion and Background Subtraction techniques [11]	Spatial Kernel K-Harmonic Means clustering (SKKHM)	Dataset contains the 10 multispectral pictures by Hediam and Cheriet.	Previous system scores an average of 63% while the proposed system scores 79%
12.	A Copy-Move Forgery Detection System Using Approximation Image Local Binary Pattern [12]	AILBP (Approximation image local binary pattern)	Using adobe photoshop 7.0, the dataset of Mountain, Monkey,	High and precise accuracy including the properties of wavelet decomposition is achieved
13.	Digital Image Forgery Detection[13]	SVM	Dataset consisting of multiple images.	Machine learning yields better results.
14.	SINGLE IMAGE SUPER-RESOLUTION USING A NON-LOCAL 3D CONVOLUTIONAL NEURAL NETWORK[14]	3D convolutional neural network (3DCNN)	Dataset of 91 images from and 200 images from Berkeley Segmentation Dataset	Model has achieved superior performance especially for the images with rich textures.

15.	Simple Convolutional Neural Network on Image Classification[15]	Convolutional neural network(CNN)	The MNIST dataset consists of 60000 28x28 Grayscale images	The CNN network also has a relatively good recognition effect.
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#### IV. CONCLUSIONS

In this project the Image processing technique using Convolutional Neural Network (CNN) is used for determining whether the input digital image of the document is forged or not. The algorithm used along with feature extraction techniques will be able to extract the features from the document image. These features are used by the convolutional layers to process the image and give a binary classified output as whether the input image is forged or not. The system will use the features to process and will detect and classify whether the image is forged or not. However, the system cannot detect if there is any tampering done on the physical document which was scanned, or picture clicked and uploaded to the system.

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# Machine Learning for Software Development

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**Abstract**— Machine learning is the discipline researching pattern for automatically inferring data models. Machine learning has many applications over life cycle of software development, for testing, to bug fixing and code correction. However better understanding of ML methods would help software developers to identify better model for their software applications. In this technical analysis we will review and reflect on the applications of ML for software development. In this paper we will look around the various algorithms or methods of ML throughout process and their usefulness in Software Development Life-Cycle. We will also discuss some key method and a few obstacles for reaching full potential of ML for software development.

**Keywords**— Application, Development, Machine learning, Methods, Software.

## I. INTRODUCTION

Machine learning is used for developing application which performs better by experience. ML has advanced drastically in the course of decades from research facility interest to common sense innovation in far reaching business use. The use of ML techniques has been increased since last 5 years. Within artificial intelligence, ML has emerged for developing useful applications for computer vision, speech recognition, NLP, robot control, and other applications. In this paper we will examine about how software development paradigm is changed after introducing machine learning in software field and the ML's impact in software development. By examining the recent literature, we can see small but perhaps significance changes in SDLC. A far reaching pattern has risen for creating application utilizing ml techniques. Developing and deploying ML systems is comparatively fast and non-expensive but maintaining them over a time is not. An ML system has its own specific problem and additionally software related problem. For instance, probabilistic modeling provides a framework for a machine to learn from observed data and infer models that can make predict. Uncertainty plays a fundamental role in probabilistic modeling: Observed data can be observed with different models, and thus which model is appropriate given info is uncertain [3]. Predictions about future data and the future consequences of actions are uncertain as well. To tackle the ML specific issues in the field of ML continuous advancement is being made as we speak.

Computer professionals also struggle to operationalize and standardize system software development practices using ML despite these efforts. [3][4]. The one obstacle to tackle is general lack of awareness and the way they could be applied? How does machine learning change software development practices? To systematically explore the ML's impact, we went through the series of interviews given by experts. Experts says "Reinforcement learning (Deep adversarial, Q), semi-supervised and using Closed-loop ML techniques have proven to be beneficial in several stages of SDLC. ML is becoming standardized throughout the SDLC people are researching how to use it to gain insight into where things are going and we see more about deep learning and unique ML methods [1]. According to a 2016 Forrester Research survey, AI also can help in code generation. The survey further revealed that if an AI software is given a business requirement in tongue, it can write the code to implement it — or maybe come up with its own idea and write a program for it [8]. for instance, Microsoft's Intellisense has been integrated with Visual Studio to reinforce the developer experience.

This paper we present the impact of ML technology in SDLC paradigm; also we are going to discuss the limitation for ML in development, and we shade some light on the change in SDLC after introduction of ML tools for software. In this paper we will be addressing the common questions for Software Developers. We will discuss about recent advances in ML which making significant difference in software industry.

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## II. BACKGROUND

The technical briefing is meant for some readers, software engineering researchers, developers and practitioner. The advancement of AI frameworks may be a multifaceted and sophisticated task. Various sorts of procedures of ml improvement are proposed. These procedures share a couple of normal basic advances: setting understanding, information curation, information displaying, and creation and checking. Machine learning is poised to vary the character of software development in fundamental ways, perhaps for the primary time since the invention of FORTRAN and LISP [6].

## III. THE CONCERNS OF ML

### 3.1. DATA QUALITY

The most widely recognized issue when utilizing ML is poor data quality. Data is not up to the mark for software development; it needs to be preprocessed. Be able to generate trusted insights with high-quality data It is a new area that requires developers to make changes to the way data are obtained and analyzed around the SDLC transition from qualitative to quantitative selenium procedures [11]. Selenium was never architected to use ML. Data issues, getting the right data to eradicate bias, taking into account organizational principle. The variance of what the model is trying to do and what you're trying to accomplish.

### 3.2. BIAS

There can be inherent bias that portion of the training data sets may open on to. Comparably few models can produce more false positives and this is true in employing ml in SDLC as well. Selecting the correct algorithms and tools will be an important aspect of leveraging ml in SDLC [12].

### 3.3. SKILLS

Skills are a concern. Having the ability and practice to apply ML correctly is key and top of mind for all tech companies today. Another big topic is availability of the upright datasets with correctly labeled data for the development of software [12].

### 3.4. OTHER CONCERNS

One fundamental concern I have is the understanding of the issue that is attempting to be solved. First there needs to be an understanding of whether ml in the SDLC is truly needed. You can do a great deal with essential guideline based methodologies ml can make commotion particularly when you're attempting to accomplish something extremely broad and expansive. I think individuals will in general beginning with something that is pointless excess for what they need. The subsequent issue is building a one size fits all arrangement. it is extremely difficult to assemble something that can be applied wherever the issue exists in light of the fact that the setting is constantly significant. Continuously center around quite certain and custom fitted use cases first [12].

## IV. ML ALGORITHMS

ML manages the problem of building software that enhances their performance at some task through experience. Machine learning algorithms have been utilized in: (1) data mining issues where large databases may contain implicit regularities that can be found automatically; (2) ineffectively understood domains where people might not have the necessary skills needed to develop powerful algorithms. (3) Areas where projects should progressively adjust to changing conditions.

### 4.1 DECISION TREE

The concept of decision tree technique is centered on divide-and-conquer algorithm and it is generally integrated into two indispensable concepts i.e., entropy and information gain. The algorithm in decision tree technique locates the best predictor attributes so that its value is divided according to its information value and thus the highest information gain is indicated by the one with right classification [15].

A decision tree is a logical model that is contributes in research, specifically in decision analysis [8]. Decision tree is a may be a quite tool to return with a decision on the basis of some conditions and their possible consequences. [10]. Decision tree is a method used for classification and regression. Decision tree is a flowchart like tree structure, where each internal node stands for a test on an attribute, each branch expresses an outcome of the test, and each leaf node holds a category. The root node is the topmost node in a tree [7]. Decision trees are generated from training data in a top down, general to specific direction. The initial

state of tree is root node that is assigned all examples from training the training set. If it is case that each one the examples belong to same class, then no further decision need to be made to partition the examples and therefore solution is complete. If example at this node belongs to two or more classes, then test is made at node that will end in split. The method is recursively repeated for every intermediate node until completely discriminating tree is obtained. M5P is powerful because it implements as maximum amount decision trees as linear regression for predicting a continuous variable. This algorithm is a multivariate tree algorithm which is acceptable for noise removal and also applies for huge database. The M5P Introduced by Quinlan, the model tree technique (M5) are often recognized as an extension to CART.

## V. APPLYING ML ALGORITHMS IN SDLC

### 5.1. BUG FIXING

This is perhaps the biggest areas being reformed with AI innovations. Given the large volume of information that should be tried and human blunder because of ignored bugs, programming testing instruments [1], for example, bugspots give us that projects can use AI algorithms to auto-right themselves with least intervention of a human developer. Different methods are being developed to tackle the problem of device error detection sbp the most popular are machine learning ML techniques in SBP the ml techniques are commonly used to model unstable modules based on historical error data [15].

### 5.2. CODE OPTIMIZATION

Machine learning requires programming a program model to generate automatic code and answers from production data [16]. The ML algorithms study and identify the pattern to extract relevant knowledge and make accurate predictions [6] ML is as of now making code increasingly efficient. Google's Jeff Dean has said that 500 lines of TensorFlow code in Google Translate is more efficient than 5000 line of code. Although a line of code is not a good metric a decrease of code is tremendous both in programming commitment and in the amount of code to sustain [6]. But what's more noticeable is the manner by this code works: as opposed to a large portion of a million lines of factual code it's a neural system that has been prepared to interpret.

### 5.3. CODE COMPLETION

Code completion tool is mostly used in almost all IDE present today. To analyze the progress made so far by the IDE we have read different papers. The most documented usage for ML approaches in code completion has involved the experiments with the n-gram models. Frequency correlation and matching neighbor based approaches are used to boost predictions of ideas such as eclipse [2].

### 5.4. TESTING

For testing entering data in a form field it is recommended to know the 'selector' to find the objects in the HTML page. When code and test go out of sync, tests that are irrelevant will fail. Machine learning can be helpful to detect these non-functioning tests automatically and remove them [7]. For example, appvance pegged as a software-driven automation testing tool uses ML for output and load testing and produces test cases based on user behavior [5]. Testim.io deploys machine learning to speed up the execution, and maintenance of automated tests. As one user points out that the tool becomes intelligent when more tests are run.

### 5.5. SOFTWARE DEFECT PREDICTION

Prediction of software defects is a very useful tool for evaluating the consistency of produced software product. Predicting defects requires a holistic model rather than a single-issue model that hinges on either size, or complexity, or testing metrics, or process quality data alone. Bayesian Belief Networks (BBN) proven to be a very useful approach to the software defect prediction problem [13]. A BBN represents the joint probability distribution for a set of variables.

## VI. MATERIAL AND METHOD

### 6.1. MATERIAL

The materials we used for our research is articles which presents us the interviews of software personnel and ML personnel has experience more than 7 years. We analyze different machine learning papers on Software development for come to the conclusion and answer the commonly asked questions "do the Software engineers/developers need to know the ML practices for developing software?" "What is the impact of machine learning in software industry?" and "what is the future of software with ML technology and tools? Do they make any difference"? We compared interviews given by ML experts and Non-ML technology experts and analyzed their standpoints on topic.

## 6.2. METHODS

The scope and power to learn interesting models increases each year, because of continuous growth of ML technology. Therefore, what was technical limitation for software industry 5 years ago was, is about to change. This fast growth is reflecting on software developing paradigm. Even so SE community must be aware of and be preparing for adopting the changes in upcoming years. We gathered data from different sources.

## VII. CONCLUSION

In this research, we found the recognizable changes in execution among ML and non-ML events. The distinctness lies in a variety of aspects taking account of SE and the context to the programming enhancement. In this paper we discussed how ML algorithm can be helpful for developing effective software systems. ML algorithm is useful for not only build better software application but also it can be used to improve the user experience of application. We've seen research which shows that neural networks can write code for new module by inferring old modules. There is continuous progress is being made by the machine learning community for developers and machine learning practitioner for training and practice purposes. In software sector use of machine learning tools is increased over the years since the demand of users for better software experience has risen. That being said, making complex problems manageable remains one of the most important issues for data science. Data engineers are responsible for maintaining the data pipeline that integrates data cleaning capabilities and concept exploration that they are responsible for implementing applications in very complex environments. In huger sense this paper represents a step towards software development not as homogeneous bulk but as rich tapestry of varying practices that involves individual of diverse background across non-similar domain. Code reuse is challenging because of different context and input data, and management of data is also a challenge for ML.

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# Positive and Negative Impact of Artificial Intelligence and Machine Learning on Society

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**Abstract**— *In the near future, machines will slowly enhance and replace human capabilities in many fields. Artificial Intelligence along with machine learning are becoming dominant problem solving techniques. Artificial intelligence is an area of computer science that emphasizes the creation of intelligent machines that work and react like humans. In this research paper, I will represent the positive and negative impacts of machine learning and artificial intelligence on today's society. With the help of various impacts discussed in the research paper, I will find the conclusion. Depending upon the point of view, artificial intelligence and machine learning can either affect positively or negatively to the society.*

**Keywords**— *artificial intelligence, automation, algorithms, machine learning, self-driving cars.*

## I. INTRODUCTION

People tend to make things more brilliant and more intelligent: the phone turned into a cell phone, the wristwatch turned into a smartwatch [7].

Another model is the place people empowered a PC to ingest information, process it, give a result, at that point gain from extra new information and give an improved result. In layman terms, this is cognition and technologies that enable cognition are cognitive technologies such as Machine Learning, Natural Language Processing, Natural Language Generation, etc [7].

In one model, Facebook had to close down an AI motor after engineers found that the AI had made its own remarkable language that people couldn't decipher. Analysts at Facebook found that the visit bots had digressed from the content and were imparting in another dialect created without human info or intercession.

AI is any gadget that can see its own condition and takes activities that augment its risk of accomplishment. Computer based intelligence incorporates frameworks that peruse and decipher composed language and natural language processing applications like Amazon Alexa.

Machine learning is a kind of AI, where pc's can learn without being expressly customized. AI programs instruct themselves to develop and change when presented to new information. This is the genuine meaning of hands on preparing.

Person to person communication locales are extraordinary instruments for associating with individuals. Nonetheless, as person to person communication has gotten across the board, individuals are finding unlawful and untrustworthy approaches to utilize these networks. We see that people, especially teens and young adults, are finding new ways to bully one another over the Internet. Close to 25% of parents in a study conducted by Symantec reported that, to their knowledge, their child has been involved in a cyberbullying incident.

## II. LITERATURE REVIEW

Artificial Intelligence is basically a superset of machine learning. Artificial intelligence is a branch of computer science that aims to create intelligent machines. It has become an important part of the technology industry. Robotics is one of the major field of the artificial intelligence. Robots needs some kind of intelligence to handle tasks such as manipulation and navigation. In the today's

world, artificial intelligence is used mostly in all the sectors. With the help of artificial intelligence, we can do smart weather forecasting which helps us to analyze complex weather data. Artificial intelligence also increased the automation like today artificial intelligence can perform almost all kinds of work that human can do. In advertising sector also, advertisers will be able to predict what kinds of ads emotionally impact you. Productivity increased a lot after implementing AI solutions in their business as stated by 54% of executives.

Machine learning is one of the most exciting technologies that we would have ever come across. We most likely utilize a great deal of learning calculation many time without knowing it [12]. There are various applications of machine learning but same case as artificial intelligence it is not necessary that there will be only positive impact of machine learning on the society. It can happen that there can also be various negative impacts of machine learning on the society. With the help of machine learning, healthcare and transport sector is widely spread. In health sector it is used to spot the abnormalities which can be done through various algorithms. In transport sector, car can learn by itself how to drive and how to perform various actions according to the situations.

**TABLE 1**  
**MACHINE LEARNING IMPACT FROM SOCIAL PERSPECTIVE**

	Social Perspective		
	Domain	Merits	Demerits
Healthcare / Medical	1. Digital Health Records 2. Advanced Analytics Visualization	1. Personalized medical experience. 2. Lower cost of care.	1. Leak of sensitive information. 2. Lack of human touch.
People Mobility	1. Precise information on infrastructure development. 2. Mobility predictions.	1. Traffic prediction - effective routing enabling time saving. 2. Promote better driving behavior.	1. Personal Data Privacy 2. Personal Data Security.
Political Campaign	1. Digital election campaigns 2. Predictions on sponsors	1. Create awareness and engaging public voters to understand the importance of political issues. 2. Micro-targeting campaigns to educate voters.	1. Strategizing voters emotions and behaviors. 2. Jeopardies ethical, fairness and privacy.
Banking & Marketing	1. Banking customer acquisition.	1. New customer acquisition and retentions.	1. Privacy of personal data. 2. Leak of sensitive information

### III. IMPACT OF ARTIFICIAL INTELLIGENCE ON SOCIETY

#### 3.1 POSITIVE IMPACT OF ARTIFICIAL INTELLIGENCE ON SOCIETY

Similarly as with most changes throughout everyday life, there will be certain and negative effects on society as man-made brainpower keeps on changing the world we live in. How that will adjust is impossible to say and up for much discussion and for some individuals to mull over. With AI spending expected to reach \$46 billion by 2020, as indicated by an IDC report, there's no indication of the innovation easing back down. Adding AI to your business might be the following stage as you search for approaches to propel your tasks and increment your exhibition [4].

In spite of the fact that the ramifications of fusing AI into our lives may sound overwhelming enough to dispose of its applications inside and out, here is the reason AI is a help to mankind and not a revile that may hurt it later on [4]. Society will gain unlimited hours of productivity with just the concept of autonomous transportation and artificial intelligence influencing our traffic congestion

issues not to mention the other ways it will improve on the job productivity. Saving time from stressful commutes, humans will be able to spend their time in a variety of other ways.

### **3.1.1 INCREASED AUTOMATION**

Today, AI can perform intensive human labor and backbreaking tasks easily without the need for human intervention. This has hugely mechanized a few applications and assignments in ventures just as in various segments [13].

Simulated intelligence advances are in effect progressively received and consolidated in ventures and associations to lessen the outstanding burden of people.

An excellent case of the marvels of AI in upgrading the degree of robotization can be found in the Japanese machine tool builder, Okuma. They as of late offered a huge number of developments to exhibit the fate of shrewd assembling.

### **3.1.2 SMART WEATHER FORECASTING**

In the recent few years, we have perceived the importance of Artificial Intelligence and its technologies in weather and climate forecasting. The field of "Atmosphere Informatics" is continually blooming as it rouses a productive joint effort between information researchers and atmosphere researchers.

This joint effort has thought of instruments to watch and examine progressively complex atmosphere information. This has helped fundamentally in crossing over any barrier among comprehension and information [13].

There are endless uses of AI focused on precise climate anticipating. IBM, for example, utilized its PCs to improve their figures in 1996.

### **3.1.3 CHANGING GOVERNMENT**

Less desk work, speedier reactions, a progressively proficient organization - AI has the ability to definitely change open organization, however are governments prepared? This tech accompanies the two dangers and openings that should be comprehended and assessed. Scholarly Kevin D'souza accepts gamification and pretending could be the way to community workers breaking down complex cases, concocting better arrangements, and genuinely understanding the eventual fate of self-ruling frameworks.

### **3.1.4 ADVERTISING**

At last, artificial intelligence is going to take focused on/customized promoting to an entire other level. On the off chance that you think the Facebook Cambridge Analytica outrage was awful, at that point you have no clue what's in store in the following decade.

Publicists are as of now ready to anticipate what kinds of promotions sincerely sway your buying conduct. Over the long haul, advertisements are going to keep on getting progressively customized to the person.

Ads are going to continue to become smarter and more embedded in our daily lives thanks to AI. Machine learning algorithms are building personality profiles on every human being. The amount of data collected by advertisers continues to grow. Related item proposals, indexed lists and social news source things are for the most part instances of spots where publicists are implanting shrewd promotions that utilization AI to target you as an individual shopper.

## **3.2 NEGATIVE IMPACT OF ARTIFICIAL INTELLIGENCE ON SOCIETY**

Artificial intelligence calculations can be found in forms in everything from youngster welfare to recidivism rates. In the event that off base information is incorporated or if the calculation incorporates a hidden predisposition, the outcomes could be deplorable.

For the working environment, these negative effects can be seen in enlisting choices which see managers abstaining from employing qualified ladies and minorities. This saw Amazon approach the previous fall and offer its own difficulties with these procedures, which saw some defame the organization for its outcomes. Notwithstanding, I accept that sharing this useful example was bold, especially on the off chance that it enables different firms to understand the difficulties that may exist [11].

### **3.2.1 MAKES UNINTENDED AND UNFORSEEN CONSEQUENCES**

While fears about executioner robots snatch features, unintended and unexpected outcomes of man-made reasoning need consideration today, as we're as of now living with them. For instance, it is accepted that Facebook's newsfeed calculation impacted a political decision result that influenced geopolitics [15].

### **3.2.2 AI BIAS**

Since AI calculations are worked by people, they can have worked in predisposition by the individuals who either purposefully or accidentally bring them into the calculation. In the event that AI calculations are worked with a predisposition or the information in the preparation sets they are given to gain from is one-sided, they will deliver results that are one-sided. This reality could prompt unintended results like the ones we have seen with prejudicial enlisting calculations and Microsoft's Twitter visit bot that got supremacist. As organizations manufacture AI calculations, they should be created and prepared capably.

### **3.2.3 LOSS OF CERTAIN JOBS**

While numerous occupations will be made by artificial intelligence and numerous individuals foresee a net increment in employments or possibly envision a similar sum will be made to supplant the ones that are lost gratitude to AI innovation, there will be employments individuals do today that machines will dominate. This will expect changes to preparing and training projects to set up our future workforce just as helping current specialists progress to new places that will use their extraordinary human capacities.

### **3.2.4 SECURITY**

Security is a critical aspect, if somebody compromises a smart system, for instance a self-driving car, the consequences can be disastrous, particularly given the ever increasing cyber security threat.

## **IV. IMPACT OF MACHINE LEARNING ON SOCIETY**

### **4.1 POSITIVE IMPACT OF MACHINE LEARNING ON SOCIETY**

Neural systems (mirroring the procedure of genuine neurons in the cerebrum) are making ready toward leaps forward in AI, called "deep learning." Machine learning can assist us with living more joyful, more advantageous, and increasingly profitable lives... in the event that we realize how to bridle its capacity [8].

The potential for machine learning is colossal, and nobody realizes that more than Danny Lange, VP of Machine Learning at the US-based games motor Unity.

Having recently worked for Uber and Amazon, Lang accepts that future employments of machine learning will extend over all segments, disturbing the vast majority of what we know.

Awareness is vital to know that machine learning is now growing not only in the education field but medical, defence ministry, election processes, transportation and urbanization of cities and all at the means of improving quality.

#### **4.1.1 HEALTHCARE**

We already know that through algorithms, small and hard to spot abnormalities can be discovered in all kinds of things, from legal documents to financial papers. So it's fitting that the same can be said for healthcare.

"Anything that has to do with specialists, such as doctors that need to learn a lot of things, computers will be able to learn that as well," Lange says.

#### **4.1.2 TRANSPORT**

With machine learning, you're ready to open vehicles to a huge number of potential situations and ensure the PC in the vehicle, transport or truck acts with a specific goal in mind.

If we look at self-driving cars, if the computer within the car can learn as we know it can to drive that car around that's a massive step forward.

The reason we've not been able to do this until now is because we've had lots of software engineers, but we need to programme it to handle all kinds of situations and that's where machine learning has come into it.

I think transportation is a big one, because transportation will be made much more efficient, not just by the creation of self-driving cars however.

#### **4.1.3 EDUCATION**

The utilization of VR and AR in education has just been demonstrated, with understudy specialists ready to rehearse life-like restorative techniques and kids ready to investigate nations without leaving the study hall. Education will be large. We've not got a system that can learn how to teach you on a very individual basis, rather than one size fits all. While the classroom teacher will still exist, the ability to quickly curate lessons for struggling individuals is possible with machine learning, he explains.

#### **4.1.4 CLIMATE CHANGE**

ML can prove to be a game changer in addressing this global issue. ML can control road lights, which can thusly help in decreasing vehicle emanation, it tends to be utilized to outline earth's surface which will help in finding deforestation, water deficiencies and alarm about other geological changes [14].

### **4.2 NEGATIVE IMPACT OF MACHINE LEARNING ON SOCIETY**

As there are numerous benefits of Machine Learning on the society, there are negative impacts as well. These impacts should not be ignored as they can prove to be a threat to us. One of the negative impacts is unemployment. As there is increase in automation, ML algorithms can outperform humans in most jobs and fields, this would lead to mass employment. From self-driving cars to video editing, algorithms are being used everywhere. ML is capable of creating lethal weapons which can be used for mass destruction. Fake news and videos are another negative aspect. As deep learning becomes better at creating fake videos, there is a high risk of negative and fake news being spread around the world.

#### **4.2.1 TIME & RESOURCES**

ML needs enough time to let the algorithms learn and develop enough to fulfill their purpose with a considerable amount of accuracy and relevancy. It also needs massive resources to function. This can mean extra prerequisites of PC power for you.

#### **4.2.2 HIGH ERROR SUSCEPTIBILITY**

Machine learning is self-governing however exceptionally powerless to blunders. Assume you train a calculation with informational indexes sufficiently little to not be comprehensive. You end up with one-sided forecasts originating from a one-sided preparing set [17]. This prompts unessential commercials being shown to clients. On account of ML, such botches can set off a chain of mistakes that can go undetected for significant stretches of time. And when they do get noticed, it takes quite some time to recognize the source of the issue, and even longer to correct it [17].

## V. CONCLUSION

Artificial Intelligence despite many challenges now have a potential to really fast pace itself as significant research in going for its development. Around the globe, each and every person would love to have a smart home. To achieve this, we need to perform the automation and that automation can be done with the help of ML and AI. These are the reasons, why these two topics are one of the hot topics in the recent times. Sometimes, It feels like artificial intelligence will replace humans in almost every aspect that we can think of but it's good for the bettering the quality of life.

## ACKNOWLEDGEMENTS

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# Mind Controlling Virtual Reality Gaming

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**Abstract**— There are many way to control Virtual Reality Games using motion controllers, haptic gloves and even full body motion controlling suits. The Fundamental focus of this research is to prove how gaming in virtual reality can help not only the gamers but also patients (Children and Youth especially) who are in terminal stages in hospitals. This Research shows how it helps the patients to live a life in another world. With the help of mind controlling the VR game the patient does not need to exert any energy and can enjoy a seamless experience of the VR world. In this way the patients will also forget their suffering.

**Keywords**— Brain Activity, Gaming, Mind Controlling, Neural Waves, Virtual Reality.

## I. INTRODUCTION

Virtual Reality is a way in which the user can experience real world places or experiences in a virtual world. Virtual Reality enables a user to move around and perform various actions in the virtual world. Virtual Reality lets a user interact with other players or items in the virtual world. Virtual Reality lets a user interact a virtual world with the help of VR gear which can be a head-mounted display or VR joysticks or even full body suits.[1][10]

Mind controlling VR is currently being developed by a company called Neurale, they make this possible by reading the brain activity of the user. With the help of this the user is able to control the objects in the VR world with his/her brain. According to them the user just has to think of the object or action that the user wants to perform and that action can be performed.[4][5]

This technology helps the patients who cannot move their body to move it in the virtual world. This gives them the feeling of what it means to walk and interact with the world especially the patients who cannot walk. This technology even helps patients who are in terminal stages or who are sick since birth. It gives them a second chance in life to enjoy their life like the rest of the world.

Patients who are under constant suffering because of various treatments or by constant medication can also enjoy this experience by forgetting about their illness/sickness in life and enjoy their experience in the virtual world.

## II. TYPES OF VIRTUAL REALITY

There are mainly three types of virtual reality which are used these days.[2][8]

1. Fully-Immersive
2. Semi-Immersive
3. Non-Immersive

### 2.1 FULLY – IMMERSIVE VR

In this type of Virtual Reality the users are made unconscious of their physical body and surrounding environment. The users interact with the system with their senses, which are nerve impulses in different degree of fidelity.[6] These types of system can be possible only if it's a fully virtual world, then it should be able to reproduce our senses and more fantastical feelings, thoughts and more. These type of system makes it possible to control the operations of the VR world with our mind.

These Types of VR gives users a more realistic experience possible with complete sight and sound. With this you will feel like you are actually physically doing the things in the virtual world.[11]

## 2.2 SEMI – IMMERSIVE VR

In this type of Virtual Reality the users are fully aware of all their experiences since most of the experiences done by the user is done physically. These types of system are mostly used for educational and training purposes.[12] These systems are mostly seen when companies need to train employees in a particular hardware or some kind of vehicle which is expensive.[11]

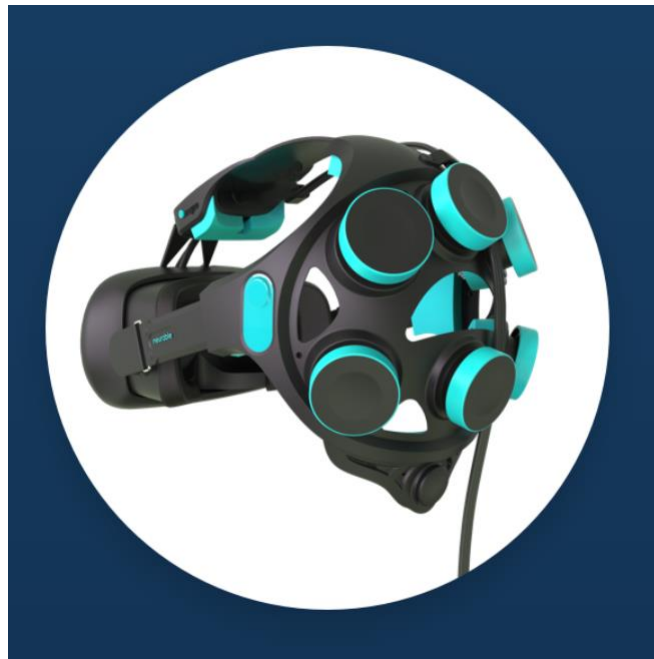
We mostly see these types of system when training pilots for flight simulations or training a formula 1 driver to handle racing on the track. These types of technology helps to save hardware cost and also helps to decrease the loss of life.[7]

## 2.3 NON – IMMERSIVE VR

These types of system are usually seen in most of the games. These systems are seen by both the eyes of the user's i.e. on a display unlike VR which has one display for each eye. These systems gives the users the experience of the virtual world but the user does not feel immersed in the virtual world. These systems gives the user the perception of the image in two dimensional height and width while fully immersive gives users the perception of three dimensional that has height, width and depth.[9]

## III. MIND CONTROLLING VIRTUAL REALITY

This technology makes use of fully-immersive VR which helps to scan the brain with the help of 6 dry EEG (Electroencephalography) sensors. With the help of this they use signal processing and real time machine learning techniques to identify which neural features correlate with stress, calm, performance and other cognitive states and then they turn them into actionable insights.[3]



**FIGURE 1: Neurable DK1 VR-Compatible brain sensing device.[3]**

**TABLE 1**  
**COMPARISON BETWEEN CURRENT VR SYSTEMS AND MIND CONTROLLING VR SYSTEMS**

Sr. No.	Feature	Current VR	Mind Controlling VR
01.	Usability	It is easy to use but requires a lot of body movements and can make you exhausted pretty fast.	It is easy to use but does not require any body movements and the user does not get easily exhausted.
02.	Control	Most of the operations are controlled with the help of VR controller or VR gears.	Most of the operations are controlled with the help of the user's brain.
03.	Simulation	Simulation systems can be easily made to train people how to use a particular equipment.	Simulation systems can be a little tricky since the user will not easily understand how exactly he must use the system in the real world.
04.	Applications	It can be used for entertainment, medical, education , training, etc.	It can be used for entertainment, medical and educational purposes.
05.	Immersion	These systems can be used in fully, semi and non-immersive way.	These systems can be used only in fully immersive way.

**TABLE 2**  
**MIND CONTROLLING VR ADVANTAGES AND DISADVANTAGES**

Sr. No.	Feature	Advantages	Disadvantages
01.	Usability	Users can easily control the system with the help of their brain, Operations can be easily carried out by the user just thinking about what the operation should be.	If a user has any brain damage then the user won't be able to use the system.
02.	Immersion	The system will be fully immersive so the user will perform all the operations while having their body in a constant state.	Since the body will be a constant state for some time there can be body pain.
03.	Applications	It can be used for entertainment, medical and educational purposes. Medical purposes here is to give users a psychological relief from the pain during treatments.	It cannot be used for simulation purposes.
04.	Users perception	Users can easily enjoy their life in the virtual world since most of the operations which will be done will feel as it is done in real life.	Users won't know the difference between the real world and virtual world after long period of use of Virtual Reality.

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#### IV. CONCLUSION

From this we can conclude that Virtual Reality game has certain advantages as well as disadvantages. It helps the people to go into a different world i.e. Virtual world. But we also need to consider the variety of new sensors and displays technologies dealing with different kind of stimuli, issues regarding the level of immersion may arise. Also, what could be the optimal combination of these technologies depending on the kind of stimulated Virtual Reality and the proposed games?

User-related studies, such as the level of engagement, satisfaction, learning or skills improvement needs also to be investigated. It aims to provide a collection of high quality research articles that addresses broad challenges in both theoretical and applied aspects of Virtual Reality games, including new software and hardware developments and user-related studies.

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We also wish to thank all my teachers from my past years who have helped me to succeed in life and bestowed deep understanding and knowledge in us over the past years.

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# Edge Computing: Vision and Challenges

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**Abstract**— Edge computing enables data generated by internet of things (IoT) devices to be processed nearer to where it is generated rather than sending it across long routes to data centers or clouds. Doing this computing nearer to the edge of the network it provides organizations analyze necessary data in near time Period – a requirement for organizations across several industries, together with manufacturing, health care, telecommunications, and finance. Edge Computing, being a possible analysis dimension within the realm of 5G networks, targets to boost the network capability by harnessing the effectiveness of each cloud computing and mobile devices within the user's proximity. Keeping in view the far-ranging impact of Edge Computing in future mobile generations, a comprehensive review of the current Edge Computing frameworks and approaches are given with an in-depth comparison of its classification. Considering the data accumulated, procedures analyzed and theories mentioned, the paper provides a comprehensive summary on progressive and future analysis.

**Keywords**— Cloud computing, Cloudlets, Edge cloud, Fog computing, Internet of things

## I. INTRODUCTION

Cloud computing has dominated IT discussions for the last 20 years, notably, since Amazon popularized the term in 2006 with the release of its Elastic Compute Cloud. In its simplest type, cloud computing is that the centralization of computing services to take advantage of a shared data center infrastructure and also the economy of scale to scale back prices. <sup>[4]</sup>However, latency, influenced by the amount of router hops, packet delays introduced by virtualization, or server placement within a data center, has continuously been a key issue of cloud migration. This is where edge computing comes in. Edge computing is basically the method of decentralizing computer services and moving them nearer to the source of data. <sup>[14]</sup>this will have a major impact on latency, because it will drastically scale back the amount of information affected and also the distance it travels. The term "edge computing" covers a large area of technologies, together with peer-to-peer, grid/mesh computing, fog computing, blockchain, and content delivery network. It has been well-liked among the mobile sector and is currently branching off into nearly each business.

With the explosive growth in numerous access devices and end-user demands, IoT is driving digital transformation altogether aspects of the present fashionable life it's predicted by Cisco that the amount of devices connected to IoT can become fifty billion by 2020. The rising IoT introduces new challenges, like tight latency, capability constraints, resource-constrained devices, uninterrupted services with intermittent connectivity, and increased security, that can not be adequately self-addressed by the centralized cloud computing design. A progressive cloud computing paradigm that breaks through the centralized design and alleviates the capability and latency constraints is desperately needed to deal with these challenges.

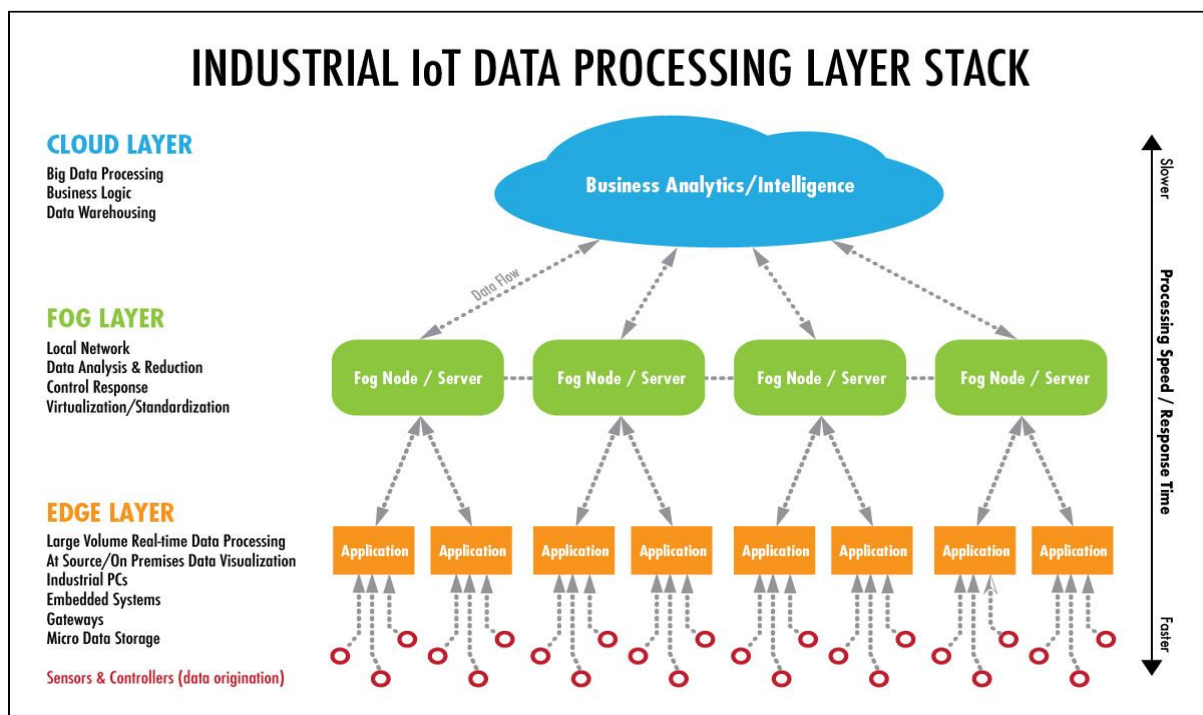
IoT applications generate enormous amounts of data by IoT sensors. Big data are afterwards analyzed to work out reactions to events or to extract analytics or statistics. <sup>[7]</sup>However, sending all the information to the cloud would require prohibitively high network bandwidth. Recent analysis efforts are investigating on a way to effectively exploit capabilities at the edge of networks to support the IoT and its needs. In edge computing, the large information generated by differing kinds of IoT devices may be processed at the network edge rather than sending them to the centralized cloud infrastructure attributable to bandwidth and energy consumption issues. Edge computing will offer services with quicker response and larger quality, compared with cloud computing. Edge computing is more appropriate to be integrated with IoT to produce economical and secure services for an oversized range of end-users, and edge computing-based design will be thought-about for the long run of IoT infrastructure.

## II. PREVIOUS GENERATION TECHNOLOGIES

### 2.1 CLOUD COMPUTING

Most enterprises are aware of cloud computing since it's currently an actual standard in several industries. <sup>[3]</sup>Fog and edge computing are extensions of cloud networks that are a group of servers comprising a distributed network. Such a network will permit a corporation to greatly exceed the resources that may rather be accessible to it, releasing organizations from the necessity to stay infrastructure on-site the first advantage of cloud-based systems is that they permit information to be collected from multiple sites and devices that is accessible anyplace within the world. Embedded hardware obtains information from on-the-spot IIoT devices and passes it to the fog layer pertinent information is then passed to the cloud layer that is often in a very completely different geographical location. The cloud layer is therefore able to have the benefit of IIoT devices by receiving their information through the other layers. Organizations typically reach superior results by integration a cloud platform with on-the-spot fog networks or edge devices. Most enterprises are currently migrating towards a fog or edge infrastructure to extend the use of their end-user and IIoT devices.

The extended distribution of information processing and storage created attainable by these systems reduces network traffic, so rising operational efficiency. The cloud additionally performs high-order computations like estimate analysis and business management, that involves these computations are then passed back to the computation stack in order that it may be utilized by human operators and to facilitate machine-to-machine (M2M) communications and machine learning.



**FIGURE 1. Cloud, Fog and Edge Computing**

<sup>[5]</sup>Edge computing and cloud computing both are different things. One doesn't replace the opposite. However several articles confuse IT professionals by suggesting that edge computing can displace cloud computing. It's no truer than saying PCs would replace the datacenter.

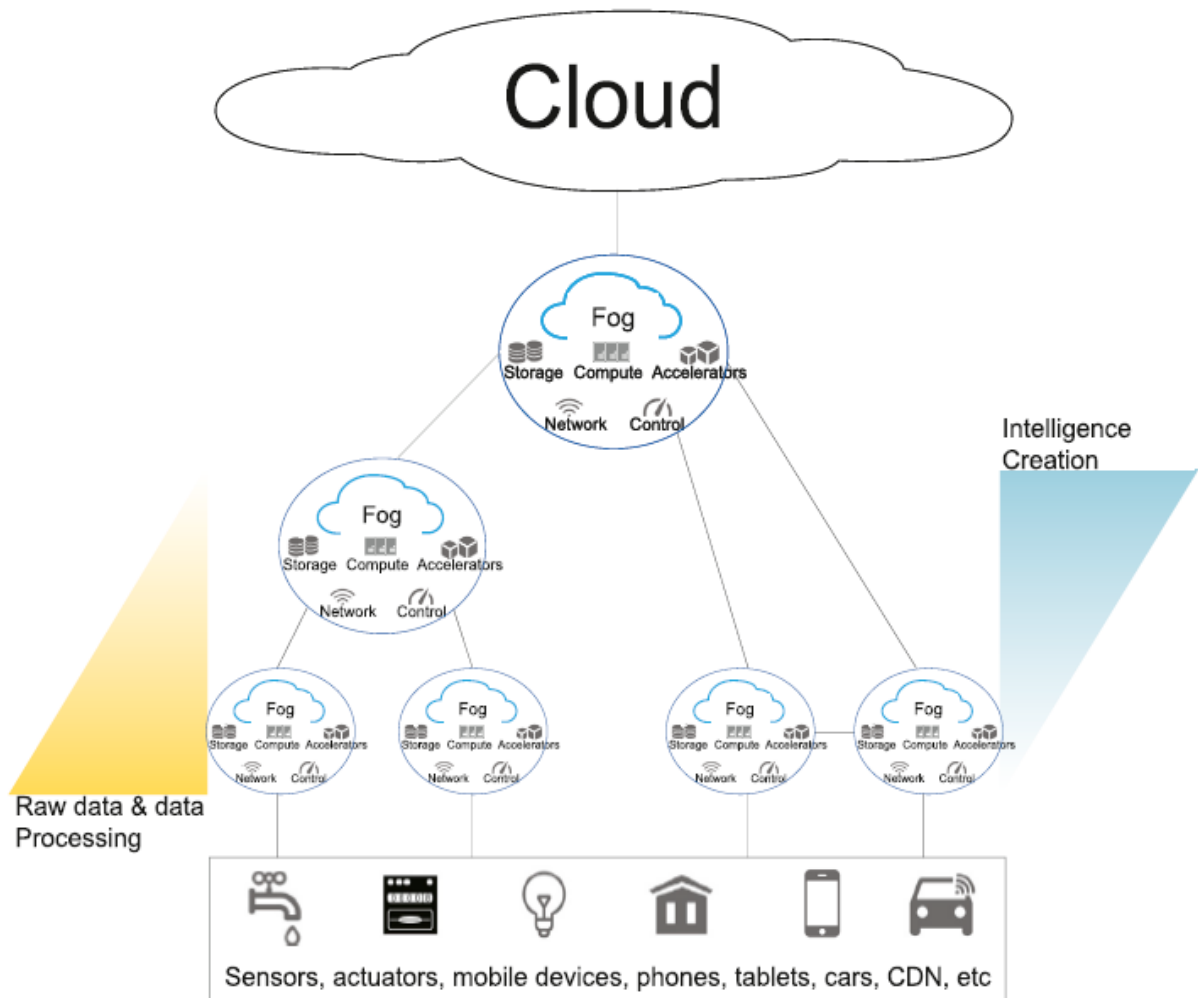
Edge and cloud computing will and work well along, however edge computing is for purposeful systems with special needs. Cloud computing could maybe a general platform that can also work with purposeful systems in this recent client/server model.



## 2.2 FOG COMPUTING

Fog computing and edge computing seems similar since they involve bringing intelligence and processing power nearer to the creation of information. However, the key difference between the fog and edge lies in wherever the location of intelligence and computing power is placed. A fog atmosphere places intelligence at the local area network (LAN). This design transmits data from endpoints to a gateway, wherever it's then transmitted to sources for processing and return transmission.

Edge computing places intelligence and processing power in devices like embedded automation controllers. The goal of this can be to bring basic analytic services to the network edge, increasing performance by positioning computing resources nearer to where they are required, thereby reducing the gap that data needs to be transported on the network, increasing overall network efficiency and performance. Fog computing may also be deployed for security reasons, because it has the power to segment bandwidth traffic, and introduce extra firewalls to a network for higher security.

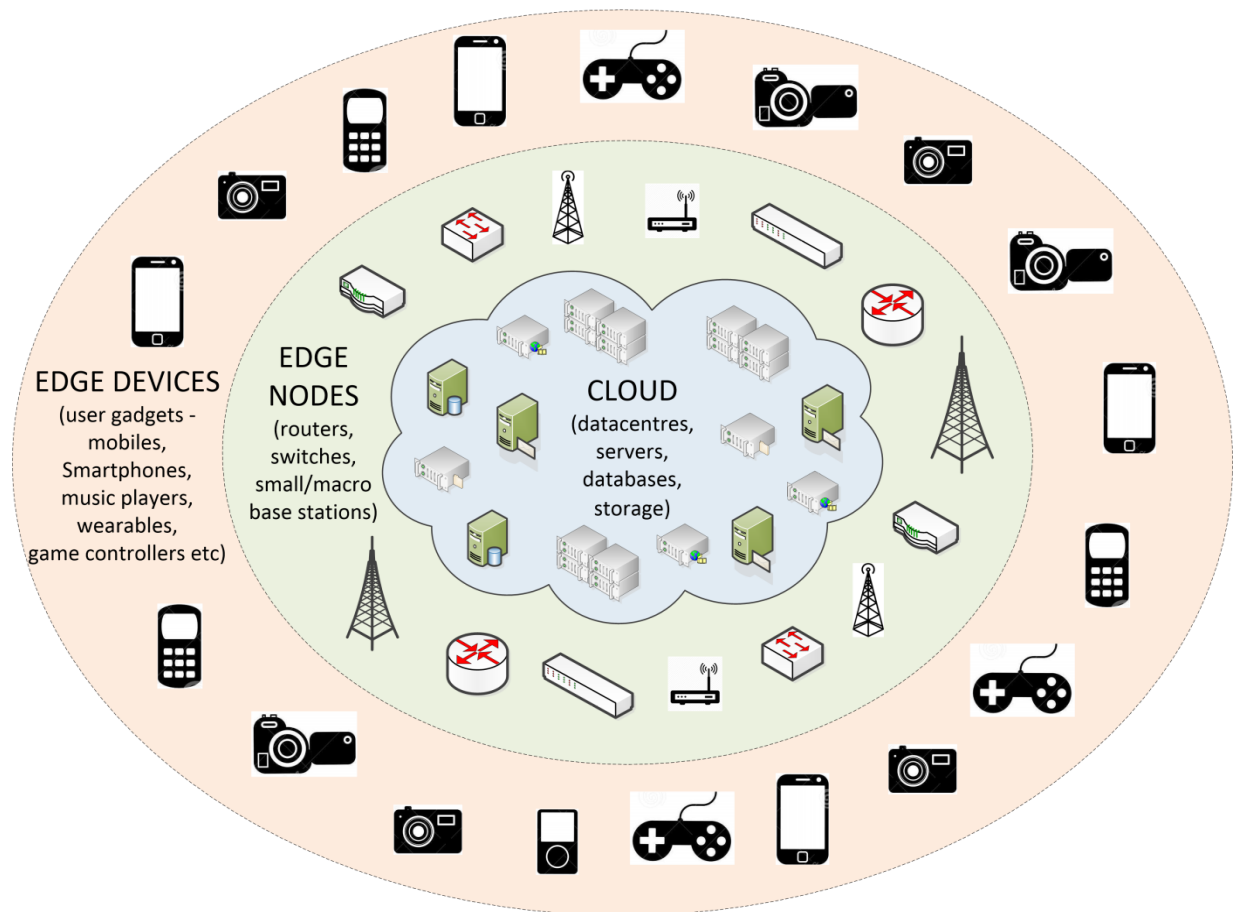


**FIGURE 2. A typical hierarchical architecture based on fog computing**

### III. NEW TECHNOLOGY DETAILS

Edge computing are often traced back to the Nineties when Akamai launched its content delivery network (CDN), which introduced nodes at locations geographically nearer to the end-user. These nodes store cached static content like pictures and videos. Edge computing takes this idea further by allowing nodes to perform basic computational tasks. In 1997, scientist Brian Noble signifies how mobile technology might use edge computing for speech recognition. 2 years later, this technique was additionally used to extend the battery lifetime of mobile phones. At the time, this method was termed “cyber foraging,” that is largely how each Apple’s Siri and Google’s speech recognition services work.

<sup>[8]</sup>Typically, IoT information is collected and transmitted to a cloud or data center, wherever it is processed and analyzed. This approach is reliable but long. As a result, edge computing is changing into an progressively well-liked and quicker approach. In edge computing, sensors, controllers, and different connected devices collect and analyze IoT information themselves, or transmit it to a close-by electronic computer, like a server or laptop computer, for analysis. <sup>[13]</sup> once this processing and analysis occur at the edge of a network, as opposition a data center or cloud, the data are often instantly analyzed—and place into action. Edge computing is sometimes erroneously referred to as fog computing, however both are completely different. In fog computing, one centralized electronic computer processes data from multiple endpoints in a network. In edge computing, every device in a network plays its own role in processing information. Edge computing works at the individual device, fleet, or plant level.



**FIGURE 3. Edge devices and edge nodes with relation to the cloud**

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### **3.1 ADVANTAGES**

#### **3.1.1 HIGHER LATENCY**

If applications depend upon immediate feedback (e.g. to create “real-time” decisions), sending information to the cloud, calculating and sending the information back to the device might take too long. However, if the trail is reduced to the (much closer) Edge Node and back, several use cases will be completed.

#### **3.1.2 DATA THROUGHPUT**

<sup>[9]</sup>Devices might generate huge amounts of information. One single autonomous automobile as an example might generate up to 4000 gigabytes of information per day. If each single automobile sent all information it generates all the way to central datacenters it might produce an enormous load on the network. By performing the required computations on edge Nodes near to the device, most of the trail is often cropped. This can be particularly necessary when considering the increasing importance of the internet of things and also the rising variety of devices connected to the internet.

#### **3.1.3 RELIABILITY AND ROBUSTNESS**

the main functionality of devices should still be accessible, though communications to the central cloud are impaired. This could be achieved by relying on local communication with an edge Node that should (in theory at least) be less vulnerable to issues. If an edge Node fails, the devices are shifted to another Edge Node.

#### **3.1.4 PRIVACY**

In several use cases grouping user information is needed or at least helpful. However, in cases where collective information is enough, the users’ privacy is preserved by aggregating the information on the edge Node rather than the cloud.

#### **3.1.5 SCALABILITY**

In most cases, the computing power of devices is restricted by their little size. What is more, developing a brand new use case that needs stronger hardware would require all potential users or the network administrator to update the devices that limit the use cases’ adoption rate. Edge Nodes don't suffer from these issues and might be extended both very simply and continuously. Using a appropriate Edge Computing framework, adding, exchange or upgrading Edge Nodes could be a terribly easy and extremely machine-driven method.

### **3.2 DISADVANTAGES**

Where there are advantages, there are risks, and edge computing is not any exception. Firms should bear in mind of the subsequent risks of edge computing:

#### **3.2.1 PROCESSES SUBSET OF DATA**

Edge computing processes and analyzes solely a subset of data, discarding raw information and incomplete insights. Firms should think about what level of data loss is suitable.

#### **3.2.2 SECURITY ISSUE**

Edge computing will increase attack vectors. With the addition of the IoT, network-connected devices, and built-in computers, the opportunities have enhanced for attacks and malicious hackers to infiltrate the devices and access sensitive information.

### 3.2.3 NEEDS ADDITIONAL NATIVE HARDWARE

as an example, IoT cameras need an inbuilt computer to send video information over the internet likewise as a more subtle computing method for a lot of advanced process application, like motion-detection or facial recognition formula.

## IV. CONCLUSION

This paper outlines and surveys the state-of-the-art edge computing technologies. With the goal of understanding further intricacies of the key technologies, we have broadly divided the body of knowledge into cloudlet, mobile edge computing, and fog computing. Within each of these aspects, we have given a detailed tutorial on the principle, system architecture, standards, and applications. Nevertheless, given the relative infancy of the field, there are still many outstanding problems that require further investigation from the perspective of key techniques and advanced solutions. Given the extensiveness of the research areas, it is also concluded that more rigorous investigations are required with greater attention to be focused on transforming well-established fog computing into fog computing-based RANs. Furthermore, with the introduction of the advanced big data mining and network slicing, the availability of varied degrees of freedom along with the associated constraints further beckon the design and validation of the original models in the context of edge computing.

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## Use of Artificial Intelligence in Speech Recognition

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**Abstract**—Purpose of this research Paper is to define what is role played by artificial intelligence in *speech recognition*. *Speech recognition is a term in which computer convert human voice in machine-readable form and act upon that. Humans use speech and gestures during interaction with each other's. Speech recognition makes possible that interact with computer same as humans. Using speech recognition user can perform another task simultaneously. This research paper defines the role of Artificial Intelligence in Speech Recognition. Natural Language Processing used for interaction with computers in natural languages like English. NLP used in speech recognition for understand input and perform right action.*

**Keywords**— *Artificial Intelligence, converting Speech signals, gesture recognition system, Natural Language processing, Speech Recognition.*

### I. INTRODUCTION

The purpose of this research paper to introduce the use of artificial intelligence in speech recognition. Speech recognition also referred to as ASR (automatic speech recognition) or STT (Speech to text) or CSR (computer speech Recognition).

In today world, everyone wants to do things in easy way and very fast and that is the reason we use technology in every field like industry, business, sports, households, agriculture, war etc.

With the use of AI, we make our technologies faster compared to without using AI. Some of the example is some speech recognition technology like amazon Alexa and google home mini; they are smart speakers that is work on human voice commands.

In old days if anyone wants to give public speech in their own language and community does not understand that language then they use a person as a translator who is responsible for translate particular speech in community native language. This process takes a lot of time and efforts now with the use of speech recognition technique this problem solved easily and fast (speaker speeches in their own languages and listener listen in native language) that is the power of AI.

### II. BASIC CONCEPT OF SPEECH RECOGNITION

Speech recognition is a complex phenomenon. Most of people does not understand that how this technology works. When two or more people interact with each other that comes in area of telecommunication services, in this paper we focused upon man-machine interaction. Let us try to understand speech recognition process in some steps.

**Structure of Speech:** speech is a continuous voice stream where rather stable states mixed with dynamically changed states. In this states sequence, one can define less or more similar sounds classes or **phones**. Phone is simply defined as speech sound in a given language. For example the English word kid and kit end with different phenomes, /d/ and /t/ , and swapping one for the other changed one word into different word.

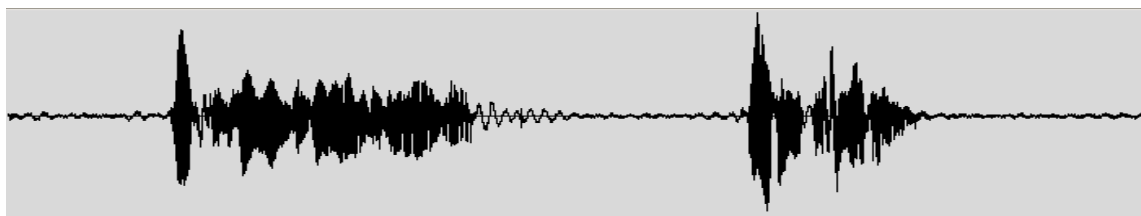


Figure. 1. Structure of Voice Analog signal

#### a. Recognition Process:

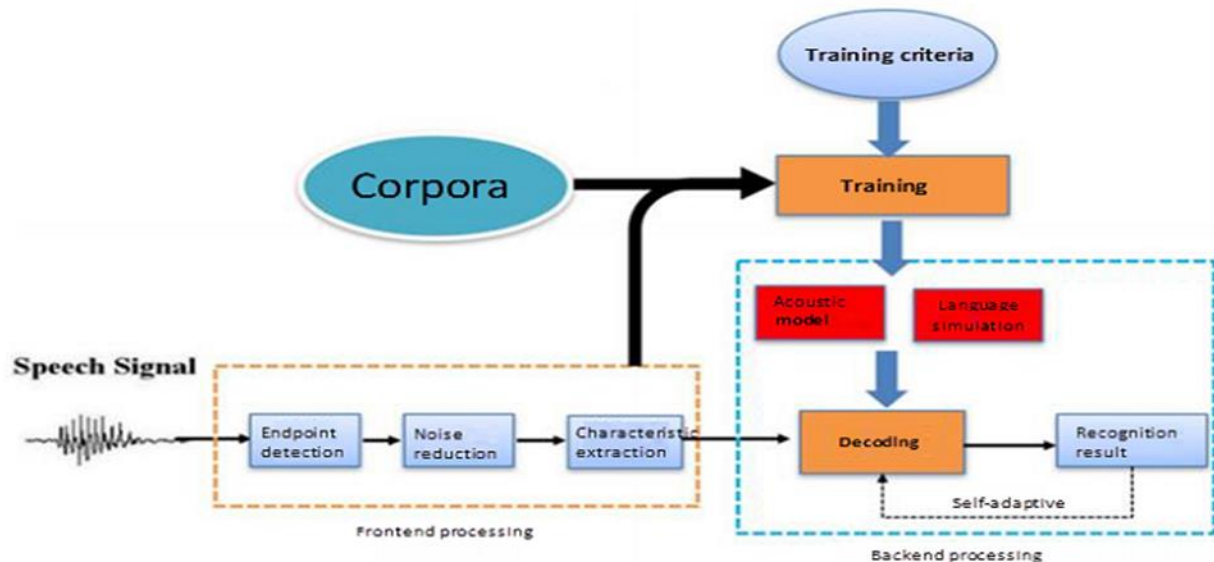
The user interact with application using input devices i.e., a microphone. The simple way of recognize speech is the following: Microphone receive waveform's, after removing background noise split it at utterances and then try to recognize what's the meaning of each utterances.

To perform that, we should take all possible combinations of words and try to match them with audio and choose the best matching combination. We should always take care some points in matching process.

First, it is **feature's** concept. Since there is large number of parameters, we are trying to optimize it. Number's that computed from speech usually by dividing the speech into frames.

Second, it is **model** concept. Signal modeling for speech recognition is challenging task. The concept of model describes some mathematical object that gathers common attributes of the spoken word. This model of speech known as **Hidden Markov Model** or **HMM**. HMM is describe as the heart of automatic speech recognition system. HMM describes the black-box communication channel. In HMM model process described as a sequence of states, which change each other with a certain probability. From the concept of model, the following issues raise:

- How much model describe the reality
- How much model is adaptive if conditions will changed



**Figure. 2. Recognition Process**

The given Figure shows the structure diagram of Automatic Speech recognition System. It is mainly comprises a frontend Processing model, Acoustic model, Language model and decoder.

**b. Models:** following models are used in speech recognition for matching purpose:

#### i. Acoustic Model

Acoustic was the originally the study of small pressure wave in air which can be detected by human ear. In addition, the perception of sound is an area of acoustical research. In our present paper, we will define the propagation of signal only in fluids like air and water. Acoustic Model used for represent the relationship between an audio signal and phenomes or other linguistic units that make

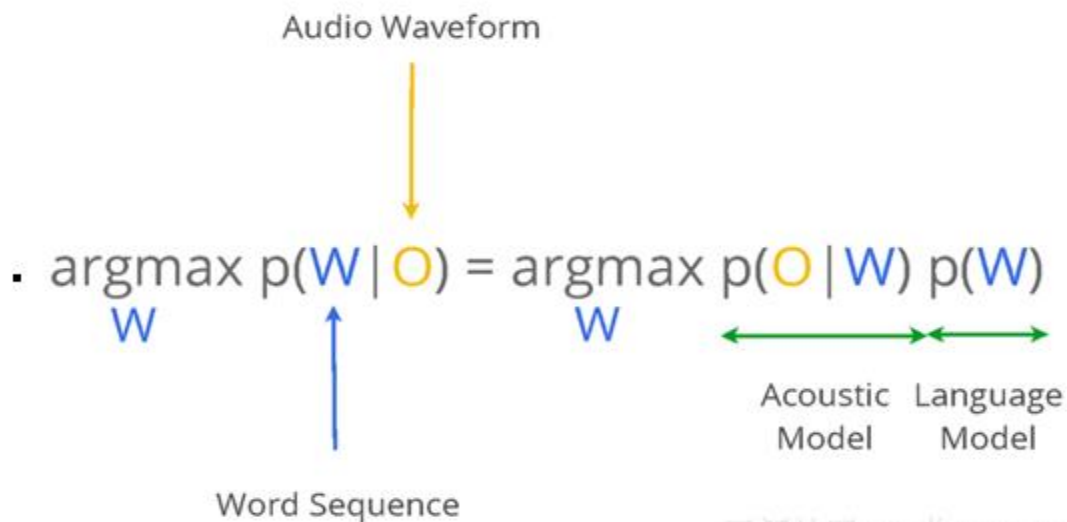


up speech. The main task of Acoustic model is computing the  $P(O|W)$ , i.e. the probability of generating a speech waveform by Acoustic model. Acoustic model is backbone of Automatic Speech Recognition.

## ii. Language Model

The language model worked for modelling the word sequences in the language. In new technical devices speech recognition systems operate on the audio in small chunks known as frames with an approximate duration of 10ms per frame. Language models used for retrieving the information from query likelihood model.

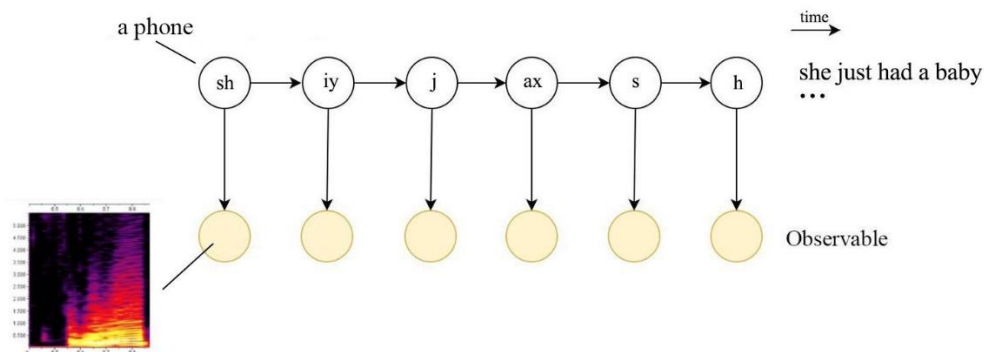
For building language, model data sparsity is a major problem, most possible word sequences not observed in training. There are only one solution seems good for data separation is find the probability of word which is only depends on previous n words.

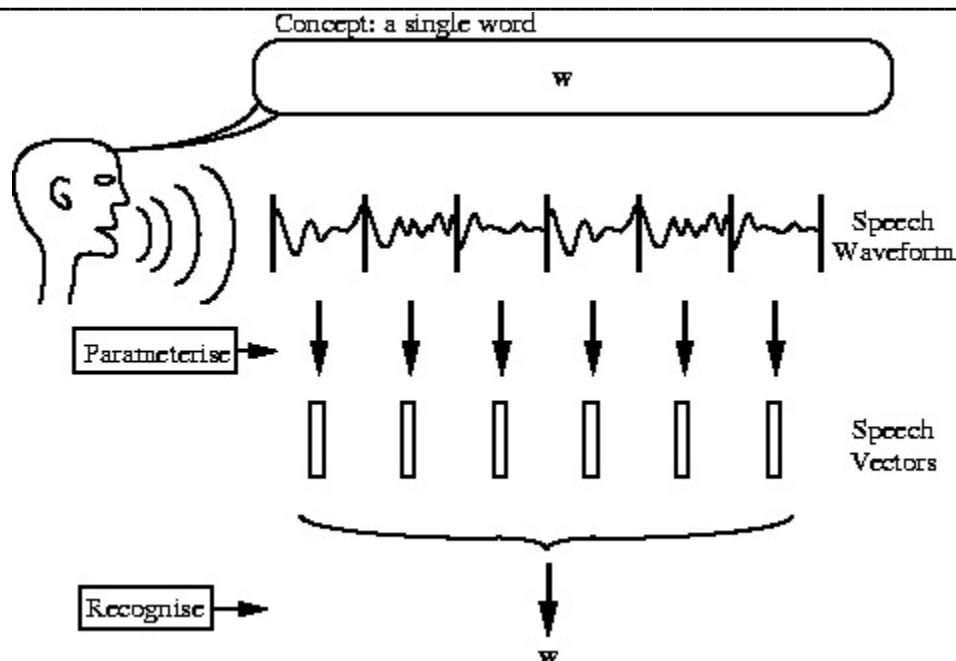


**Figure. 3. Formula for calculating Audio Waveform**

## iii. Hidden Markov Model

Hidden Markov models is especially known for their work in reinforcement learning and temporal pattern recognition e.g. speech recognition, handwriting recognition, gesture recognition etc. The term Hidden is nothing but a markov process behind the observation. A Hidden Markov process can be shape as a generalization of the urn problem with replacement. Hidden Markov model is become predominant model from the last serval years. With the use of HMM models we do not require search phone sequences one-by-one. With the use of HMM Model, we can find optimal sequence in polynomial time. That is the reason this method become so popular. HMM is describe as the heart of automatic speech recognition system. HMM describes the black-box communication channel. In HMM model process described as a sequence of states, which change each other with a certain probability.





Today Speech recognition technologies use both acoustic and language model to represent the statistical properties of speech. The main idea of AI is to collect and employ knowledge from a number of sources for solving the problem in question (Rabiner and Juang, 1993).

### III. APPLICATION AREAS OF SPEECH RECOGNITION

#### a. In the Modern office

Speech recognition technologies can improve the throughput of modern office. It helps to minimize the human efforts and do simple task easily and fast. There are some examples of modern offices are as follows:

- Print document on request.
- Start video conferences.
- Schedule meeting
- Make travel arrangements
- Search for reports or documents on your computer etc.

#### b. In Marketing

With the use of speech recognition, there are new type of data available for marketers to analyses customer needs and requirements.

#### c. In Healthcare

Speech recognition system is more useful thing in health industry. There are following types of benefits available of speech recognition.

- Quickly finding information from medical records
- Less Paperwork
- Less time required for inputting data
- Improved workflow

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- ASR systems provides facilities to physically challenged person to command and control a machine.

#### IV. CURRENT SPEECH RECOGNITION LANDSCAPE

Smartphone are the sole place of residence for digital assistance like google assistance, Siri and Cortana. Recent google research found over 50% of users keep their voice activated speaker in their living room.

### Where people keep their voice-activated speakers



#### V. CONCLUSION

Speech recognize will revolutionize the way people conduct business over the web and will, ultimately, differentiate excellent e-business. Voice XML tries to merging speech recognition and telephony together and provides the technology with which business can develop and deploy voice-enabled web solutions today! These solutions can greatly expand the accessibility of web based self-service transactions to customers who would otherwise not have access, and, at the same time, leverage a business' existing web investments. Speech recognition and voiceXML clearly represents the next wave of the web.

Speech Recognition Systems are indefensible part of the ever-advancing field of human computer interaction.

#### ACKNOWLEDGEMENTS

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## Blockchain in HealthCare

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**Abstract** — By the entry of Blockchain in Healthcare it is considered to be the new Era of opportunities. Blockchain in the Healthcare can provide a new and various models for HIE i.e. (Health Information Exchange) by making the medical records that are generated electronically more efficient, secure and disintermediated. Blockchain in Healthcare is expected to improve record management of medical and advance biomedical and healthcare data ledger. It is expected to bring out the massive development in this ecosystem as it can bring specific changes for the patient's healthcare management. With the help of this technology, the power will come to the people's hand back. By this it is meant that the individuals will be responsible for getting the overall control of their own data. The Blockchain can also provide the solution for the growing need of both i.e. securing the patient's health data from an unauthorized access and secondly make the access to such a data easier to the patient. In this paper, we will study about the things to be in this, the real Use cases of Blockchain in Healthcare, opportunities and applications and challenges, and the protection of the data of the patient through the Blockchain.

**Keywords** — Blockchain, Digital health, Drug traceability, Healthcare, Healthcare interoperability.

## I. INTRODUCTION

Blockchain alleviates the dependence on a methodical reservation of authority at central points, and the support of secure and trustless transaction between interacting entities directly [1]. This record are often shared among a network of computers, and users on the network can increase the record of transactions. The distribution of the database is made between the networks instead of a database that is located centrally and that maintains and manages the medical records. Transactions are kept secure via cryptography, and approval of the transaction need to be done and verified by the network during a process called mining. Each transaction are often thought of as a block, and therefore the links that is done by the ledger and is put together are often thought of because the chain. Since users' transactions are directly added to the current present ledger, it eliminates the necessity for a middleman that traditionally may facilitate such transactions. Process called mining is then used to link the blocks together in the chain, by using this process the pending transactions are turned into a mathematical puzzles. People, called miners, need to solve the puzzle (typically using computer systems) and produce what's called a hash, a sequence of letters and numbers unique to the block. A block's hash is developed using the hash of the previous block, therefore ensuring that each block is valid. The hash of the before or previous block is used to produce the corresponding hash block which in turn becomes a digital version of a wax seal. It confirms that this block — and each block after it — is legitimate, because if you tampered with it, everyone would know. This technology could become very effective within the industry of the healthcare, too. It offers a way to interoperate since all users of a network can access that network and every one pieces of data are verified and show the history of transactions. Potential healthcare application is population health. Middleman can be eliminated by the organizations and access patient databases on an outsized, population scale, instead of relying on health information exchanges or other ways to aggregate data.

The healthcare researchers struggle with the fragmented or the data which are in pieces and the isolated data, communication delay and the different workflow tools. Therefore the providers hesitate to share the data. The first issue is that the perception of the provider about the safety keeping regulation for preventing the patient health and the information about the identification. And the other is potential liability and the financial consequences that is associated with the sharing of the data [2,3]. The health systems which are the vendor specific create gaps in the communication in healthcare, which makes it very difficult to coordinate and provide the patient centric care [4]. The important distinctive issue of a blockchain is that the data is added to the distributed ledger after a bit and nobody can alter it. The data that is hold on a blockchain in its entirety it is totally secure. Health care suppliers will leverage blockchain to firmly store their patient medical records. Once a medical record is

generated and signed, it are often written into the blockchain that provides patients with the proof and confidence that the record cannot be modified. These personal health records may well be encoded and hold on the blockchain with a non-public key, so they're solely accessible by sure people, thereby making certain privacy. So as for anyone to create an amendment in one block, it's obligatory to create changes to all or any the next blocks when it.

Blockchain technology is very beneficial for healthcare because you can actually track who is accessing it, when they accessed it, and not to worry about not been able to delete the data. Recording digital information is allowed and distributed and it is not to be edited is one of the goal of blockchain. Blockchain has conjointly garnered interest as a platform to boost the credibility and transparency of aid information through several use cases, from maintaining permissions in electronic health records (EHR) to streamlining claims process.

A blockchain powered health information exchange may unlock verity worth of ability. Blockchain-based systems have the potential to cut back or eliminate the friction and prices of current intermediaries. The promise of blockchain has widespread implications for stakeholders within the health care system. Capitalizing on this technology has the potential to attach fragmented systems to get insights and to raise assess the worth of care. Within the future, a nationwide blockchain network for electronic medical records could improve efficiencies and support higher health outcomes for patients.

By the healthcare remodeling potential of the Blockchain technology and by placing the patients at the middle of the ecosystem of the healthcare and by increasing interoperability i.e. ability of health data and privacy and security i.e. safety. This technology may offer a replacement model for Health Information Exchange (HIE) by creating electronic medical records more efficient, disintermediated, and secure. Whereas it is not a solution, this new, rapidly evolving field provides fertile ground for experimentation, investment, and proof-of-concept testing. Blockchain technology is predicted to enhance anamnesis management and the insurance claim process, accelerate clinical and medical analysis, and advance biomedical and healthcare ledger of data. These expectations are based on the key aspects of blockchain technology, such as decentralized management, immutable audit trail, knowledge cradle, robustness, and improved security and privacy. Although several possibilities have been discussed, recovery of information subjects right is the foremost notable innovation that may be achieved with blockchain. By the colossal breakthrough in the healthcare ecosystem the specific changes in the healthcare management of the patient can be brought out with the ability of the blockchain. The ability can return to people's hands with the aid of the blockchain technology. Meaning people are accountable for handling their own records which means, getting the control of data of their own. The technology could enable better privacy protections, more efficiency and easier information exchange, by giving patients control over their data. The technology holds the ability to successfully improve quality care of patient whereas maintaining the funds at an affordable rate. All the challenges and hindrances that occur in multiple level authentication is eliminated through blockchain. Blockchain has made its way in the healthcare sector with the increasing in the adoption rate. The technology is being accepted positively by people in healthcare ecosystem.

In this paper, we will study about the things to be in this, the real Use cases of Blockchain in Healthcare, opportunities and applications and challenges, and the protection of the patient data through the blockchain.

## **II. METHOD AND MATERIAL**

### **2.1 HEALTHCARE BLOCKCHAIN APPLICATIONS**

The main areas of interest in the healthcare industry are :-

- Hospitals, clinics, doctors and Care Services
- Patients, Insurance companies and customers
- Pharmaceutical companies
- Biotechnological companies
- Medical technological companies



The applications of blockchain in healthcare can be in:-

- Digital Identification – here patient identity validation is done, identity validation of healthcare provider is done, and validation of drug identity is done.
- Smart Contracts – where healthcare data backed research/treatment and healthcare regime obedience tracking is done.
- Record Keeping – where medical treatment history tracking, medical devices usage, drug supply chain tracking and history tracking and is done.
- Financial Transactions – where healthcare service payments and healthcare regime gratification is done directly.
- Marketplaces – where healthcare service provision bidding and medical product and service customization is done.

### 2.1.1 USE CASES BLOCKCHAIN IN HEALTHCARE

Here are the couple of use cases that utilize the potential of technology which will make the healthcare industry more secure, accessible, reliable and describing existing issues in the sector and considering possible solutions through the use of this technology.

Blockchain in healthcare include the following usage:-

- **Drug traceability:-** The main feature is the security which will be effectively use in drug traceability of blockchain technology. The block will be immutable as well as timestamped whenever the new transaction is added. The tracing of the product will become easy and we should make sure that the knowledge can't be altered inside block. Pharmaceutical companies that register any specific drug on the blockchain got to be trustworthy in order to make sure the trace and authentic of medical drugs. Therefore, the usage of personal blockchain during which the control is within the hands of a central authority would add up in such cases. When such companies are given access to the precise drug blockchain, they might have a symbol that the drugs manufactured by them are authentic. The pharmaceutical companies have the proper to settle on among actors of the availability chain who are going to be acting as miners they can be, manufacturers, distributors or retailers pharmaceutical companies that register any specific drug on the blockchain got to be trustworthy. Every individual can have different rights or accessibility options. The permission is given to the wholesalers to verify transactions while the labs can register the drugs. Moreover, every block containing the drug information will have a hash attached thereto which can be linked to a different block. When drug moving along the availability chain among different entities, it are often easily tracked.
- **Data security in clinical trials:-** Clinical trials are conducted in order to ensure and analyze the effectiveness of any particular medicine that is developed and proposed for curing a specific disease. The proposed drugs are often tested and supported the success of the trial, they will be implemented on a bigger scale and to conduct a clinical test, huge amounts of knowledge sets are required. The researchers specialize in these data sets and conduct regular tests under different circumstances to get reports, statistics, and effectiveness ratio. Based on these reports, the data is analyzed and further decisions are taken. In many cases, however, most of the pharmaceutical companies today show interest in recording the results which will assure certain benefits for his or her firms. In such cases, the researchers often hide or modify their collected data and knowledge so as to vary the result. So as to make the clinical trials more fair and transparent, to record secure, unbiased and transparent clinical trials researchers can make use of blockchain technology. On the opposite hand, for the businesses who believe conducting authentic clinical trials, everything must be secure and transparent. To accomplish this, the documents created and used in the process such as informed consent, research plans, regulations and study protocol need to be time stamped. This means that the documents should have a symbol and details of their creation time. For pre-planned endpoints, it's especially important to stay this information timestamped to make a symbol that showcases that the agreement was there even before the trial started. Blockchain technology would increase the credibility of clinical trials and results. These documents are often stored as smart contracts on the blockchain acting because the digital thumbprints. The blockchain also will keep the supply chain management of the pharma also because the accountability of drugs tracking.

- **Patient Data Management:-** HIPPA, insurance Portability, and Accountability Act has strict regulations round the privacy of a patient's data. To be secure from breaches and modification PHI (Patient health information) is required. Patient data can't be restricted despite of the safety regulations. Healthcare requires sharing of data by the patients and medical records across the ecosystem despite being the posh system with multiple entities. For instance, patients while going for the treatment or merely buying the medicine, they have to share their health related information with doctor as well as the providers. Additionally, the more and more data management by the healthcare providers is resulted with the increase in the number of patients. Therefore the difficulties in managing the patient information within the clinics are led by the growing data .Many issues are resolved by introducing blockchain to this data-centric system. A blockchain system would create a hash for individual patient health information blocks in place for patient data management and on a theoretical basis a collective system would constitute a patient ID. Even patients are allowed to reveal their necessary data to 3rd parties while their identity been secret by the blockchain system. The patients can even control the deadline and access permissions for data sharing with 3rd parties.

### 2.1.2 INTEROPERABILITY

The power for heterogeneous information technology is described by the healthcare interoperability and software application which are used to communicate, exchange data and use the data which has been exchanged [6]. Information systems are been allowed for figuring organizational boundaries are paramount within or across it to enhance healthcare effectively for people and communities [5]. Providers are enabled by the interoperability to securely and scalable share the medical record of patient with each other, no matter the location of the provider and the trust relation between them. Secure and scalable data sharing is important to supply effective collaborative treatment and care decisions for patients. For improving diagnostic accuracy [7], data sharing helps by gathering confirmations or recommendations from a gaggle of doctors, also as preventing inadequacies [8] and errors in treatment plan and drugs [9,10]. Likewise, aggregated intelligence and insights [11-13] help clinicians understand patient needs and successively apply simpler treatments. Despite the importance of medical data sharing, today's healthcare systems frequently require patients to get and share their own medical records with other providers either via physical paper copies or electronic hard disk copies. Patients getting and sharing their own medical records via paper copies or electronic hard disk copies with other providers is frequently required by todays healthcare systems despite the importance of medical data sharing.

For the following reasons obtaining and sharing medical records is ineffective:-

- The medical data is prepared, delivered and picked up by the patients since the process of sharing is *slow* [15].
- **Insecurity** is also the reason for the sharing of medical data because during the physical transmission of data by patients from one location to another the data copies may get lost or stolen.
- The sharing of medical records is **incomplete** as patient health history may be fragmented because the medical records and data of the patient are stored in disparate and soiled systems.
- The patients are prevented from taking control of their own health data or records and also the patients have no knowledge about of what is done to their and who has accessed it. This happens because the process **lacks the context** since all the healthcare systems are provider centric instead of patient centric [16].

Lack of trust between the providers and the lack of interoperability between health systems and applications has caused the ineffectiveness of the data sharing process in the healthcare. Foundational, structural and semantic are the three levels ordered in lowest it highest fidelity [17] which are comprised of Healthcare Interoperability.

Exchanging of data between healthcare systems are enabled by **Foundational Interoperability**. Interpretation of the data is not required by it for the providers who are receiving it. Formats for exchanged clinical data is additionally defined by **Structural Interoperability** and ensures that preservation is done of the received data and see that if the data is at field level using predefined formats. The interpretability of the exchanged data not only by the syntax but also by the semantics is demanded by the **Semantic Interoperability**. For the *semantic interoperability* the *foundational interoperability* and *structural interoperability* are prerequisite, to advance the quality of care it is most desired but hardest to achieve. Delivery of information with requisite data quality and safety from the disparate health systems and the applications is ensured with the help of the 3 levels.

**TABLE 1**  
**VARIOUS APPLICATIONS AREAS OF BLOCKCHAIN BASED HEALTHCARE SYSTEMS**

Sr. No.	Application Area	Target Research Challenges	Description
01.	Sharing Clinical Data	Securing Data Accessibility	Should secure medical data and must be ensured by it and sharing and storing medical data among various involved stakeholders.
02.	Global data sharing	Securely global data storing and sharing	Should provide secure healthcare data even outside the respective Country or from anywhere in the world at global level.
03.	Maintaining Medical History	Availability of medical data or records	Should guarantee for the continuous availability of medical data to maintain the medical history for better treatment and avoid extra resources and costs.
04.	Healthcare Data Access Control	Managing access control	It promises to give patients more secure access control to manage their healthcare data.
05.	Drug Supply Chain Management	Counterfeiters and pilfering of supply chain process	It can provide secure means of handling and monitoring the availability chain processes in healthcare systems.

### 2.1.3 IDENTITY AND ACCESS MANAGEMENT

**TABLE 2**  
**IMPROVING SECURITY AND EFFICIENCY IN HEALTHCARE**

Key issues in identity and access management	Explanation	Challenges with the current system	Description
Information authenticating the subject's identity	Information to verify that someone is who he/she claims to be.	Current identity-management techniques in hospitals believe password-based systems, which involve shared secrets that are exchanged and stored on insecure systems.	In blockchain-based identity authentication, each transaction must be signed by the right private key. Only the patient has the private key.
Information describing the information	Information about different pieces of data flow among participants and records of data transaction.	There are not any audit trails of who accessed patients' data. Some hospitals still believe paper medical records.	The presence of an audit trail means there's complete documentation of events associated with the creation, modification, and deletion of electronic records.
Actions that are authorized to perform by various participants	It specifies access rights and privileges of every participant.	Various parties are authorized to take actions supported patients' data. Patients often haven't any control over their own data.	Blockchain prevents unauthorized and illegitimate access to data. Patients hold ownership and ultimate control over their information.

### III. CONCLUSION

Blockchain technology offers a platform that would be used for several potential applications in health care. Solutions were proposed by many organizations that have the potential to extend operating efficiency and transparency of data within the early stage of the design and development. However, the scalability, security, and price effectiveness of blockchain technology would require further research before large-scale production deployments. The longer term of this technology in healthcare and other industries remains being written, and therefore the applications in research and clinical care aren't yet established. In spite of a distributed system that eliminates intermediaries, it has substantial potential to disrupt many current processes in health care and research. The acceptance of the new technology within the healthcare ecosystem is the case on which the blockchain for healthcare highly depends. The technology remains popular within the healthcare sector, though there are certain concerns and speculations regarding blockchain's integration with current healthcare systems and its cultural adoption. Blockchain has taken the healthcare industry by storm over the past year and lots of solutions are being developed to adopt it. With numerous potential use cases and possibilities, blockchain is certain to disrupt the healthcare landscape permanently.

We have seen the good potential of blockchain technology in creating secure and effective healthcare ecosystems with its inherent unique properties. In addition we have also observed the importance of integrating domain-specific concerns and wish into blockchain-based designs. Overall, blockchain features a wide range of possibilities in healthcare, which invites many research opportunities in this space.

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## Home Automation

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**Abstract**— Home automation is a system in which user can control his home's subsystem's using an application to achieve the purpose of home automation. The idea of home automation came from modern home which filled with electronic appliances to make life easier at home, secure, and more comfortable that the user can control his house while he is relaxing or working. When the user leaves his/her home to go on holiday/work, he/she loses all control over the functions of the house while he/she is away and cannot tell whether someone has broken security or whether he/she had left the living room light on. If the alarm has been triggered at his/her home, there is no way that the user can become aware of this unless he/she returns to his/her home. In order for the system be useful. Automation is needed in a house so that some functions in the house occur automatically, for example the outside light can turn on when it becomes dark outside. It is mandatory of having secure, reliable and user friendly system that it can have full control on electronic equipment's of the house that can be access from across the globe.

**Keywords**— *Bluetooth, gesture-based automation, internet of things (Iot), microcontroller, smart home system, Wi-Fi*

### I. INTRODUCTION

Home automation means control of electrical appliance of our house. Technology advancement in electronic devices is producing a large number of user-friendly and flexible systems which take smart living technology to the next level. Daily usages appliances can be remotely controlled by our electronic devices such as smart phones which makes our life easier and comfortable. Home automation system is used to control the activity of electrical components in our home. Depending on activities, automated systems has been developed. Automation helps to control of electrical appliance, save time, and reduce efforts. Nowadays many wireless technologies are coming into day to day life. Home automation based on Internet is one of the most popular home automation system in today's market. To control and monitor the houses through Internet requires big and heavy computers. It becomes difficult to carry out. For this we are using mobile phones or tablet from which we can controlled the appliances wherever we are. The different wireless communication standards such as Blue-tooth, Zig Bee, and GSM are used by the home automation system to exchange the data. This helps to reduce the installation cost, reduce human efforts and becomes more scalable and flexible. Android based home automation helps the user to provide secure and configurable home automation system.

### II. LITERATURE REVIEW

In earlier decades so many inventions were invented in the field of electronics such as cell phone, air conditions, home security devices home theaters etc. these appliances can be controlled by a single controller, using personal area network in a home or in office . Due to busy environment, large area and personal limitations home automation system come in picture, in which Bluetooth is an ideal solution for this invention. In home and offices electronic devices can be easily controlled by home automation system but it required highly configured computer, it become more costly .to overcome this issue simple home automation system was developed which consists Bluetooth enabled mobile, host controller, and home appliance. The client module communicate with the host controller through a wireless medium such as Bluetooth.<sup>[13]</sup>

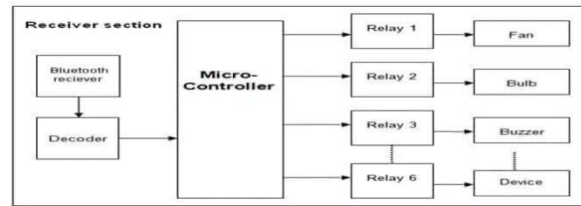


Figure: - block diagram of Bluetooth based home automation

Home Automation is also involved in large space offices such as warehouse in which lights, security devices and other appliances are controlled through highly configured computer. All the devices used in large space offices are controlled by a single controller using a wireless network. Client module and host controller communicate with each other through a wireless device or medium such as Bluetooth-enabled Android smart mobile phone. Home automation system is not a big thing but it is an advanced automation system which nowadays it uses in big and expensive infrastructure. Using an automation system can lead to high cost to overcome this issue, low cost, flexible secure home automation system comes in picture which can easily control TV, lights, fans and other electronic appliances with the help of Android-based mobile phone using Bluetooth.<sup>[13]</sup>

### III. PROPOSED SYSTEM

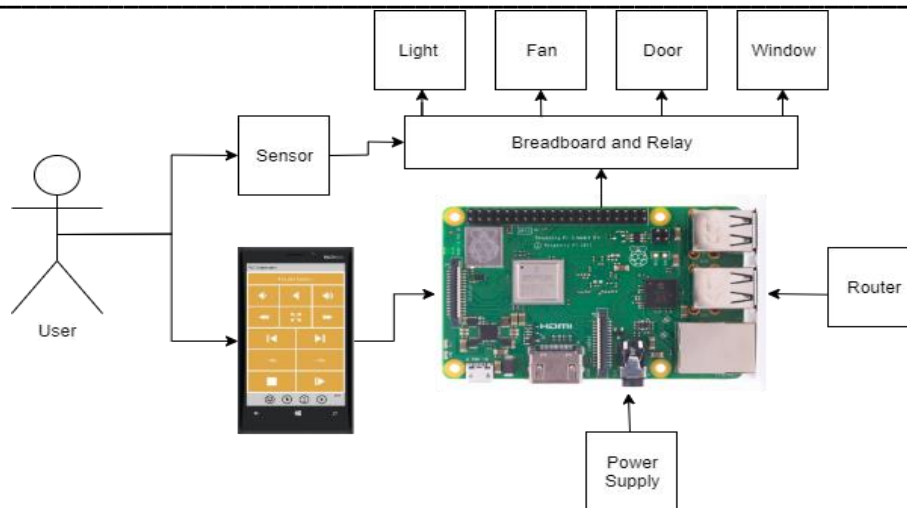
The proposed system is designed in such a way that it overcomes the limitations of existing systems. The proposed system is designed with quality of more secure, scalable and flexible. Home automation system is implemented using Raspberry Pi, an Android application from which we can control the devices and relay circuit. The Wi-Fi signals must be strong so that devices can control the appliances. Through relay, the appliances can be also controlled vice versa. The main purpose of the home automation system is to provide a cheap, secure and open source home automation which can control all the home appliances through smart (Android/iOS) device. The main advantages of home automation is that it provides security and flexibility through the Android system, good range of scalability. It will help the user to save his or her effort. It will help to save electricity when not in use.

### IV. SYSTEM ARCHITECTURE

In home automation many new inventions have been made. So the concept of home automation is still trending. The architecture consists of Wi-Fi, relay circuits, sensors, Android application and Raspberry Pi which is a small size computer that is used for the purpose to manage the network and for remote access. With the help of Wi-Fi network the user can communicate through Raspberry Pi and it can be configured according to our home system. The Wi-Fi signal must be strong and the system also scalable and flexible too. The Wi-Fi plays most important role in it which is the medium to communicate with the devices. It can be also modified to make services secured. The main part of the home automation is the Raspberry Pi circuit which is a credit card size computer and performs many functions. For every home appliances, the Raspberry Pi is configured and the corresponding relay will get switch ON/OFF so that corresponding device will function appropriately. Home automation has a very easy installation. The project consists of 4 main modules which are as follows:

- 1) Android/iOS Application (Smart Phone)
- 2) Raspberry Pi
- 3) Relay circuit
- 4) Wi-Fi





**FIGURE:1 - Architecture of system**

## V. DEVELOPMENT PLATFORM

### 5.1 Android/iOS Application (Smart Phone)

User interface is developed by using android / iOS so that the user can easily control the home appliances. Smart phone devices is use control the home automation system.. Smart phone devices provide special interface such as menus. The interface must allow user to view the status of automation system as well as control the system. There are n number of applications are available on play store / app store to make home automation system. We can download that software / application or else we can build stand-alone application for the same. Home automation application can communicate with different devices via differ ent signals. There are several connection options are such as <sup>[1]</sup>



**FIGURE 2:- Android/iOS Application (Smart Phone)**

#### 5.1.1 Bluetooth

Bluetooth module HC-05 supports master and slave mode communication SPP and UART interface. Using this features it can communicate with other Bluetooth-enabled devices like mobile phones, tablets and laptops. this module can runs on 3.3V to 5V power supply.<sup>[3]</sup> The slave mode in HC-05 will not initiate a connection to other Bluetooth device, but it can accept connections. Master mode can initiate a connection to other devices.<sup>[4]</sup>



**FIGURE 3:- Bluetooth module HC-05**

### 5.2 Z-wave

Z-Wave is a wireless technology that can help electronics of your home to talk with each other, and it gathers them into a personal area network, it can be added any electronic device of your house. It is used to provide remote control access and automated operation of lighting, locks & unlocks and garage door controller devices in your home.<sup>[5]</sup> Z-Wave modules are available in a variety of sources cheaply so that they can provide an excellent service for home automation.<sup>[6]</sup>



**FIGURE 4:- ADT Z-Wave module**

### 5.3 Zigbee

It is a wireless communication technology developed by Zigbee Alliance as an open global Standard. It has low-cost, low power, wireless sensor networks. Zigbee can be used almost anywhere and it is easier to implement and needs less power to operate. It sends and receives data up to the 2.4GHz or 900 MHz. ZigBee Module Small size, light weight, easy for embedded development. One to one communication of this module is up to 1KM,



**FIGURE 5 -F8913 Embedded ZigBee Module**

#### **5.4 Raspberry pi**

Raspberry-pi develop in United Kingdom is a single board computer. it runs multiple programs simultaneously. The home appliances will connect to the Raspberry Pi with help of relay driver which will perform On/Off actions on the basis of given instructions. The system will connect to the internet via Wi-Fi and an interface will be developed to control home appliances from a remote location. a Raspberry Pi device can also be connect with an Android App or iOS app which you can develop on your own using some applications (ADT). By using this application, we will be able to monitor and control the home appliances from any part of the world with ease. We can also include a PIR sensor with this project to make it switch ON automatically the appliances whenever a person enters the room and switch OFF the appliances whenever the person leaves the room. <sup>[8]</sup>



**FIGURE 6:- Raspberry pi**

#### **5.5 Relay**

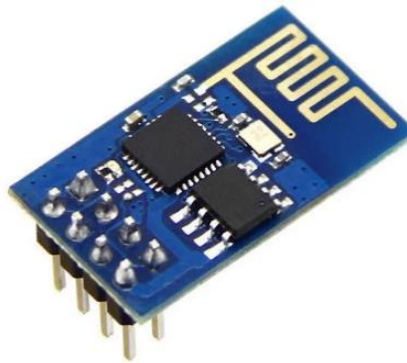
A relay is an electrical device that can be turned on or off, letting the current go through or not, and can be control with low voltages, like the 5V provided by the Arduino pins. Controlling a relay module with the Arduino is very simple as controlling any other output. Relay module has two channels . Below shown module is powered with 5Voltes, which can be used with an Arduino. There are many other relay modules they are powered using 3.3V, which is ideal for other microcontrollers. <sup>[9]</sup> It provides complete isolation between the low-voltage and high-voltage load control. It can turn on/off controls of electrical appliances like fans, lights and air-conditioners etc. <sup>[10]</sup>



**FIGURE 7:- Relay circuit**

### **5.6 Wifi (ESP-01 module)**

ESP-01 is a module which is available in the market. It acts as both Wi-Fi access point and a Wi-Fi client. It is pre-programmed with AT commands, so we can easily access and configure it using a microcontroller.<sup>[2]</sup>



**FIGURE 8:- ESP-01 ESP8266 Module**

## **CONCLUSION**

Home automation system provides easy and attractive interface and makes the system more flexible and secured. We are using smart phone devices to integrate with the home automation system. Wi-Fi is used to communicate between the raspberry pi and the android / iOS application to control the devices. The three main modules are raspberry pi, wifi, relays. We have hidden the complexity of the project by making the application simple.

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# Unified Payment Interface - An Advancement in Payment System

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**Abstract**— In this study the researcher aims to identify the customer preference towards unified payment interface and to know the impact of unified payment interface in customer satisfaction. Unified Payment Interface (UPI) is a payment system which facilitates the instant fund transfer between two bank accounts on the mobile platform. UPI is launched by National Payments Corporation of India (NPCI) and regulated by the Reserve Bank of India (RBI). UPI is built to extend Immediate Payment Service (IMPS) for transferring funds using account number with IFS Code, virtual payment address (a unique ID provided by the bank), Aadhaar Number, or a one-time use virtual ID, mobile number with MMID (Mobile Money Identifier). An MPIN (Mobile banking Personal Identification number) is compulsory to confirm each payment. UPI has made digital transaction for each and every individuals very easy like sending simple text messages. This service is available 24X7, not like RTGS or NEFT which don't work during non-banking hours or on holidays. This will bring extensive efficiency in the system and help India to become a truly cashless economy. It is secure, easy, cheap and more user friendly.

**Keywords**— Aadhaar Integration, Cashless Transactions, E-commerce, Instant-transfer, Unified Payment Interface

## I. INTRODUCTION

The Indian economy has traditionally been heavily dominated by cash, over the fifteen years, India has made little slow but steady progress in E-Payments. Till now many methods are invented in E-Payments to digitize the current Banking system, including National Electronic Funds Transfer (NEFT), Real Time Gross Settlement (RTGS) and Immediate Payment Service (IMPS). So UPI is one of them. India is large scale country and so many are unbanked or don't know how to avail the banking services which are easy and secure. But due less literacy people facing difficulties in using banking services. So we needed to overcome these difficulties to make payment process easy.

An important contributor to the Indian digital payments market was the arrival of India's real-time payments platform, Unified Payments Interface (UPI). Government started NPCI (National Payments Corporation of India) in 2009, which controls all E Payments in India and it is setup with guidance and support of Reserve bank of India (RBI) and Indian bank association (IBA). This collaborative effort was focused on making India as a cashless economy.

## II. EXISTING PAYMENT SYSTEM VS UPI

UPI, allows users to take the cashless path and transact digitally. It offers Instant Transfer of Money within few seconds, so it's practically real time money transfer, unlike NEFT or RTGS which works in batches and takes time in money transfer. It allow money transfer even on Holidays and outside working hours unlike NEFT or RTGS, where it doesn't allow money transfer on holidays or even Sundays.

The NCPI launched this payment system in between demonetization to encourage cashless transactions in the India and make mobile-based payments easier. Here the question is, what makes UPI better? This question especially arises when comparisons are made between UPI and IMPS, which offers similar features and benefits that are available through the UPI application.

The major differences between UPI and IMPS is the convenience that UPI gives to the customers, compared to IMPS. UPI allows complicated and lengthy information to be integrated into a simple virtual address. So, only that you need for a UPI transaction is a Virtual Payment Address (VPA). However, this is not the case with IMPS, where one needs the name of the account holder, the name of the bank, branch, IFSC code, and account number. Not just this, if a payment is being made for the first time to a payee, he/she needs to first be added as a beneficiary, but this is not the case with UPI.

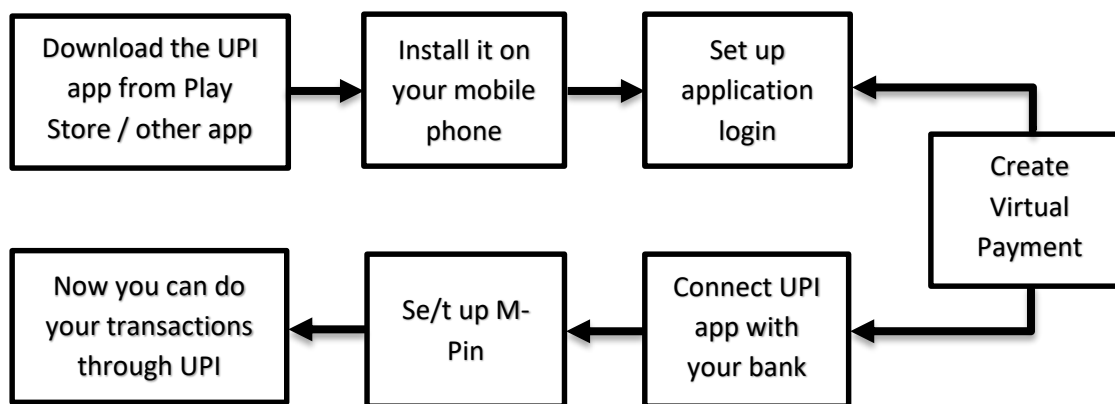


**TABLE 1**  
**COMPARISON BETWEEN UPI AND OTHER EXISTING SERVICES**

		UPI	Net Banking	Cards
For customers	Payment information needed for authentication	UPI ID – simply like email id (4 digit MPIN)	Bank Login Bank Password OTP or PIN	16 digit card number CVV Card expiry Cardholder name OTP or ATM PIN
	Mobile friendly design	High	Low	Low
For businesses	Settlement to business account	1 Day	1-2 Days	1 Day
	Success Rates	70-95%*	70%-90%	70%-95%

### III. WORKING MECHANISM OF UPI

UPI can be used to do transactions of money, who have internet enable smart phone and bank account. Below figure shows complete mechanism to use UPI.



**FIGURE 1: Process mechanism to download and use UPI application**

1. To get started with UPI, the users has to download UPI application from Google play store or from any other third party source. It is not mandatory that you should download app with respect to your bank account, you can download any other UPI application.
2. Now to use this application an authentication will be done for your respective bank account. For this authentication a request message will be send using your mobile number. Here we to remember that the SIM card of that mobile number should be already inserted inside your smart phone and that mobile number should be linked with bank account. Then by entering last 6 digits of debit card number, your bank account will get registered with UPI application.
3. Now in the next step VPA (virtual payment address) is to be created by user. VPA is the unique address like email id and every user will get unique id and it will get attached to their bank account and M-Pin is set for Bank account. For example if you are using Phone Pe application, then you will get VPA as usern01demo@ybl or 93215xxx9@ybl.
4. User can now send and receive payment worth minimum ₹ 1 up to ₹ 100000 per day. Currently NPCI is not charging any money for the transactions of UPI.

#### IV. BENEFITS

**Simplicity & ease of transacting:** Most people get bored if they have to fill in lengthy payee details, add a beneficiary and then make a fund transfer. Also, a bank cannot process a fund transfer using IMPS until and unless the beneficiary is added. Some banks, also have a waiting period up to 30 minutes, after which, user is allowed to make a fund transfer. This is not required in UPI as one does not need to provide any other details except the VPA to make a fund transfer.

**A single application with multiple bank accounts:** The UPI app gives users a convenient way to link all their existing bank accounts with one single application. Therefore, there is no need to download multiple applications for different bank accounts. All existing bank accounts can be linked in the application.

**Security:** The UPI application is also backed by the RBI and hence comes with many security features. UPI is safer than IMPS or other net banking service. Since here no bank account details or other account related data is provided, it is very safe and reliable. UPI works on a single click with two factor authentication system. It means that with a single click, the transaction will be verified at two levels. Every user will need a mobile phone along with a mobile pin known as M-PIN and virtual id. On a single click, the transaction is checked and if the mobile pin is matched with the virtual id, then only the transaction will go to be proceed.

**No charges are needed for transaction like IMPS:** Most banks do not charge a transaction fee for UPI transactions, unlike IMPS where a set fee is applied depending on the amount of money that is transferred.

#### V. CONCLUSION

UPI is a great step towards making the cashless payments easier, smoother and faster. It is a complete set to become an efficient alternative to mobile wallets. It is a fantastic value based suggested scheme as it includes simple upgradable & acquiring infrastructure, simple authentication process and real-time money transfer, which makes the fund transfer experience user-friendly and hassle free. As we know that most of the small transactions are still done through cash. Hence the ease and convenience way of UPI offers the individuals to pay their day-to-day expenses like fund transfer, bill payments, etc. digitally.

UPI is a clear step towards breaking the hurdles that exist in the BFSI industry by removing the multi-step authentication processes with one-click process. UPI will definitely have an advantage over the existing digital wallets and streamlines the entire process.

On the other side, the ATM sector will further become stronger along with the existence of UPI as it will bring on more users into the digital age while hold on to their ATM accounts. Moreover, this will also help in the rise and adoption of card less ATMs, Aadhaar ATMs, with innovative new age technologies, where the ATMs will give cash without inserting ATM cards.

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## **EBall Technology**

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**Abstract**—A new idea of laptop is coming back currently that's E-Ball idea laptop. The idea of E-ball laptop is introduced by the Apostol Tnokovski. This is often the littlest laptop among all the laptops and desktops. It having all the options and therefore the components sort of an ancient laptop-ball laptop is intended to be placed on 2 stands which may be opens and closed by pressing and holding a selected button on either side. E-ball laptop doesn't need any external supply for the show purpose. It's inherent projector that may be pop by pressing a button focus the screen on the wall which may be adjusted with the navigation keys. E-ball laptop having a 6-inch diameter sphere and therefore the 120mm × 120mm motherboard. This laptop is intended just for Microsoft Windows software package. E-ball has feature sort of a twin core processor, 250-500 GB disk drive, 2GB of RAM, Integrated graphic card, sound card.

**Keywords**— *EBall Technology, External show, Projector, Sphere PC, Umbrella*

### **I. INTRODUCTION**

The idea of E-ball laptop is introduced by the Apostol Tnokovski. this is often sphere formed laptop. this is often the littlest laptop among all the laptops and desktops. It having all the options and also the components sort of a ancient laptop. E-ball laptop is intended to be placed on 2 stands which may be opens and closed by pressing and holding a selected button on both sides. E-ball laptop doesn't need any external supply for the show purpose. it's integral projector that may be pop by pressing a button focus the screen on the wall which may be adjusted with the navigation keys. E-ball laptop having a 6-inch diameter sphere and also the 120mm × 120mm motherboard. This laptop is intended just for Microsoft Windows software. E-ball has feature sort of a twin core processor, 250-500 GB disk drive, 2GB of RAM, Integrated graphic card, sound card. 2x50 W speakers, DVD recorder, wireless optical mouse, optical maser keyboard, computer network and WLAN card, Web camera, and integrated alphanumeric display project.

#### **1.1 RELATED WORK**

The E-ball could be a new thought of computer that having the littlest size computer among all the laptops, and also the desktops. This computer is intended specified it's mounted between the 2 stands. The user is open this computer by pressing and holding the buttons that are placed at each aspect of the stands. Ones the computer is activate user will connect the optical mouse to the current computer by pressing the correct button of the mouse as per her demand. The E-ball computer features an optical maser keyboard shown in fig.1 This keyboard is visible only if the computer is in operating condition. The keyboard isn't physically gift it's taken by lasers that seems once press the button thereon. The optical maser keyboard acknowledges the user fingers with the assistance of associate IR sensors once the user writing at a specific place. E-Ball computer haven't got any external show unit, it's a button once this button is pressing a projector can pop and it focus the screen on the wall which may be adjusted victimization navigation keys. after we are operating in situ wherever no projector is obtainable then we are able to create use of a paper sheet as a screen. This technology supports the paper sheet and may be act as a show unit in order that we are able to simply perform the add the absence of external show unit. The E-ball computer supports all the windows software. The work with this computer is straightforward once the user creating a presentation, observation a flick with family and chatting with the friend on internet.

## II. WORKING OF E-BALL

E-Ball is meant such it may be mounted on 2 stands. E-Ball has 2 buttons on both sides and therefore the users will merely open this laptop by pressing and holding them at a time. Once you open the stand and switch the E-Ball on, you'll be able to connect the optical mouse from the body of the E-ball by merely pressing the connecting button of mouse. This technology incorporates a button that enables its optical device keyboard to induce activated. E Ball laptop haven't got any external show unit, it's a button once this button is pressing a projector can pop and it focus the screen on the wall which might be adjusted victimization navigation keys. after we area unit operating in situ wherever no projector is offered then we will build use of a paper sheet as a screen.



**FIGURE 1: Working of EBall**

The paper sheet holder is placed at the rear panel. The holder is opened by pressing it within the lower a part of computer. The E-Ball computer supports a paper holder and therefore the paper sheet on the holder may act sort of a screen wherever you'll watch movies or perform the works. E-Ball conception computer contains an optical device keyboard that's visible once the computer is in operating. The keyboard isn't physically gift it's taken by lasers that seem once press the buttons thereon. This acknowledges your fingers with the assistance of Associate in Nursing IR sensing element at the time after you are typewriting at a selected place. The software package interface of E-Ball conception computer is most unreal with icons that may be remembered simply that support all style of windows software system. E-Ball computer work terribly straightforward whereas you're creating video shows, listening music, observation movies, and chatting on information superhighway. There are 5 easy steps to ON computer that are you'll use-press and hold the facility button for five second, alter the alphanumeric display Projector and detach the optical mouse. Activate the virtual mouse and do no matter you wish.

### 2.1 DISPLAY UNIT:

Devoid of any external show unit, it's a button, on pressing pops up a projector that focuses the screen on the wall. For adjustment operations their square measure navigation keys additionally there.

### 2.2 PAPER SHEET HOLDER:

It is at the rear of laptop and is employed once there's the absence of a wall for projection. The lower half ought to be press for gap the paper sheet holder. By pressing and holding the paper sheet holder on/off button for 5 seconds the projector can recur. it's

divided into 3 items like associate degree umbrella when bargaining in, and it show desktop on the paper sheet. It will act as a supply for shows or looking at shows and films or chatting on net.

### **2.3 LASER KEYBOARD:**

Laser keyboard is predicated on optical maser ray's technique. It deals with fingers with associate degree aid of associate degree IR device once writing at a particular place. it's a careless device.

### **2.4 OPTICAL MOUSE:**

It is a detachable optical mouse that depends on the optical maser ray technique. It utilizes light-emitting diodes or optical maser as a way of pursuit movement of mouse. Like associate degree optical mouse doesn't contain mobile elements, it doesn't need improvement.

## **III. OPTIONS OF E-BALL**

The options of E-Ball area unit.

### **3.1 PROCESSOR**

Intel Core may be a name. it's used for numerous mid-ranges to high-end client and business chip that area unit created by Intel. The recently lineup of Core processors includes the subsequent processors:

**3.1.1** Intel Core i7 Intel Core i5

**3.1.2** Intel Core i3 Intel Core

**3.1.3** Intel Core Intel Core two couple

**3.1.4** Intel Core two Solo Intel Core Two Quad

**3.1.5** The e-ball laptop primarily uses Intel core two couple processor

### **3.2 RAM**

RAM is stands for Random Access memory. It gets the word random as a result of the knowledge will be accessed in non-sequential order. although the information itself is keep, it may well be anyplace within the quantity of RAM accessible. RAM is live in "bits", and eight bits adequate one computer memory unit. A KB is adequate 1024 bits, and a MB is adequate 1024 kilobytes. The E-BALL laptop uses two GB of RAM. It contains 2 forms of RAM. they're SRAM and DRAM. SRAM doesn't need external refresh electronic equipment. SRAM is quicker than DRAM. SRAM is additional power economical once idle. SRAM is many times dearer than DRAM

### **3.3 HARD DRIVE**

Hard drive may be a storage device. Drive is nonvolatile in nature. It consists of metal plate lined with chemical compound which will be magnetized to represents knowledge. knowledge will directly access from drive. The E-ball laptop principally consists of 350-500GB drive.

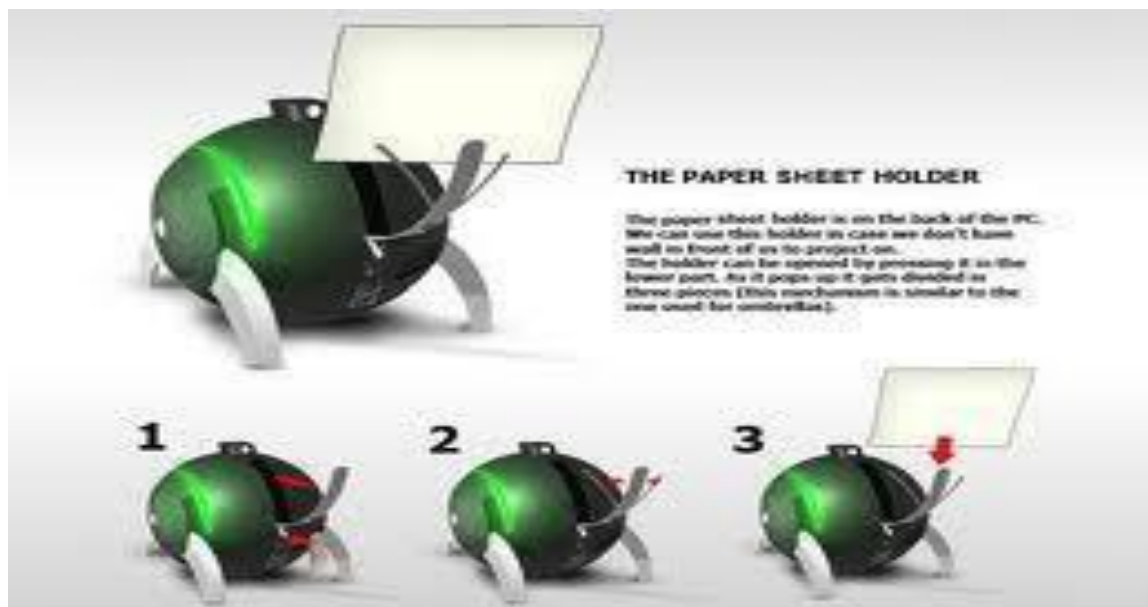
### **3.4 GRAPHIC & SOUND CARD**

A video card, show card, graphics card and graphics adapter are a growth card that generates output pictures to the show. Most video cards provide numerous functions like accelerated rendering of 3D scenes and 2nd graphics, MPEG 2/MPEG-4 decryption,

output, or the power to attach multiple monitors. alternative current high-performance video cards also are used for additional diagrammatically stringent functions like laptop games. Video hardware is usually integrated into them alternative board, all fashionable motherboards offer growth ports to that a video card will be hooked up. during this style it's typically named as a video controller, a video card, graphics card, or graphics adapter is AN growth card controller.

### 3.5 HERE IS NOT ANY WALL:

Suppose, there's no shut in the place wherever you're employed on E-Ball, you'll be able to use a paper sheet provided to the laptop because the screen. once the projector is taken off, the paper sheet holder is divided into 3 items like AN umbrella and you'll be able to see the desktop on the paper sheet. you'll be able to additionally watch movies, build presentation or the other factor on the paper sheet that's control by the paper holder of the E-Ball laptop.



**FIGURE 3: SCENARIO IN CASE OF NO WALL PRESENT**

## IV. ADVANTAGES OF E-BALL

- 4.1 It has large memory i.e.5 GB.
- 4.2 It is useful for making video presentation.
- 4.3 It supports user defined keyboard layouts.
- 4.4 It is efficient.
- 4.5 It is very easy to use and understand.
- 4.6 It is more secure than other computers due to its shape.

## V. DISADVANTAGES

- 5.1 Normal operating systems cannot work with these computers.
- 5.2 Cost of E-BALL is very high.



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**5.3** It is difficult to understand and track if any problems occur in hardware part.

## VI. CONCLUSIONS

As the technology develop, the scale of pc become smaller and smaller, though the scale becomes smaller and smaller, the options of computers square measure will increase. the pc becomes a lot of economical and convenient to the users. E-Ball is taken into account to be the eighth surprise that has the potential to reform the globe with its wonderful options. As evolution is finished in technology, it's simple to use anyone.

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## Scrum Methodology

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**Abstract**— The Agile ways, like commencement and Extreme Programming (XP), are a subject of abundant language within the computer code community over the previous few years. Whereas these have gain significance within the trade as a result of their approach on the problems of human liveliness and come back on investment, sometimes inside a state of affairs of small-to medium size comes with necessary needs instability, those UN agency don't hold these ways have articulated serious considerations regarding the helpfulness of the ways. Commencement makes an attempt to create the add short iterations wherever every iteration consists of short time boxes. This paper offers Associate in nursing insight of the commencement Methodology to any beginner.

**Keywords**— Agile method, Scrum, Scrum master, Scrum rolls, Scrum artifacts.

### I. INTRODUCTION

Scrum is an incremental and iterative agile software development framework for be in command of product development. It was first define as "a supple holistic product development plan where a development team works as a entity to reach a universal goal" in 1986 by Hirotaka Takeuchi and Ikujiro Nonaka in the New Product Development Game. This approach challenges assumptions of the "usual, chronological approach" to product improvement, and encourages teams to self-organize by cheering close online association of all team members, as well as face-to-face communication among all group members and disciplines in the project.

A key principle of scrum is —requirements instability i.e. it recognizes the fact that during fabrication processes, the customers can change their minds about what they desire and require. These surprising challenges cannot be easily addressed in a established foretelling or designed manner and thus it's an advantage of scrum/ agile methodology. Scrum adopt an practical approach—accommodating that the trouble cannot be fully defined, instead focuses on responding to talented requirements and to adapt to budding technologies and changes in market circumstances.

Scrum employs immediate decision-making processes based on actual events and information. This requires expert teams skilled of self-management, communication and decision-making. Scrum is an agile methodology that can be applied to almost any project; however, it is most frequently used in software development. The Scrum process is well-matched for projects with promptly changing or highly growing requirements.

### II. WHAT'S SO SPECIAL ABOUT SCRUM?

Scrum may be a tool, a framework which will be accustomed build troublesome merchandise. it's a versatile development approach. It doesn't advocate any of the common engineering, people, risk management, or alternative apply. Since commencement doesn't expressly describe any engineering practices, it's potential and now and then fascinating too to think about non-Scrum practices which will be tightly coupled to commencement success. as an example, test-driven Development has been established productive for agile comes however isn't a precise commencement apply. Commencement is usually enforced in conjunction with ways like Extreme Programming that influences the success of commencement.

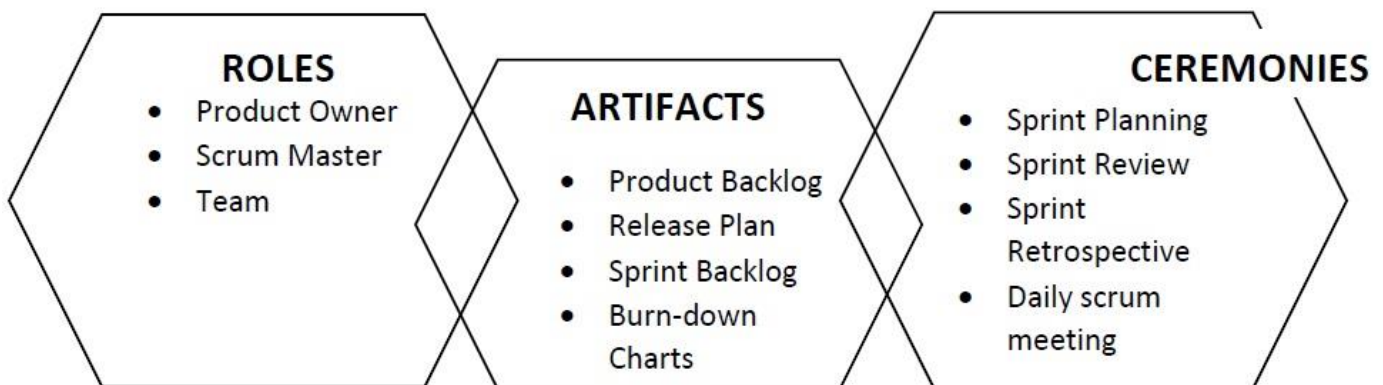
What commencement will give is feedback so somebody victimization commencement will improve the results. As an example, if somebody desires productivity and quality and might have a co-located team, commencement can facilitate deciding the most effective potential approach. If the person starts with a spread team and compares its productivity to a different co-located team, conclusions are often reached. The person will then showing intelligence take alternative supported the conclusion received and might create changes consequently. Thus, Scum specialty lies in constant method improvement.

Using commencement properly suggests that following all of its rules, that expose everything (transparently) for check up and revision. Associate degree intellectual person would then examine what commencement is production clear and create changes to optimize the results I assume, the changes area unit price even. Commencements are often used justifiably and ignoring what's created clear. Commencement is often used defectively and taking under consideration a number of the items that has been created clear. World Health Organization uses commencement dead and acts additional smartly on what has been created clear can outcome anyone else.

### III. SCRUM PRACTICES AND ROLES

The start Alliance has printed a start Guide giving the official definition of the tactic. Dame Joan Sutherland and Vodde created Tests to assess the standing of groups claiming to use start. Silver, another start Alliance member, has additionally recognized crucial individuality and practices for start. These descriptions of start and its practices are careful and processed in numerous reports and preparation, in addition as connected books. The subsequent transient description of start practices and roles highlights the precise aspects of start which will be investigated to verify that a start implementation could be a valid one.

In several cases start is adopted as a full with very little modification, however in some cases it's adopted in an exceedingly in an exceedingly. This craft could, or could not, represent an affordable adaptation of the initial methodology. Inappropriate start variations are referred to as Scrum but Start could be a bundle of information that's best adopted as a whole; piecemeal adoption or inappropriate tailored adoption of start practices is unlikely to realize the expected behaviors and edges of the tactic. With scrum, the merchandise is made in an exceedingly series of fixed-length iterations referred to as sprints.



Sprints area unit mounted length cycles throughout that the merchandise is constructed and is delivered for feedback. A Sprint is one iteration of a month or less that's of consistent length throughout a development effort. Solely the merchandise Owner has the authority to cancel the Sprint. Milestones i.e., the ends of a sprint—come out and at regular intervals, delivery with them a sense of tangible progress with every cycle that energizes everybody Associate in Nursinging unceasingly inspire the team and conjointly helps establish the shortcomings or misunderstood necessities at an early stage. Short iterations conjointly reinforce the importance of excellent estimation - a revenant struggle in falls comes.

#### 3.1 Scrum Roles

In contrast to classical project management methods, Scrum doesn't have and doesn't need a product manager, a task manager or a team leader.

A scrum team has a slightly different composition than a traditional waterfall project, with three specific roles:

- ☐ Product Owner,
- ☐ Scrum Master, and
- ☐ Development Team.

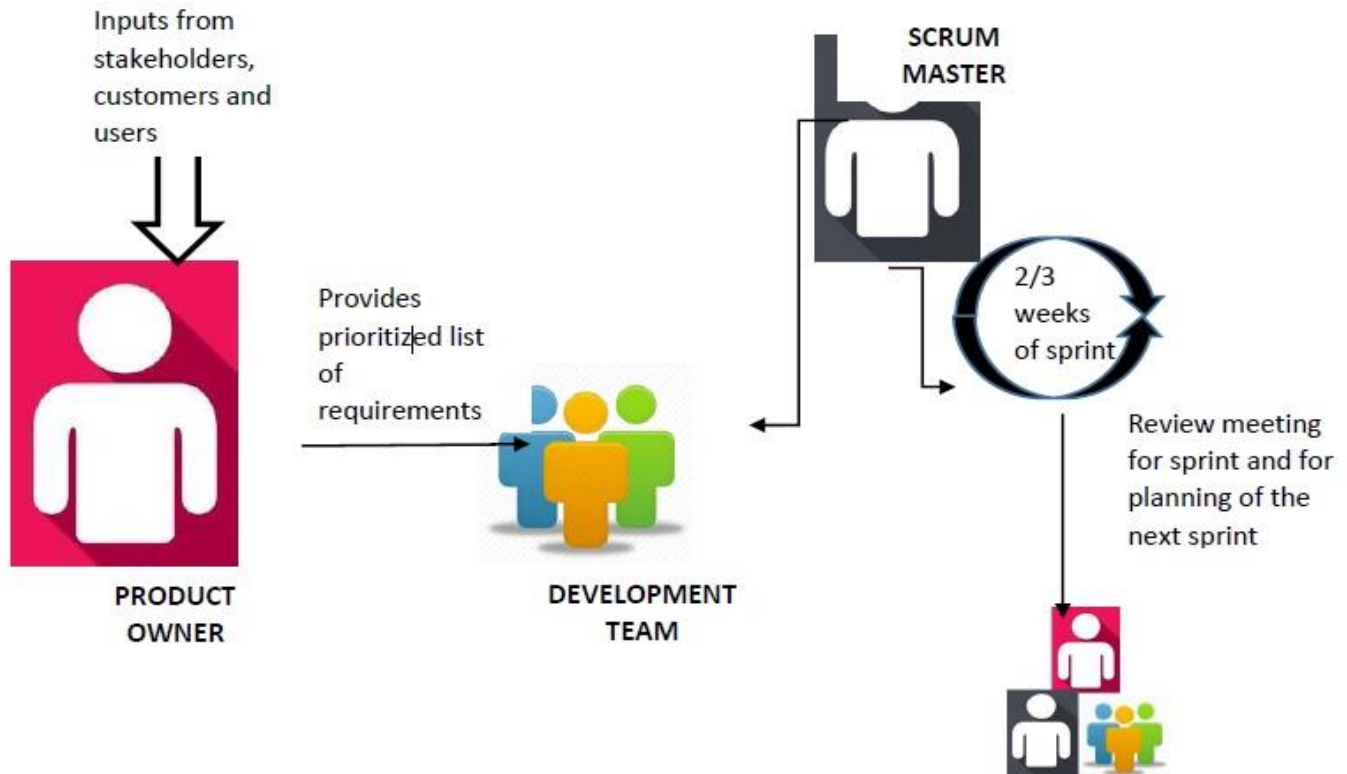


Figure 2. Scrum Roles and their relationship.

These three roles are coequal and all of them have certain responsibilities. The Product Owner is responsible for the vision of the product, the gathering and the prioritization of the requirements, control over the budget and the ROI. The Scrum Master takes care of the problems, takes responsibility that the rules of Scrum are appropriately followed and he coaches the team too. The team of Scrum is a self-organized group of people, responsible for the creation and the quality of the product. And because scrum teams are cross-functional, "the development team" includes testers, designers, and ops engineers in addition to developers. Besides these three roles there exist some more Stakeholders, who e.g. serve as an observer or a counselor.

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### 3.2 Scrum Master

Scrum masters square measure the champion for start inside their team. The start Master is that the specific individual chargeable for making certain that starts values, practices and rules square measure enacted and implemented. They coach the team, the merchandise owner, and therefore the business on the start method and appearance for tactics to fine-tune their follow of it. The Scum Master is typically characterized because the project manager WHO leads by employment, teaching and supporting the Team instead of directive and dominant.

A start Master isn't a project manager. Project managers do not extremely have an area within the start methodology. The project manager role inside start ceases to exist as its responsibilities square measure stirred to the opposite start roles. A start team controls its own destiny and self-organizes their work. Some start comes could have each a start Master and a project manager and in some cases wherever the project is just too giant employing a start of starts approach may need a program manager operating with multiple Scrum Masters.

- An efficient start master deeply understands the work being done by the team and may facilitate the team optimize their delivery flow.
- Because the facilitator-in-chief, they schedule the required resources (both human and logistical) for sprint designing, stand-up, sprint review, and numerous different start practices.
- Start masters conjointly explore the impediments and distractions for the event team and resolve them.
- They insulating the event team from external disruptions whenever potential.
- Start master's job includes another vital task of observant that the team obeys the principles and realizes the strategy of start entirely.

For example: Some groups new start attempt to modification the scope of the sprint when it's already begun. Product homeowners can typically raise, "Can't we tend to get this an additional super-important very little issue into this sprint?" however keeping scope air tight reinforces smart estimation and products planning—keeping in mind that this doesn't becomes a supply of disruption to the event team. the foremost obvious distinction between a team leader and a start Master is depicted by the name itself though'.

- Whereas one is leading the team and sets the tasks, the opposite one is accountable of observant that the team obeys the principles and realizes the strategy of start entirely.
- The start Master doesn't interfere into the selections of the team relating to specifically the event, however rather is there for the team as associate degree authority. He solely interferes actively once anyone inside the team or the other participant of a project (Stakeholder) doesn't confirm the principles of start.

Where as a team leader typically provides needs and takes responsibility for the completion of these. Associate degree veteran start Master provides solely impulses and advises to the team to steer the proper approach, to use the correct technique or to decide on the correct technology and sees that each one these resources square measure created on the market to the team whenever they're needed. In specific, the start Master acts additional sort of a Team Coach than a team leader.

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#### IV. CONCLUSION

Software development victimization agile methodologies are turning into a much bigger reality within the way of life of code development firms. Nimbleness brings quality to the code development and management method. so as to feature price to the ultimate code, one should have a well structures team that follows the methodology and uses correct ways. The hybridization of commencement with alternative code development methodologies is common as commencement doesn't cowl the total development lifecycle; so, organizations realize the necessity to feature in further processes to form a lot of comprehensive implementation. Varied authors and communities of individuals United Nations agency use commencement have conjointly advised a lot of elaborated techniques for a way to use or adapt commencement to specific issues or organizations. Also, comes wherever the developers are geographically separated is less appropriate for the commencement approach. As a result of commencement sprints are short, less time is obtainable for unvaried testing, creating it tough to take care of internal control for such comes once employing a commencement approach.

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## Drone Security Surveillance

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**Abstract**— This paper gives a brief idea of Drone Surveillance technology. We all know that security is very important aspects for any civilence or any country. Many people are attacked by animals, who lived with in forest. Over the last five centuries, an estimated 1 million people have been eaten by tigers. In Southeast Asia, attacks decreases after peaking in the nineteenth century, but attacks in south Asia have remained increase, particularly in the Sundarbans. Drone security surveillance helps to surveillance such type of region where it having heat detector sensor and thermal camera view who can detect animals and gives security alerts . It can also use in army at border surveillance there are some region in under Indian army where 24hrs security surveillance is very difficult task. Where we can use this drone surveillance technology, which suspect intruder and give security alerts to army force.

**Keywords** — Animal attacks, Drone, Heat Detector Sensor, Security Surveillance, Thermal Camera.

### I. INTRODUCTION

This research paper based on solution for two major problems in our country. In India yearly many peoples are suffered from animal's attacks who lived with in forest or green zone for example Mumbai aarey colony, Sundarbans National Park. Also Indian defense force facing same type of problems where army needs to 24/7 surveillance on border area but at some place due to natural cause 24/7 surveillance is difficult task. The intruder takes advantage such situations and tries to penetrate border surveillance. Drone security surveillance is the solution for those major problems. In today's world, every one of us needs security every one want to be remain safe from any danger. Thus we use technology in every sector whether household or industrial purpose to get our work done easily. Traditional way to be connected all the time and access information easily is through newspapers television, internet but this is the advanced way to get quick information about any animal attack or any suspicious activity nearby border with drone.

### II. SYSTEM IMPLEMENTATION

This paper describe the working of drone which would allow us to detect presence of animal nearby human living in green zone also to detect presence of any intruder near border, so list down the hardware and software required for implementing this concept of surveillance drone.

This technology is the use to captures of video record to collect information about specific targets or intruders and gives alerts signal to appropriate receiver.



**FIGURE 1: A UAV fitted with a camera for Security surveillance.**

## 2.1. Movement System

### 2.1.1 Frame

The frame is important because it is where to put the Other Components of drone. The most of mini and micro frames are cut from carbon fibre sheet. The frame can be made up of material such as Aluminium, PCBs Fibre, Carbon fibre etc. Drones are divided into different types such as Bicopters – 2 engines, Tricopters – 3 engines, Quadcopters – 4 engines etc.



**FIGURE 1: Frame**

### 2.1.2 Heat Detector Sensor

This device which can able to capture heat which is emits by any material or any animal or intruder.



**FIGURE 2 : Heat Detector Sensor**

### 2.1.3. Motor OR Rotor:

Motor are used to produced torque which can lift drone body. Brushless motors are better than brushed DC motor whereas brushed motor 85% efficient then brushed DC motor.



**FIGURE 3: Motor OR Rotor**

### 2.1.4. ESC (Electronic Speed Controls)

It is a important component because it controls rotation of blades which is provided by motor. For drone we need four pieces of ESC that are connected to each motor.



**FIGURE 4: ESC (Electronic Speed Controls)**

#### **2.1.5. Flight Controller**

This is the central component of a Quadcopter. helps to determine the orientation of drone and accelerometer sensor that reads the speed and slope of the quadcopter.



**FIGURE 5: Flight Controller**

#### **2.1.6 Propeller**

It used in two pair's one rotates clockwise and another rotates opposite direction. The engine makes the propeller spin round and causes the drone to move.



**Figure 6: Propeller**

#### **2.1.7 Wireless Charger Pad**

This is a wireless charging pad which use to charge drone wirelessly which help drone to continue surveillance without any pause.



**Figure 7: Wireless Charger Pad**

### 2.1.8 Battery

It is rechargeable battery which can charge itself by wireless charger.



**Figure 8: Battery**

### 2.1.9 Thermal camera

This is a thermal camera, which can detect (human/animal) heat in surveillance area.



**Figure 9: Thermal camera**

## 2.2 Software

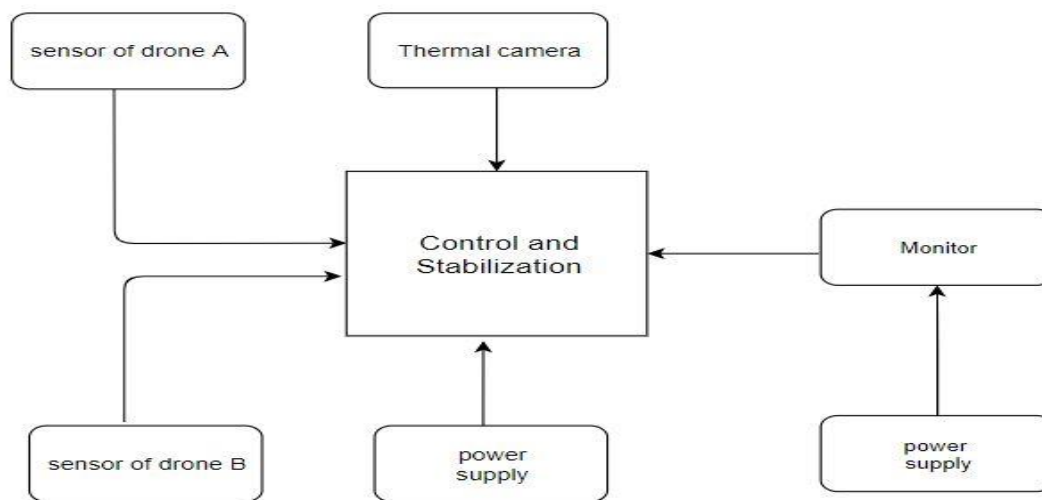
It is a software, which can receive red alerts, which are coming from surveillance drone. Software is based on android or any environment friendly programming language. This development also continuously makes UAVs possibly more autonomous as algorithms required.

## III. Working

- We have to set a particular region to the drone where they are surveillance.
- We are using drone A and drone B both drone are interconnected with each other that's means when drone A complete his task and back to the base station when drone B are ready to take takeoff and take position of drone A and start to surveillance now drone A start to charge his battery by wireless charging which is attached to its base station. When drone B are back to the base station then drone A start to take takeoff and take position of drone B and drone B starts to recharge his battery, this all activity will process 24/7 without any disturbance.
- When any drone found some suspicious activity in his thermal camera that drone will send alert message to the software to make awareness.

### 3.1 Algorithm for drone flight surveillance

- Step 1: start
- Step 2: Drone A take takeoff start to surveillance to pre-decided region.
- Step 3: After completing one round Drone A get back to the base.
- Step 4: Drone B take takeoff start to surveillance to pre-decided region.
- Step 5: Drone A start to recharge its battery.
- Step 6: Drone B get back to its base, start to recharge its battery.
- Step 7: Drone A take takeoff.



**Figure 9: Block diagram of drone surveillance**

## IV. Advantages of drone surveillance

- 4.1 It is very much help full to capturing animal attacks on people.
- 4.2 It is also helps to spread awareness between peoples who lives in green zone area for if any animal entered in civilian area.
- 4.3 It can play major role in border security surveillance where, there are some place where 24/7 surveillance is difficult task.

## IV. Environmental Challenges

Environmental challenges involve rain, wind, humidity, temperature etc. In experiments we have observed that the power intake may depend significantly more on environmental conditions such as side winds than on either the payload or the altitude.

Generally speaking, the environment the device is intended to operate in will influence the choice for device and hardware. The more specialized an application is, the more specialized the operational requirements regarding the environment may get, and it is important to clearly define the specifications of environmental conditions beforehand. In jungle sometimes because of natural cause, jungle catches fire so in such condition drone cannot suspect intruder properly. Because there are many things, which emits heat, so thermal camera cannot distinguish.

## V. CONCLUSION

This drone technology will help humans to surveillance at un-reachable place. It mostly useful in jungle and for army for surveillance. Due to an increase in the availability and diversity of reasonable hardware, and the performance of virtually all applicable sub-systems, and due to the immense decrease in cost and difficulty to operate, UAVs are rapidly becoming a common part of a variety of applications. We make the distinction between sensing hardware and actuators, both of which can be mounted onto UAVs to become specialized devices.

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## Cloud Technology in Healthcare

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**Abstract**— Recently, IT resources area unit more and more being place. Use altogether spaces of the state of being health area. Cloud technology offers a promising approach to slake the IT desires in an auspicious means. This paper addresses the gap and is aimed to identify the state of study and ensure the potential areas of future analysis within the domain .The term "Cloud Technology" might be a recent cant within the IT world and has been a significant topic of speech as of belated and is rising together of the foremost preponderant technologies of this era of your time. Astronomically large technology corporations area unit already investment ample bucks in building infrastructure, accommodations and applications to make cloud computing facilely accessible to customers, organizations and businesses. We have a bent to conduct a structured literature search predicated on a longtime framework. In India, the healthcare sector has started to use new evolving technologies such as mobile computing, cloud computing. A large bulk of knowledge is collected and processed in patient digital information records called electronic health records, Journal provides an study of some potential cloud-based healthcare systems on the edge of each technology.<sup>[1][2][4]</sup>

**Keywords**— AZURE, Cloud Computing, Domain, Healthcare, Infrastructure.

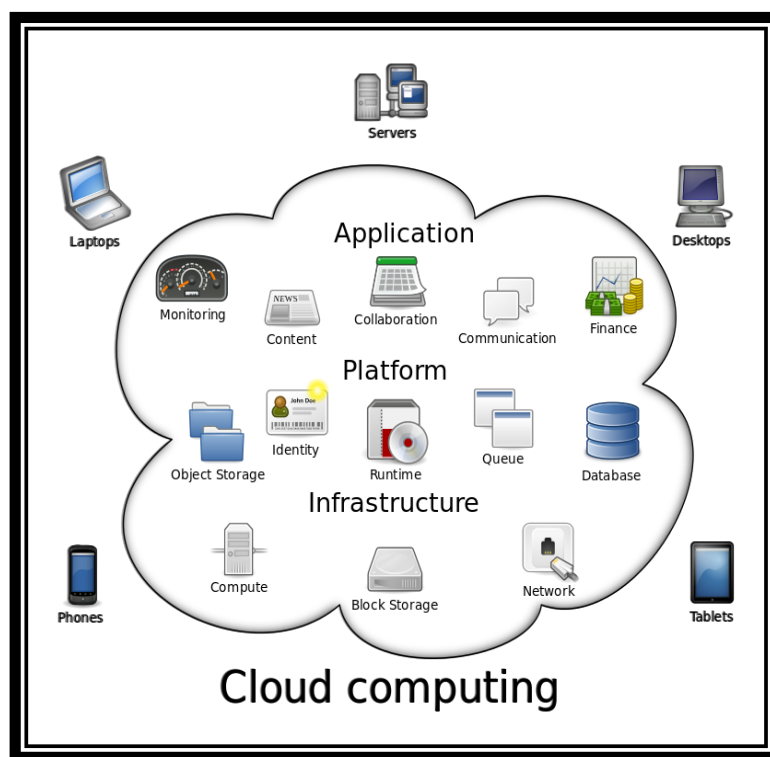
### I. INTRODUCTION

Cloud computing is that the on-demand delivery of IT resources over the web with pay-as-you-go pricing. The term cloud refers to servers, storage and software development platforms over the internet. Cloud computing is a method used for retrieving resources, data or information stored over the internet through web-based tools and applications. Cloud computing allow us to store the data in the cloud rather than keeping in the hard drive or local storage device. The information or data being accessed is found in "the cloud" and does not limit a user to be in a specific place to access it. The expert also states that cloud computing does not prevent companies from encouraging their applications to run faster, with better management and less maintenance, which makes IT teams to sooner adjust resources to satisfy fluctuating and unpredictable demand, providing the burst computing capability: high computing power at certain periods of peak demand. Cloud has become a crucial tool within the healthcare field for better collaboration. The cloud allow to store and remote access of healthcare information to professionals. Now better care are often delivered by healthcare experts around us with none delay. Further, a foreign conferencing facility updates a patient's condition within minutes and saves overall travelling time for doctors. Healthcare sector has been moved to digital platform today where it collects many data. IT Companies do provide cloud computing services that mainly focused on healthcare data to transform it into meaningful information. Further, it allow to data sharing easy and accessible for the users.

Healthcare technology is labelled by the Health Organization as ' the application of organized knowledge and skills to the resources, medicines, vaccines, procedures and systems developed to unravel an ill health ill health and improve quality of lives". Such innovations include structured physical objects inside us as well as conventional and built social means and methods for treating or caring for patients. During the last five decades, technology development has been remarkable within the healthcare industry. With cloud solutions, it is possible to share large data files with the suitability that saves overall healthcare costs.It also boosts efficiency too. Healthcare industries need to be alert to adapt the changes in higher rates and reasonable costs that might be made possible with cloud technology only. When you have to reach or manage many purchasers then you had sort of a more powerful system to urge the work done, and patient data need to be shared securely with healthcare providers. New EMR systems provide better control over healthcare data and the introduction of such systems within the industry is becoming the first priority for

hospitals. The healthcare regulations are pushing the industry towards better storage, collaboration and data sharing within the cloud. With EMR systems, there are chances of sensitive information loss. The only solution is to use cloud services with EMR systems to affect the matter. This process will not only secure data but also makes data transfer faster between parties. The more important responsibility of healthcare providers is to define the security responsibilities between cloud vendors and tenants.

Technological advancements within the healthcare sector have accompany various key benefits in several operational aspects. One of the advances that have impacted the healthcare sector heavily is that the utilization of cloud computing technologies. The impacts of cloud computing within the healthcare sector are huge and permit further exploration of the prospects of technology use in healthcare. for instance, benefits like improved data security, advanced capability of remote diagnosis and increased value awareness are all regarding cloud use within the world. The paper concludes by giving a recap on the concept of clouds within the healthcare sector with recommendations on how the planet can proceed in its consideration of the cloud concept.<sup>[4][5][6][7]</sup>



**FIGURE 1: Cloud Computing**

## II. EVOLUTION

### 2.1 EHR USE IN 1992

Early use of EHRs also included data interchange for claims processing and image scanning as a way for document capture. Each of those efforts saved time by eliminating filing and retrieval of charts, photocopying, and chart location control. More clinical use began when the physician workstation became the term used for private computers integrated with EHRs that allowed access to physician notes, orders, consults, laboratory results, radiological studies, direct patient measurements, nursing duties and notes, and patient care procedures. Workstations interfaced with tools like drug references, clinical manuals, textbooks of drugs, literature search engines, CDS, and transmission. Data also might be represented during a sort of graphical formats which especially facilitated the management of critically ill patients. While not widespread, new applications and functionalities were being

developed and used. for instance, physicians began to use electronic documentation but many didn't believe that computerization saved time, although they appreciated its value for administrative functions and for producing printouts. Networks of microcomputer workstations were wont to write all inpatient orders linked to an EHR. While this significantly lowered patient charges and hospital costs, the systems required more physician time than did the paper charts. Automated management of patient records became available through the event of patient data management systems which might be connected to bedside monitoring devices to record and interpret patient data within the EHR. However, laws still required hospitals and practitioners to be in charge of the accuracy and completeness of medical records and thus all documents had to be reviewed and signed. While regulatory and accrediting agencies restricted the auto-authentication of medical records, electronic signatures could and were getting used within EHRs.

## **2.2 EHR USE AND EVOLUTION BY 2015**

Large health care organizations and government agencies are recognizing the worth of data in EHRs to work out optimal patterns of care. However, growing issues facing healthcare coverage, privacy, and particularly the safety of EHRs remain crucial obstacles for his or her acceptance. Patients, providers, and healthcare facilities still demand assurance that these records are securely protected. Thus, as EHR use has increased over time, technical issues continued to be overshadowed by procedural, professional, social, political, and particularly ethical issues and therefore the need for compliance with standards and knowledge security.

## **2.3 WHERE ARE EHRs EXPECTED TO BE within the NEXT 25 YEARS?**

Current EHRs don't meet the requirements of today's distributed systems and of the rapidly changing healthcare environment. The power of applications to speak, interpret, and act intelligently upon complex healthcare information has assumed paramount importance. Much of EHR adoption continues in an environment shaped by paper chart thinking, which continues to limit success. More research is required to work out the way to integrate the EHR into patient encounters more effectively and supply clinicians with a greater control of the EHR leading to greater flexibility to suit to their needs and preferences. Physicians are positive about the long term advantage of EHRs, but are unsatisfied with the non-intuitive interfaces existing EHRs.<sup>[6][7][8]</sup>

# **III. BENEFITS**

## **3.1 EXCELLENT REACH IN TOUGH TIMES**

In case of disaster, when this is often impossible to travel to any particular place then cloud technology represents doctors with necessary information they need at that specific time. Today on-duty doctors with little surgery experience can get real-time guidance by information transmission systems to make sure an outstanding work is completed by the team.

## **3.2 BETTER AND SAFE STORAGE**

Cloud makes sure it possible to hold a maximum of data at minimum cost. During this manner, cloud doesn't just make data storage safe but adorable for healthcare providers.

## **3.3 INFORMATION TRANSFORMATION FOR INFORMED DECISIONS**

In the medical industry, the more information that's available, the more informed decisions are often made. due to cloud computing, data can quickly and easily be shared and analyzed by healthcare experts across various fields so on form the foremost informed decisions regarding a patient's healthcare.<sup>[8][9]</sup>

# **IV. CHALLENGES**

## **4.1 PRIVACY AND SECURITY CHALLENGES**

Data sent to cloud sometimes contain confidential personal information on person's healthcare that needs proper safeguarding. This is often to stop disclosure or misuse of such data. Although rare, sometimes data stored within the cloud could also be hacked and used inappropriately hence becoming a challenge.

However, we tend to fear what we don't know one or two things about. Data stored within the cloud are safer than the normal systems. When data are stored within the cloud the shortage of physical access from employees or visitor makes it harder for data leaks and misuse. Cloud infrastructures are monitored around the punch in order to kick off potential threats. Cloud Service Providers (CSP) perform a yearly audit to guard against setbacks in their security systems, unlike traditional systems which don't have such feature.

#### **4.2 INCOMPATIBILITY**

Numerous hospitals think that it's hard to ensure that cloud services are compatible with existing parts of the IT infrastructure. It's necessary to check that everything works before the service is deployed – otherwise, the usage of this service can have a particularly negative impact on operations. If things don't go smoothly during the test, the organization should recognize what to overhaul and determine if it's worthwhile, despite all the difficulty.

Nevertheless, you'll build applications using any language, tool, or framework within the cloud and also integrate Public Cloud Applications together with your existing IT Environment. Supplying you with little or zero problems with incompatibility.

#### **4.3 IT SKILL**

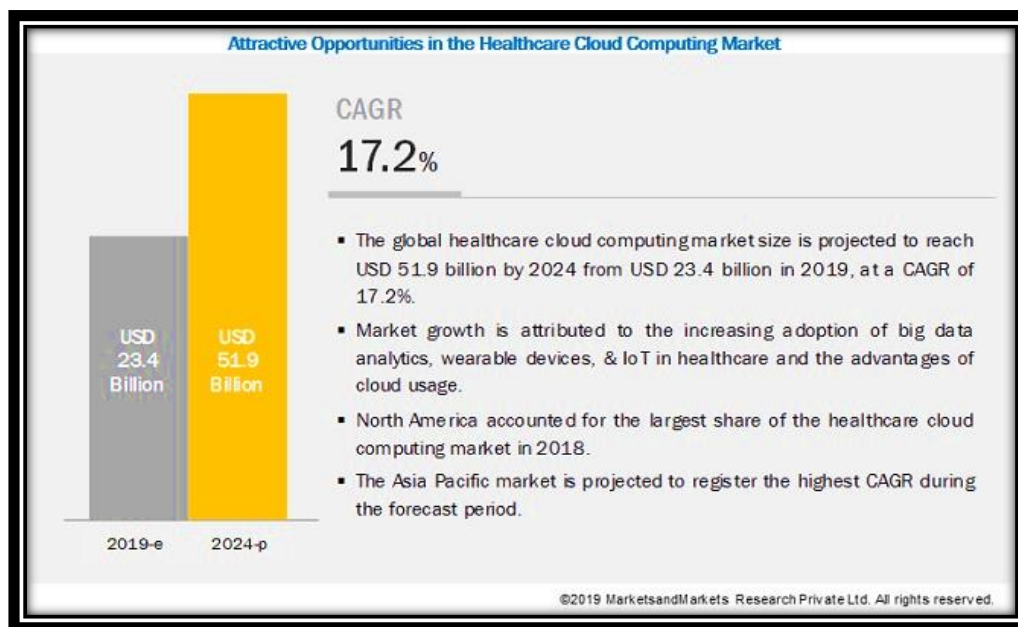
As more organizations embrace cloud services, the positives in IT with cloud computing skills are highly wanted and may be troublesome for healthcare providers to supply. One of the solutions recommended by some experts is to supply training to staff already on the staff list. Many organizations will find that this is often less expensive than trying to find external help.<sup>[10][11][12]</sup>

### **V. EXAMPLES OF HOW CLOUD SOLUTIONS CAN TRANSFORM HEALTHCARE**

Cloud computing is quickly becoming a necessity in the medical field. It just able to help transform healthcare to share patient information to medical providers on urgent cases in real-time. Before total transformation occurs, however, there has to be strategy. A realistic cloud strategy for a healthcare facility, for example, could be using a public cloud platform to allow public access to common health information or to receive medical resources. Hospitals and health clinics could even use a public cloud for remote storage of their own medical data (not the patient's data). Essentially, a public cloud may deliver mobility and cost-saving capabilities to the healthcare industry. Alternatively, a private cloud could be set up to allow healthcare providers to safely move electronic documents and exchange patient health information. Such information might include: Clinical applications (EHRs, physician enquiries, pharmacy orders, etc.) Non-clinical tools for handling health care to manage the sales process Patient care, such as paying for patients and claims. Either operated internally in the data center or hosted externally through a service provider, it is important to know that such an architecture could provide improved privacy and security over the application of a public cloud approach. A stable, private cloud environment that uses policy-based control of computer resources is an effective solution to avoid serious vulnerabilities for cloud consumers.<sup>[13][14]</sup>

### **VI. REPORTS**

The global healthcare cloud computing market is projected to reach USD 51.9 billion by 2024, from an estimated USD 23.4 billion in 2019 at a CAGR of 17.2% during the forecast period. This market's growth is driven primarily by the growing adoption of big data analytics, wearable devices, & IoT, and cloud use benefits. However, concerns over data security and privacy are expected to curb that market's growth.<sup>[15][16]</sup>



**FIGURE 1: Future trend in cloud market**

## VII. CONCLUSION

Transformation of the healthcare industry is accelerating. Healthcare organizations switch to cloud computing to support new models of care delivery and the business skills required to address the diverse technical, regulatory, legislative and cultural changes taking place in the industry. The versatility, scalability and connectivity offered by cloud environments make them perfect platforms for exchanging information, including emerging information needs for greater collaboration and tailored healthcare patient care. Despite of so many benefits and importance of cloud computing, there are also networking issues and challenges faced by the organization. Rightly said every coin has two sides, viz, negative and positive prospect. Hence, Challenges of cloud computing are also addressed. In spite of so many limitations and the need for better methodologies processes, cloud computing is becoming a very attractive paradigm, especially for large organizations.

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## BIG DATA

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**Abstract--**Big data is a new driver of the world economic and societal changes. The world's data collection is reaching a tipping point for major technological change that can bring new way in decision making, managing our health, city, finance and education. While the data complexity are increasing including data volume, variety, velocity and veracity, the real impact hinges on our ability to uncover the 'value' in the data through Big Data Analytics technology. Big Data Analytics poses grand challenge on the design of highly scalable algorithm and system to integrate the data and uncover large hidden values from dataset that are diverse, complex, and of a massive scale. Potential breakthroughs include new algorithm, methodology, system and application in Big Data Analytics that discover useful and hidden knowledge from the Big Data efficiently and effectively. Big Data Analytics is relevant to Hong Kong as it move toward a digital economy and society. Hong Kong is already among the best in the world in Big Data Analytics, taking up such leadership position as chair and editor in chief of important conferences and journals in Big Data related area. But to maintain such leadership position, Hong Kong university, government and industry must act quickly in addressing a number of major challenge. These challenges include "foundations," which concerns new algorithms, theory and methodologies in knowledge discovery from large amounts of data and "system and application," which concern innovative application and system useful for supporting Big Data practice. Big data analytics must also be team effort cutting across academic institution, government and society and industry, and by researchers from multiple discipline including computer science and engineering, health, data science and social and policy areas.[14]

**Keywords—**Analytics, Big data, Decision Making, Foundations, Integrate

### I. INTRODUCTION

In computerized world, information are produced from different sources and the quick progress from advanced innovations has prompted development of large information. It furnishes transformative leaps forward in numerous fields with assortment of huge datasets. All in all, it alludes to the assortment of enormous and complex datasets which are hard to process utilizing conventional database the board instruments or information preparing applications. These are accessible in organized, semi-organized, and unstructured arrangement in petabytes and past. Officially, it is characterized from 3Vs to 4Vs. 3Vs alludes to volume, speed, and assortment. Volume alludes to the immense measure of information that are being created regular though speed is the pace of development and how quick the information are assembled for being examination. Assortment gives data about the kinds of information, for example, organized, unstructured, semistructured and so forth. The fourth V alludes to veracity that incorporates accessibility and responsibility. The prime goal of enormous information investigation is to process information of high volume, speed, assortment, and veracity utilizing different customary and computational canny systems.[18]

### II. LITERATURE REVIEW

Literature review bring us to a point that it is vast topic. It deals with the data from around the world. It is one of the most complicated system. It deals with unique data, methodology and operations. It comprises of sorting data according to the system need and benefits. Big Data is a source between a client and access to the collection of data that he is in need of. Data can be visualize accordingly. It has become a platform for the users to access the data on the go whenever need, saves the time too.[17]

### III. CHALLENGE IN BIG DATA ANALYTICS

Late years enormous information has been amassed in a few areas like medicinal services, open organization, retail, natural chemistry, and other interdisciplinary logical researches. Electronic applications experience huge information every now and again, for example, social registering, web content and reports, and web search ordering. Social registering incorporate interpersonal organization investigation, online networks, recommender frameworks, notoriety frameworks, and expectation markets where as

web search ordering incorporate ISI, IEEE Xplorer, Scopus, and so forth[1]. Considering this focal points of enormous information it gives another open door in the information preparing task for the up and coming specialists. For instance, numerous factual techniques that perform well for little information size don't scale to voluminous information. Thus, numerous computational procedures that perform well for little information face critical difficulties in examining huge information. Different difficulties that the wellbeing segment face was being looked into by a lot of scientists.[2]

#### **IV. OPEN RESEARCH ISSUE IN BIG DATA ANALYTICS**

Huge information investigation and information science are turning into the examination point of convergence in industry and scholarly. Information science targets looking into huge information and information extraction from information Application of large information and information science incorporate data science, vulnerability demonstrating, unsure information examination, AI, measurable learning, design acknowledgment, information warehousing, and sign handling. Principle focal point of this area is to talk about open research issues in large information investigation[12]. The exploration issues relating to enormous information investigation are ordered into three general classes in particular web of thing (IoT), distributed computing, bio propelled processing, and quantum registering. Anyway it isn't constrained to these issues. More research issues identified with human services enormous information can be found in Husing Kuo et al. Paper.[15]

#### **V. TOOLS FOR BIG DATA PROCESSING**

Huge quantities of instruments are accessible to process large information. In this area, we examine some present systems for investigating large information with accentuation on three significant developing apparatuses in particular MapReduce, Apache Spark, and Storm[9]. A large portion of the accessible devices focus on clump preparing, stream processing, and intuitive examination. Most cluster preparing apparatuses depend on the Apache Hadoop foundation, for example, Mahout and Dryad. Stream information applications are for the most part utilized for ongoing analytic. Example of huge scale spilling stage are Storm and Splunk. The intuitive investigation process enable clients to legitimately collaborate continuously for their very own examination.[13]

#### **VI. SUGGESTIONS FOR FUTURE WORK**

The measure of information gathered from different application everywhere throughout the world over a wide assortment of field today is required to twofold like clockwork. It has no utility except if these are broke down to get helpful data. This requires the advancement of systems which can be utilized to encourage large information investigation. The advancement of incredible PCs is a shelter to actualize these methods prompting robotized frameworks. The change of information into information is in no way, shape or form a simple errand for superior huge scale information preparing, including abusing parallelism of present and up and coming PC models for information mining. In addition, these information may include vulnerability in a wide range of structures. These qualities should be created or the tuples having these missing qualities are wiped out from the informational index before investigation. All the more significantly, these new difficulties may involve, some of the time even crumble, the exhibition, effectiveness and versatility of the devoted information serious figuring frameworks. The later methodology here and there prompts loss of data and consequently not liked.[20]

#### **VII. CONCLUSION**

As of late information are produced at a sensational pace. Investigating these information is trying for a general man. To this end in this paper, we overview the different research issues, difficulties, and devices used to break down these huge information. From this review, it is comprehended that each large information stage has its individual core interest. Some of them are intended for cluster preparing while some are acceptable at ongoing systematic. Each huge information stage additionally has explicit usefulness. Various procedures utilized for the examination incorporate factual investigation, AI, information mining, astute examination, distributed computing, quantum registering, and information stream handling. We believe that in future scientists will give more consideration to these strategies to take care of issues of large information viably and proficiently.[15]

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## Cloud computing

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**Abstract**— Cloud computing is that the latest of computing paradigms. It guarantees to alter the manner folks use computing resources. mistreatment web because the backbone, cloud computing asserts that it's attainable to produce computing as a "utility" to finish users "as and once needed" basis. Cloud computing includes a potential to serve users of all kinds: individual users, establishments, business at giant. Cloud computing could be a term accustomed describe each a platform and kind of application. A cloud computing platform dynamically provisions, configures, reconfigures, and deprovisions servers as required. Servers within the cloud is physical machines or virtual machines. Advanced clouds generally embody alternative computing resources like cargo area networks (SANs), network instrumentation, firewall and alternative security devices. I actually have done the analysis on cloud computing and find the on top of details concerning cloud computing.

**Keywords**— Computing paradigms, network instrumentation, platform and kind of application, Virtual machines

### I. INTRODUCTION

Cloud computing may be a complete new technology. it's the event of parallel computing, distributed computing grid computing, and is that the combination and evolution of Virtualization, Utility computing, Software-as-a-Service (SaaS), Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS). Cloud may be a figure of speech to explain net as an area wherever computing has been pre-installed and exist as a service; knowledge, in operation systems, applications, storage and process power exist on the net able to be shared. To users, cloud computing may be a Pay-per-Use-On-Demand mode that may handily access shared IT resources through the net. wherever the IT resources embrace network, server, storage, application, service so on and that they is deployed with abundant fast and straightforward manner and least management and additionally interactions with service suppliers. Cloud computing will abundant improve the provision of IT resources and owns several blessings over alternative computing techniques. Users will use the IT infrastructure with Pay-per-Use-On-Demand mode; this could profit and save the price to shop for the physical resources which will be vacant

### II. CLOUD COMPUTING: OVERVIEW

Cloud Computing may be a model for sanctioning convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that may be chop-chop provisioned and discharged with least management effort or cloud supplier interaction. In easy words, Cloud Computing is that the combination of a technology, platform that gives hosting and storage service on the web. In such Associate in Nursing setting users needn't own the infrastructure for numerous computing services. In fact, they'll be accessed from any laptop in any a part of the globe. This integrates options supporting high quantifiability and multitenancy, providing increased flexibility compared to the sooner existing computing methodologies. It will deploy, allot or allocate resources dynamically with a capability to ceaselessly monitor their performance. Moreover, cloud computing minimizes the cost. This approach is device and user-location freelance. Main goal of the cloud computing is to supply climbable and cheap on-demand computing infrastructures with sensible quality of service levels.

### III. ARCHITECTURAL COMPONENTS

Cloud service models area unit ordinarily divided into SaaS, PaaS, and IaaS that exhibited by a given cloud infrastructure. It's useful to feature a lot of structure to the service model stacks: shows a cloud reference design that makes the foremost vital security-relevant cloud elements express associated provides an abstract summary of cloud computing for security issue analysis.

#### 3.1 Software as a Service (SaaS)

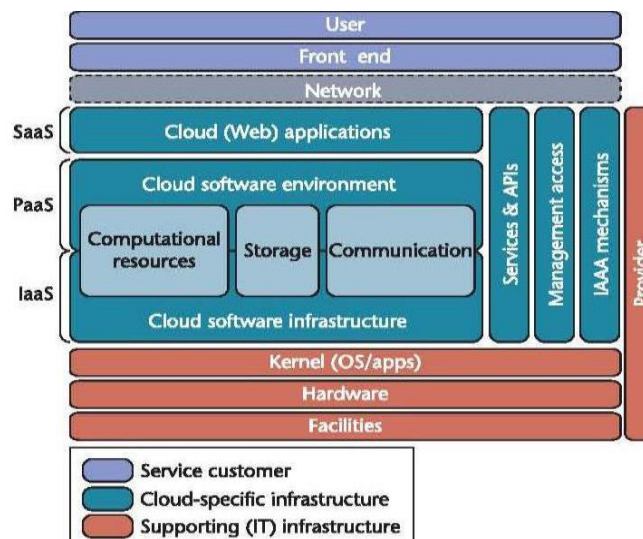
Cloud customers unharness their applications in a very hosting surroundings, which might be accessed through networks from varied purchasers (e.g. applications programme, PDA, etc.) by application users. Cloud customers do not have management over the cloud infrastructure that always employs multi-tenancy system design, namely, totally different cloud consumers' applications square measure organized during a very single logical surroundings within the SaaS cloud to realize economies of scale and improvement in terms of speed, security, accessibility, disaster recovery and maintenance. samples of SaaS embrace Salesforce.com, Google Mail, Google Docs, then forth.

#### 3.2 Platform as a Service (PaaS)

PaaS may be a development platform supporting the complete "Software Lifecycle" that permits cloud customers to develop cloud services and applications (e.g. SaaS) directly on the PaaS cloud. Hence, the excellence between SaaS and PaaS is that SaaS solely hosts completed cloud applications whereas PaaS offers a development platform that hosts each completed and in-progress cloud applications.

#### 3.3 Infrastructure as a Service (IaaS)

Cloud shoppers directly use IT infrastructures (processing, storage, networks and various basic computing resources) provided among the IaaS cloud. Virtualization is extensively utilized in IaaS cloud therefore on integrate/decompose physical resources in associate ad-hoc manner to satisfy growing or shrinking resource demand from cloud shoppers. the elemental strategy of virtualization is to line up freelance virtual machines (VM) that square measure isolated from every the underlying hardware and various VMs. Notice that this strategy is totally totally different from the multi-tenancy model, that aims to transform the applying code style so as that multiple instances (from multiple cloud consumers) can run on one application (i.e. identical logic machine). associate example of IaaS is Amazon's EC2.



#### **IV. POPULAR CLOUD COMPUTING PLATFORMS**

##### **4.1AbiCloud**

Abicloud may be a cloud computing platform. It is accustomed build, integrate and manage public still as personal cloud within the solid environments. mistreatment Abicloud, user will simply and mechanically deploy and manage the server, storage system, network, virtual devices and applications and then on. the most distinction between Abicloud and alternative cloud computing platforms is its powerful web-based management operate and its core encapsulation manner. mistreatment the Abicloud, user will end deploying a brand new service by simply dragging a virtual machine with mouse. this can be abundant easier and versatile than alternative cloud computing platforms that deploy new services through command lines.

##### **4.2Eucalyptus**

Eucalyptus (Elastic Utility Computing design for Linking Your Programs to helpful Systems) primarily was accustomed build ASCII text file personal cloud platform. Eucalyptus is associate elastic computing structure which will be accustomed connect the users' programs to the helpful systems, it's associate ASCII text file infrastructure mistreatment clusters or digital computer implementation of elastic, utility, cloud computing and a well-liked computing customary supported a service level protocol that let users lease network for computing capability.

##### **4.3Nimbus**

Nimbus is associate open tool set and conjointly a cloud computing resolution providing IaaS. It permits users lease remote resources and build the desired computing atmosphere through the preparation of virtual machines. Generally, of these practical elements is classified as 3 types. One kind is client- supported modules that ar accustomed support all types of cloud shoppers. Context consumer module, cloud consumer module, reference consumer module and EC2 consumer module ar all happiness to the current reasonably element. Nimbus is associate open tool set and conjointly a cloud computing resolution providing IaaS. It permits users lease remote resources and build the desired computing atmosphere through the preparation of virtual machines.

#### **V. ADVANTAGES OF CLOUD COMPUTING**

- 5.1** Cloud computing provides dependable and secure knowledge storage center.
- 5.2** Cloud computing will understand knowledge sharing between completely different equipments.
- 5.3** The cloud provides nearly infinite chance for users to use the web.
- 5.4** Cloud computing doesn't would like prime quality instrumentation for the user and it's straightforward to use.

#### **VI. DISADVANTAGES OF CLOUD COMPUTING**

- 6.1** Now not on top of things.
- 6.2** Might not get all the options.
- 6.3** No Redundancy
- 6.4** Information measure



## VII. CONCLUSIONS

This paper mentioned the design and widespread platforms of cloud computing. It conjointly self-addressed challenges and problems with cloud computing thoroughly. In spite of the many limitations and therefore the want for higher methodologies processes, cloud computing is changing into a massively engaging paradigm, particularly for big enterprises. Cloud Computing initiatives may have an effect on the enterprises inside 2 to 3 years because it has the potential to considerably amendment IT.

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# Facial Identification Using Convolution Neural Network

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**Abstract**—Facial identification is a common biometric authentication technique used to analyze the face images and extract useful recognition information from them, which are always called as a feature vector that is used to distinguish the biological attributes. Face identification process begins with extracting the coordinates of features such as width of mouth, width of eyes, pupil, and compare it with a stored face template. The aim of the proposed system is to design an autonomous security system that performs face recognition based surveillance combined with a hardware mechanism to lockup the secured region. Haar Cascade algorithm is used to detect and extract the face from an image thereby storing samples in order to train the system. The camera locates, tracks people entering the secured room, recognize the individual and message is passed to the control room which is stored in the log file. Any unauthorized access is logged along with a buzzer alarm to notify the control room followed by locking the exit points of the system. This system focuses on system security using facial identification which can be installed at banking suits.

**Keywords**—biometric authentication, facial identification, feature vector, recognition, unauthorized access.

## I. INTRODUCTION

A biometric system is a technological and professional system that uses data about a specific human (or other biological organism) to identify that person. Biometric systems depends on specific data about unique biological traits in order to work productively. Biometrics refers to metrics related to human characteristics and features. Biometrics authentication (or realistic authentication) is used in computer science as a form of identification and access control [16]. Biometric authentication is mainly based on physiological and behavioral characteristics. The traits such as uniqueness, permanence, measurability, performance and acceptability is checked in an individual for biometric verification [8].

There are various types of biometric authentication like fingerprint identification, Iris scan, retina scan, face recognition, voice analysis etc. Fingerprint identification is most commonly used form of authentication in biometrics. But the disadvantage is that a person's fingerprint's pattern or form may change over time and fingerprint scanner does not take this into consideration.

In current scenario, there are lot of facial identification approaches and algorithm found and developed across the world. Face recognition therefore, has received a great deal of attention in various applications in the field of image processing, computer vision, etc. due to several advantages it has over other biometric method. For example, in public security system, it can identify the identity of the suspect; in the bank and customs control system, it can identify and prove the identity; it also helps users safeguard its own confidential information and experience more secure financial transactions. We show the performance of machine learning for face recognition using partial faces and other manipulations of the face such as rotation and zooming which we use as training and recognition cues.

The proposed system is instructed and trained to only recognize a set of authorized person. Haar Cascade system is used to create dataset of authorized person dynamically by identifying and extracting the facial features of face helping the system to recognize the face. All others who enter the guarded area are considered strangers. Neural network is used to train the system in order to identify the stranger by comparing the dataset of all authorized person. When an unauthorized person is detected in

secured region, the buzzer alarm alerts the control room and the system triggers the hardware which closes all the exit points at the same time.



**FIGURE 1: Facial recognition and machine learning in react**

## II. RELATED WORKS

The algorithms commonly used for face recognition are active contour model and deformable template model. This model is based on the geometrical characteristic, which is first applied to the face recognition problem. Its basic idea is the difference of everyone's face because of difference in components of every face, like the eyes, noses, mouths and jaws are different. Thus the system uses the set of architectures and shapes of these components to be the features for the face recognition problem. There are five useful methods for face recognition developed in the past study.

The sub-space analysis method is often used in face recognition, which contains two methods such as Principal Component Analysis(PCA) and Linear Discriminant Analysis(LDA). PCA is a method used for identifying of a smaller number of uncorrelated variables known as principal components from a larger set of data. The technique is widely used to emphasize variation and capture strong patterns in a data set. Principal component analysis is considered as a useful statistical method and used in predictive model and exploratory data analysis. The most classic method is PCA-based Eigen face which was put forward by Turk [4] in 1991. This method take the face images as random variables, which turns the  $N \times N$  vector of a face image to a  $N^2 \times 1$  vector, and after minuses the mean data vector, uses the K-L transformation to get a set of orthogonal basis, then after keeps part of the principal components, the reduced dimension vector space of face images is obtained. LDA is aimed at the reparability of the samples. It tries to find a projection direction, which can make the distance of within-class, is small and the distance of between-class is large based on the training samples' projection to that direction.

Based on this model, the features observed treated as a sequence of unobserved states. Different people use different HMM parameters, and for the same person, system uses the model with same parameters to represent the observed sequence of gestures and facial expressions. Samaria first proposed the face model, which used a rectangular window sampling face images from top to bottom.

Another commonly practised method for face recognition is Neural network (NN). Neural network uses its ability of learning and classifying to extract and recognize face features. Lin, etc. uses the positive and negative samples for reinforcing learning to get an ideal probability result. And then increase the learning speed by applying a modular network.

Proposed system was inspired by Ya Wang's Deep learning method[5] for Face Recognition in Real-world. This system automatically generates dataset from real world surveillance videos. This helps in dataset with various light illuminations with different facial expressions etc.

Another inspiration is Ze Lu's system[6] that performs extremely well. It improves face recognition performance of Convolutional neural network (CNN's) by using non-CNN attributes. The non-CNN features showcase the characteristics from a different perspective of the targeted face images.

In terms of results, Facial identification based on deep neural network works the best. The system uses CNN which is a neural network capable of handling image data. It comprises of three layers, one convolution layer, one pooling layer and one fully connected layer. CNN can learn the variations of data without prior knowledge. This method also helps in identifying a person

using additional features. The system uses labelled Faces in the Wild (LFW) dataset for its implementation. A dataset of face photographs designed for studying the problem of unconstrained face recognition, known as LFW (Labelled Faces in the Wild) contains more than 12,000 images of faces collected from the web.

### III. PROPOSED SYSTEM

#### 3.1 SOFTWARE IMPLEMENTATION

Software system is used to identify the unauthorized person and trigger the hardware to take appropriate action. Now, when system has a clear view that there are limited number of images in some of the classes, the data can be bifurcated further into training, validation and testing datasets inclusive of few basic operations.. For a human to correctly recognize a new face, 50 images are said to be more than enough, whereas for a ideal machine learning, training set is considered a small sample. Software implementation is carried out in following ways:

##### 3.1.1 IMAGE PRE-PROCESSING

The selection of a appropriate dataset plays a very important role in the proposed system. The dataset should consist of valid labelled images in each class in order that the neural network can learn every label. Having no restriction to the number of images per class, better results can be obtained through a wide range of images in the LFW dataset. The main purpose of the LFW dataset is to verify whether two images are of the same individual or not as well as facial verification.



**FIGURE 2: Sample of LFW dataset [12]**

##### 3.1.2 ELIMINATION OF CLASSES, WHICH CONTAIN LESS IMAGES

Using all of the classes (individuals) would result in a useless model as many of the individuals have only a single image. Limiting the data to only 10 individuals with the most images in the dataset, is considered by the proposed system in order to give the model a chance to learn all the classes resulting in 10 classes with at least 50 images per class. It is indeed considered a feasible idea to avoid using all the images from the LFW dataset. It is quite baffling for a neural network trained on such a dataset where 4096 individuals have only a single images of themselves.

#### 3.2 TRAINING USING INCEPTION MODULE

Considering the latest and updated Inception V3 model which comprises of the parameters learned through training on the Image Net dataset, Google's pre-trained Inception Convolution Neural Network is selected to perform image recognition as building and training the CNN is not needed.

##### 3.2.1 PERFORMANCE MEASURE

###### 3.2.1.1 LOSS FUNCTION

To measure the performance of a classification model whose output has a probability value between 0 and 1, Cross-entropy loss or log loss is used. It increases if the predicted value diverges form the actual labels[17]. If the actual observation label is 1 and a

probability of 0.012 is predicted the it is not assumed to be good and may result in high loss value. A perfect model has log loss log 0.

For binary classification, the Cross-entropy can be calculated as follows [number of classes (M) equals to 2] :

$$-(y \log(p) + (1-y) \log(1-p))$$

For multi-classification [number of classes(M) > 2], a separate loss for class label per observation is carried out followed by summing the results:- $\sum_c 1 \text{Myo}, \log(p_{o,c})$

### 3.2.1.2 OPTIMIZATION FUNCTION

It is considered as one of the best optimizer till date. With a learning rate of 0.01, the proposed system uses Adam Optimization function as it is able to measure top-1 accuracy. In order to save the model during training and restore it for later, an initialize is used followed by a saver.

### 3.3 RESULT

After training the neural network, checking for usefulness is the next step. It can be done by carrying out evaluation against the test set, which is completely unseen by the model. The training will b done by going through the test set one batch at a time. 62% of individuals are correctly identified at the first attempt in this proposed system. Not quite impressive for a machine learning system (although it outperforms most humans), it is successful in displaying the fact that the network has learned during training. Even if not satisfies by the performance so far, various steps are available to improve the neural network which avoids building their own CNN.

## IV. EXPERIMENT

We can carry out our experiments on two publicly available datasets namely, the controlled Brazilian FEI and the uncontrolled LFW dataset. Our results will display that individual parts of the face such as the eyes, nose and the cheeks have low recognition rates though the rate of identification goes high when individual parts of the face is in combined form which are presented as probes.

### 4.1 INCREASING THE NUMBER OF IMAGES BY AUGMENTATION

The system increases the accuracy by expanding the dataset. The two main approaches used here are increasing the amount of training data and augmentation. The system gathers more labelled images to improve the performance of machine learning system. For image, we apply various shifts that do not change the identifiable features in the image. Likewise, it is applied to the face as well other applied transformations include altering the background in the image changing the contrast and lightning, adding noise etc. The altered image is then appended to the original image with the correct label.

#### 4.1.1 SHIFTING AND FLIPPING THE IMAGE

Number of image of a particular class can be increased in two ways i.e. by shifting and flipping the existing images .Image can be shifted in four directions(left,right,up and down).Flipping is done by mapping the image present in left to right to right to left and vice versa.

#### 4.1.2 TRAINING ON AUGMENTED DATA

The new dataset created by augmentation is used again for training the system in order to increase the accuracy of face recognition.

**TABLE 1**  
**COMPARISON BASED ON AUGMENTATION**

	No. of images before augmentation	No. of images after Augmentation	Accuracy before augmentation	Accuracy after augmentation
Before Augmentation	30	-	64.8%	-
Shifting	40	210	69.4%	73.1%
Flipping	220	490	73.3%	81.8%
Illumination	450	780	83.7%	86.2%

## V. CONCLUSION

In conclusion, it is found that this system identifies a person with improved accuracy, when compared with previous system from [4] and [5] and this can be used for safeguarding banking system in an automated manner. To further improve this system one should train system with more number of samples which will help in improved authentication. The facial expression recognition system presented in this research work contributes a strong face recognition model based on the mapping of behavioral characteristics with the physiological biometric characteristics. In future, with improved dataset one can use it for safeguarding army weapon rooms. The use of LFW datasets can be further improved with use of data augmentation.

## ACKNOWLEDGEMENTS

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## Sixth Sense Technology

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**Abstract:** - This paper gives brief overview of sixth sense technology. As we human has senses to interact with world. A sixth sense is an ESP(Extra Sensory Perception) that aims at a more developed future with both the physical and digital world connected without the help of hardware devices. Steve Mann is father of sixth sense technology. This sixth sense technology provide us with the freedom of interacting with the digital world using hand gesture. This technology has a wide application in the fields of artificial intelligence. This technology has two components camera and projector camera capture the object in view and object is recognized by webcam. Using computer vision based technique user gesture are tracked and it sends the data to the smartphones. The second component is projector, the project the visual information in any, surface including the object itself or your hand.

**Keywords:** - Artificial Intelligence, camera, projector, sixth sense technology, vision based techniques.

### I. INTRODUCTION

We humans, interact with world using our five senses. However, as the name suggest this technology brings forward an addition sixth sense. A sixth sense is an ESP(Extra Sensory Perception) that aims at a more developed future with both the physical and digital world connected without the helped of hardware devices. When we encounter something , someone or some place , we use our five natural senses which include eye , ear , nose , tongue , mind and body to perceive information about it, that information helps us make decision and chose the right action to take, But the most useful information that can help us make the right decision is not naturally noticeable with our five senses , namely data , information and knowledge that mankind and has gathered about everything and which is increasingly all available online. Sixth Sense Technology allow us to interact with this information via natural hand gesture. Sixth sense Technology is like making the entire world your computer.

### II. SIXTH SENSES

Sixth Senses is wearable gesture based device that make numerous the physical world with digital information and lets people use natural hand gesture to interact with that information. Right now, we use our devices to go into the internet and get information that we want. With Sixth Sense, we will use a device no bigger than current cell phones and probably as small as a button on our palm to bring the internet to us in order to interact with our world. Sixth Senses will allow us to interact with our world like never before. We can get information on anything we want from anywhere within a few moments. We will not only be able to interact with things on a completely new level but also with people. Another great part of the device is its ability to scan object or even people and project out information what you are looking for.

### III .HISTORY AND EVOLUTION

Steve Mann is father of sixth sense technology who made a wearable computer in 1990. Steve Mann first attempted to propose a neckworn projector and a camera combination. The idea of implementing computer technologies to daily tasks as our "6th sense" was further developed by Pranav Mistry who also appears to be an MIT student as well as Steve Mann. The first prototype of the

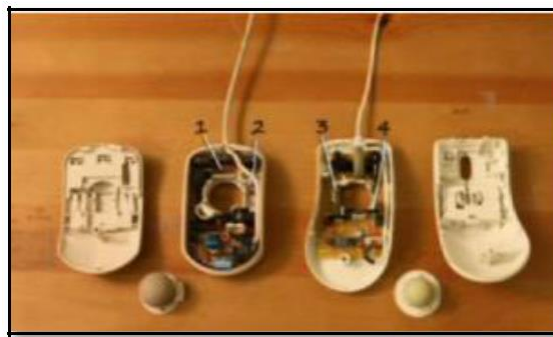
sixth sense technology was actually bigger than what it looks like today and it was not working properly to use in daily life. In an article called The sixth sense technology Arjun K. R says that "They started with a larger projector that was mounted on a helmet. But that proved cumbersome if someone was projecting data onto a wall then turned to speak to friend- the data would

project on the friend's face". Therefore, Mistry came up with a different and more convenient device, which is a neckworn portable camera that allows users more space for their daily actions.



**FIGURE 1: Image Showing Pranav Mistry Introducing New Applications from Sixth Sense Technology**

On the other hand, Mistry first tried out his idea on a simple computer mouse. First, he put two rollers into one mouse and see if he could obtain data and guide the movements of the mouse. Two rollers did not work properly so he decided to use four rollers and see if it could work better. Four rollers gave him the idea that he could use the same idea on fingers and that's what he next moved on to. The picture below shows how four rollers were tried out in Mistry's experiment.



**FIGURE 2: Four Roller Computer Mouse**

The sixth sense technology was a bit pricey back in 1990's because the specifications that the device needed were barely entering the market and it was costly to convert them into commercial use. However, today, with the fast pace of technological innovations, the cost of this technology is getting ready to enter the commercial market which will allow people to actually use it in their daily life in a few years.

#### **IV: PURPOSE OF SIXTH SENSE TECHNOLOGY**

Humans take decisions after acquiring inputs from the senses. However, the information we collect are not enough to result in the right decisions. However, the information, which could help making a good decision, is largely available on internet. Although the information can be gathered by connecting, devices like computers and mobiles but they are restricted to the screen and there is no direct interaction between the tangible physical world and intangible digital world. This sixth sense technology provides us with the freedom of interacting with the digital world with hand gestures. This technology has a wide application in the field of artificial intelligence. This methodology can aid in synthesis of bots that will be able to interact with humans.

Sixth Sense Technology allow us to interact with digital world using hand gestures. This technology has a wide application in the field of artificial intelligence. This methodology can aid in synthesis of bots that will be able to interact with humans. The sixth sense prototype implements several application that demonstrate the usefulness, viability and flexibility of system.

## **V. CONSTRUCTION**

Sixth Sense technology comes with a pocket projector a mirror and camera contained in wearable device. Both the projector and the camera are connected to mobile computing device in the user's pocket. The projector projects visual information enabling surface or on wall, while the camera recognizes and tracked user's hand gesture using computer vision based technique. The software program process the video stream data capture by the camera and tracks the location of the coloured markers at the tip of the user's.

## **VI. TECHNOLOGIES RELATED TO SIXTH SENSE DEVICES**

### **6.1 Augmented Reality**

Augmented Reality is a term in which "a live direct or indirect view of a physical real-world environment whose elements are augmented by virtual computer-generated sensory input such as sound or graphics" (Sharma, 2012) . Basically, a user is able to see the facts and artificial information about a certain place, picture, sports game, weather "in real time and in semantic context with environmental elements".The augmented reality is a visualization technology that allows the user to experience the virtual experience added over real world in real time. Augmented reality adds graphics, sounds, hepatic feedback and smell to the natural world, as it exists

### **6.2 Gesture Recognition**

Gesture recognition can be considered one of the first technological innovations that understands the motions of humans and therefore it is somewhat similar to the 6th sense technology. Gesture recognition is a "computer interaction through the drawing symbols with a pointing device cursor" which throws the keyboard and mouse into the trash with its technology. It is a technology, which is aimed at interpreting human gesture with the help of mathematical algorithms. Gesture recognition technique special type of hand glove, which provide information about hand position and flux of the fingers.

### **6.2 Computer Vision**

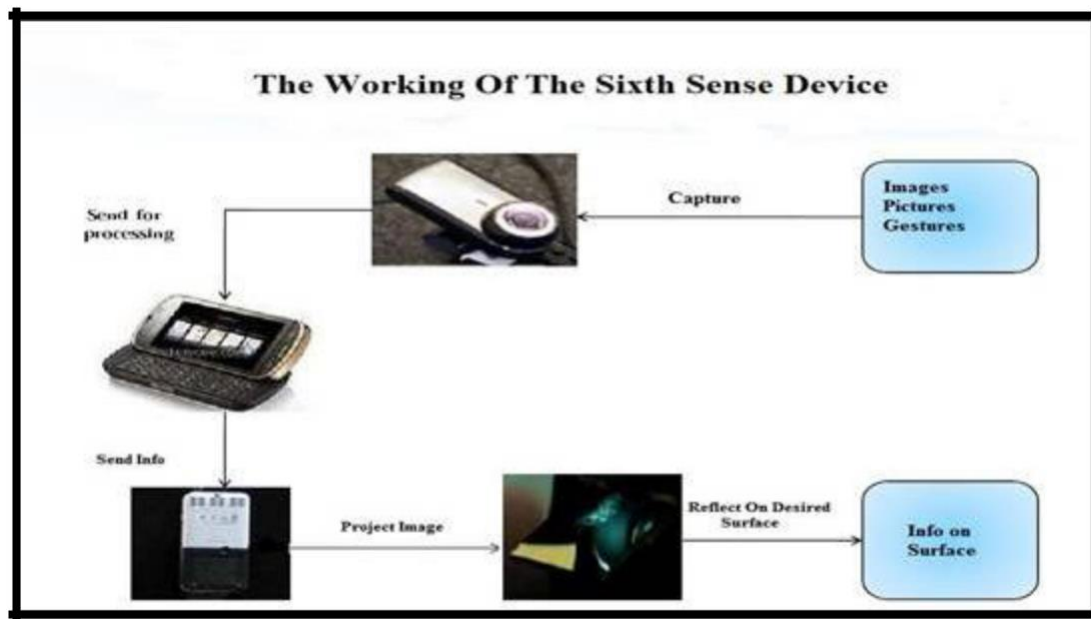
Computer vision is the technology in which machines are able to interpret necessary information from an image. This include image processing, image analysis, machine vision. Computer vision is the automated extraction of information from images. Information can mean anything from 3D models, camera position, object detection and recognition to grouping and searching image content.

### **6.3 Radio Frequency Identification**

Radio-Frequency Identification (RFID) is the use of radio waves to read and capture information stored on a tag attached to an object. A tag can be read from up to several feet away and does not need to be within direct line-of-sight of the reader to be tracked. Frequency identification system transmit the identity of an object wirelessly, using radio magnet waves. The main purpose of this technology is to enable the transfer of a data via a portable device.

## VII. FUNCTIONING

The hardware that makes Sixth Sense work contains a camera, a mirror and a projector and is connected to a Bluetooth of the smart phone that can slip comfortably into one's pocket. The camera recognize individuals, images, gesture one makes with their hands, information is sent to the smartphone for processing. The downward facing, projector the image on to the mirror. Mirror reflects images on to the desired surface.



**FIGURE 3: The Working of The Sixth Sense Device**

## VIII. CHALLENGES

- 8.1 Hardware Limitation- The prototype in the lab have not been assembled into a compact device. Which user on daily basis can use.
- 8.2 Software Limitation- dependency on image processing challenges and accurate positioning along with synchronization are the main obstacle before implementation.
- 8.3 Security and privacy- Hacking information from Facebook, taking picture in public, a person could even obtain information about a total stranger in public due to face recognition algorithm of device.
- 8.4 Safety Concern- safety concern about wearing the device while driving and brightness of projector on user's eye.
- 8.5 Away from Reality- Excessive dependence on technology may take away from real world where no physical surface touch is available to feel.

## IX. ADVANTAGES

- 9.1 The device is portable and accessible anywhere.
- 9.2 This technology is multi-touch and multi-user interaction.
- 9.3 Formation of real world and digital world.

9.4 Mind mapping is possible.

9.5 Software is made open source.

## X. CONCLUSION

Sixth sense devices are very much different from the computers; this will be a new topic for the hackers and other people also. First thing is to provide security for the sixth sense application and devices. Lot o good technologies came and died due to the security problems. There are some weakness that can reduce the accuracy of the data. Some of them were the on palm phone keypad.it allow user to dial a number on palm. Sixth Sense Technology required some hardware improvement and involvement with user.

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# REVIEW PAPER ON DEEP DISSERTION OF DATA SCIENCE: RELATED ISSUES AND ITS APPLICATIONS

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**Abstract**— In the era of digital evolution data science plays important roll to manage various kind of big data. Data science related to collecting, gathering, performing various operation on data. To handle big data is next to impossible for normal person, but human having ability to generate algorithm to handle such kind of big data. In the given review paper author mainly focus on future scopes and present stage of data science.

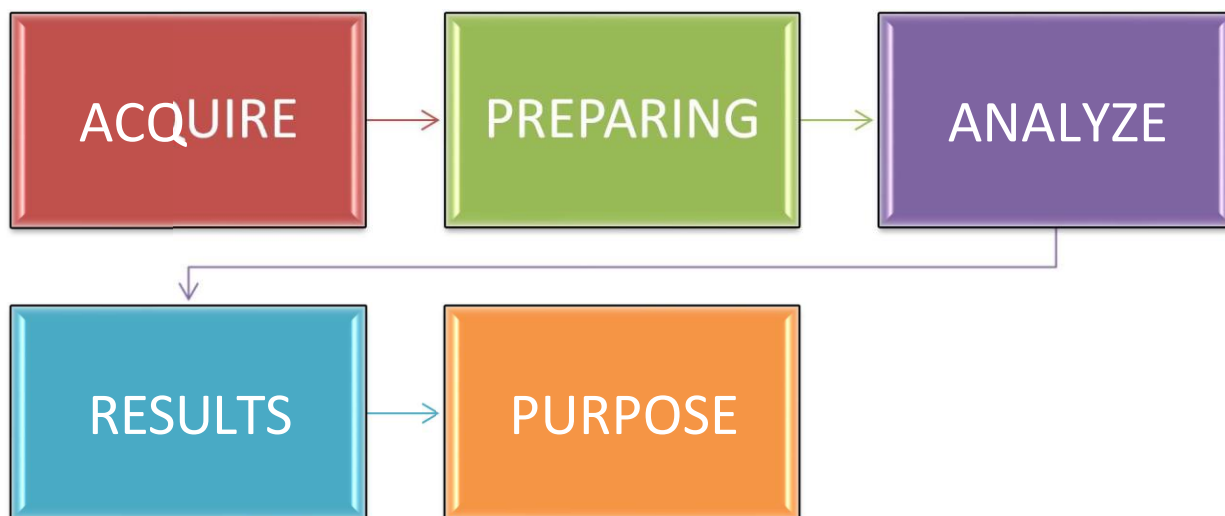
**Keywords**— Application of Data Science, Data mining, Data science.

## 1. INTRODUCTION

Now a day's data science used everywhere, the popular field like machine vision, IOT, cloud computing is incomplete without data science. It is thing which used to handle big data which having lots of information. The data science consists of arranging the data, extracting important data from available data, study on available data to store it in less space. Data mining is the important part of data science. It studies previous data and extract useful information out of it. Data science is field which uses scientific method, statistical data, algorithm create fruitful information from past available data or data generated using various **sensors**.

## 2.STEPS INVOLVED IN DATA SCIENCE PROCESS

Data science is a vast process which include following steps as shown in block dia.1.



**BLOCK DIA.1**

## 2.1 ACQUIRE

Acquire is anything from which we get data including finding accessing or moving data. In the field like IOT we get data from sensors which can be of temperature humidity persons activity, distance etc sensors get all data and stores it in particular memory locations for further use. Acquiring can be finding also we can use data from available source from previous finding. It includes transportation of data from source to distributed file system.

## 2.2 PREPARE DATA

Prepare data step further classifies into two steps which include explore data and pre-process the data.

Explore data: - As the name suggest it is process in which data scientist or person who using data is just see the available data and try to understand what things we have in the above data, quality and format of the data.

Pre-process data: - The step contain performing basic operation on available data to clean the data to integrate it and make it available in user understandable format. It includes modelling data into more convenient data model or packaging it using specific data format. If more steps are involved the step integrate the data.

## 2.3 ANALYSIS OF DATA

Prepared data is then pass to analyse data step which include selecting appropriate analysis technique or data model to get desire outcomes. The analytical technique includes hypothesis testing, linear regression, hypothetical regression, neural networks, decision trees etc. this step is completely related to previous step in which format the data is available

## 2.4 RESULTS

The fourth step contain results which means presenting filter data which is used for different application. The result is in the tabular or statistical format. The step contains summarization or visualization of filter data.

## 2.5 PURPOSE

The last step brings us back to the first step for which we do data science THE PURPOSE.

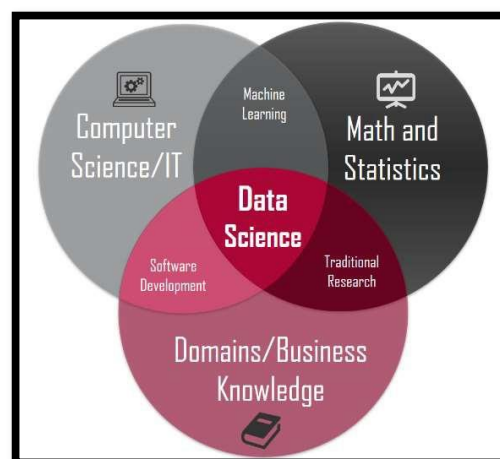
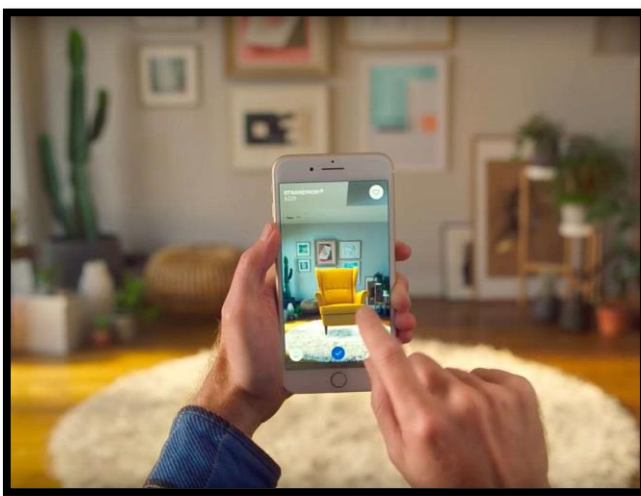


Fig 1

### 3. APPLICATION

There are innumerable applications of data science which include fraud and risk detection, healthcare, internet search, target advertising, website recommendation. The best application is target application. If you thought Search would have been the biggest of all data science applications, here is a challenger – the entire digital marketing spectrum. Starting from the display banners on various websites to the digital billboards at the railway station – almost all of them are decided by using data science algorithms. This is the reason why digital ads have been able to get a lot higher CTR (Call-Through Rate) than traditional advertisements. They can be targeted based on a user's past behavior.

Augmented reality is the upcoming technology in the field of data science. The popular game Pokemon Go is a best example of both the field. The game contains lots of data of user's location, way of playing the games and according the articles are placed using augmented reality.



**Fig 2: Application Of Data Science (Augmented Reality).**



**Fig 3: Application In Target Advertising**

### 4. CONCLUSION

Now a day's large amount of data is generated through various application. To identify, to process on data and to take out useful information is necessary. Data science is a branch of science which related to big data and to perform various operation on it. In this paper, author try to glance on various topic related to data science and its real-life application. Method to create useful and effective data is also explained in this paper. We believe that in future analysts will give careful consideration to these methods to take care of issues of enormous information successfully and effectively.

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# The Rise of Automation in Aviation

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**Abstract:** This paper describes rise of automation in aviation. Automation in aviation industry is adopted to fulfill the requirement for – to reduces human workload and error, to avoid accident, ease of customer, to provide security, for economic aspect and many more. In this work explore the present and future automation application to minimize the human efforts, time and risk. In this discussed various technologies arising in aviation, based on the automation and artificial intelligence that will helps to make the process more efficient, flexible and stable. The aviation industry has seen a significant advancement in terms of automation, and in the upcoming years, it is only going to increase further. Automation not only helps in enhancing the security of the aircraft, but it also saves a lot of manual labor which lowers the overall airfare. From low-cost carriers to full-service airlines, efficiency is the keyword in the aviation industry. Automation is happening at a new level in the workplace nowadays. This is because of the recent advances in the fields of robotics and AI. Whereas these advancements are likely to create some new jobs in the many industries where robotics is used, some other old ones may be wiped out altogether. The aviation industry is no exception.

**Keywords—** Automation, Artificial Intelligence, Efficiency, Robotics, Technology.

## I. INTRODUCTION

In recent years, the aviation industry has skilled tons of turning points to reinforce the services it provided. From enhancing the inflight experience of passengers with luxurious cabins that remind us of a hotel room to providing inflight entertainment services to the customers, the aviation trade has created plenty of changes by implementing many advanced technologies. The aviation trade has plans to grow within the future years to produce high-end services to shoppers and customers.<sup>[1]</sup>

Let's try and perceive what's the which means automation and why is it necessary for the aviation trade. Automation is that the utilization of various management systems and technologies that reduces the need of human interference. The aim of automation to replace certain task, once completed by human operator with an automatic system; namely by a devices and computers including autopilots, flight management system, flight directors, warning and alerting system. Within the aviation trade, the automation of assorted processes is increasing. For example, the air traffic control systems are currently undergoing various automation works that could find the weather and reduce the likelihood of air accidents and crashes.<sup>[2]</sup>

All the commercial flight, including those undertaken by private jets, takes place with some aspects being handled entirely by a computer. As AI becomes more sophisticated, it's a near-certainty that a greater portion of piloting duties are going to be handed over to automated systems. One Monarch pilot said in an interview with the Telegraph in 2015 that the autopilot "does about 90 percent of flight", The industry has witnessed a precipitous fall in fatal accidents over the past few decades, and automation is essentially responsible. Automation is not only limited to aircraft or airplane but also included in airport to establish security and various airside operations and landside operations.<sup>[3]</sup>



## II.

### BRIEF HISTORY OF AUTOMATION IN AVIATION

The first successful airplane pilot, invented by two men named Orville and Wilbur Wright in 1903. Since then, piloting a plane has become tons less physical, because of automation and autopilot functions that do tons of pilot's work for them. In the beginning of economic flight there have been no instrumental aids to assist pilots to fly. Automating certain functions was necessary to creating bigger and better planes in any case, Wright's plane couldn't fly as fast or far as jets today, including seat the amount of individuals that a contemporary commercial plane can. Just nine years after Wright flew his plane at Kitty Hawk, North Carolina, a person named Lawrence Sperry created the primary successful autopilot. It's innovation was to automatically balance the plane in flight and it has become so popular during 1920's and 1930's.<sup>[4]</sup>



**Figure 1: Lawrence Sperry invented first autopilot aircraft**

The boom in commercial aviation travel came after the war, and more competition for automation. In 1950's, first computer reservation system (CRS) system was introduced to book tickets and check-in passenger. In the 1950s, commercial planes had five crew members in the cockpit: a navigator, a aircrewman, a operator and two pilots. Over subsequent few decades, automation and improved technology made the primary three jobs unnecessary and saved airline companies lot of money.

The 1960's saw many innovations introduced on board aircrafts that enhanced safety: electric autopilots, auto-throttle (to manage the facility setting so as to take care of a specific speed, or a vertical speed), flight directors (used to point out pilots the way to manoeuvre to realize a pre-selected target like speed, path-tracking then forth), airborne weather radars, navigation instruments, inertial platforms, but also improved warning systems and alarming capable of detecting several engines parameters and other equipment.<sup>[5]</sup>



**Figure 2: electric autopilots**



**Figure 3: auto-throttle**



**Figure 4: navigation instruments**

During the 1970s, using digital technology airline companies started exploring automation . At that time, most plane accidents were caused by human error rather than mechanical error, so automation seemed like a way to make air travel safer. Aviation company developed a new "fly-by-wire system" to avoid accident. Fly-by-wire is a computer-based system that can interpret what the pilot wants to do and then perform the command smoothly and safely. In the late 1980s, Airbus fully introduced this technology for the primary time on its A320 plane, also referred to as the "Electric Jet". Other aircraft carriers like Boeing adopted these fly-by-wire systems within the 1990s.<sup>[6]</sup>



### **III. CURRENT AUTOMATION IN AVIATION**

#### **3.1 Recent technology used in aviation industry are as follows:**

##### **3.1.1 Blockchain Technology**

Blockchain is a digital ledger that stores de-centralized digital information records. Blockchain Technology identities of people are often forged and wont to accomplish fraudulent and terrorist activities. Nowadays, airplane tickets are either electronic passes or paper-based. With the implementation of Blockchain, the necessity for using paper tickets are often fully eliminated and therefore the e-tickets are often tokenized through smart contracts. Blockchain technology along side a security wrapper creates a secure medium to share this data reliably through authorities. E.g Aeron.com is one of the most successful companies.<sup>[7]</sup>

##### **3.1.2 Artificial Intelligence**

The airline industry understands the facility of AI in helping them stepping up their technology game. Many of forward thinking airlines understand the impact AI can have in multiple areas of the industry and are already investing within the same.

For example, UK based EasyJet uses AI for predictive analysis. The airline is employing a mixture of these technologies to make sense of all the available data and use these insights making offers and services personalised for individual travellers. The airline also features a recognition tool that reads passports and fills out all the knowledge for flyers — easing out the data entry and data management tasks more manageable.<sup>[8]</sup>

##### **3.1.3 Wearable Technology**

Airlines have began to use wearable technology in various ways to do more than improving customer experience on flights. Recently Japan Airlines used Microsoft's HoloLens for training its engineers and new crew members. With the use of HoloLens, the mechanics can be trained about engine mechanics akin to the experience they will have working on an actual plane. British Airways and EasyJet are among the airlines that have created apps for the Apple Watch, enabling passengers to store boarding passes and receive real-time updates on their wrist.

##### **3.1.4 Big Data and Analytics**

Airlines industry can drive valuable insights by analysing the massive amount of data available to them to understand customer preferences in real-time supported data of their purchase history, make delightful experiences for travellers and provide them customised offers etc.

E.g. United Airlines uses a sensible "collect, detect, act" system to analyse around 150 variables within the customer profile including their previous purchases, preferences etc. and supply tailor-made offers to them. United Airlines has seen a YoY revenue increase of 15% after implementation of this technique.

##### **3.1.5 Internet of Thing**

Virgin Airlines have implemented IoT in its Boeing 787. All single element on the plane is attached to a wireless aeroplane network, providing real-time IoT data on elements like maintenance, performance etc. The airline is using the deluge of knowledge that it's collecting through these flights to enhance the efficiency of the aircraft and also being pro-active.

##### **3.1.6 Mobile Solution**

Today, smartphones became an integral part of people's life. Airlines have started venturing into the planet of mobile solutions and are using this platform to attach with their customers throughout the passenger journey ranging from booking of a flight till deplaning it. E.g. Delta Airlines recently started providing their passengers' virtual boarding passes 24 hours before their journey through their mobile app, easing out the check-in process for his or her passengers.

### **IV. AVIATION SECURITY AND AUTOMATION**

The aviation industry plays a important role in global economic development and competitiveness. It reside in the center of the domestic and international transportation. Thus, aviation security is the major priority of all the airports around the world. Since 9/11, with the succeeding terrorist attacks and strengthen security measures, there is increase in growth of passenger in the length and intensity at security checks in airports.<sup>[9]</sup> Some recent technology is used in aviation to provide security are as follows:

#### **4.1 Biometric Technologies**

This technology helps the system to automate the process of identification of people through their distinct physical and behavioral features. It also covers a wide range of technologies used to identify unique features of the individual characteristics. The biometric technologies include fingerprints, face recognition, iris recognition etc.<sup>[10]</sup>

## 4.2 ssDetection system for Passengers and Baggage

The main detection systems on airports which are still operating are:

### 4.2.1 X-Ray Body Scanner

Many government agencies in countries all around the world adopted advance imaging technology (AIT) in response to 9/11 terror attacks which is used to detect metallic and as well as non-metallic explosives materials as the primary passenger screening method.

### 4.2.2 Explosive trace detection system (ETD)

The ETD is used to detect hints of explosive materials followed by the hand luggage or postal matter in a very short interval.

### 4.2.3 Metal Detector

Metal Detectors used for security screening at airports to detect concealed metal weapons on a person's body.

### 4.2.4 Radio Frequency Identification(RFID)

RFID is the most powerful automation technology that uses both electromagnetic and electrostatic coupling with radio frequency to identify objects. It used in airport to real time track passenger baggage.



Figure 5: Security at airport

## V. IMPACT OF ROBOTICS ON AVIATION

In the airport environment, autonomous vehicles and systems are attracting a lot attention. Some recent application of robotics applied in airline industry are:

### 5.1 Robotics

Airports like Haneda, Incheon, Auckland and Changi are exploring the utilization of robots to supply on-the-spot assistance to passengers, or as a part of terminal cleaning functions.

### 5.2 Self Driving Vehicle

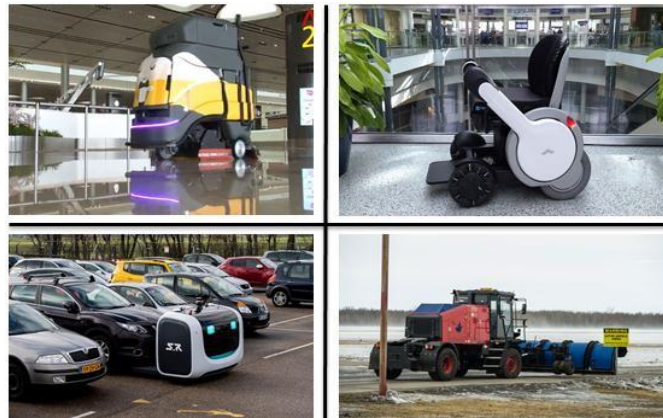
Christchurch, Heathrow, Gatwick and Cincinnati/Northern Kentucky are all examples of airports that are trialling self-driving vehicles, either outside the terminal building or airside; transporting staff and passengers with reduced mobility.

### 5.3 Airport Parking

Autonomous vehicles can help maximise the utilization of parking lot, as demonstrated by Lyon Airport, Paris Charles-de-Gaulle and Dusseldorf Airport.<sup>[11]</sup>

### 5.4 Airside operations

Among the many examples, airports such as Edmonton, Oslo, Winnipeg and Heathrow are testing or deploying driverless perimeter patrol vehicles, snowplows or foreign object debris (FOD) radars.



**Figure 6: Use of robotics at airport**

## VI. FUTURE OF AVIATION

### 6.1 Autonomous flight

In the commercial flight, from day one, pilots are an integral part of the flying experience. However, as technology has progressed, systems once designed to help pilots are starting to verge towards replacing them. For brief distance flights, testing of pilotless flying taxis is currently underway in Dubai, United Arab Emirates. Major aviation players seem to be performing on this also. Boeing has just acquired Aurora Flight Sciences, an aviation research firm that focuses on the the planning unmanned aircraft.<sup>[12]</sup>

### 6.2 In-flight connectivity

The world is increasingly getting interconnected and connectivity is becoming a business necessity. The airline passengers will expect even in-flight connectivity in the coming days, getting rid of the need to disconnect phones in the air. After the offering free Wi-Fi services across airports, now airlines are also starting to offer the provision inside the flight. Recently, Delta airlines took the initiative to provide Wi-Fi in all its domestic and international flights to let passengers experience an entertaining flight journey.<sup>[13]</sup>

### 6.3 Electric Flight

Nowday, zero-emission flight is closer to reality than ever. Electric and hybrid-electric propulsion is rapidly revolutionising mobility technologies across industries, from automotive to marine. And the aviation industry is no exception. Airbus is committed to developing, building and testing electric and hybrid-electric future technology that will enable the aviation industry to significantly reduce the CO<sub>2</sub> emissions of commercial aircraft.<sup>[14]</sup>

### 6.4 Quantum Technologies

Quantum technologies are expected to make a huge paradigm shift within the way aircraft is made and flown. At airbus we aim to be an early adopter of quantum technologies to reinforce the performance of our products and services and to assist us solve the foremost complex aerospace challenges.

## VII. MERITS OF AUTOMATION

### 7.1 Multi-Function Cockpit Display

It is convenience for pilots in cockpit to see their position during vector approaches, for example, in an advanced system interface and guide pilots to accurately locate their position at all times.

### 7.2 Cost Effectiveness

As new the technology has introduced, there reduced time wasting and workload systems are really saving the cost. Also, Old airplanes need more fuel to fly that was becoming the biggest cost threat to the airline business. Airplanes such as DC-9, B707s and many like this were now exempted from operations as new technologies introduced that promised to be eco-friendly. They burn less fuel and operate for longer periods effectively

### 7.3 RFID Benefits

RFID is mostly used such as location identification; the reader is assigned a known location so it can possibly track the unique item holding the tag.

### 7.4 Safety

Safety has become the major factor in the aviation industry. Many airlines have terrible losses over lack of safety awareness. As new technologies are placed, the human labor that cause erroneous incidents are replaced and new policies are made based on automated system. This has worked over last decade, by revising new strategies for safety in aviation, achieving goal for safe and smooth operations made possible.<sup>[15]</sup>

## VIII. CONCLUSION

This brief paper highlights how automation involve in aviation industry. This describes what technology use in the past, what use in today and what technology will be implemented in future in aviation industry. In this paper we have discussed about impact of automation on security, how automation improve flight safety, consistent help to pilots, improve performance etc. In this we have also discussed, how automation change airport environment, provide more security, reduces manual thing, provide passenger better experience and ultimately result in potential growth in aviation industry.

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# **SECTION C**

# **ELECTRICAL**

## Air Core Generator

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**Abstract**— Generator is a device which basically converts mechanical energy into electrical energy and used for various electrical application. Normally in conventional generator we are using iron as core which has a lot of disadvantages like core losses, heavy construction due to the use of iron, also magnetic saturation of iron takes place due to which there is requirement of replacing iron thereby increasing the cost. So in our project we are replacing iron with air as core so the above mentioned disadvantages are eliminated there by increasing the efficiency and reducing the cost. In this project we are providing mechanical energy with a help of wind turbine which rotates the rotor. As the stator is placed between the rotor there is relative motion between the stator and the rotor and according to faraday law of electromagnetic induction an EMF is induced which produces current and this current is taken as output and used for various electrical application.

**Keywords**— Air core, EMF, MMF, Magnets, Stator, Rotor.

### I. INTRODUCTION

An engineer always focuses towards challenges of bringing the idea and concepts into reality therefore sophisticated machine and modern technique have to be developed and implemented for economical manufacturing of product and at same time no compromise is done with quality and accuracy. We the group of young engineers found that there is impending need to make more ways to make non-conventional energy attain popular acclaim. It is also very essential to preserve the conventional source of energy and explore viable alternatives like sustainable energy (the energy that we are already utilizing but for some safety of uses, we are wasting it, that can be reutilize) solar, wind, and biomass energy can enhance sustainable growth. Here we have put our efforts to generate energy i.e. electricity by coreless generator. This system is more efficient then existing traditional iron core generator as it is design to give good output even at low input. Normally the traditional core generator faces problems such as core losses which comprises of eddy current and hysteresis losses, and also the copper used in both stator and rotor causes loss equal to square of current times resistance of wire, due to the presence the slip ring suffer frictional losses. Coreless generator is design to reduce all the above drawbacks of tradition core generator their by providing good out at low input.

### II. AIM OF THE PROJECT

In conventional generator we are using iron as core which has a lot of disadvantages like core losses, heavy construction due to the use of iron, also magnetic saturation of iron takes place due to which there is requirement of replacing iron thereby increasing the cost. So in our project we are replacing iron with air as core so the above mentioned disadvantages are eliminated there by increasing the efficiency and reducing the cost. In this project, we are providing mechanical energy with a help of wind turbine, which rotates the rotor. As the stator is placed between the rotor there is relative motion between the stator and the rotor and according to faraday law of electromagnetic induction an EMF is induced which produces current and this current is taken as output and used for various electrical application.



### III. GENERATION OF EMF BY FARADAY'S LAW

Electric generators are devices that convert mechanical energy into electrical energy. The operating principle of these generators can be found in Faraday's law which, states that an electrical potential difference is generated between the ends of conductor that moves perpendicularly through a magnetic field. In this experiment, Faraday takes a magnet and a coil and connects a galvanometer across the coil. At starting, the magnet is steady, so there is no deflection in the galvanometer i.e. needle of galvanometer is at the zero position. When the magnet is moved towards the coil, the needle of galvanometer shows deflection in one direction. When the magnet is steady, at that position, the needle of galvanometer returns back to original position. Now when the magnet is moved away from the coil, again there is some deflection in the needle but in opposite direction and again when the magnet becomes steady, at that point with respect to coil, the needle of the galvanometer returns back to the zero position.

Similarly, if magnet is held steady and the coil is moved away and towards the magnet, the galvanometer shows deflection in similar manner. It is also seen that, faster the change in the magnetic field, the greater will be the induced EMF or voltage in the coil. More specifically, that the electromotive force (EMF) that is induced in any closed circuit is equal to the rate of change of the magnetic flux through the circuit.

Consider a magnet approaching towards a coil. Here we consider two instants at time  $T_1$  and time  $T_2$ .

Flux linkage with the coil at time,  $T_1 = N\Phi_1$  Wb Flux

Linkage with the coil at time,  $T_2 = N\Phi_2$  Wb

Change in flux linkage =  $N(\Phi_2 - \Phi_1)$

Let this change in flux linkage be,  $\Phi = \Phi_2 - \Phi_1$

So, the Change in flux linkage =  $N\Phi$

Now the rate of change of flux linkage =  $N\Phi / t$

Take derivative on right hand side we will get

The rate of change of flux linkage =  $Nd\Phi/dt$

But according to Faraday's law of electromagnetic induction, the rate of change of flux linkage is equal to induced EMF.

$$E = N \frac{d\Phi}{dt} \dots\dots\dots 1$$

Lenz's law states that when an EMF is generated by a change in magnetic field according to Faraday's Law, the polarity of the induced EMF is such, that it produces an current that's magnetic field opposes the change which produces it. The negative symbol used in Faraday's law of electromagnetic induction, indicates that the induced EMF and the change in magnetic flux have opposite signs. Considering Lenz's Law.

$$E = -N \frac{d\Phi}{dt} \dots\dots\dots 2$$

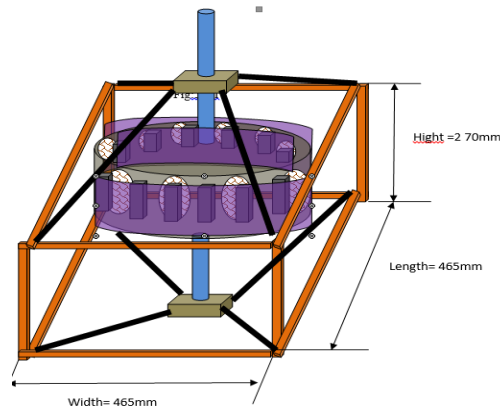
### IV. REASON FOR OPPOSING, CAUSE OF CURRENTS ACCORDING TO LENZ'S LAW

Lenz's law follow the law of conservation of energy and if the direction of the magnetic field that creates the current and the magnetic flux of the current in a conductor are in same direction, then these two magnetic fields would added up and produce the current of twice of the magnitude and this would in turns to create more magnetic field, which will cause more current and this process continuing on and on leads to violation of the law of conservation of energy. If the induced current creates a magnetic field which is equal and opposite to the direction of magnetic flux that creates it, then only it can resist the change in the magnetic field in the area, which is in accordance to the Newton's third law of motion

## V. PROPOSED SYSTEM

Traditional core generator suffers numerous inherent inefficiency such as the core in both the rotors and the stators have losses equal to square of current times resistance of wire, slip rings suffers friction losses and are a source of wear and breakdowns, leakage fluxes causes stray load losses, and occurs in both stator and rotors in traditional system. The iron in both stator and rotor suffers from eddy current losses which result from change in electric field introducing a parasitic perpendicular reactionary electromagnetic effect. Thus we have design a generator which overcome above all the losses which does not have any laminations, brushes and slip rings thus reducing frictional losses, weight of generator and its cost. This generator is specially design to operate at low speed.

## VI. BLOCK DIAGRAM



**FIGURE 1: Block diagram**

## VII. PARTS OF GENERATOR

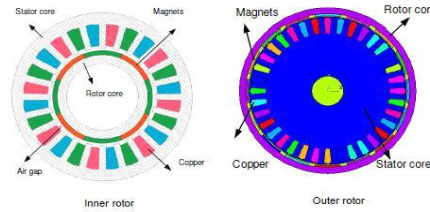


**FIGURE 2: Rotor**

### 7.1 Rotor

The rotor of the RFPM generator consists of two cylindrical steel yokes located concentrically one inside the other. The reason for both an inner and an outer yoke is the double row of permanent magnet (PM) material necessary to maintain the required magnetic flux density in the air-gap located between them. The large effective air-gap present in an air-cored generator possesses a much lower permeability than an iron-cored generator does. To maintain the same flux density levels in the air-gap more PM material is needed. The two steel cylindrical rotors provide a rigid steel construction, which maintains the air-gap length as well

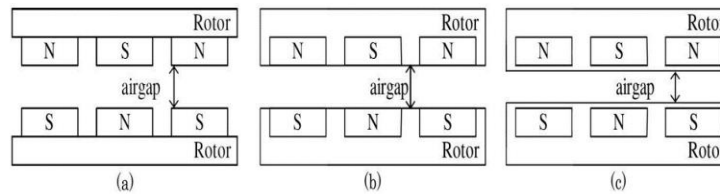
as supplies a return path for the PM's magnetic flux. Unlike in iron-cored generators, in an RFPM air-cored machine the flux distribution inside the steel rotor yokes remains static during operation. For this reason the iron losses in the rotors become negligible.



**FIGURE 3: Inner and outer rotor configurations**

## 7.2 Permanent Magnet

The RFPM generator yokes have circumferential arrays of alternating polarity permanent Magnets. The magnets are equally spaced on each yoke's periphery.



**FIGURE 4: (a) Surface mounted, (b) partially embedded and (c) fully embedded.**

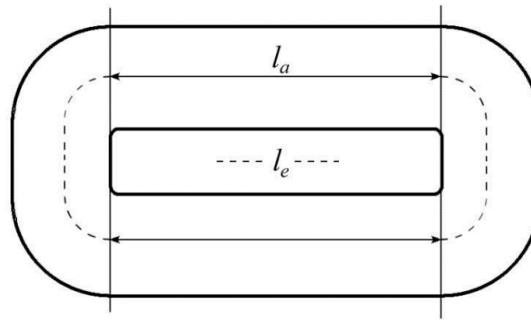
Inner and outer magnets are placed opposite to each other to form pole pairs. A pole pair is magnetized in the same direction. The permanent magnets can be placed in one of three ways. They are fully embedded, partially embedded or surface-mounted. These three configurations are depicted in Fig. 4. A major advantage of the surface-mounted magnets is that the steel yokes do not have to possess machined slots as in the case of embedded magnets. The absence of slots allows machining costs to drop, which makes the generator more economical. Another advantage is that the surface mounted magnets act as a fan which creates a natural wind cooling effect inside the machine. The rated operating speed of the direct drive RFPM generators are relatively low and centrifugal forces present on the magnets are small. This means that the magnets can be glued onto the yokes. If the speed of such a machine increases other means of fastening, like through magnet screws, should be considered. The RFPM generator discussed in this study makes use of the surface-mounted topology. This is primarily due to the large air-gap present in air-cored machines, which causes high amounts of magnet leakage flux to occur if the magnets are embedded within the steel. This leakage flux occurs between the magnets and iron yoke and is discussed later in the chapter. Both surfaces on which the magnets are placed are arc shaped due to the circular yokes. This means that the shape of each magnet also needs to be curved and to be radially magnetized.

## 7.3 Coils

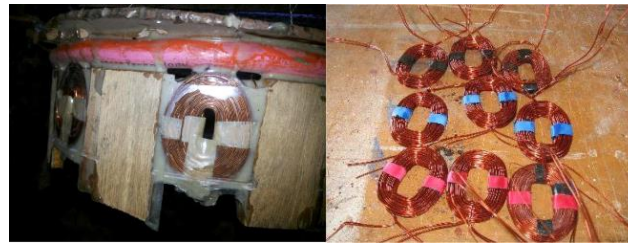
$l_a$ = active length

$l_e$ = end winding length Therefore, total length is  $2l_a + l_e$

In an alternator producing 3-phase power, so one group of Coils is at peak current while the others are not. Therefore the magnets align with only one phase at a time. Here the alternative to this. For every coil of wire in the 3-phase stator, there are 1.33 magnets.



**FIGURE 4: Coil profile in the air core generator**



**FIGURE 5: Actual coils**

No, don't go slicing a magnet in half. The total minimum number of coils in a 3-phase alternator is 3 coils. One for each phase. You would therefore need 4 magnets. Actually, that would be fairly clunky. Here are some typical combinations. Anything with more than 24 magnets is getting complex, and the first-time builder should beware. Similarly, varying the ratio of magnets and coils begs will create a problem, unless you know how to avoid the pitfalls of making single-phase alternators (but you wouldn't be a newbie).



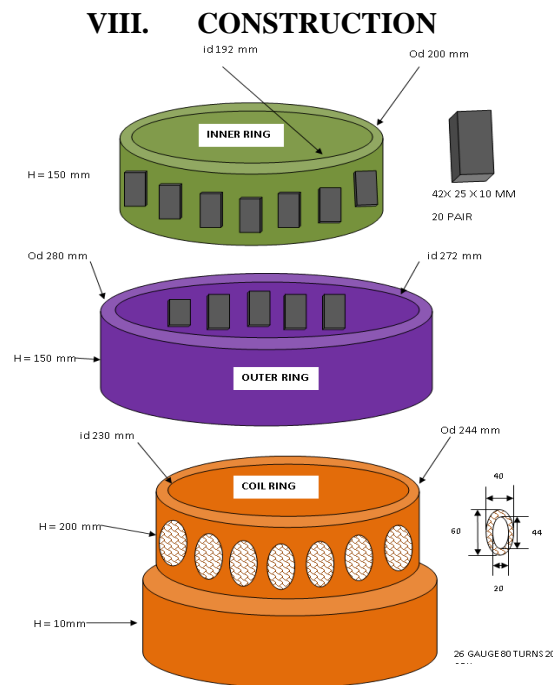
**FIGURE 6: Coil housing**

If regular insulated wire was used to wind coils, a lot of space would be wasted in plastic. A solution was found a long time ago and wire can be bought that is coated in a thin non-conductive insulating material. When coils of enameled wire are wound each loop is isolated from the other, and the maximum compactness occurs. Connecting the coils of wire when used first time creates an important question in the design of the Permanent Magnet Alternator. Single phase alternators are simple to hook up – all coils are wired to each other in series, and they all work together to make one larger pulse at a time. When the coils of wire are cast together into one plate, they are supported as a unit called a "stator" (it remains "static" while the rotor rotation). Usually arrangement of the coils in a star-shaped pattern in a flat mould. Into the mould they pour a polyester or epoxy resin. Then they

close the mould, and when it has cured, the stator comes out as one big disk with the coils enclosed inside. All of the internal electrical connections were made in advance. Either they selected one particular 3-phase connection, or they have enough wires coming out to allow some external connection changes.

#### 7.4 Windings

Recent studies on RFPM machine winding layouts have found the benefit of incorporating concentrated windings in these machines. The main reasons for considering this winding topology is the potential reduction in manufacturing cost, while simultaneously producing the same amount of torque as that of an overlapping winding in three phase. Using concentrated coils allows for a simpler coil construction which could ultimately lead to automated manufacturing of the stator and smaller end-turn lengths of the coils implying less copper being used. Overlapping windings are also very difficult to realize in these machines (three phase) because of their double-sided rotor topology.



#### 8.1 The construction can be explained through the above parts of the generator:

There is an inner and outer rotor between which lies the stator. The stator is moulded and in the mould are affixed coil of the concentrated winding type since the generator will be working in low rpm condition (considering the velocity of the wind), number of poles has to be high. The selection of the poles for this machine is therefore 20 on each rotor

#### 8.2 Generation of EMF in the coil:

The current is induced in the active length of coil by faraday's law of electromagnetic induction. The coil consist of multiple number of turns. Alternate poles N and S are produced along the rotor magnets. When the coil passes through a single set of poles a positive cycle EMF is induced in it and further when it passes through another set of pole a negative cycle is induced in it. Hence, for a completion of one cycle of e EMF, 4 poles are required



### IX. WORKING PRINCIPLE

The inner and the outer rotor are attached to the same shaft. The project will be a hand generator, so a handle will be the prime mover. The prime mover rotates the inner and the outer rotor. Alternating poles in double rows are present on the rotor and the stator is in between the rotor. As a result of the resulting motion between the conductors and the magnetic field an EMF is generated in the winding according to the faraday's laws. The terminals from each coil in the generator can be brought out either to form a series or a parallel connection. Hence the EMF produced by the generator is the resultant of the series or the parallel connection as per the required voltage. The waveform of the flux density is sinusoidal in nature.

### X. CONCLUSION

We have proposed air core generator which is portable and less in weight which serves many advantages in comparison with conventional generator, due to absence of stator the losses related to it is vanished, it also saves the raw material required for stator core thus reducing the cost, natural cooling is achieved due to absence of stator which saves the additional cost required for its cooling system. It also serves good efficiency when low input is provided.

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# Operational Requirements of Robotic Tank with Electric Coilgun

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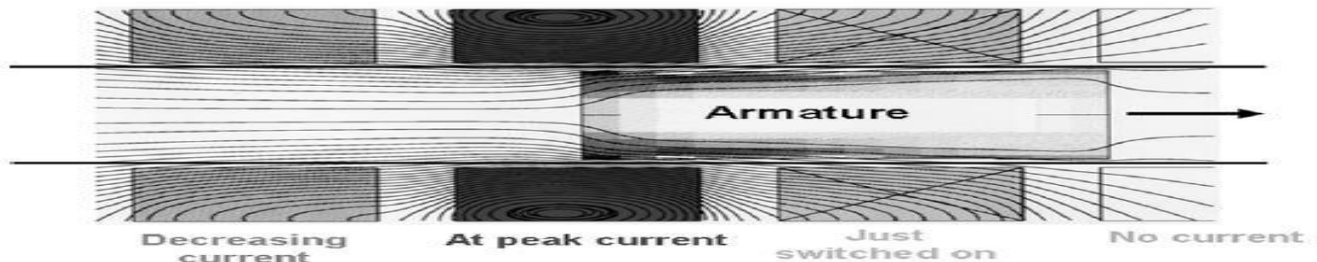
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**Abstract**— this paper presents a robotic tank with electric coilgun operated with IoT. This tank is designed to overcome disadvantages of conventional chemical launch technology such as dynamic properties of propellant gases, storing, and handling and transportation problems of chemicals. This technology provides fuel free launching technology with electromagnetic coilgun. Coilgun consist of electromagnetic coils, switches and capacitors which provides ease in control of muzzle velocity. Simulation with two coilguns was performed to understand the performance of coilgun in aspect of electrical parameters.

**Keywords**— Robotic tank, electric coilgun, IoT, coilgun simulation, fuel free launching technology.

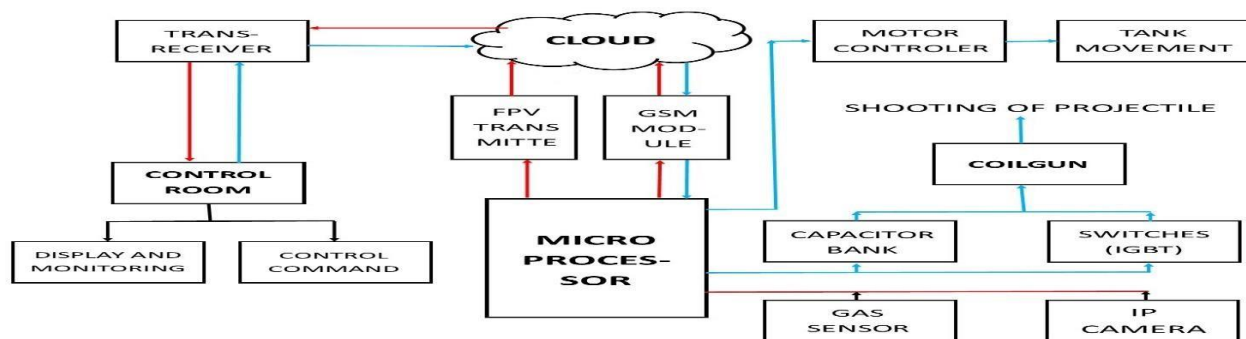
## I. INTRODUCTION

Electric coilgun is made with electromagnets which are operated in series after one by one with the help of fast switching components like IGBT. During the switching process electrical energy is provided to electromagnets from charged capacitor. This energy is then converted into electromagnetic energy and it attracts the ferromagnetic material inside the barrel. Ease in control of muzzle velocity can be obtained with the help of current control. The major challenge in coilgun is to avoid the suckback effect. To avoid this opto-coupler is used to detect the position of projectile and accordingly switching is performed.



**FIGURE 1: Basic operation of electric coilgun**

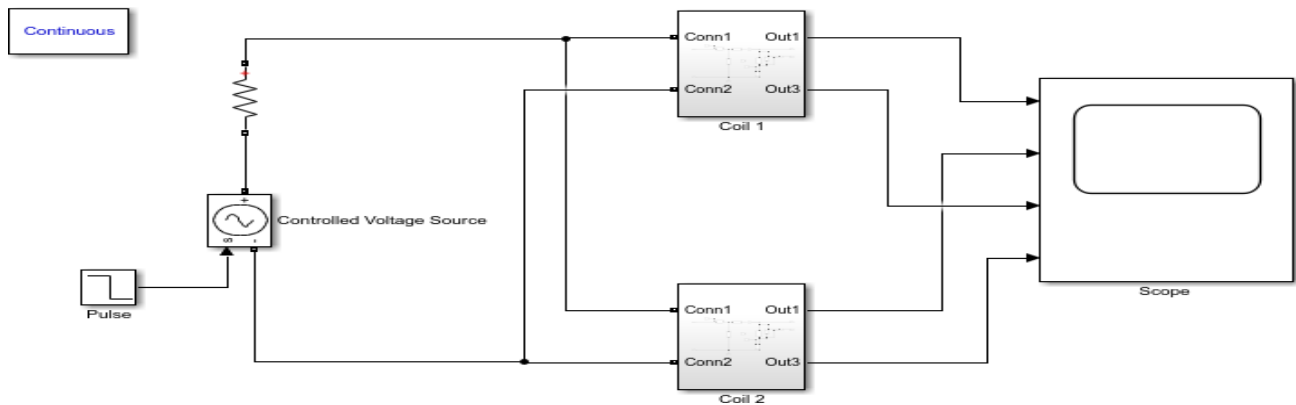
## II. PROPOSED METHODOLOGY



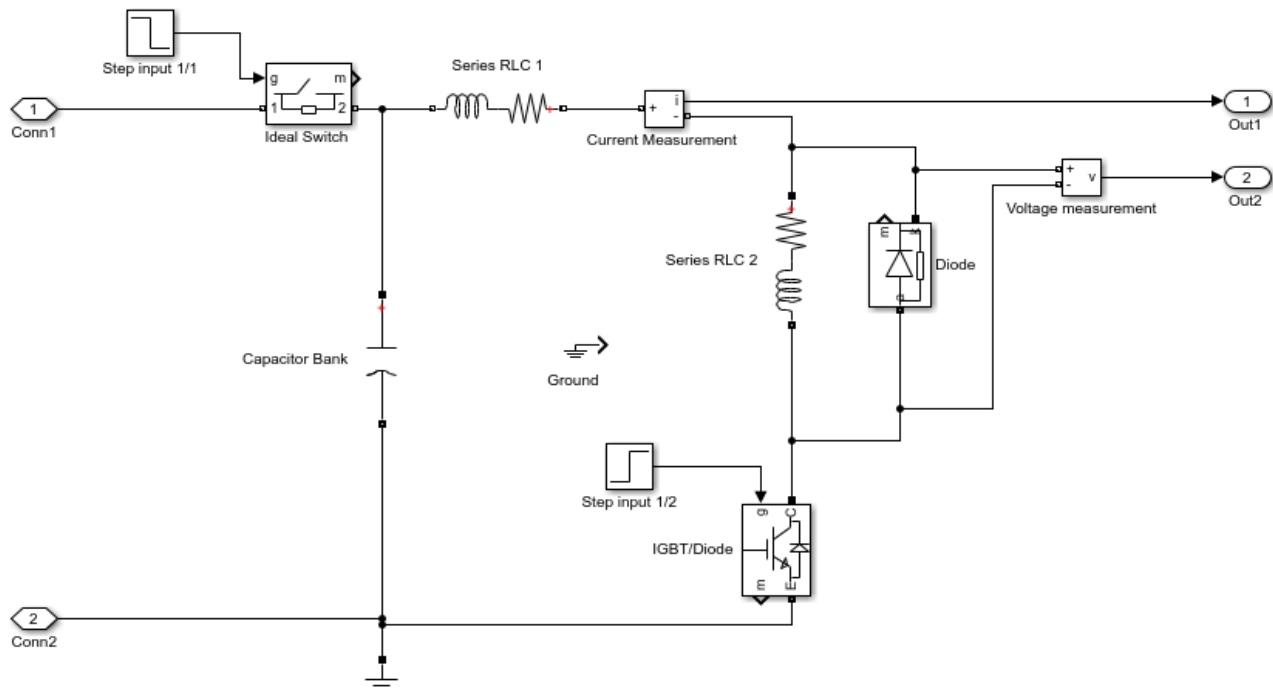
**FIGURE 2: Basic operation of electric coilgun**

Control room is equipped with display and monitoring devices and control commands. Trans-receiver such as WIFI module is used to transmit the command signal. Cloud provides the link between tank and control room with the help of internet. GSM module inside the robotic tank transmits and receives the command. Microprocessor is used to control and process the commands received from the control room. It also controls the forward backward and right, left movement of the tank with motor controllers. Coilgun, capacitors and switches simultaneously performs to shoot the projectile.

### III. COILGUN SIMULATION



**FIGURE 3: Overall Simulation model of electric coilgun**



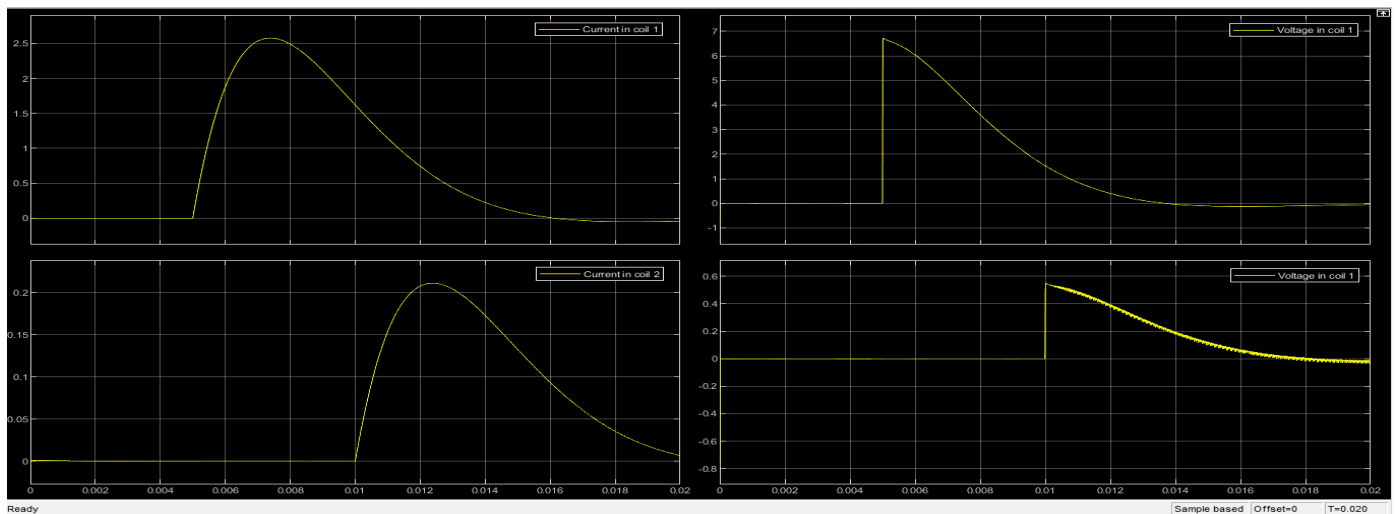
**FIGURE 4: Overall Simulation model of electric coilgun**

#### IV. SIMULATION PARAMETERS

**TABLE 1: SimulationParameters**

Coilgun 1	Coilgun 2	Coilgun 1	Coilgun 2
Capacitor bank: 1 Milli farad	Capacitor bank: 1 milli farad	Series RLC 1:- Resistance:- 1.7 Ohm Inductance:- 2.44 milli Ohm	Series RLC 1:- Resistance:- 1.7 Ohm Inductance:- 2.44 milli Ohm
Step input 1/1:- Step Time:- 0.005 sec Initial value:- 1 Final Value:- 0	Step input 2/1:- Step Time:- 0.01 sec Initial value:- 1 Final Value:- 0	Series RLC 2:- Resistance:- 1.7 Ohm Inductance:- 2.44 milli Ohm	Series RLC 2:- Resistance:- 1.7 Ohm Inductance:- 2.44 milli Ohm
Step input 1/2:- Step Time:- 0.005 sec Initial value:- 0 Final Value:- 1	Step input 2/2:- Step Time:- 0.01 sec Initial value:- 0 Final Value:- 1	IGBT:- Internal resistance (Ron) :- 0.05 ohm Snubber resistance (Rs) :- 0.1 Mega Ohm Snubber Capacitor (Cs) :- inf	IGBT:- Internal resistance (Ron) :- 0.05 Ohm Snubber resistance (Rs) :- 0.1 Mega Ohm Snubber Capacitor (Cs) :- inf
Ideal Switch: Internal resistance (Ron) :- 0.001 Ohm Snubber resistance (Rs) :- 0.1 Mega Ohm Snubber Capacitor (Cs) :- inf	Ideal Switch: Internal resistance (Ron) :- 0.001 Ohm Snubber resistance (Rs) :- 0.1 Mega Ohm Snubber Capacitor (Cs) :- inf	Diode across Coil:- Internal resistance (Ron) :- 0.001 Ohm Snubber resistance (Rs) :- 500 Ohm Snubber Capacitor (Cs) :- 250 nano Farad Forward Voltage:- 0.8	Diode across Coil:- Internal resistance (Ron) :- 0.001 Ohm Snubber resistance (Rs) :- 500 Ohm Snubber Capacitor (Cs) :- 250 nano Farad Forward Voltage:- 0.8

#### V. SIMULATION RESULTS



**FIGURE 5: Simulation results of electric coilgun**

## VI. CONCLUSION

This project demonstrates the basic idea and design of the coilgun. This project presents the best solution with a robotic tank with electric coilgun and IoT. Electric coilgun provides features such as fuel-free launching technology, eco-friendly, ease in control of muzzle velocity through electric current. This coilgun eliminates most of the disadvantages of conventional chemical launching systems such as dynamic properties of propellant gas, hazardous nature of propellant gas, storing, handling and transporting difficulties of propellant gas and also high operational cost. This project gives a detailed idea of a simulation of coilgun and analysis of the simulation result.

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## Comparative study on different types of fuel cell

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**Abstract**— Nowadays, the use of non-conventional sources is increased as compared to the use of conventional sources to generate electricity. The commonly used sources are wind, tidal, solar, biomass energy, etc. But the use of fuel cell can play a vital role in producing electricity. Fuel cell is an electro chemical cell which converts the chemical energy of the fuel combined with an oxidizing agent to form electricity through a pair of redox reactions. This paper shows a comparative study of different types of fuel cell along with its advantages, disadvantages, applications and importance in the industry.

**Keywords**—Solid oxide fuel cells, Alkaline fuel cells, Molten carbonate fuel cells, Phosphoric acid fuel cells, fuel cell.

### I. INTRODUCTION

Fuel cells are classified initially by the type of electrolyte they employ. This given classification determines which type of electro-chemical reactions happen in the cell and the which kind of catalyst is required for the temperature range in which the cell can operate, the fuel required, other factors, etc. This characteristic also affects the applications for which these type of cells are largely suitable. There are several other types of fuel cells which were currently under development, each having its own advantages, disadvantages, and applications.

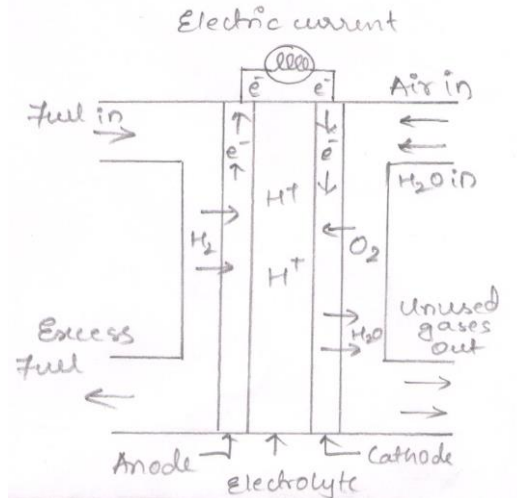


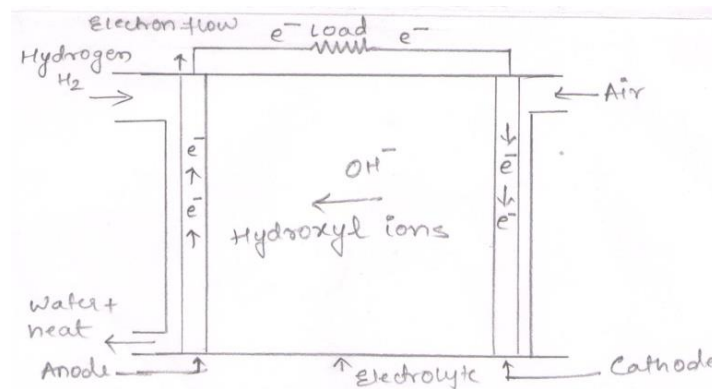
FIGURE 1: Fuel cell

### II. ALKALINE FUEL CELLS

Alkaline fuel cells also called as AFC was one of the very first fuel cell technology developed, and they were the first type which was widely used in U.S. space program to produce source of electrical energy and water on the board spacecraft. These fuel cells were used as a solution to potassium hydroxide in the water as an electrolyte and they can also be used as a variety of common metals and a catalyst at the anode and/or cathode. In recent years, novel AFC were developed as a polymer membrane which acted like an electrolyte. AFC can be closely related to Proton exchange membrane (PEM) fuel cells. The only difference is AFC use alkaline membrane and PEM use acid membrane. AFC has high performance rate as compared to other fuel cells because of

its rate at which the electro-chemical reactions occur in the cell. It can also be demonstrated that AFC have 60% efficiency in space applications.

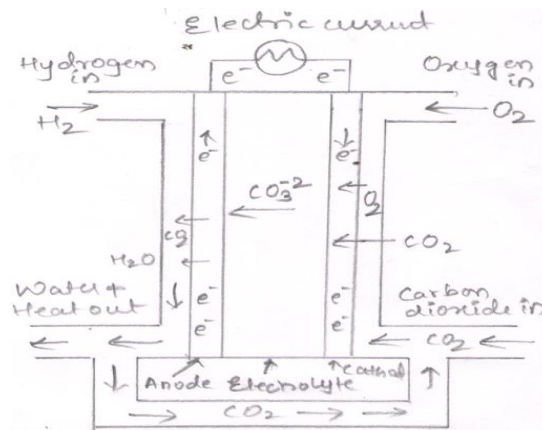
This type of AFC cell face major challenge is viable to poisons gas such as CO<sub>2</sub>. Even a small portion of CO<sub>2</sub> present in the air can majorly affect fuel cell performance and its durability because of the carbonate formation. Alkaline fuel cells with electrolytes in liquid form can be operated in recirculating mode, which allows the electrolyte for regeneration and it helps to reduce the effects from carbonate formation used in the electrolyte, but the recirculation mode also introduces issues with the shunt currents. The electrolyte systems in liquid form also suffer from major additional concerns which include wetness, increased level of corrosion, and difficulties in handling the differential pressures. Alkaline membrane fuel cells (AMFCs) are used to address such type of concerns and they have lower susceptibility to CO<sub>2</sub> emission poisoning than the liquid-electrolyte AFCs. However, CO<sub>2</sub> gas still affects its performance and the durability of AMFCs still lag then that of PEMFCs. AMFCs can be used for the applications in Watt to kilo Watt scale. Various challenges faced by AMFCs are membrane conductivity, tolerance to carbon dioxide, durability, operation in higher temperature, waste water management, power density.



**FIGURE 2: Alkaline fuel cell**

### III. MOLTEN CARBONATE FUEL CELLS

Molten carbonate fuel cells (MCFCs) are currently being under high pressure for natural gas and coal-based power plants for generation of electricity for utility, industrial application etc. MCFCs are operated at very high temperature based fuel cells that are used like an electrolyte composed of molten carbonate and mixture with salt suspended in a porous and chemically inside ceramic lithium aluminum oxide matrix. Because they can be operated at very high temperatures of the range 650°C, non-precious metals that can be used as catalysts at the side of anode and cathode. This also reduces costs.



**FIGURE 3: Molten carbonate fuel cell**

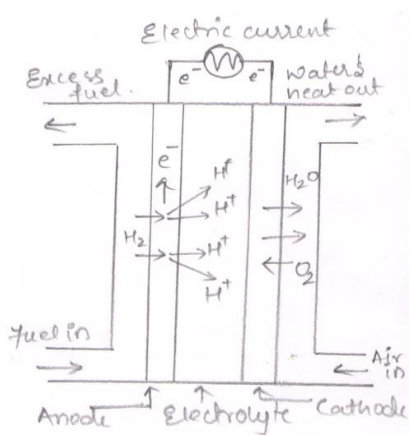


Increased efficiency is one more reason for which the MCFCs offer significant reductions in cost as compared to phosphoric acid fuel cells. Molten carbonate fuel cells (MCFC), when operated with a turbine, it can reach efficiencies approximately upto 65%, considerably greater than phosphoric acid fuel cell plants. When the waste heat is collected and used its overall efficiencies can be increased over 85%. Unlike the AFCs, PAFCs, PEM fuel cells, molten carbonate fuel cells MCFCs do not require any external reformer to convert its fuels such as natural and biogas to hydrogen. At the very high temperatures in which the MCFCs operate, methane and other such light hydrocarbons in such fuels can be converted in to hydrogen within the cell itself by a process called internal reforming. This helps to reduce the cost.

The main disadvantage of current molten carbonate fuel cells technology is its durability. In the high temperatures at which such cells operate and corrosive electrolyte they use accelerate the component breakdown and its corrosion. This results in decrement of cell life.

#### IV. PHOSPHORIC ACID FUEL CELLS

Phosphoric acid fuel cells (PAFCs) are used in liquid form of phosphoric acid which is an electrolyte. This acid is filled in a Teflon coated silicon carbide matrix sheet and porous carbon electrodes contain a platinum catalyst. The PAFC (Phosphoric acid fuel cells) is determined as the very "first generation" of modernize fuel cells. It is said as one of the most mature type of cells and it is considered to be used commercially for first time. This type of fuel cell is basically used for the power generation which is stationary, but some of the PAFCs have also been used to provide power in large vehicles. City buses are one of the best examples where PAFCs are used.



**FIGURE 4: Phosphoric acid fuel cell**

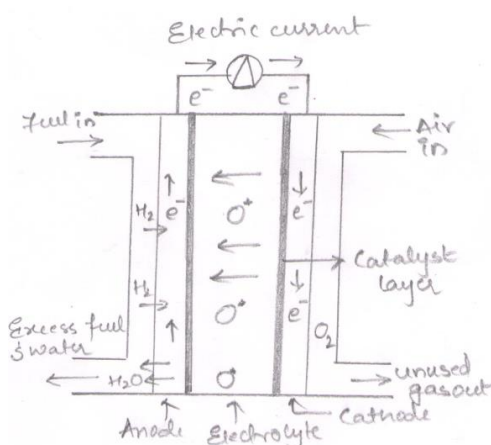
PAFCs have more tolerance to sustain the impurities in fossil fuels that are transformed into hydrogen ( $H_2$ ) from the PEM cells. This hydrogen can be easily poisoned by the use of carbon monoxide as they bind to the platinum which is used as a catalyst at the anode. This decreases the efficiency of fuel cell. The efficiency of PAFCs is approximately 85% when they are co-generated with some other sources for generation of electricity and heat. But, when they are used solemnly then they have the efficiency of around 37-42% only. When we use combustion based power plants, with the use of PAFCs we can increase the efficiency more than 33%. PAFCs are large and heavy because they prove less powerful when prone to same weight and volume as compared to other fuel cells. This makes PAFCs more expensive. The cost increases further when expensive catalyst like platinum is used with higher loading.

#### V. SOLID OXIDE FUEL CELLS

Solid oxide fuel cells (SOFCs) are used in hard form. It is non-porous ceramic compound in nature which is used as the electrolyte. SOFCs have efficiency around 65% when it is used to generate electricity. The applications in which the waste heat is captured and then utilized which is also referred to as co-generation, the efficiency increases up-to 85%. The operating

temperature where SOFCs can operate is as high as 1000°C (1,830°F). when it is operated at high pressure and temperature, the use of catalyst can be boycotted, therefore, the overall cost can be reduced. SOFCs can retain the fuel internally, which allows us to use large variety of fuels. This also helps to reduce the cost as the necessity of another component known as reformer can be eliminated from the system.

SOFCs are said to be most sulfur resistant type of fuel cell which can tolerate several powers of more sulfur as compared to other types of fuel cell. In addition to this, they cannot be poisoned with carbon monoxide which can also be used as a fuel. Other sources like natural gas, biogas, and gases made from coal can be used with SOFCs due to the above mentioned property. The disadvantages of operation in high temperature is that it results in low startup. It also requires large thermal shielding to retain its heat which can also be used for utility applications but it cannot be use for transportation. SOFCs have to be more durable when they are working under high temperature conditions. In matter of cost, low cost materials having high durability is the major challenge.



**FIGURE 5: Solid oxide fuel cell**

## VI. TABLE 1

### COMPARATIVE STUDY

Parameter	Alkaline fuel cells	Molten carbonate fuel cells	Phosphoric acid fuel cells	Solid oxide fuel cells
Electrolyte	KOH, NaOH + water	High temperature carbonate like sodium / magnesium	Phosphoric Acid	Hard ceramic compound like calcium oxide
Efficiency	70%	60 – 80%	40 – 80%	60 %
Operating temperature	150-200 C	650 C	150-200 C	1000 – 1800 C
Cell output	300 W to 5 KW	2 MW	200 KW – 11 MW	100 KW
Catalyst	Potassium	Nickel	Potassium	Pure hydrogen

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## VII. CONCLUSION

From the above papers, it can be concluded that alkaline fuel cells are majorly used due to its efficient properties. Also, the other fuel cells which are discussed above can be used in the absence of alkaline fuel cell due to its distinct properties. The advancement in the field of fuel cells can be proved very beneficial in the world of science as it can be completely replaced by the ever-growing demand of non-renewable energy sources. Fuel cells are much more compatible than the other renewable energy sources.

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# Fully Automated System for Monitoring & Controlling Water Usages using IoT

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**Abstract**— In India, this unexpected shortage of water supply has become a common phenomenon in summer. The situation is worsened as there is no fixed time allotted for releasing the water from Municipality Water Tank. Apparently, there is no early warning system to monitor the water level of tanks of housing societies. The situation gets worse when there is no person in charge to do the maintenance of the tank at the time when it is needed. Wastage of water is mainly due to the overflowing of tanks. Conventional tanks can neither monitor nor control the water level in the tank, leading to a large amount of wastage. The need for removal of these short-coming and providing an efficient and economical solution has been the main aim of this project.

**Keywords**— ESP8266 Wi-F Module, Arduino, Android, Solenoid Valve, Ultrasonic Sensor, Motor Pump.

## I. INTRODUCTION

The process of monitoring and controlling the water tank uses the manual system yet. The very large amount of water is wasted every day for using manual processes around the world, the majority of the water wastage takes place because of the overflowing water tank. In the absence of a person, water keeps on overflowing until the valve or motor is switched off. Mankind has always facing the issues of water scarcity and water wastage. We have worked on System for Monitoring & Controlling Water Usage using IoT. This system will help address the issue of water scarcity and water management in the large township and also in small housing societies, which will help conserve water and keep a track of water and inform the residents in a situation.

## II. LITERATURE REVIEW

The Literature review contains a brief discussion of some recent works of automation system for monitoring & controlling water usage using IoT.

Design of water tank, monitoring system based on mobile device is presented. With the (IRMA) Interface for Monitoring Water tanks system the user can control and monitor the watering facilities online, via any mobile device, either connected to a wireless network or the GSM network.

[I]The ultrasonic sensor will identify the water level present in the tank. This system helps to conserve water and keep track of water usage. It assists the users to check the water level in the water tank. Using the solenoid valve can avoid the wastage of water by cutting off the water supply. The project works automatically and hence reduces human effort.

[II]The concept of the internet of things (IoT) is used to continuously monitor and track water usage via the wireless sensor nodes. Server collects the data through Wi-Fi to process and track usage and wastage of water at every outlet. When water is used at the excess level it gives an alarm and an alert is sent to the user. The user can keep a track of the water usage or wastage through mobile with an internet connection.

[III] The paper proposes a water level monitoring as well as controlling by using IoT and Android application. Using IoT, with which, the user can directly monitor and control the working of the tank through the Smartphone and from any place in the world. This system helps the users to check the water level of the tank and turn the pump ON and OFF from remotely using the android application. Hence reduces human effort.

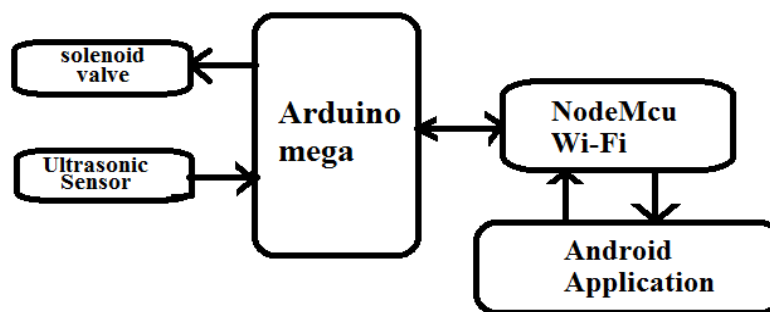
A basic model of the android application is proposed in paper [IV] which states that water pumps can be switched ON and OFF with the assistance of radio transmitters and a Wi-Fi router. The wastage of water and wastage of electricity can be avoided by this system. User can check the water level of the tank and turn the pump ON and OFF from remotely using the android application

Paper [V] propose Water Management System (WMS) is an automated system for water to make daily life easy and comfortable through the use of mobile application. WMS is providing a system that can observe the water tank and take action if the water surface is high or low, it can automatically turn ON/OFF motor and also if any user wants to change water temperature then user can also do it. By using mobile messaging users get a notification before cut off his/her line and also show how much water he/she already used.

### III. SYSTEM ARCHITECTURE AND DESIGN

To overcome the issue of water wastage and water scarcity, we have researched the following architecture for Water Monitoring and Controlling using IoT. The system will comprise two parts the Hardware Part and the Software Part.

The Hardware and Software part will include all the sensors. The software part will include all the API's (Application Programming Interface) and the protocol necessary for communication of different hardware components. The software part also includes Android for User-Interface and communication.



**FIGURE 1: Block diagram**

The Architecture consist of following hardware components.

#### 3.1 Arduino Mega:

The Mega 2560 is a microcontroller based on the ATmega 2560. It has 54 digital I/O pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator. It is a open source hardware platform which is able to work with various sensors and communication technology.

### 3.2 Nodemcu ESP8266 Wi-Fi:

NodeMCU is an open-source progress board and firmware based in the widely used ESP8266 -12E Wi-Fi module. It allows you to program the ESP8266 Wi-Fi module with the Arduino IDE.

With just a few lines of code, we can establish a Wi-Fi connection and define I/O pins according to your needs exactly like Arduino, turning your ESP8266 into a web server and a lot more.

### 3.3 Ultrasonic Sensor:

The ultrasonic sensor is used to generate ultrasonic sound waves that are bombarded on the surface of the water. Ultrasonic sensor operate by generating a high-frequency pulse of sound and then receiving and evaluating the properties of the echo pulse. It is used to detect the water level present in the tank.

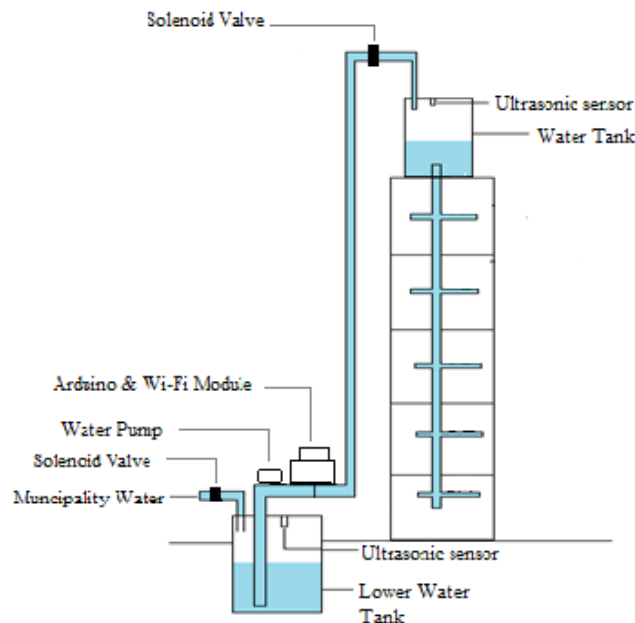
### 3.4 Solenoid Valve:

A solenoid valve is an electromechanically operated valve. Solenoid valves are the most frequently used to control the flow of water. Their tasks are to shut off, and release water.

### 3.5 Android Application:

The working of these hardware components of the system in coordination with Android application is as described as follows: Ultrasonic Sensor will identify the water level present in the tank. This data then will be sent to Arduino. After the data collected on the Arduino board will be sent to Cloud by Wireless Module using PHP files for analysis and calculation of the data.

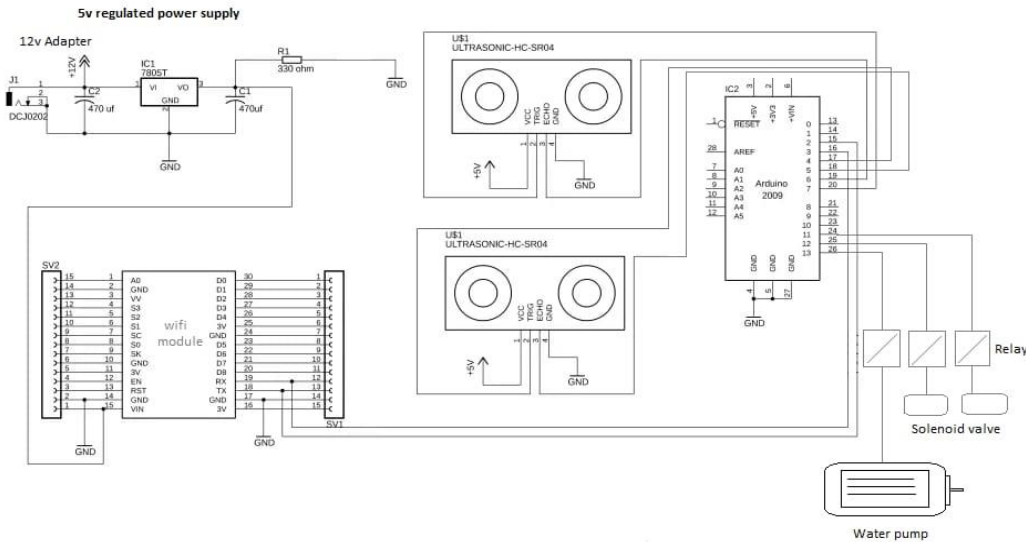
The data analyzed on Cloud is given to users depending upon the queries which will be given by users with the help of the android app interfaced with the help of Wi-Fi module. Regular updates of the water tank will be given to the members on their registered cellphones with the help of Wi-Fi module. Solenoid Valve will be used for closing the water supply. The water flow can be cut-off with the help of Solenoid Valve.



**FIGURE 2: System design**



## IV. DESCRIPTION



**FIGURE 3 : Circuit diagram**

The trigger pin of the ultrasonic sensor is connected with Arduino PIN 7. While the echo pin of the Ultrasonic sensor is connected with PIN 6 of the Arduino. The Vcc and Gnd pins of the ultrasonic sensor are connected with the Arduino's 5v and ground pins. The circuit in the left corner is the 5v regulated power supply based on the Im7805 voltage regulator. This 5v power supply will be used to power up the Nodemcu esp8266 wifi module. J1 is the DC female power jack where we can connect a 12v adaptor or battery. A wire from the output of the voltage regulator is connected with the pin of the NodeMcu module. The Tx and Rx pin's of the Nodemcu are connected with pin 2 and 3 of the Arduino. So the Nodemcu will communicate serially with the Arduino through pin 2 and 3. Pin 2 is the Rx and pin 3 is Tx. A 12v SPDT type relay is used to control the water pump

### ADVANTAGES

1. Reduces Human Effort
2. Easily Monitored and Control
3. Saves wastage of water
4. Saves the time
5. The system can work without any personnel in charge for maintenance of water tank.
6. We can monitor and control the system from anywhere

### DISADVANTAGES

1. System requires Internet
2. To monitor and control the system we require android app

### APPLICATIONS

This project has enormous applications. It can be installed in the following areas:

1. Private houses or Bungalows
2. Housing societies
3. Apartments
4. Institutions like school and colleges, hostels

- 
5. Hospitals
  6. Offices
  7. Municipal overhead Tank

## V. CONCLUSION

Water is the most important basic needs of all living beings. But unfortunately, a huge amount of water is being wasted because of the uncontrolled use and exploitation of water resources. We try to overcome these problems and implemented an efficient automated water level monitoring and controlling system. Our objective of this research was to develop flexible, economical, easily configurable and most importantly, a compact system that can solve our water wastage problem. This system helps to monitor and control the usage of water and people can use water in an efficient way. Water wastage can be avoided using the Android app by cutting off the water supply using the solenoid valve. This automation helps to reduce human efforts and helps to manage water carefully and will also reduce the problem of water scarcity.

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# **SPEED CONTROL OF INDUCTION MOTOR USING UNIVERSAL CONTROLLER**

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**Abstract**— When connected to main power supply, Induction motors run at their rated speed, however there are many applications where variable speed operations are required. This paper presents the development of an efficient and versatile universal board which is used to control the speed of single-phase or three-phase machines with minor modifications in software and hardware. Although a range of induction motor control techniques are available, generating variable frequency supply is a popular control technique having a constant voltage to frequency ratio in order to attain constant (maximum) torque throughout the operating period. This control technique is called variable frequency control. The complete system consists of an AC voltage input that is put through a rectifier to produce a DC output which is across a shunt capacitor, this will in turn feed the PWM inverter. The PWM inverter is controlled to produce desired sinusoidally voltage at a particular frequency and then through the induction motor.

**Keywords**— Induction Motor; Microcontroller; Pulse Width Modulation; Inverter; Speed Control.

## **I. INTRODUCTION**

The synchronous speed of the stator revolving flux (Ns) is given by -

$$N_s = \frac{120f}{p}$$

Where, the supply frequency in Hz is f and the number of poles is p. As the number of poles is fixed varying the supply frequency would result in variation in the speed of induction motor. Variation of voltage should be in proportion to frequency so that the torque developed is constant over the speed range. This in particular what variable frequency (V/f) control attempts to accomplish. For speed control of an electric machine, the AC machine is equipped with an adjustable frequency drive. The speed of the electric machine is controlled by converting the fixed voltage and frequency of the grid to adjustable values on the machine side. This paper interests in three-phase inverter circuit that changes DC input voltage to a three-phase variable frequency variable voltage output. Three-phase inverters are also used in applications in which AC with a controllable frequency is required. In this application, single-phase AC is rectified into DC and then filtered to minimise the ripple content generally, the DC link is used for this purpose. This DC is converted into controlled pulses by means of a voltage to frequency converter. These controlled pulses are fed to the inverter bridge for producing variable voltage variable frequency output. For controlling its speed this output is fed to the three phase induction motor.

## II. LITERATURE REVIEW

The literature search was mainly focused on topics related to the speed control of induction motor. The review of publications and research work revealed the basic guidelines and area of work need to be conducted on an induction motor, where a positive result is expected. New technological development efficiency of the electronic switches is increasing every day and it is becoming cheap also for use in regular day to day use. The system was designed and implemented with the following goals to be completely different from traditional speed control methods of induction motor.

[I]K.Sandeep Kumar et.al:-

In this paper, recent advances in semi-conductor technology and implementation of microcontroller for speed control of induction motor are summarized in detail. The had addressed the variable speed drives of induction motor for constant maximum using V/f method. The proposed system in this paper is designed with closed loop where the actual speed of motor is compared with reference speed and the difference the speed is adjusted by changing firing angles of switching devices and thereby variable speeds.

[II] Puja Talukder et.al:-

This research interests in three-phase inverter circuit that changes DC input voltage to a phase variable-frequency variable-voltage output. Three-phase inverters also used in applications in which AC with a controllable frequency is required. In this application, three phase AC is rectified into DC and then filtered to minimize the ripple content. Thus a variable DC is obtained by employing three phase full controlled power transistors bridge. This controlled DC is converted into controlled pulses by means of voltage to frequency converter. These controlled pulses are fed to the inverter bridge for producing the variable voltage variable frequency output. This output is fed to the three phase induction motor for controlling its speed.

[III] Sachin Hegde et.al:-

In this paper a new speed control approach for ac motor drives that use programmed switching patterns over the complete range of output speed is presented. The propose Provides smooth operation during the require switching pattern changing transitions high quality output voltage and current in the ac motor load and is therefore most suitable for high performance, high efficiency applications.

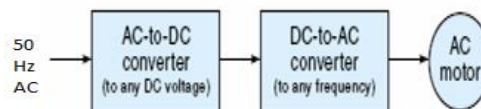
[IV] Thida Win et.al:-

In this research paper drive schemes of three phase induction motor, principle of operations of components used in constructing variable speed drive and design calculation to construct this drive are included.

## III. METHODOLOGY

### 3.1 Variable frequency AC motor drive

The traditional variable-frequency drive changes the motor's frequency and voltage using solid-state control units.



**FIGURE 1: A block diagram of a variable-speed-control system.**

The basic steps for this process are shown in the block diagram of fig.1. The first step is to convert 50 Hz AC into DC power. The second step is to convert this DC power back into AC at the desired frequency.

### 3.2 Transistor based variable-frequency Induction motor drive

The modern strategy for controlling the AC output of such a power electronic converter is the technique known as Pulse Width Modulation (PWM), which varies the duty cycle of the converter switches at a high frequency to achieve a target average low frequency output voltage or current. All modulation schemes aim to create trains of switched pulses, which have the same fundamental volt-second average as a target reference waveform at any instant. The major difficulty with these trains of switched pulses is that they also contain unwanted harmonic components, which should be minimised

### 3.3 Variable frequency control of induction motor (V/f method)

The synchronous speed of an induction motor is given by,

$$N_s = \frac{120f}{p}$$

Where, f =supply frequency

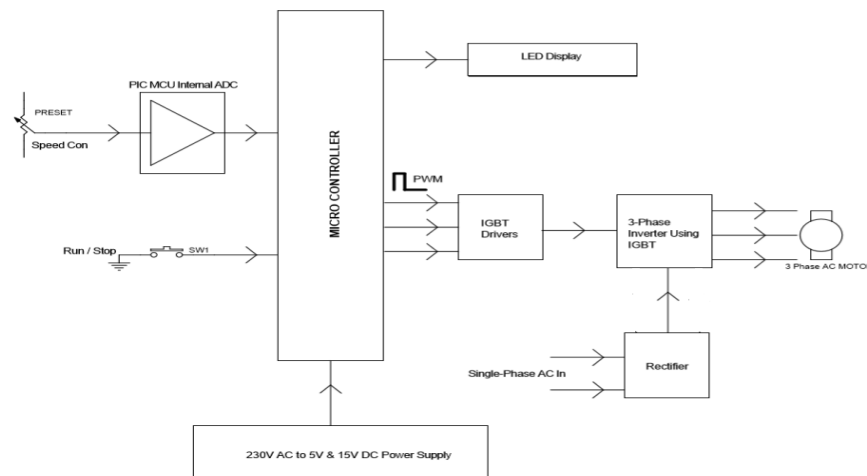
P=number of poles.

Synchronous speed is directly proportional to the supply frequency. Hence, by changing the frequency, the synchronous speed and motor speed can be controlled below and above the normal full-load speed. The voltage induced in the stator is proportional to the product of the slip frequency and air gap flux. The motor terminal voltage can be considered proportional to the product of frequency and flux, if the stator drop is neglected. Any reduction in the supply frequency without a change in the terminal voltage causes an increase in the air-gap flux. Induction motors are designed to operate at the knee point of the magnetisation characteristics to make full use of the magnetic material. Therefore, an increase in flux will saturate the motor. This will increase the magnetising current, distort the line current and voltage, increase the core loss and the stator copper loss, and produce a high pitch acoustic noise. While any increase in flux beyond the rated value is undesirable from the consideration of saturation effects, a decrease in flux is also avoided to retain the torque capability of the motor. Therefore, the variable frequency control below the rated frequency is generally carried out by reducing the machine phase voltage along with the frequency in such a manner that flux is maintained constant.

## IV. IMPLEMENTATION

### 4.1 Block Diagram

The complete block diagram of speed control of three-phase induction motor is as shown in figure 2.



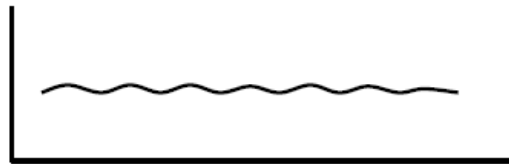
**FIGURE 2: Complete block diagram of drive.**

The hardware control system includes squirrel cage induction motor, controlled rectifier, bridge inverter, microcontroller and switches for user interface.

#### 4.2 Controlled rectifier unit

The rectifier unit converts AC signal into DC output, which is adjusted by the delay time of the gate firing pulse to each thyristor from the instant it would have turn ON. In other words adjusting the gate firing pulse with respect to reference instant.

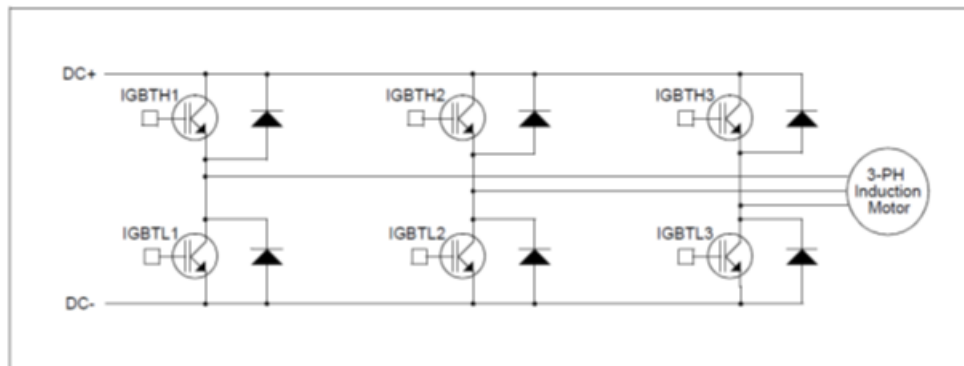
The figure 3 shows DC output of the rectifier, it serves to input of bridge inverter, an intermediate filter circuit will be desirable to minimize the ripples in the voltage.



**FIGURE 3: DC output of rectifier**

#### 4.3 Motor Drive

The 3-phase induction motor is connected to a 3-phase inverter bridge as shown in Figure 4. The power inverter has 6 switches that are controlled in order to generate 3-phase AC output from the DC bus. PWM signals, generated from the microcontroller, control these 6 switches. Switches IGBTH1 through IGBTH3, which are connected to DC+, are called upper switches. Switches IGBTL1 through IGBTL3, connected to DC-, are called lower switches. The amplitude of phase voltage is determined by the duty cycle of the PWM signals. While the motor is running, three out of six switches will be on at any given time; either one upper and two lower switches or one lower and two upper switches. The switching produces a rectangular shaped output waveform that is rich in harmonics. The inductive nature of the motor's stator windings filters this supplied current to produce a 3-phase sine wave with negligible harmonics. When switches are turned off, the inductive nature of the windings oppose any sudden change in direction of flow of the current until all of the energy stored in the windings is dissipated. To facilitate this, fast recovery diodes are provided across each switch. These diodes are known as freewheeling diodes. To prevent the DC bus supply from being shorted, the upper and lower switches of the same half bridge should not be switched on at the same time. A dead time is given between switching off one switch and switching on the other. This ensures that both switches are not conductive at the same time as each one changes states.



**FIGURE 3: Three phase Inverter Circuit**



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#### 4.4 Pulse Width Modulation

Pulse-width modulation is a digital technique for varying the amount of power delivered to an electronic component. By adjusting the amount of power delivered to a motor or LED, the speed or brightness (respectively) can be controlled. The simplest and most flexible PWM is generated by a microcontroller.

Pulse-width modulation (PWM), or pulse-duration modulation (PDM), is a commonly used technique for controlling power to inertial electrical devices, made practical by modern electronic power switches.

The average value of voltage (and current) fed to the load is controlled by turning the switch between supply and load on and off at a fast pace. The longer the switch is on compared to the off periods, the higher the power supplied to the load is.

The PWM switching frequency has to be much faster than what would affect the load, which is to say the device that uses the power. Typically switching have to be done several times a minute in an electric stove, 120 Hz in a lamp dimmer, from few kilohertz (kHz) to tens of kHz for a motor drive and well into the tens or hundreds of kHz in audio amplifiers and computer power supplies.

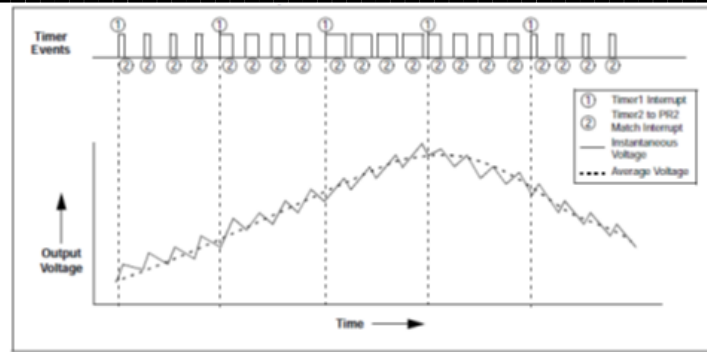
The term duty cycle describes the proportion of 'on' time to the regular interval or 'period' of time; a low duty cycle corresponds to low power, because the power is off for most of the time. Duty cycle is expressed in percent, 100% being fully on.

The main advantage of PWM is that power loss in the switching devices is very low. When a switch is off there is practically no current, and when it is on, there is almost no voltage drop across the switch. Power loss, being the product of voltage and current, is thus in both cases close to zero. PWM also works well with digital controls, which, because of their on/off nature, can easily set the needed duty cycle. PWM has also been used in certain communication systems where its duty cycle has been used to convey information over a communications channel.

#### 4.5 Microcontroller

PIC (Peripheral interface controller) is the IC while was enveloped to control the peripheral device, dispersing the function of the main CPU. PIC has the calculation function and the memory like the CPU and is controlled by the software. However the throughput, the memory capacity isn't big. It depends on kind of PIC but the maximum operation clock frequency is about 20MHZ and the memory capacity to write the program is about 1K to 4K words. The clock frequency is related with the speed to read the program and to execute the instruction. Only at the clock frequency, the throughput cannot be judged. It changes with the architecture in the processing parts for same architecture; the one with the higher clock frequency is higher about the throughput. The point, which the PIC convenient for is that the calculation part, the memory, the input/output part and so on, are incorporated into one piece of the IC. The efficiency, the function is limited but can compose the control unit only by the PIC even if it doesn't combine the various IC's so, the circuit can be compactly made.

A potentiometer connected to a 10-bit ADC channel (AN1) determines the motor frequency. The microcontroller uses the ADC results to calculate the PWM duty cycle and thus, the frequency and the amplitude of the supply to the motor. For smooth frequency transitions, the channel AN1 is converted at every 4 ms. The Timer1 reload value is based on the ADC result (AN1), the main clock frequency (FOSC) and the number of sine table entries (36 in the present application). After every Timer1 overflow, the value pointed to by the offset register on the sine table is read. The value read from the sine table is scaled based on the motor frequency input. The sine table value is multiplied with the frequency input to find the PWM duty cycle and is loaded to the corresponding PWM duty cycle register. Subsequently, the offset registers are updated for next access. If the motor direction key is pressed, then PWM1 ~ PWM6 duty cycle values are loaded to PWM1 ~ PWM6 duty cycle registers, respectively. The new PWM duty cycle values will take effect at the next Timer2 overflow. Also, the duty cycle will remain the same until the next Timer1 overflow occurs, as shown in Figure 5. The frequency of the new PWM duty cycle update determines the motor frequency, while the value loaded in the duty cycle register determines the amplitude of the motor supply.



**FIGURE 5: Timer events and Output Voltage**

## V. CONCLUSION

To control the speed of a three phase induction motor in open loop, supply voltage and frequency need to be varied with constant ratio to each other. The method used to control the inverter switches is sinusoidal pulse width modulation (SPWM). The control circuit using microcontroller is developed, therefore the inverter control circuit hardware is reduced modulation ratio, the frequency modulation ratio, dead time period and duty cycle can be easily change through programming without further hardware changes.

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## Control System for Solar-Plus-Battery Microgrid

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**Abstract**— With the linking of renewable PV in the critical facility, it is essential to develop a suitable MG control system offering a completely autonomous and self-sustained MG system. This paper presents an MG solution aiming to develop an MG control system battery-based (Solar with Storage) MG to support any critical facility with increasing penetration of PV. Excess electricity generated from the PV can be stored in a battery to be used later, and if required electricity must be taken from the Grid if the PV generation and battery are unable to meet the demand. A microgrid control system is required to monitor efficiently and optimally operate a microgrid with Distributed Energy Resources (DER) and storage devices. This control system should furnish several functions to be able to reliably and optimally manage the microgrid.

**Keywords**— Critical facility, Distributed Energy Resources (DER), grid, microgrid, microgrid control system, photovoltaic (PV).

### I. INTRODUCTION

A microgrid is essentially a collection of loads, Distributed Energy Resources and potential energy storage devices connected to form a relatively small size distribution network. An MG can be defined as an aggregation of DER and controllable loads with the ability to:

- Operate connected to the utility grid.
- Operate isolated.
- Provide a smooth transition between both operation modes.

According to the vision of the Department of Energy (DOE) the future electric power infrastructure, a microgrid is identified as one of the three major technical cornerstones for a more reliable and congestion-free energy delivery system. While microgrid would typically operate connected to the grid, they would have the ability to disconnect from the grid and function in "island mode" when necessary. This would increase customer reliability by reducing their liability to grid disturbances while offering desirable security features. Though, MG technology enabling to support critical facilities for instance hospital, police and fire department, etc., is overlooked because an uninterruptible power supply (UPS) unit or standalone generator is always used as a backup supply and there is no real operation and management for this critical facility.

While operating at connected mode, MG can work exporting or consuming power from the utility grid. These variations occur when MG generation is greater than its loads (exporting power) and when MG loads are greater than its generation (consuming). Operating at island mode, MG must be self-sufficient in terms of generation. In this mode, there is a need for the MG control to maintain frequency and voltage level inside an acceptable threshold. The exporting of power will be kept as a future scope and will be added as required.

All the microgrid assets are equipped with the local controllers which can take decisions according to the set parameters within it and take suitable action.

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## II. LITERATURE REVIEW

A literature review focused mainly on topics related to the solar-based microgrid, maximum power point tracking, partial shading condition, a function of the controller.

Jing Wang et.al proposed that the MG is a single distribution feeder that can be operated in an islanded mode when required by the utility grid or in a serious situation such as unacceptable voltage, frequency and power quality, etc. at the Point of Common Connection. In islanded mode, load shedding is very necessary for this small MG as the generation cannot cover all the loads. [I].Zadeh et.al reviewed that the recent DERs are normally equipped with advanced control and communication systems and they can communicate directly with the supervisory controller to receive new commands and control to the DER to achieve the new set-points

[II].Bruno A et.al reviewed that the MG connection point with the utility distribution grid is made through a medium voltage recloser with microprocessor control. This unit is responsible for detecting outages in the utility distribution grid. It also contains the logic that allows MG transit between its operation modes

[III].Achim Woyte et.al proposed that the PV system is simulated as a generic crystalline silicon PV array connected to an inverter with an ideal maximum power point (MPP) tracker. The PV array is represented by a simplified model for its efficiency at MPP as a function of solar irradiance and PV cell temperature. When the available PV power is higher than the inverter's dc rating, the inverter must limit the power to prevent overload

[IV].Ghasemi et.al reviewed that a condition in which the entire modules of an array do not receive the same solar irradiance is called partial shading condition (PSC). PSCs are inevitable especially in solar systems installed in urban areas and in areas where low moving clouds are common.

## III. SYSTEM DESCRIPTION

### 3.1 SOLAR PANEL

PV systems generate electrical energy from sunlight during the day. This energy goes into a grid connected inverter which converts the DC into AC, like that of the grid. This solar electric current can then power all the appliances. Power comes directly from the solar inverter and leftover electricity can then feedback into the grid. If we need more power than our grid-connected solar system produces, that power will simply come from the main distribution grid. On the other hand, if we produce more energy than what you use, then we can store into BESS.

### 3.2 Solar Meter

A solar meter is used to measure KWh production from a PV system. This system will help to give information about whether the panels are generating to their max or so.

### 3.3 Solar Inverter

A solar inverter converts the variable direct current (DC) output of a photovoltaic panel into a utility frequency alternating current (AC) that can be fed into a commercial power grid or used by a local, off-grid electrical network. For using solar inverter with photovoltaic arrays it has adapted a special function such as, maximum power point tracking (MPPT) and anti-islanding protection.

### 3.4 Controller

The controller is the heart of the system which will monitor the entire system with accordance to the usage of the system and also switching purposes, the controller will make appropriate system changes like connecting and disconnecting the grid while excess or low power, the controller will also look after the types of load like differentiating resistive and inductive loads and send accurate power and change appropriate current/voltages.

### 3.5 Battery Energy Storage System

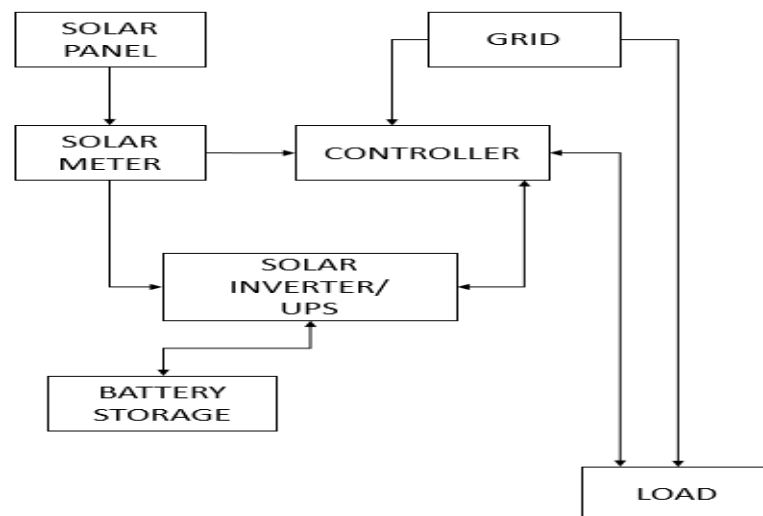
BESS makes it possible for the MG to work isolated from the utility grid. This is the only source that can provide a controllable voltage level for the MG during islanded operation. It is a promising versatile technology to provide electric-grid challenges. Advanced energy storage systems enable users to store excess energy to be later used. Depending upon the facility the BESS can be used adjusted or removed accordingly.

## IV. OPERATION

MG is connected to the utility grid or isolated, operating on islanded mode. With such an ability to operate in different modes, MG can work with different power sources and different loads, which allows a drastic topology change.

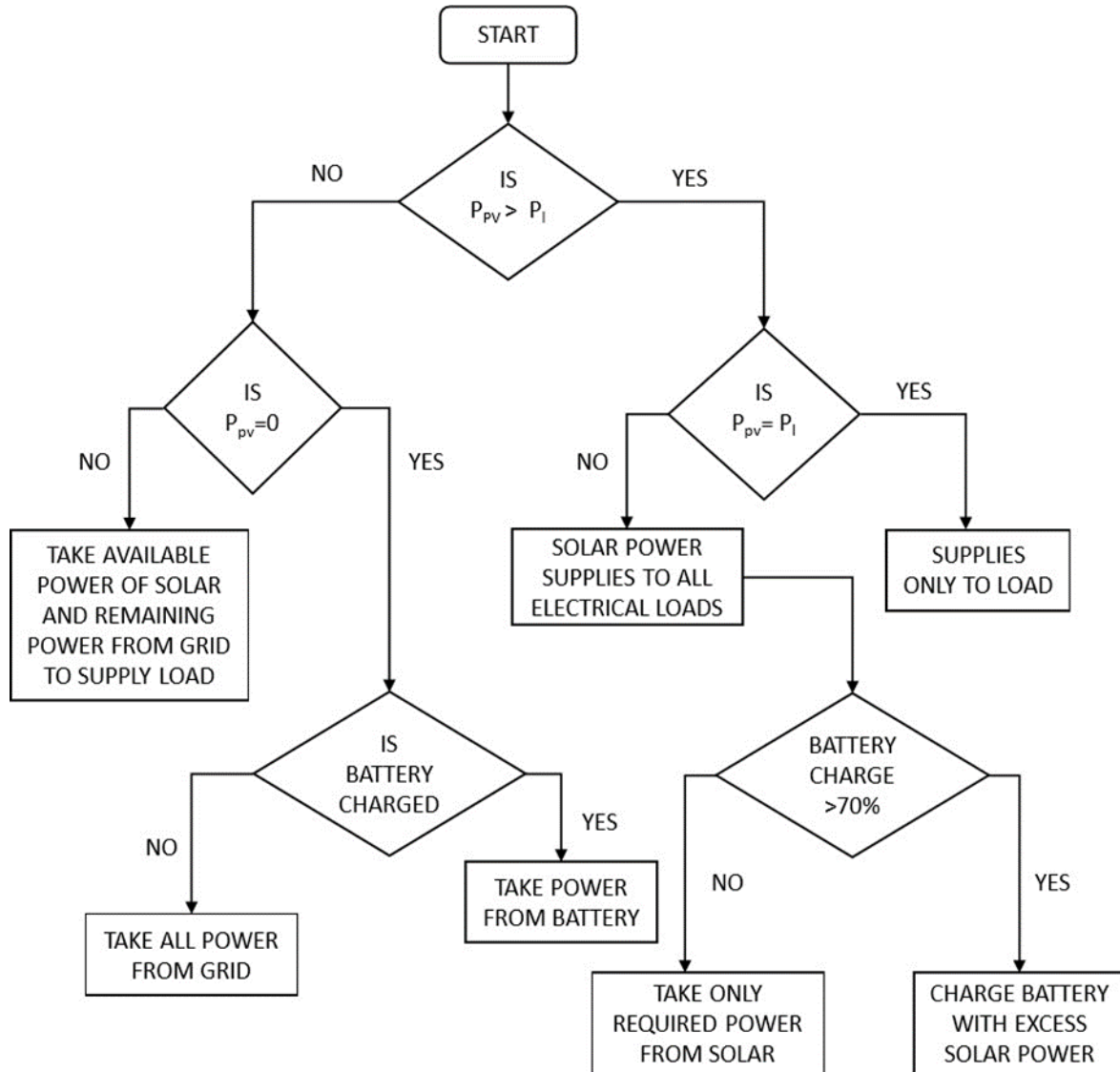
It will be operating in two modes:

1. Connected: While connected to the grid it will operate in two ways.
  - If MG generation is less than its load requirement in this scenario the required amount of power will be taken from the grid and will be added to the MG generation. E.g. If load requirement is 100Kw and PV generation is 80Kw then the remaining 20Kw will be taken from the grid to fulfill the load. The advantage of this system is the system will self-adjust with according to its need via the controller.
  - During monsoon, when there is no availability of sunlight the Solar will not be able to generate and charge the battery, so in this case, the controller will shift the entire load-bearing to the grid and maintain continuity in the supply.
2. Islanded Mode:
  - Islanding is the condition in which a Distributed Energy Resources continues to power a load even though electrical grid is no longer present. Island mode operation relates to power plants that operate in isolation from the electrical grid.
  - In this mode, the system will supply power as well as charge the BESS during daytime and during night-time the BESS will supply the power to the system and keep the power in continuity.



**FIGURE 1: Block diagram of control system for solar-plus battery microgrid**

## V. CONTROLLER ALGORITHM



**FIGURE 2: Controller algorithm of control system for solar-plus battery microgrid**

## VI. CONCLUSION

In this paper, a solution aiming towards the development of an MG Solar-Battery system which helps in giving continuous power supply. Increased focus in such cases will be on the management of the system and accurate management of loads to sustain the load and keep the continuity of the system. The system will often work under islanding and also look after the protection of the system simultaneously.



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# Design and Implementing of Roof Ventilator in Small Scale Industry for Future Prospective

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**Abstract**— This paper gives an idea about a futuristic method for producing electricity with the help of Renewable energy driven by wind. The Rooftop Ventilator works on the simple principle of wind-assisted rotation and stack effect. Several electrically active material is assigned on the turbine ventilator under the wind speed in the surrounding are ultimately assesses the efficiency of wind harvest. This concept resembles with DC generator. This paper prominence on the materials and the construction methodology for developing the Rooftop power generating system. Thus, a roof ventilator reduces air- conditioning energy use and increases the occupant comfort level. It can become a grand success for any industry/factory for using an electricity saver item.

**Keywords**—(Rooftop Ventilator, DC generator, Renewable Energy)

## I. INTRODUCTION

Global warming is increasing drastically due to the use of Non- Renewable energy. It is very hazardous for the environment as well as for humans. The consumption of Non-Renewable energy is evanescent for example oil will run out in a few years. Increasing the supply of renewable energy would allow us to replace carbon-intensive energy sources and significantly reduce global warming emissions.

This project is based on power generation by using renewable energy. Mostly this roof ventilator is elevated on the tip of the roof for providing ventilation on the floor. A rooftop ventilator provides a form of natural ventilation, moving air continually and causing trapped, stale air to be replaced with cleaner, cool air from outside. The supplementary function of the rooftop Ventilator is to produce electricity without any charges. Even a small amount of wind is enough to rotate a rooftop ventilator.

## II. LITERATURE REVIEW

The literature exploration was mainly targeted on topics related to Power Generation using RTV. The review of publications and probing work revealed the basic arrangement and generation by using a precise model of roof ventilator, where a positive result is expected, in favor of civilization and future demand for the saving of fossil fuel and environment pollution point of view.

The system was devised and implemented with the following goals to be completely distinctive from conventional electricity labs and to be fresh and interesting. To show a convoluted, relevant system that is closer to the "real world" than the usual simple systems covered in educational labs.

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**[1] Miss. Autade Puja Padamnath et al.:-**

In this paper, they have examined electricity generation using rooftop ventilation they have told about generating electricity from RTV. Generally, RTV is used for ventilation purposes. A standard RTV is typically escalated on rooftops of industry and factory. It does not deplete electricity for its working. According to their research journal, it can produce electricity for low wind speed. The structure can produce electricity without provoking any kind of pollution. Wind energy is a renewable source of energy; it can replace conventional or non-renewable sources of energy that cause pollution to the environment. According to their research, we can use an inverter to convert DC to AC and operate light load or for other applications.

**[2] Sirichai Dangeam:-**

In this paper, Dangeam developed a model by installing a three-phase synchronous generator into the roof ventilator. The AC voltage is developed in the three-phase stator winding is rectified into DC voltage and charged into the 12V 5A lead-acid battery. The author studies the working of this model under two different conditions such as with motor driven and with natural air driven. Further the author design and installs the generator. The maximum voltage is raised to 8V and 28mA at 49 rpm.

**[3] Ponnson Kaewdip et.al:-**

In this research, establishes a prototype to reduce the self-starting speed. This is accomplished by installing the magnetic levitation system to carry the weight of the turbine body followed by the adjusting of rotor and stator for power generation. The test is conducted by diverging wind speed and obtained a self-start at 0.4 m/s wind speed. The methods include Axial Flux Permanent Magnet (AFPM), Permanent Magnet Synchronous Generator (PMSG), AC-Generator and AC Synchronous Generator coupled with Rooftop ventilator for power generation.

**[4] Anthony Lloyd et al.:-**

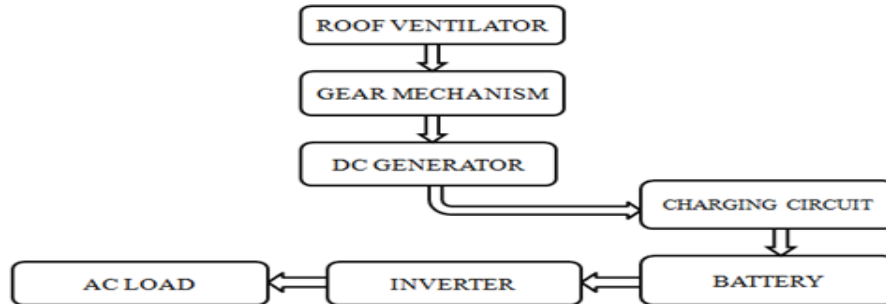
In this paper, they develop an approach by experimenting with the model designed. This paper modifies the rooftop ventilator by adding extra fins to spin faster and to improve efficiency. Here AC generator is coupled so that the system charges the 12 V dc batteries. The author asserts that this concept is not practical in the business world after performing the economic and feasibility study.

**[5] Ganesh K.Jadhav et al.:-**

In this paper, they developed a model to enhance the ventilation by installing a fan inside the ventilator and propeller system geared to the inside drive. The power required to drive the fan is supplied using the Solar PV panel. A model for power generation from a rooftop ventilator by mounting a DC generator inside the ventilator geared to the central shaft. The maximum output obtained from this model generates a voltage of 40.32 V and current up to 220 mA glows the LED lamp. Further, the authors conduct several trails under different conditions followed by three-dimensional analyses.

### III. FUNCTIONAL PATTERN

As shown below the Fig.1 the architecture consists of a rooftop ventilator, Gear mechanism, DC generator, charging circuit, Battery, Inverter, AC load. The brief description is epitomized in below.



**Figure 1: Block diagram of Power generation by using Rooftop Ventilator**

#### 3.1 Rooftop Ventilator



**Figure 2: Rooftop Ventilator**

Roof vents- These vents are used in roof assemblies to furnish a means of allowing outside air to enter and exit Garret and ventilation expanse. Roof vents should be located along with a roof assembly's lowest spout at or near soffits or eaves. The roof ventilator can enhance the architectural and aesthetic appearance of your building.

The continuous positive extraction provided by the roof turbine ventilator eradicates heat, dust and fume penetration - The ventilator thus helps ensure a cleaner and healthier working environment. The roof ventilator helps improve productivity by promoting a healthier and more convenient working environment.

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**TABLE 1**  
**SPECIFICATIONS OF ROOF VENTILATOR**

Sr. No.	Parameters	Rating
1.	Height	10 to 14 inch
2.	Neck	Approx. 420mm
3.	Type of material	Aluminum
4.	Area to be ventilated	Roof

### 3.2 Gear Mechanism

The Roof vents are fabricated with a Gear mechanism. The elementary function of a gear mechanism is to transmit rotary motion as well as power from one shaft to another. Gears can also be used to amplify power. When two gears mesh, if one gear is bigger than the other, a mechanical influence is produced, with the rotational speeds, and the torques of the two gears differing in proportion to their diameter. The gear ratio of a system is the ratio between the rotational speed of the input shaft to the rotational speed of the output shaft.

### 3.3 DC Generator

The small gear is mounted on a shaft of a DC generator. The generator is a device that converts motive power into electrical power. In a DC generator, field coils produce an electromagnetic field and the armature conductors are rotated into the field. Thus, an electromagnetically induced emf is generated in the armature conductors. The direction of the induced current is given by Fleming's right-hand rule.

### 3.4 Charging Circuit

The output of the DC generator is fed to an electronic circuit that regulates the voltage into a constant level and is applied to the battery undercharge. The circuitry to recharge the batteries in a conveyable product is a prevalent part of any power supply design. The charging system is primarily dependent on the type of battery and recharge time.

### 3.5 Battery

The output of the charging circuit is applied to Battery for undergoing a chemical reaction. It is a storage device. Batteries convert chemical energy into electrical energy. A battery consists of a several voltaic cells. Each cell consists of two half-cells connected in series by a conductive electrolyte containing anions and cations. Cations are reduced (electrons are added) at the cathode during charging, while anions are oxidized (electrons are removed) at the anode during charging. During discharge, the process is reversed.

### 3.6 Inverter

In many industries/factories, Warehouses, household applications it is vital to glow AC loads like LED panel lamps, CFL bulbs. The DC voltage is stored in Battery; we need to convert the DC voltage to an AC voltage by using an inverter. The most prominent inverter is used to supply AC power are in three ways: 1. Square wave inverter 2. Modified Sinusoidal wave inverter 3. Pure Sinusoidal wave inverter.

### 3.7 AC Load

A 230 V, AC load is a device that receives alternating-current (AC) electrical power from an Inverter.

## IV. MATHEMATICAL MODELING

AC load = 20 watts

System Voltage = 12V

Current =?

Power = Voltage  $\times$  Current

20 = 12  $\times$  Current

Current = 1.66 A

Battery size = Total load  $\times$  No. of hours/ Voltage

= 20  $\times$  6/12

= 12 V, 10Ah

Inverter size = 120 / 0.8

= 150 VA

DC generator = 12 V, 960 rpm

	A	B
Gear Teeth	12 Teeth	36 Teeth
Speed	960 rpm	x

A = Driver gear; B = Driven gear

$36/12 = 960 / x$

$x = 960 \times 12 / 36$

$x = 320$  rpm

Gear ratio = 36:12 = 3:1

The gear A will to revolve 3 times for each full revolution of gear B. If gear A was connected to a motor which spins at 960rpm, gear B would spin at 320rpm.

## V. CONCLUSION

The conclusion focuses on the relationship between the output power and the range values of the resulting current and voltage, as well as the suitable wind speed range through the superlative design of the system. The voltage and current developed are proportionate with the speed of the roof ventilator.



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## Harvesting Electrical Energy from Sound Energy

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**Abstract**— Noise is also an important energy, but has been controlled for its harm. If noise can be made effective use of at the same time, there would be a large change in social life. Based on studies on converting sound to electricity over the years, some effective implements of electric generation using sound are put forward for the new situation of utilizing of noise. With the development of industry and transportation, new noise pollution is emerging, forcing technologists not only to try to remove noise originally but also to control noise on transmission. If the controls can be combined with recycling, it is not only a major breakthrough in pollution control but also a supplement for human's energy. The application of this technology has not been familiar to public and some aspects is not perfect. There are various renewable sources of energy that have already been discovered and some are implemented to great extent under suitable circumstance and these sources are solar, wind, biomass, water etc. As solar and wind energy have already tapped for energy generation.

This paper presents conversion of sound energy to electrical energy. Largely ignored form of energy is available in the form of sound. Noise can be used as source for electrical energy generation. Using the principle of Faraday's electromagnetic induction, sound can be converted into electrical energy using the vibrations created by noise. Diaphragm is the main tool using as transducer to convert sound into vibrations. When diaphragm vibrates, the coil moves along with it. The movement of coil creates a varying magnetic field around it and emf is induced in the coil. This induced emf is nothing but electrical energy.

**Keywords** - sound, transducers, diaphragm, electromagnetic induction, magnetic field.

### I. INTRODUCTION

The demand for electrical energy is rising rapidly. Till date, majority of power needs are met by using fossil fuels which are on the verge of extinction. Recent studies estimate that these fossil fuels will last only upto 2030[1][2]. Hence to keep up with this ever increasing power demand, we need to find alternative sources of energy. Renewable energy sources like solar, hydro and wind are already being used to cater our power needs. However their availability depends on weather conditions. The law of energy conservation states that energy cannot be created nor be destroyed; it can be converted from one form to another. By tapping this sound energy we are utilizing energy from unwanted noise pollution. Sound waves are mechanical energy and can be converted into electrical energy by using a suitable transducer i.e. diaphragm[1][3]. The proposed method generates electrical energy using principle of electromagnetic induction. Permanent Magnet, Use of conducting coil will provide the induced voltage. With the help of translational motion the above induction is performed. Rotational motion could be used for voltage generation with the help of gears and shaft.

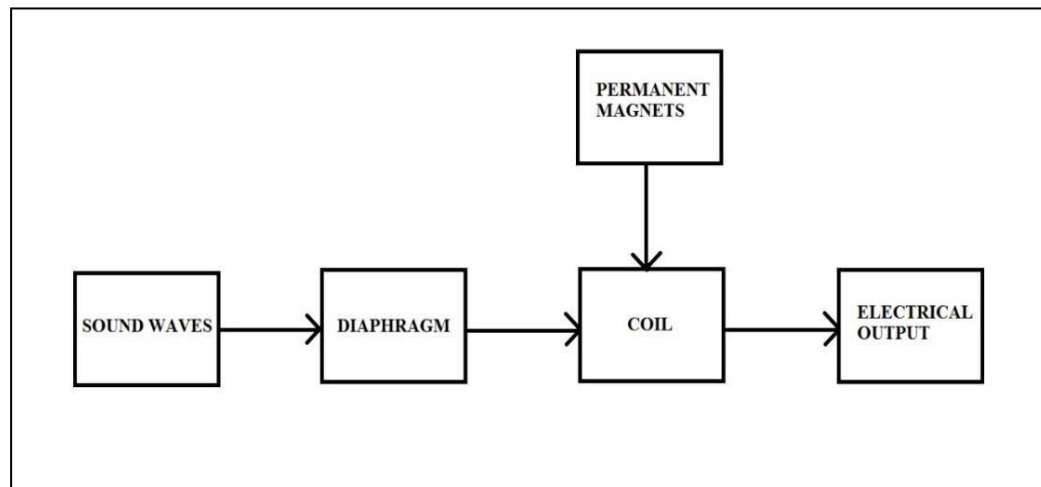
## II. SITE SELECTION

The standard level of noise at industrial area is 50-60 dB, Hospital area is 45 dB and Bus station area is 70 dB. However from survey we find that the average level of noise at industrial area is 88.59 dB, Hospital area is 70.57 dB and Bus station area is 100 dB (approximately)[1][4]. There are many sources of noise in industries, traffic place, residential area, educational institute, medical institute. The major sources are given in table no. 01

**Table 1**  
**TYPES AND SOURCES**

SR. NO.	TYPES	SOURCES
1	Industries	Finishing machines, Auto machines, Preparatory machines, Ring fan, Spreader machines, Rolling machines, Sewing Machines, etc.
2	Traffic places	Buses, Auto rickshaws, Motor vehicles
3	Public places	Railway stations, Bus stations, Airports

## III. BLOCK DIAGRAM



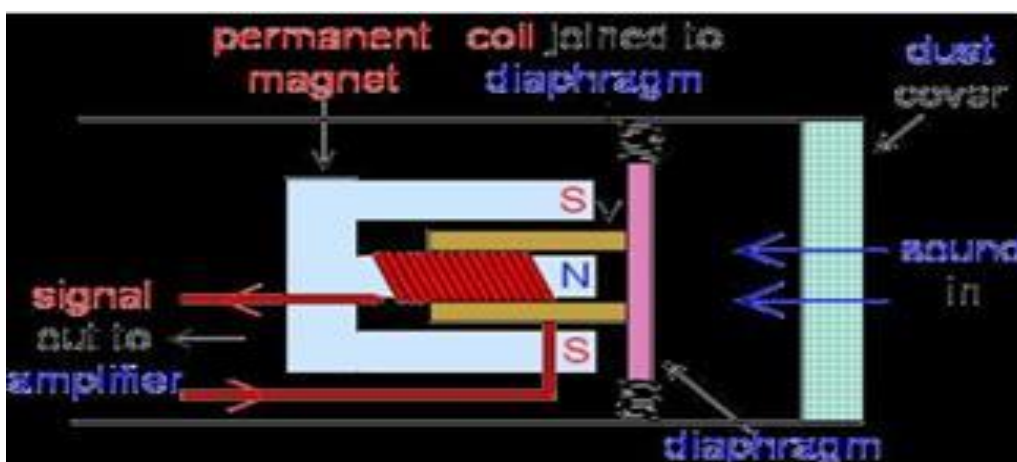
**FIGURE 1: Block diagram**

## IV. METHODOLOGY

### 1.1 Using Linear Motion

In this method, we use a transducer for converting sound waves into electrical energy. The transducer used is a simple diaphragm which vibrates when sound waves are incident on it. This in turn causes movement of conductor attached to it. The conductor is placed in magnetic field produced by permanent magnet. A magnetic field is a vector field that describes the magnetic influence of electric charges in relative motion and magnetized materials. Due to motion of conductor, the magnetic field is varied and as a result emf is induced in it as per Faraday's law of Electromagnetic Induction. The formula is as given in Eq. (E.1)

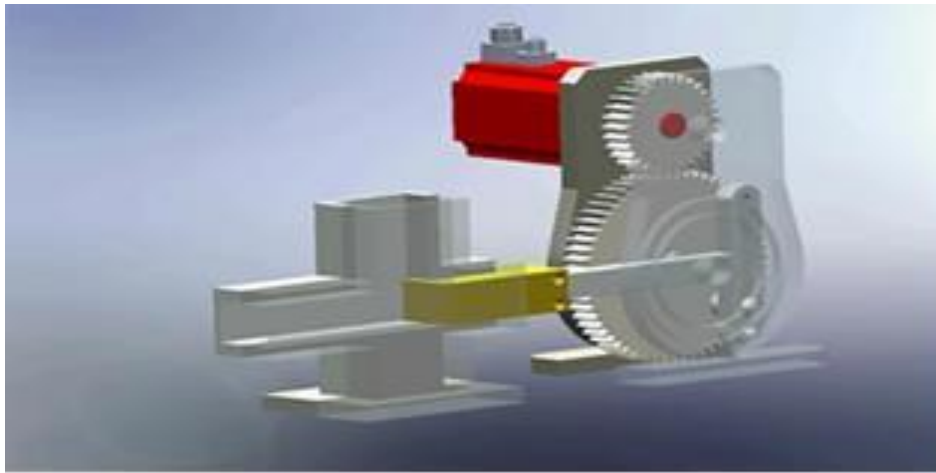
Generated voltage = Velocity of conductor x Magnetic Field x Length of conductor .....Equation(1)
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**FIGURE 2: Circuit Diagram Translational Motion**

### 1.2 Using Rotational motion

The basic principle is same as linear motion. However to maximize the output, we will be using a set of two gears. The gears used will be of different sizes. One rotation of the larger gear will result in 'n' no. of rotations of the smaller gear. The gear ratio expresses the ratio of the output torque to the input torque. Thus, we can multiply the torque supplied at the motor shaft (the input) by the gear ratio to find the torque at the wheel axle (the output). Transmitting power through a series of gears can also affect rotational speed. With this arrangement we hope to get better output voltage.



**FIGURE 3: Rotational Motion**

## V. RESULT FROM IEEE REFERENCE PAPER

**Table 2**

**Result from reference paper**

SR.NO.	Sound level(in dB)	Voltage(in Volt)
1.	87	0.60
2.	88	0.90
3.	89	1.0

## VI. CONCLUSION

Sound has huge potential and can be used as clean alternative energy source. As noise increases, the output voltage also increases. By efficient conversion, the output voltage values obtained can be further enhanced. This technology is not used practically until now due to efficiency concerns, but present work in this field makes its future quite promising.

## VII. FUTURESCOPE

- This method can be used in areas where large amount of noise is generated.
- In future we cannot completely depend upon solar, wind and hydro so sound could also be a great source.
- It could also be used near industries, airport runways as the noise pollution is to a great extent there.

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# Power Grid Monitoring and Controlling By Using Internet of Things (IoT)

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**Abstract**— This paper presents a review of monitoring and controlling electric load in Power Grid by comparing different methods of implementation of this technology. In the power grid, people are finding various efficient resources. So power is the main concern which needs to be monitor and control. In this paper, a model is a design that aims to control and monitor the power consumption of a particular area or power grid line. The objective of this paper is to design microcontroller atmega328p connected to different sensors such that current and voltage measurement sensor, Wifi module sensor for monitoring and controlling a power grid system problems. This design model monitors the power consumption of the end-user and cuts off the power supply when it exceeds the set limit. The device sends the power consumption data to the suppliers web server using the internet of things (IoT) technology.

**Keywords-** Power Grid, Internet of things (IoT), atmega328p, current and voltage sensor, Wifi module.

## I. INTRODUCTION

Conservation of energy is a very important need of the day. The concept of electrical energy efficient devices has come up in various sources such as lighting, air conditioning and so on. Electrical energy monitoring is an important tool for determining the energy efficiency of various equipment and devices. This paper implements an energy monitoring system that displays the power consumed. This can help a user to detect any fault in the power system. A smart energy monitoring system can help a user to analyses the energy consumption data at the device level and manage it assuming it to be fixed monthly rates. Also, it helps a consumer to replace the regular appliances by energy efficiency. The monitoring system can inform and alert the user on unexpected excess power consumption caused by equipment faults, lack of proper maintenance and system behaviors. Further, proper electrical energy management can make proper budgeting possible.

Internet of things has opened up a platform of applications in various fields such as medical, automation systems, healthcare systems, smart home automation, and power monitoring. IoT is expected to bring about a large number of changes in the field. IoT based energy management systems can give a lot into the conservation of energy. Energy bills are generated monthly and the user has the option of analyzing the consumption details every month and yearly. The energy meter installed in the residential buildings, commercial buildings show the energy consumed by the household. Very often, devices which operate in standby mode consume an efficient amount of power about which the end customer is unaware of. So, there is a very strong need for a novel energy monitoring system that can show the energy consumption of different devices and equipment in normal as well as standby backup mode and also alert the user on an unexpected rise in energy consumption on daily basis.

## II. CURRENT SCENARIO AND TECHNICAL CHANLLENGES

### 2.1 CURRENT SCENARIO

The current energy scenario has introduced different technical challenges to be solved such as the integration of clean electrical energy generation and the use of efficient high-power and energy storage systems. The electrical power energy industry has to face the problems in terms of reliability and stability of the power grid. Also, energy distribution systems based on the HVDC

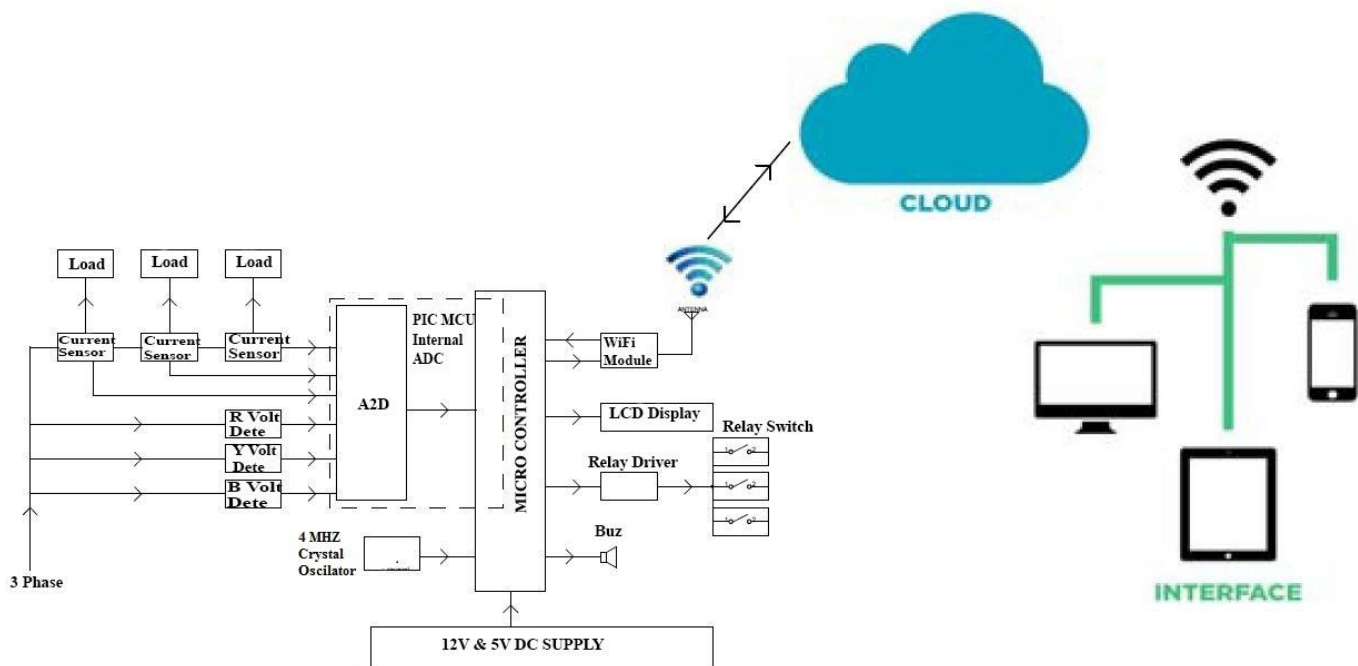
topology are being installed and online monitoring, controlling are possible all over the world. On the other hand, it becomes extremely most important to use energy storage systems to stabilize and improve the energy efficiency of the power systems using ultimate generation storage batteries, ultra-capacitors based systems, and mechanical systems, among others. Nowadays, the power devices efficient solutions to be applied to the new distributed energy grid concept. This paper briefly reviews the current scenario where power electronics converters and the internet of things are being applied. The main on the energy systems, the energy storage, Data management systems, and the high electrical power applications, reviewing the different alternatives and topologies, already as industrial products or still as research lines.

## 2.2 TECHNICAL CHALLENGES

1. Inadequacies in grid infrastructure
2. Cyber security
3. Storage concerns
4. Data management
5. Communication issues
6. Stability concerns

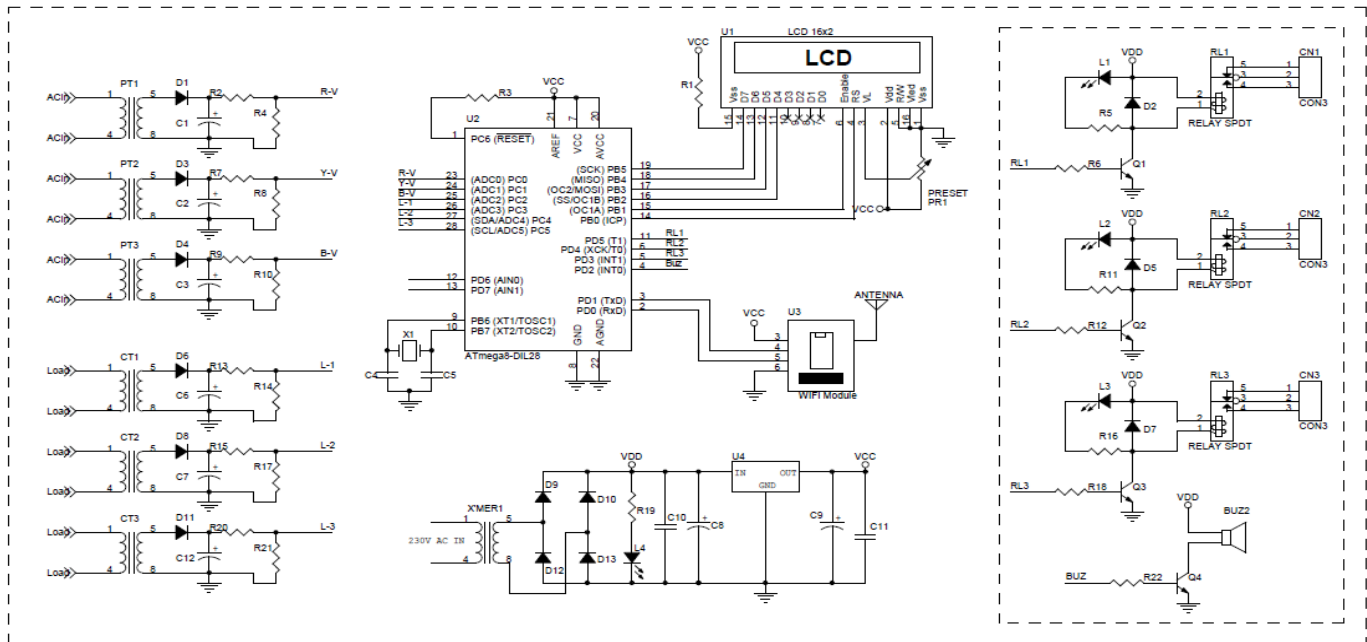
## III. BLOCK DIAGRAM

The Power Grid System consists of basic blocks mainly the Current sensor and Voltage detector, A2D convertor, Microcontroller, 12V & 5V DC supply, Buzzer, Relay Switch, LCD Display, WiFi module, Cloud, Interface block. This is diagrammatically shown in figure 1



**FIGURE 1: Block diagram of power grid monitoring and controlling by using IoT**

#### IV. CIRCUIT DIAGRAM, WORKING, COMPONENTS DESCRIPTION



**FIGURE 2: Circuit diagram of power grid monitoring and controlling by using IoT**

##### 4.1 Working

Block diagram above in Fig 1 is designed to operate in two modes. The power supply is turned ON, the microcontroller Atmega 328p and relays driver is required 5V & 12V DC supply. So by use of a step-down transformer, the Rectifier circuit to give required supply to all interface components get the required supply. The three-phase supply is fed to load by using contactor to controlling the load. In between three-phase line and load the voltage, current, zero crossing detector sensors are connected for sensing different parameters. In microcontroller write program for calculating all parameters like voltage, current, active power, reactive power, apparent power, pf, etc. All this parameter receive by three-phase main lines and load side sensors. The microcontroller reads the data from various sensors in digital digit by using A2D converter and analyses according to the given instructions, Microcontroller reads the commands from the internet and provides control signals to the relay via a three-phase contactor, which will control the Load. After the microcontroller, process on that data, the load control is based on automatic and manual mode the control is based on the sensed parameters is received an alert from the sensors and display indication on LCD or alert via a buzzer. The sensor information is displayed visually in the server in the cloud web page.

##### 4.2 Components Description:-

###### i. ATMEGA328P Microcontroller

ATmega-328 is basically an (AVR) Advanced Virtual RISC micro-controller. Its supports the data up to eight (8)bits. ATmega-328 has 32KB internal built-in memory. This micro-controller has a lot of other characteristics. ATmega-328 is mostly used in Arduino.

**ii. Power Supply**

The power supply circuit. It's based on three terminal voltage regulators, which provide the required regulated +5V and unregulated +12V. Power is delivered initially from standard 12V AC/DC adapter or 12V\_800ma Transformer.

**iii. ESP8266 (Wi-Fi Module)****FIGURE 3: ESP8266 Wi-Fi module**

It is a low cost chip with TCP-IP stack and microcontroller. In our project main importance role of wifi is it performs IOT operation. The simple device is connected from microcontroller to send the information wireless.

**iv. LCD Display****FIGURE 4: 2\*16 LCD Display**

LCD (Liquid Crystal Display) is the technology used for displays in notebook, TV & other appliances. Like LED and gas-plasma technology, LCDs allow displays to be much thinner than cathode ray tube (CRT) technology. It displays the Energy Meter reading units and balance. A 16X2 LCD is connected with microcontroller at 7,8,9,10,11 and 12 pins to display the reading of various sensors.

**v. Relay**

Single pole double throw (SPDT) relay is connected to port RB0 of the micro controller through a driver transistor (Q1). The relay requires 12 V at a current of around 100 milli amps, which cannot be provided by the micro controller. So the driver transistor is added. A relay is an switch that uses an electromagnet to move the switch from the off to on position instead of a moving the switch. It takes relatively a small amount of electrical power to turn on a relay but the relay can control something that draws much more power. The relay is used to operate external electronic lock, safety switch or any other electrical device ETC.

**FIGURE 5: Relay**

#### vi. Contactor

The contactor is an electrically controlled relay (switch) circuit used for switching an electrical power circuit by controlled power on and off. A contactor circuit has a much lower electric power level switched circuit, such as a 24V coil electromagnet controlling a 230-volt motor switch. Relays tend to be of lower capacity and are usually design for both normally closed (NC) and normally open (NO) applications. Devices switching more than 10-15 amperes or in circuits rated more than a few kilowatts and above are usually called contactors. Unlike relays, contactors are design with the features to control and suppress the arc produced when interrupting heavy currents and protect the system. Contactors come in many forms with varying rated capacities and features. Unlike a circuit breaker, contactor is not intended to interrupt a short circuit current (SC). Contactors range from those having a breaking current of sustained amperes to 1000 of amperes and 24 V DC to many kv. The contactors size is range from a device small to pick up with one hand, to large devices approximately a meter (yard) on a side. Contactors are used to control electric motors drives, lighting, heating, capacitor banks, thermal evaporators, and other electrical loads etc.

### V. CONCLUSION

In this project the concept of Internet of Things for early fault detection, monitoring, controlling of 3 phase load. The system has the ability to combine various sensed parameters in real time and improve accurate detection of different faults occur in load side. The monitoring of the lamp load system presents the measurement of different parameters namely p.f, supply voltage and current, frequency, real powers, reactive power, apparent power. The compared to other conventional methods this system has more number of fields which enables alarm, alert messages and quick controlling. The concept of IoT is presented here for remote monitoring and controlling the loads. The data is also displayed serially. The application of the system is needed today for all electrical system. The system has the specific advantage less maintenance, easy and quick controlling, monitoring and accessing of data remotely. Experimental results confirm the flexibility of the implementation of the system.

### VI. FUTURE SCOPE

The current day's mode of transmission and distribution of electricity has proven to be unreliable and inefficient. This is because the power smart grid technology currently in use has changed very little since it was developed. Researchers are now experimenting with smart grid technologies to overcome the shortcomings of the traditional grid. A power smart grid is a concept for transforming a power grid, with the modern networking communication, automated checks and other forms of information technology. It integrates new, innovative technologies of generation, transmission and distribution to home appliances and equipment. A power smart grid technology is an essential to provide easy integration and reliable service to the consumers. A power smart grid system is a self-sufficient electricity network system based on digital automation technology for monitoring, control, and analysis within the supply chain.

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# Wind-Solar Hybrid Project Identification and Formulation

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**Abstract**— Hybrid energy is the need of the hour because it is sustainable and reliable than single source of renewable energy. To get clear overview of Hybrid energy because we are planning to identify and formulate hybrid project in our area. The world is however majorly concerned of the utilities to reduce the emissions from electricity generating plants by employing renewable energy and to supply and at low cost electricity to remote areas.

**Keywords**--- Electricity, Hybrid Power System, PV cell, Renewable Energy, Solar Energy, Wind Energy

## I. INTRODUCTION

Reliable Electricity supply through renewable energy generation has always been a challenge, which can be mitigated by implementing hybrid projects. Wind solar hybrid system seems to be promising in most of the parts of India. For this purpose, we have studied the five literatures. Which we will discussed in detail. Reviewing of different projects is done for better understanding and for hybrid project formulation in our own area. A comprehensive analysis and inference is made out of the study. Due to increase in concern of global warming and the alarming stage of fossil fuel. There for we are looking at solution to preserve the earth for the future generation. Renewable Energy sources such as Wind Energy and Solar Energy is the fastest growing source of clean energy. The Location of our project is Kumbharpada in Virar (E). These regions are endowed with climatic conditions long hours of sunshine, strong radiation and rich Wind Energy resources. Most of the Single renewable resource cannot be continuous and ensure stable power supply. But by using Wind and Solar technology we can effectively solve this problem. Due to installation cost, maintenance cost and space required for battery is not convenient. Hence we are not using batteries in our Wind-Solar hybrid System. There for we connect the Wind-Solar hybrid system with utility grid. The aim of this work is implementation and formulation of rural, remote area Solar-Wind hybrid energy system.

## II. LITERATURE REVIEW

The literature search was mainly focused on topics related to Regenerative braking in Electric and Hybrid cars. The review of publications and research work revealed the basic guidelines and area of work need to be conducted exhaustively on a particular model of car, where a positive result is expected, in favor of society and future demand for the saving of fossil fuel and environment pollution point of view. The following data was surveyed for obtaining basic idea and knowledge of the project titled 'WIND SOLAR HYBRID PROJECT IDENTIFICATION AND FORMULATION'.

This hybrid model of VAWT and solar on highway shave good source of green power. Present work of model experimentally shows the hybrid wind and solar power generation can be used to generate large amount of power at almost all time of day. This can be an alternative source of energy to the non- renewable resources. By using this model all the highways and small villages can be lighted without the use of conventional energy sources. This can be implemented instead of single source, to gain more power almost at all times. Finally, conclude that this paper can give electricity without pollution to many highways and small villages.

To provide better power supply services four household the mini hybrid wind - solar power plant is use-full and in this paper we have studied the off grid electrification through hybrid power. Power is main issue for remote or isolated areas base station, because grid extension is not feasible. In these sites the above proposed renewable base hybrid system is most viable solution. These solutions of power supply to the households are cost effective and available throughout the year. The circumstance of each sites are studied in order to decide the feasible combination of alternative energy resources. Alternate power solutions are not commonly used in household system today but are actively evaluated for remote and isolated areas over worldwide. With the help of above pre-feasibility study the solar and wind hybrid energy system are most viable power solution for tribble belt in Indian sites over conventional grid supply system.

In this paper, a hybrid solar-wind energy system in combination with a grid tie inverter and a controller has been presented. The hybrid energy system has been presented with mathematical modeling, analysis and computer simulation which confirms that any voltage and power coming from solar and wind system can be controlled with LTC3784 controller which produces a constant output voltage and power that is being finally inverted using SPWM-based inverter circuit. The simulation results show that even if the input varies, the output power (240W) and voltage (220Vrms and 50Hz frequency) remain the same, which confirms that the proposed system is stable in terms of both power and voltage.

In this paper, we take some communications station in Qinghai Lake for example, make technical and economic analysis on the wind/solar hybrid system by HOMER, and try to achieve saving costs and maximizing efficiency when meeting the requirements of the load. After the analysis we find out wind speed has a great influence on the system costs, and it must be paid attention in the design process.

### **III. IMPORTANCE OF WIND-SOLAR HYBRID PROJECT**

Reliable Electricity supply through renewable energy generation has always been a challenge, which can be mitigated by implementing hybrid projects. Wind solar hybrid system seems to be promising in most of the parts of India. For this purpose, we have studied the five literatures. Which we will discussed in detail. Reviewing of different projects is done for better understanding and for hybrid project formulation in our own area. A comprehensive analysis and inference is made out of the study. Due to increase in concern of global warming and the alarming stage of fossil fuel. There for we are looking at solution to preserve the earth for the future generation. Renewable Energy sources such as Wind Energy and Solar Energy is the fastest growing source of clean energy. The Location of our project is Kumbharpada in Virar (E). These regions are endowed with climatic conditions long hours of sunshine, strong radiation and rich Wind Energy resources. Most of the Single renewable resource cannot be continuous and ensure stable power supply. But by using Wind and Solar technology we can effectively solve this problem. Due to installation cost, maintenance cost and space required for battery is not convenient. Hence we are not using batteries in our Wind-Solar hybrid System. There for we connect the Wind-Solar hybrid system with utility grid. The aim of this work is implementation and formulation of rural, remote area Solar-Wind hybrid energy system. Even during the equivalent day, in many regions worldwide or in some periods of the year, there are different and opposite patterns in terms of wind and solar resources. And those different patterns can make the hybrid systems the best option in electricity generation. An hybrid wind-solar electric system demands an higher starting investment than single larger systems: large wind and solar PV systems are proportionally cheaper than smaller systems. But the hybrid solution is the best option whenever there is a significant upgrade in terms of output and performance which happens when the sun and the wind resources have opposite cycles and intensities during the equivalent day or in some seasons.

### **IV. AIM OF PROJECT**

**4.1 THE AIM OF THIS PROJECT** is to design and Formulation of Wind-solar Hybrid system. This work is expected to help to understand the basics of solar-wind power generation. A small part of daily electricity consumption with an efficient utilization of wind and solar power. Here we made a hybrid system where the solar power and wind power output fed to the utility grid. Because of the availability of wind is throughout the day and night whereas solar power is only available in daylight and for a limited time, here we not storing the wind power and solar power.

#### 4.2 IN BRIEF, THE OBJECTIVES ARE:

- 4.2.1 Wind solar generation
- 4.2.2 Solar power generation
- 4.2.3 Make a wind-solar hybrid power system

### V. SITE INVESTIGATION AND SITE SELECTION

#### 5.1 SITE INVESTIGATION

##### 5.1.1 Why This Area

We are the students of Viva Institute of Technology Shirgaon, Kumbharpada which is rural area. In this area reliable and clean electricity is yet unaccessed by all the people living in this area. So to mitigate the problem, we came of the idea of planning electricity generation plant which will be sustainable, clean, economical, and has engineering values.

##### 5.1.2 Why Hybrid

This area having large wind flow throughout the year due to western ghat hilly geography. For our plant ample land is available. For solar plant in this area domestic and commercial rooftop is available. Due to hilly areas the land required for plant is available at quitly low cost.

##### 5.1 Images of Site



**FIGURE 1: Image of Site Selection**

#### 5.2 Site selection

After analyzing with the investigation parameter we decided to site no. 1 to 4 for wind turbine system and site no. 5 for solar system. In this site the height for wind turbine is 40m to 50m and average wind speed is 4-5 m/sec almost throughout the year.

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## VI. MATERIAL AND METHOD

### 6.1 Flow of project

- Survey of location
- Selection of location
- Collection of data
- Solar Radiance duration curve
- Wind flow duration curve
- Analysis of data
- Bifurcate capacity for solar and wind
- Designing of project mathematically
- Designing of project in Simulink

## VII. TECHNO-ECONOMIC FEASIBILITY OF PROJECT

### 7.1 TECHNICAL FEASIBILITY

The technical feasibility of this project is geographical advantage in this area. This area is hilly area where average wind flow throughout the year. Minimum 190 solar lit days is available. This energy renewable energy which clean and eco-friendly. Due to hybrid project the accessibility of electricity to all for 24\*7.

### 7.2 FINANCIAL FEASIBILITY

After analyzing the project site areas, it was clear that a hybrid project of 50 MW capacity can be build. We are yet to study that how much will a 50 MW project in Shirgoan area cost. If we consider the costing of solar generation at Rs. 60000 per KW and 1.2 lakhs Rs. per KW for wind generation, then bifurcating 50 MW project will be done as follows.

30 MW wind plant

$30000 \times 1.2 \text{ lakhs} = 36 \text{ lakhs}$

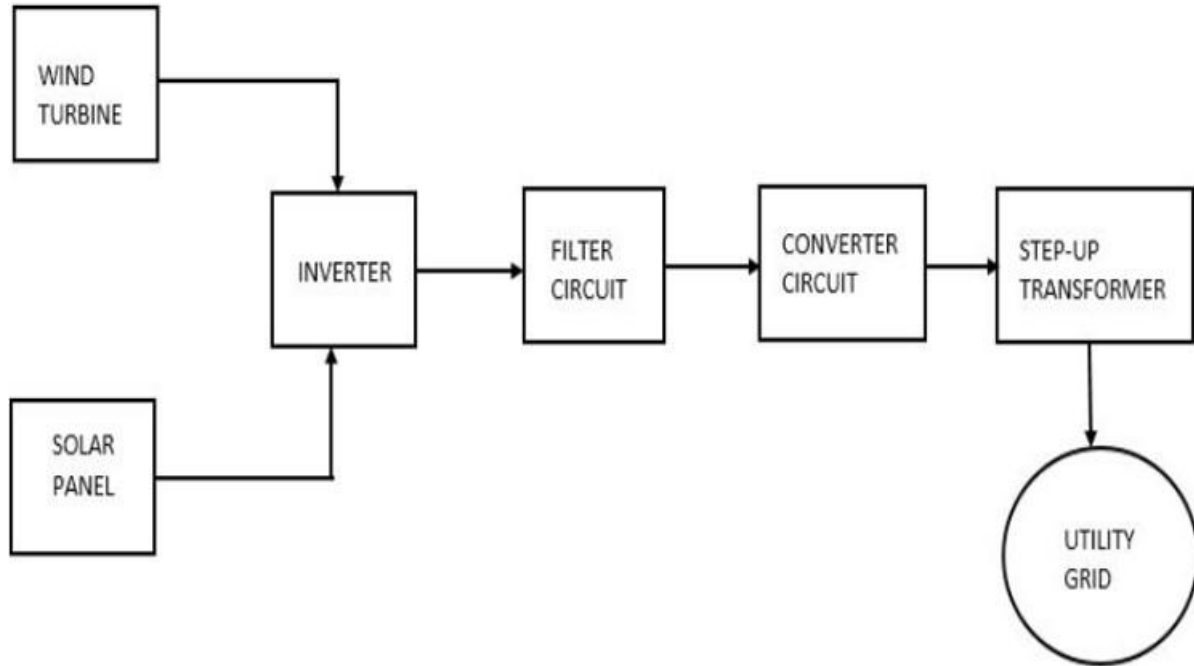
20 MW Solar plant

$20000 \times 0.6 \text{ lakhs} = 12 \text{ lakhs}$

Total cost for hybrid system =  $36 + 12 = 48 \text{ lakhs}$  (Approx 50 lakhs)

## VIII. WIND SOLAR HYBRID SYSTEM

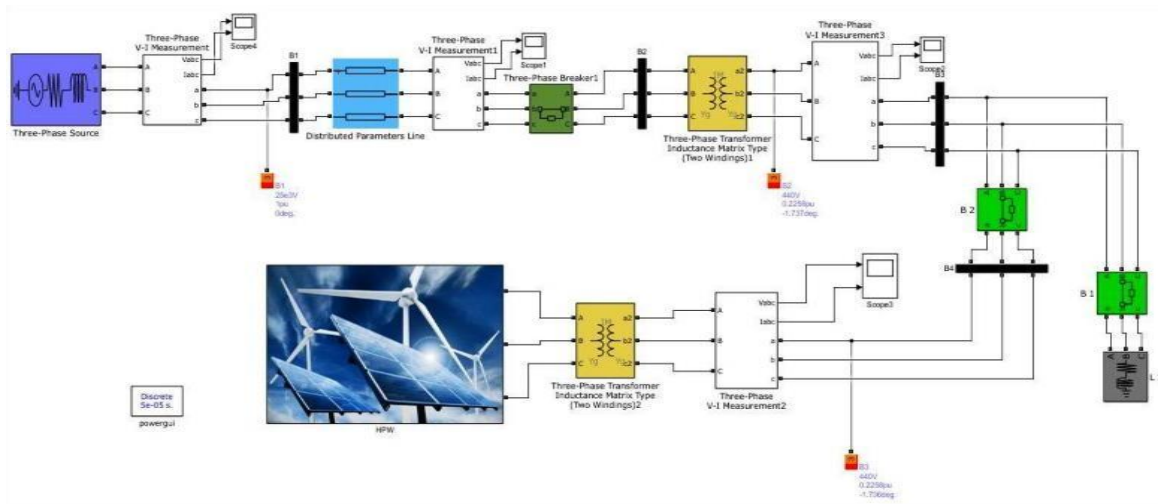
### 8.1 BLOCK DIAGRAM



**FIGURE 2: Block Diagram of Wind Solar Hybrid Project**

The two dc sources of energy are feeding the inverter, filter and converter circuit to get clean and controlled ac voltage. After getting pure ac voltage we fed this power to grid with the help of step up transformer.

### 8.1 SIMULINK MODEL OF PROJECT



**FIGURE 1: Design of Project simulink Model on MATLAB**

The above diagram is shows that the Simulink model of wind-solar hybrid project on matlab. In this system we generate power from wind & solar and after filter and controlled the power it gives to utility with the help of step transformer.

## IX. CONCLUSION

The objectives of the project have been achieved as a hybrid power system based on wind and solar energy has been de-signed to meet the load of Kumbharpada Area. This project model can be develop in rural areas where the power cut-off is regular. With some modification in wind-turbine part and increasing the number of solar panel and wattage this model can be utilized as stand-alone system especially in offshore-onshore where the speed of wind is adequate. We will not use battery because its installation cost, maintenance cost is comparatively expensive also it is harmful to an environment.

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# Measurement of Moment of Inertia by Retardation Test in Three-Phase Induction Motor

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**Abstract**— In this paper, an experiment is explained thoroughly which demonstrates the process of measuring the moment of inertia for three phase Induction Motor of 5 Hp. The rated speed of the Motor is 1440 rpm. The voltage and current ratings are 440 volts and 7 amps respectively. The method used to get the results is Retardation test. Multiple readings are taken for different values of speed, for calculation of moment of inertia of the machine. Using some standard formula, the final result is obtained. The test set up is set in the laboratory.

**Keywords**— *Electrical Machines AC, Induction Motor, Moment of Inertia, Retardation Test, Drives and Control.*

## I. INTRODUCTION

The moment of inertia can be directly found out, when the mass of the different parts of load is known. If the mass of various parts of the load is unknown, then the Moment of Inertia can be obtained experimentally. The method is known as Retardation Test. In a Load-Motor System, it is very important to balance the motor and load torque. The motor torque is balanced by load torque and dynamic torque ( $J \cdot d\omega_m/dt$ ). Retardation test is usually performed for DC-Motor Drives. But taking certain things into consideration, Retardation Test can also be performed in Induction motor successfully, yielding results good enough to get approximately original value of Moment of inertia.

## II. CONCEPT

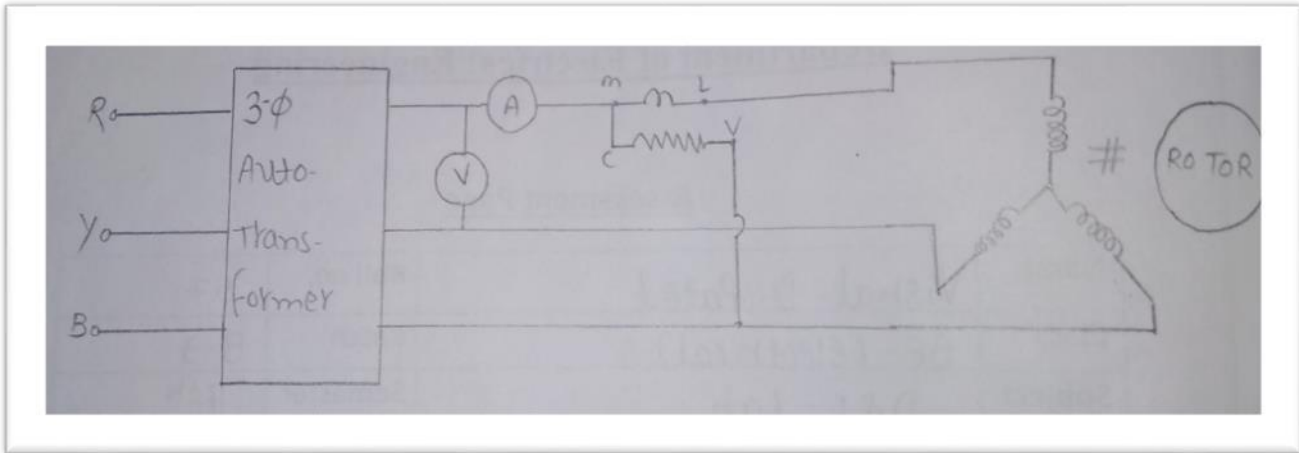
The moment of inertia is calculated by retardation test. The induction motor drive is run at rated speed. The the supply is cut off. The drive continues to run at rated speed at reted speed due to stored kinetic energy and decelerates due to rotational mechanical loses. The variation of speed with respect to time is noted. At ant speed  $\omega_m$ , power P consumed in supplying rotational losses is given by

$P = \text{Rate of change in kinetic Energy}$

$$\text{Or, } P = \frac{d}{dt} \left( \frac{1}{2} J \omega^2 \right) \dots\dots 1$$

$$\text{Or, } P = J \omega_m \frac{d\omega_m}{dt} \dots\dots\dots 2$$

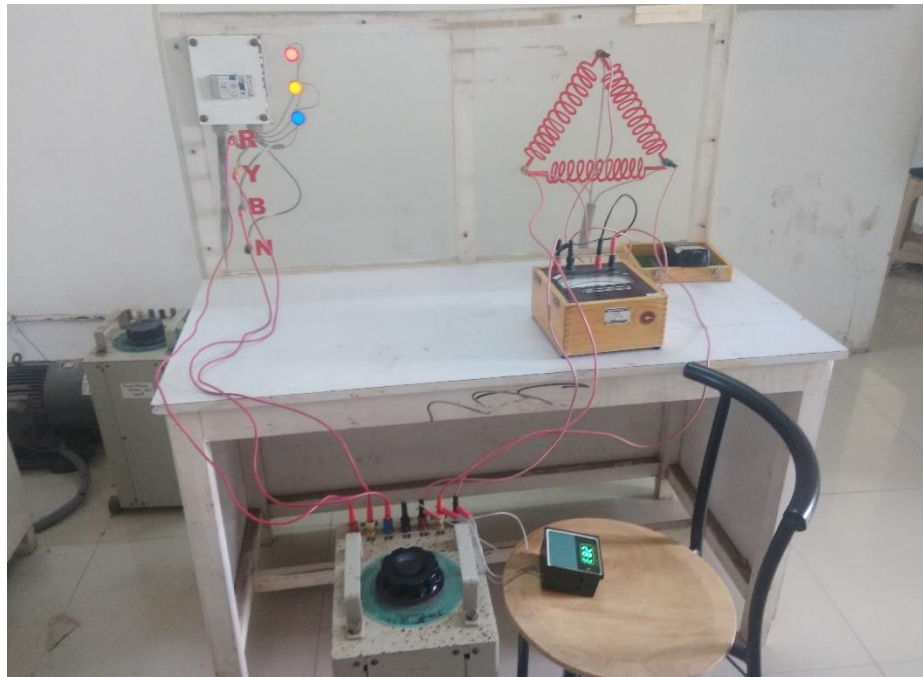
From retardation test  $\frac{d\omega_m}{dt}$ , at rated, speed is obtained. The drive is then, reconnected with the supply and run at rated speed. The rotational mechanical power input to the drive is measured. This is approximately equal to P. now J can be measured from equation 2.



**FIGURE 1: circuit diagram of retardation test**

### III. EQUIPMENT'S USED AND TEST SETUP

The following photograph shows the experiment set up in the laboratory. The photograph clearly shows the equipments required to perform the test.



**FIGURE 2: Retardation test set up in laboratory for Experiment**

#### 3.1 INDUCTION MOTOR DRIVE

A 5 HP induction motor is used. The rated rpm of the motor is 1440. The motor is provided with 3 phase rated supply. The supply voltage has to be controlled at different stage. In order to get proper value we can use connection involving single phase also.

### 3.2 AUTOTRANSFORMER

The supply voltage has to be controlled at different stage. In order to get control the supply voltage autotransformer is used. It is very important for this experiment to run the machine at rated speed.

### 3.3 MEASURING DEVICES

Three measuring devices used for this experiment are Tachometer to measure speed, Wattmeter to measure power and voltmeter to measure the voltage. We need to record the time with reference to the fall in speed. Time is noted by using stop watch.



**FIGURE 3: Measuring devices for experiment**

## IV. OBSERVATION TABLE AND CALCULATION

**TABLE 1  
OBSERVATION TABLE**

SL.NO	SPEED RPM	TIME SEC
1	1148	5
2	816	10
3	630	15
4	381	20
5	227	25

N= speed in RPM

$$W = \text{Angular velocity rad/sec} = \frac{2\pi N}{60}$$

$$P = \text{rate of change in kinetic energy} = J W m \frac{dW_m}{dt} = J \frac{2\pi N}{60} \frac{2\pi N}{60} \frac{dN}{dt}$$

$$\frac{dN_1}{dt} = \frac{816-630}{5} = 37.2$$

$$\frac{dN_2}{dt} = 49.8$$

$$\frac{dN_3}{dt} = 30.8$$

$$\text{Average} = 39.26$$

$$P = 160 \text{ watts (from measurement)}$$

$$N = 1440 \text{ rpm (from measurement)}$$

$$160 = 1.01 \times J \times 1440 \times 39.26$$

$$\mathbf{J = 0.257 \text{ kg/m}^3}$$

## V. CONCLUSION

In conclusion, we are successful in finding the value in moment of inertia for our induction motor drive, without physically weighing any part of the machine.

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# Monitoring and Analysis of Pole Mounted Distribution Substation

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**Abstract**— The Transformer is a key element in the electrical power system. The main purpose of this paper is to gather information about the distribution transformer. Monitoring of the Transformer based on deviation in voltage and current and their effects on the rise in temperature of Transformer oil and cables of the distribution transformer. This paper also includes analysis of different faults, which are responsible for the failure of Transformer, failures of Transformers such as insulation failure, winding failure, bushing failure, and core failure. Monitoring and analysis of distribution transformer are necessary and advantageous as it plays a very important role in the distribution system.

**Keywords**— *Bushing, Core, Distribution transformer, Insulation, Winding.*

## I. INTRODUCTION

A distribution transformer is a static device that transfers power from one circuit to another circuit without changing its frequency and keeping power constant on both sides. Monitoring is important because it provides the only consolidated source of information displaying project progress. Monitoring on the regular basis observation and recording of all data activities taking place in this work. It is a process of routinely collecting the information on all aspects of the project. To monitor is to check on how work-related activities are in progress. A distribution transformer of 100 KVA is monitor during a different time, events and observes its increasing voltage, current, temperature. Due to an increase in temperature, overheating takes place and insulation of transformer is deteriorates due to which hotspots are created in insulation. Most of the fault in the transformer is due to internal winding faults this is increasing day by day since loading transformer closes to their rated capacity. These internal faults result in degradation of the transformer winding insulation, which tends to cause a breakdown in dielectric strength. There are also different types of faults that occur in the transformer such as short circuit, open circuit, earth fault. These faults cause failure in transformers such as winding failure, core failure, bushing failure, tank failure, and insulation failure.

## II. MONITORING OF DISTRIBUTION TRANSFORMER

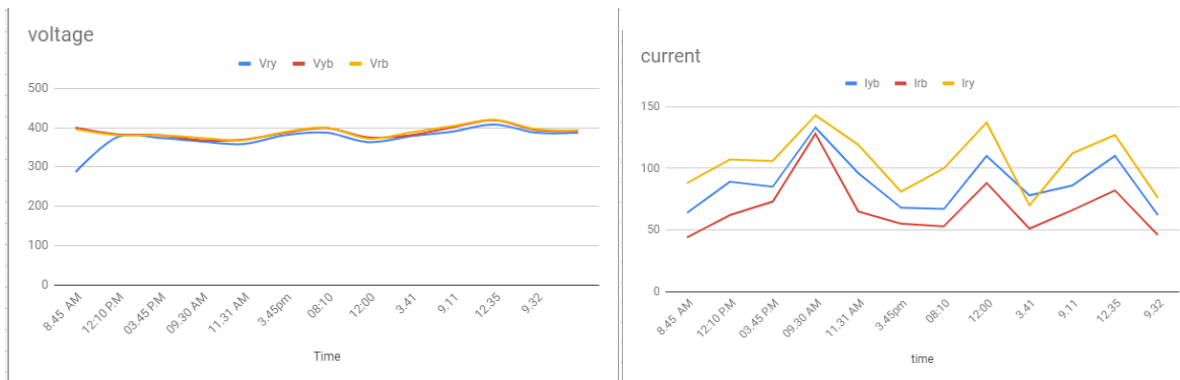
We have conducted a small experiment to calculate and monitor the overall load distribution of three-phase transformer at our college. We have monitored different values of voltages, currents and frequency at a secondary side of the transformer on the panel and at the primary side of the transformer using a clamp on meter at different intervals (i.e. in the morning, afternoon and evening) and on a different occasion. From that data, we have calculated power and plotted a graph of voltage and current with time.

From the graph, it seen that the voltage on the B phase and current on the R phase was more. An unbalance was observed between phases and as a result, the current was flowing through neutral. We also checked the temperature of the incoming and outgoing cable by using a temperature sensor and observed that the temperature of the incoming Y phase was more.

It observed that voltage on B phase and current on R phase was more because of the unequal distribution of single-phase loads. An excessive level of voltage unbalance can have serious impacts on power quality and unbalance in the line currents can lead to excessive line losses and malfunctioning of a relay. Hence by proper load distribution problem can be solve and temperature of Y phase was more so care should be taken before any further problem arises.

**TABLE 1**  
**DAILY LOG TABLE**

Date	Time	Vry	Vyb	Vrb	Iry	Iyb	Irb	Power(KW)
31/07/2018	08:45 A.M.	387	400	396	88	64	44	40385.5
31/07/2018	12:10 P.M.	376	383	381	107	89	62	47332.8
31/07/2018	03:45 P.M.	374	381	381	106	85	73	51792.0
01/08/2018	09:30 A.M.	365	368	374	143	133	128	76987.4
01/08/2018	11:31 A.M.	358	369	368	119	96	65	52852.4
01/08/2018	03:45 P.M.	381	387	389	81	68	55	40162.8
02/08/2018	08:50 A.M.	387	399	400	100	67	53	46009.3
02/08/2018	12:00 P.M.	363	375	372	137	110	88	59497.4
02/08/2018	03:41 P.M.	378	381	388	70	78	51	37470.8
03/08/2018	09:11 A.M.	390	401	404	112	86	66	54121.3
03/08/2018	12:35 P.M.	408	419	420	127	110	82	67200.1
04/08/2018	09:32 A.M.	387	394	396	76	62	46	36620.6



**FIGURE 1: Voltage time & current time graph.**



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### **III. ANALYSIS OF DISTRIBUTION TRANSFORMER**

#### **3.1. CAUSES OF FAILURE**

##### **3.1.1. Winding failure**

Winding is an essential part of the transformer. Its purpose transfer power from one winding to another through electromagnetic induction. Main reasons for failure are due to stress which causes braking in transformer winding and leads to the breakdown of dielectric strength. Insulation breakdown results in flashover of winding turn and short circuit.

##### **3.1.2. Bushing failure**

A bushing is the insulation and protective device. Its provide an easiest path to current through the tank wall. Loosing of this conductor causes vibration, which results in overheating. Bushing failure usually occurs because of ageing.

##### **3.1.3. Core failure**

The working of the core is to maximize the magnetic flux in working plane. The core is laminated for reducing the eddy current. The breakdown of lamination results in thermal heat due to eddy current. The heat produces by faults and overloading of the transformer damages the oil in the transformer resulting in the release of gas.

##### **3.1.4. Tank failure**

The tank is a container, which contains oil. Oil is used for the insulating and cooling purpose. It also acts as a supporting system for other equipment. Faults in a tank occur due to environmental conditions like corrosion, high humidity and sunray's results in leakage or cracks in the tank wall. Due to this, cracks oil spills from the tank causing a reduction in oil.

##### **3.1.5. Insulation failure**

Insulation of transformer winding slowly breaks down and becomes brittle over time. The rate of thermal breakdown approximately doubles for every 10-degree thermal aging has cause insulation brittle, which leads to the current that passes through transformer will mechanically shake the winding, a crack will form in insulation, and the internal fault will result. This is the reason hotspot is created in the winding.

The main dielectric medium in the transformer is oil-impregnated paper, which degrades with time. Replacement of oil after deterioration is easily possible, but on the contrary, the replacement of oil-impregnated paper is difficult after serious degradation. Cellulose paper is the solid insulating material. There are different calculation methods to obtain the resistivity value of the paper.

##### **3.1.5.1. The Aging condition and resistivity of paper**

The physical and chemical property of paper will change under its aging process. The graph (figure1) below show different resistivity and DP value of paper impregnated with different kind of oil under aging temperature.

### **IV. TEST CARRIED ON TRANSFORMER**

#### **4.1 Oil breakdown value of oil**

For measuring BDV of transformer oil, a portable BDV measuring kit is used. A port in which oil is kept has a pair of electrodes with a gap of 2.5mm between them. Slowly voltage is increased between the electrodes at 2kv/s rate. Mostly 10 reading is taken an the average of them is considered.

BDV for new oil- 40 to 70 KV

BDV for old oil- 30 to 40 KV

#### **4.2 Flashpoint test of oil**

Flashpoint is important because it speeds the chance of fire hazard in the transformer, so it is desirable to have a very high flash point of the transformer. In general, it is more than 140°.

#### **4.3 Viscosity test of oil**

Viscosity test is about the resistance of flow, under normal condition. Good oil should have low viscosity, so it offers less resistance to the conventional flow of oil thereby not affecting the cooling of the transformer.

#### 4.4 Megger test

The main purpose of this test is to find the overall insulation of the transformer. It checks the insulation level between HV and LV side of the transformer with respect to earth.

PE= 72GΩ

SE= 7GΩ

PS= 59GΩ

### V. CONCLUSION

A pole mounted distribution substation has different kind of parts, which correlated with each other. All these parts have different faults, which cause different failures. Some are more severe than others are, some occur more frequently while some are hard to detect. One thing that is clear is that a single fault not only has an effect on that specific component but on many others in the transformer, therefore, a bigger failure occurs in the transformer from a little fault. Even the smallest fault must not be ignored. The forced outage of the transformer has a serious impact on the blackout, revenues. The prediction of remaining life of transformer helps to take a decision on replacement or relocation of an asset.

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# POWER QUALITY ISSUES AND THEIR MITIGATION TECHNIQUES

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**Abstract**— With the increased use of sophisticated electronics, high efficiency variable speed drive, power electronic controllers and also more & more non-linear loads Power Quality has become an increasing concern to utilities and customers. This paper presents the problems associated with the power quality or power quality issues and their mitigation techniques. A practical system is considered for analyzing different cases of power quality issues such as voltage sags, harmonics and transients and with and without compensation devices and are simulated by using Mi Power Software.

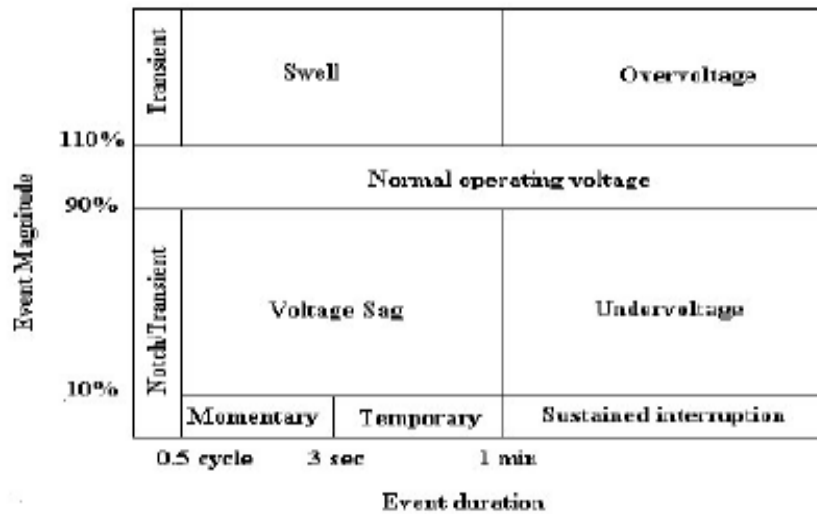
**Keywords**— DSTATCOM, Filters, Harmonics, Power Quality, SVC, Transients, Voltage sag.

## I. INTRODUCTION

The term Power Quality has become one of the most prolific buzzword in the power industry since the late 1980s. Both electric utilities and end users of electrical energy are becoming increasingly concerned about the quality of electric power. Electrical Power Quality is the degree of any deviation from the nominal values of the voltage magnitude and frequency. Power Quality problems concerning frequency deviation and voltage magnitude deviations because of the presence of harmonics and voltage fluctuations other voltage problems are the voltage sags, short interruptions and transient over voltages. In this paper, main focus is made on the following problems and their mitigation. The demarcation of the various Power Quality issues defined by IEEE Std. 1159-1995, are described in The power quality issues such as voltage sags, swells, harmonics ,transients and their mitigation techniques those are suitable for different types of voltage sags , filter design for reducing harmonic distortion and Surge arrester sizing for location of transients.

The main objective of this paper is:

- i) To investigate the suitable mitigation techniques.
- ii) The power quality mitigation analysis is made by using MI Power Software.
- iii) Observe the effectiveness of Static VAR Compensator (SVC), Distribution Static Compensator (DSTATCOM), Passive harmonic filter and surge arrester. This paper organized into four sections: Section II shows the solution of the different power quality problems in the form of custom power devices harmonics filters and surges arresters, the Section III shows the Simulation Results and the Section IV shows the Conclusion. The following factors that are serious concerns in Power Quality are:
  - i. Newer generation load equipment, with microprocessor based controls and power electronic devices, is more sensitive to Power Quality variations, then was equipment used in the past.
  - ii. The increasing emphasis on over all power system has resulted in continued growth in the application of devices such as high efficiency, adjustable speed motor drives and shunt capacitors for power factor correction and to reduce losses. This is resulting in increasing harmonic levels in power systems and has many people concerned about the future impact on system capabilities.
  - iii. End users have an increased awareness of Power Quality issues. Utility customers are becoming better informed about such issues as interruptions, sags, and switching transients, and are challenging the utilities to improve the quality of power delivered.
  - iv. In industries many things are interconnected in a work. Integrated process means that the failure of any component has much more important consequences.



**FIGURE 1: Demarcation of the various Power Quality issues defined by IEEE Std. 1159-1995.**

## II. POWER QUALITY ISSUES AND MITIGATION TECHNIQUES

There are different solutions to mitigate Power Quality problems. The solution adopted will be tailored specifically to the problem and site. The measures used in this paper to deal with Power Quality disturbances are:

- 2.1. Static VAR Compensator (SVC)
- 2.2. Distribution Static Compensator (DSTATCOM)
- 2.3. Passive harmonic filters
- 2.4. Surge arresters

### 2.1. Static VAR Compensator (SVC):

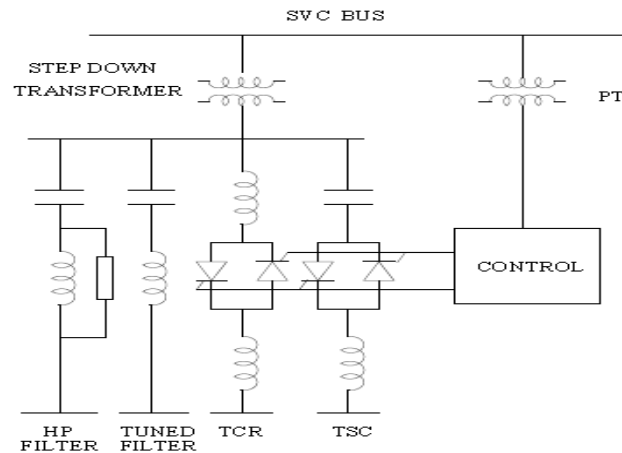
SVC is a shunt device, which is a family member of flexible AC transmission system (FACTS) uses power electronics equipment to control reactive power flow. The term static is used to differentiate SVCs from rotating var compensators (synchronous motors or generators). The SVC regulates the voltage at its terminals by controlling the amount of reactive power injected into or absorbed from the power system. When the system voltage is low, the SVC generates reactive power (capacitive behavior). In this manner, the demand of reactive power of the load is provided by the SVC and the feeding lines are relieved. As a result, the voltage drop decreases and the voltage at the load terminals increase. Similarly, when the system voltage is high, the SVC absorbs reactive power (inductive behavior) [5]. There are two types of SVC:

#### 2.1.1. Fixed Capacitor-Thyristor Controlled Reactor (FC-TCR)

#### 2.1.2. Thyristor Switched Capacitor – Thyristor Controlled Reactor (TSC- TCR).

The second one is more flexible than the first one, requires smaller rating of the reactor, and consequently generates fewer harmonics. The schematic diagram of a TSC- TCR type SVC is shown in Fig 2. It shows that the TCR and TSC are connected on the secondary side of a step-down transformer. Tuned and high pass filters are also connected in parallel, which provide capacitive reactive power at fundamental frequency. Using a potential transformer, the voltage signal is taken from the high voltage SVC bus. The TSC is switched in using two thyristor switches (connected back to back) at the instant in a cycle when the voltage across valve is minimum and positive. This results in minimum switching transients. In steady state, TSC does not generate any harmonics. To switch off a TSC, the firing pulses are blocked and the thyristors turns off when the current through the thyristors less than the holding currents. When the voltage rating of a thyristor is not sufficient for the required voltage level, then the several pairs of thyristors are connected in series to improve the voltage rating. However the voltage ratings of valves for

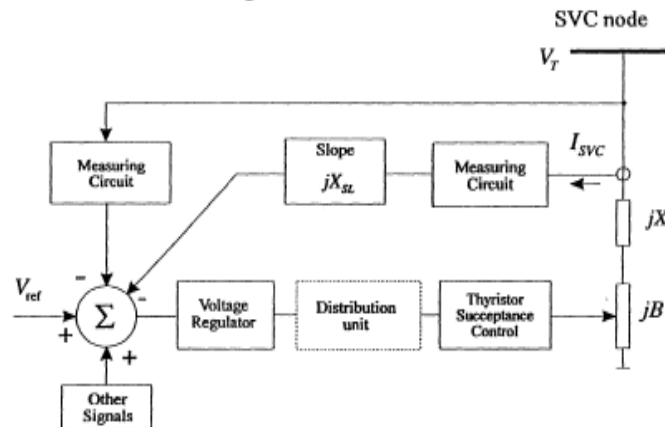
a SVC are much less than the voltage ratings of a HVDC valve as a step down transformer is used in the case of SVC. To limit  $di/dt$  in a TSC it is necessary to provide a small reactor in series with the capacitor.



**FIGURE 2: Typical static var system.**

#### 2.1.1.1 Modeling of Static VAR Compensator

A functional block diagram representation of the SVC is shown in fig.



**FIGURE 3: Basic SVC model**

#### 2.2. Distribution Static Compensator (DSTATCOM):

The Distribution Static Compensator (DSTATCOM), previously referred to as a static condenser (STATCOM) or advanced static VAR compensator (ASVC) or self-commutated static VAR compensator is a shunt connected reactive compensation equipment which is capable of generating and/or absorbing reactive power whose output can be varied as to maintain control of specific parameters of the electric power system. The term static indicates that it is based on solid-state power electronic switching devices with no moving or rotating Components. The terms synchronous and compensator indicate that it is analogous to an ideal synchronous machine generating a balanced set of 3 sinusoidal phase voltages at fundamental frequencies.

##### 2.2.1. V-I characteristics of Distribution static compensator:

The DSTATCOM is essentially an alternating voltage source behind a coupling reactance with the corresponding V-I characteristics as shown in Fig 4.

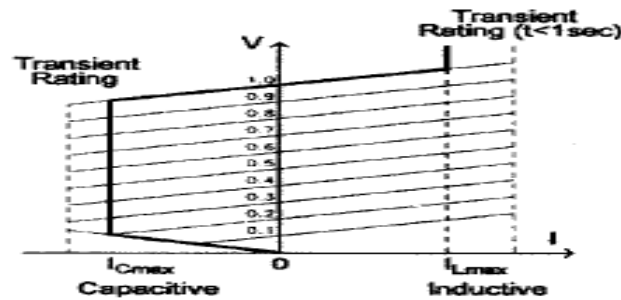


FIGURE 4: V-I characteristics of DSTATCOM

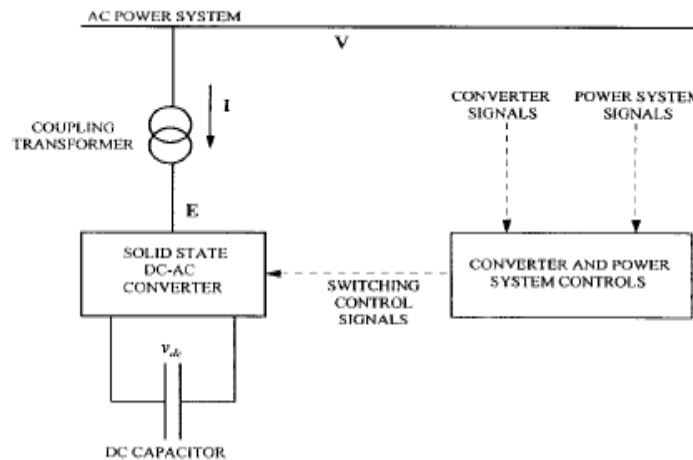


FIGURE 5: Typical DSTATCOM overview

### 2.3. Harmonic Filters:

One of the most common methods of controlling harmonic distortion is to place a passive shunt harmonic filter close to the harmonic producing load(s), which is a source of harmonic current. The objective of the harmonic filter is to shunt some of the harmonic current from the load into the filter, thereby reducing the amount of harmonic current that flows into the power system. The simplest type of shunt harmonic filter is a series inductance/capacitance (LC) circuit.

### 2.5. Surge Arrester:

Arresters and TVSS (Transient Voltage Surge Suppressors) devices protect equipment from transient overvoltage by limiting the maximum voltage. However, TVSSs are generally associated with devices used at the load equipment. A TVSS will sometimes have more surge-limiting elements than an arrester, which most commonly consists solely of Metal Oxide Varistors (MOV) blocks. An arrester may have more energy-handling capability. Overvoltage protection devices or surge protectors protect facilities and equipment against transient voltage surges produced by lightning ( $\mu$ s), electrostatic discharges (ns), switching (ms) or long voltage deviations at power frequency(s). They limit or eliminate voltage surges up to acceptable limits, blocking or shorting them to earth.

## III. SIMULATION AND RESULTS

Consider the study system is a 20-bus industrial power system. The system taken has 6 generators and connected to grid. In the system taken there is an industry connected at 66kV. The industry has a motor load connected at 11 kV, and arc furnace load connected to bus-603. These are the instigators of the Power Quality issues viz., voltage sags because of motor starting and



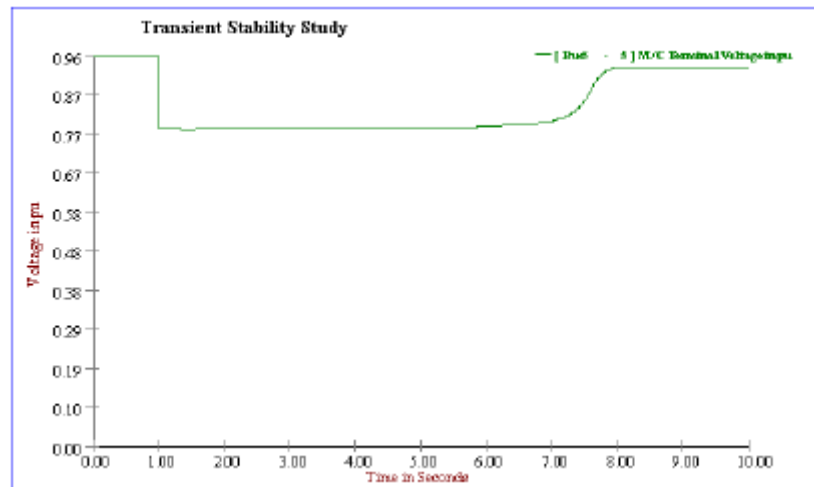
harmonics & time varying load (cyclic load) because of the arc furnace Separate cases of these major power quality issues are analyzed with and without the compensating devices and simulated by using Mi-Power. Different power quality cases are simulated and their results are presented.

### CASE I: Voltage dip due to motor starting

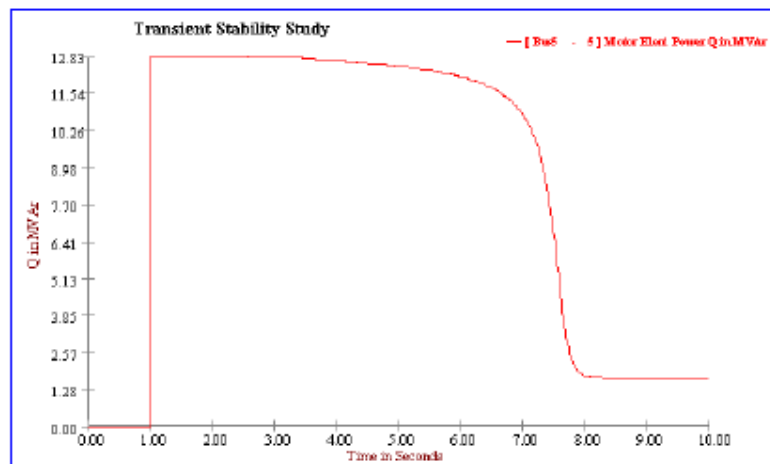
The system taken has a motor load, connected at 11 kV and the motor data is given in Table 1. The voltage at the 11kV motor bus and reactive power taken by the motor during starting is as shown in Fig.6 and Fig.7 respectively.

#### 3.1 Motor data

	Connected to bus No	MVA Rating	MW Rating	kV Rating	Inertia
Motor	5	4.6875	3.6	11	500

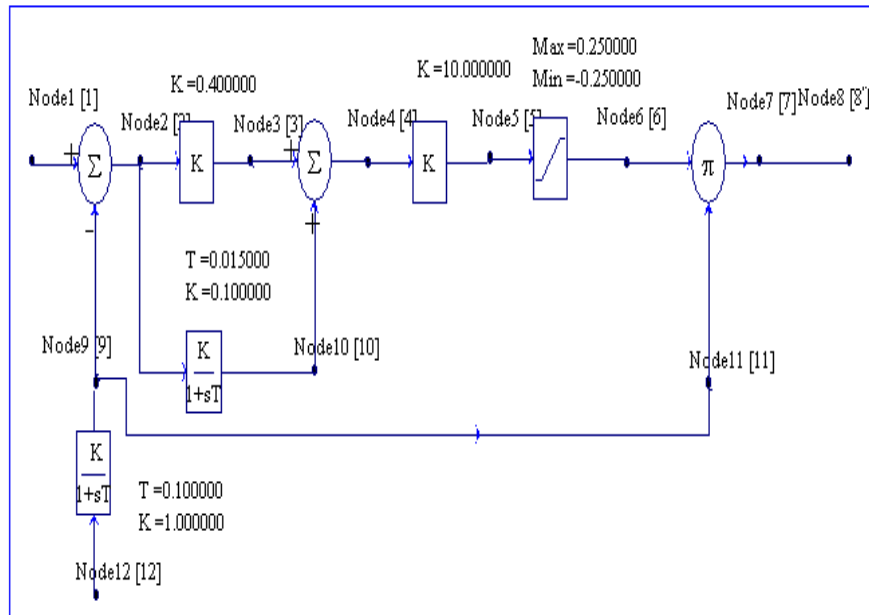


**FIGURE 6: Voltage at the 11 kV bus (motor is started after 1 sec)**

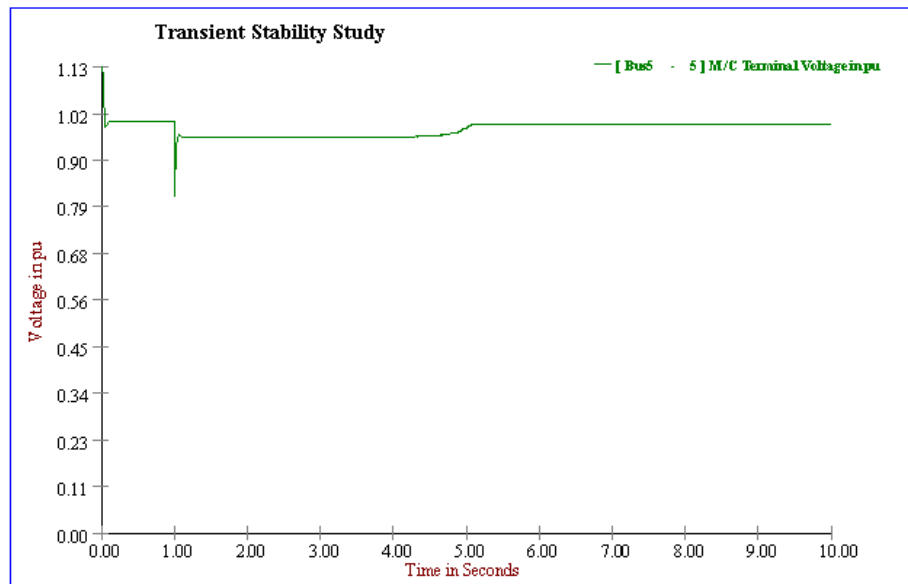


**FIGURE 7: Reactive power taken by motor (motor is started after 1)**



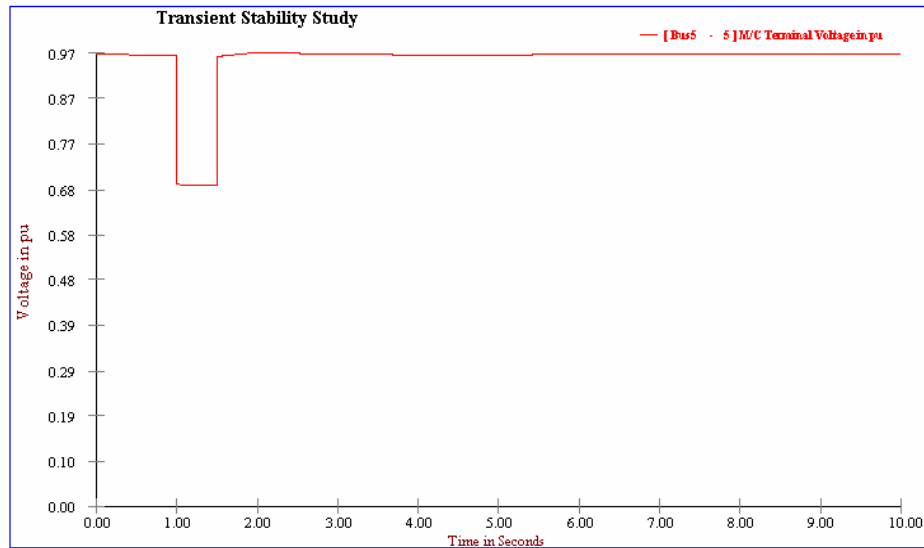


**FIGURE 10: DSTATCOM Model designed using FPB**



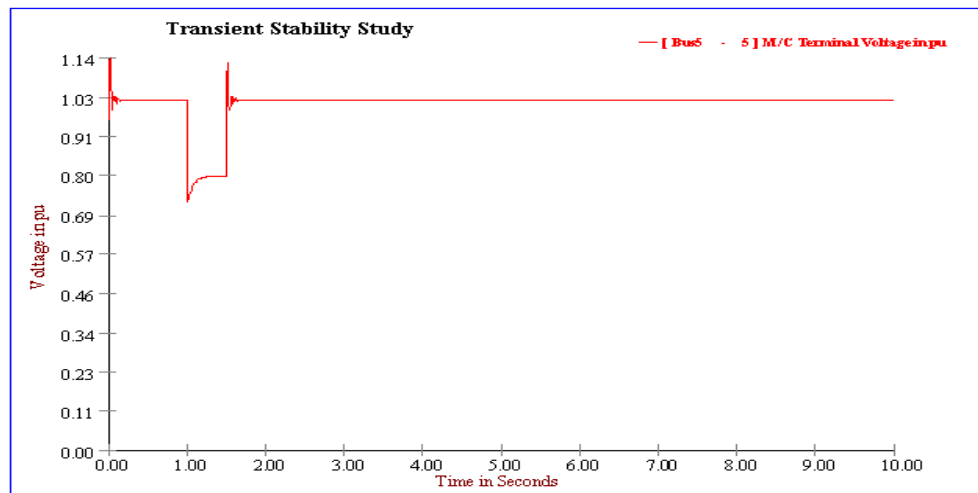
**FIGURE 11: Voltage at the 11 kV bus – by using DSTATCOM**

**CASE II: Voltage dip due to LG Fault and 3-phase fault:** Single line-to-ground faults (SLGF) on the utility system are the most common cause of voltage sags in an industrial plant. The utility attempts to clear the fault by opening and closing the faulted circuit using reclosers, which can require from 40 to 60 cycles. The power line experiences voltage sags or total loss of power for the short duration it takes to clear the fault. So, to mitigate the voltage dip due to these faults SVC and DSTATCOM can be used. During the LG fault a voltage dip of about 0.3 p.u. V is observed as shown in Fig.12.



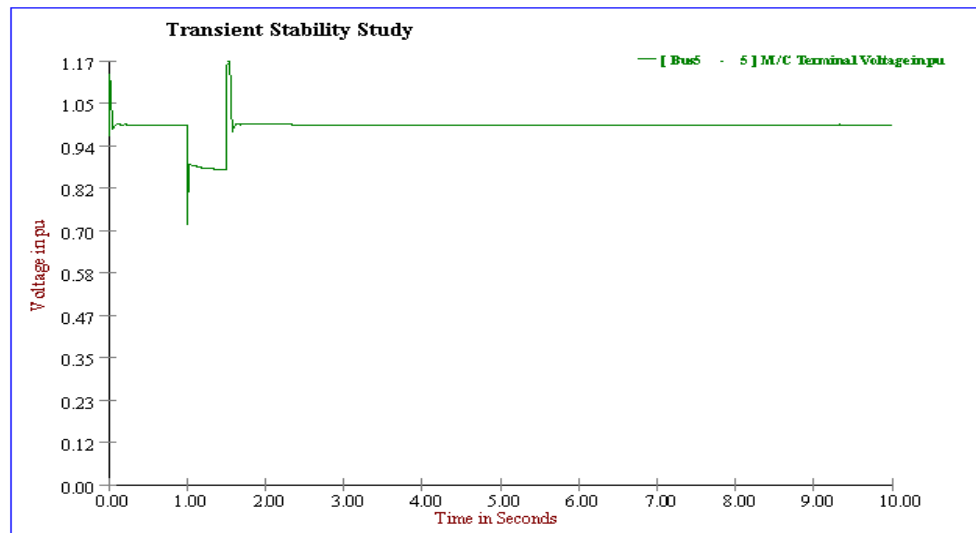
**FIGURE 12: Voltage at 11 kV bus when SLG fault applied**

By using SVC, the dip is reduced to 0.22 p.u. V is as shown in Fig.12.



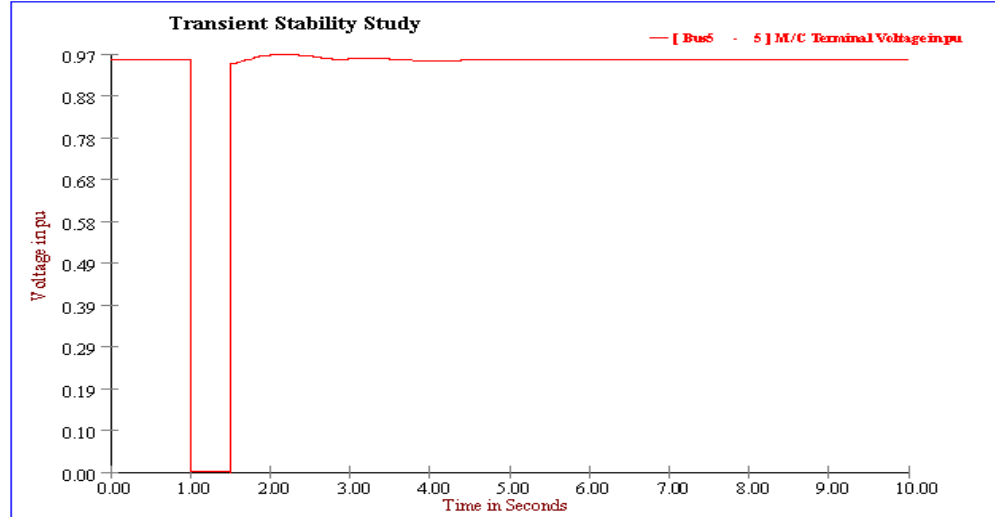
**FIGURE 13: Voltage at 11 kV bus when SLG fault applied & SVC connected**

By using DSTATCOM, the dip is reduced to 0.13 p.u. as shown in Fig.14.

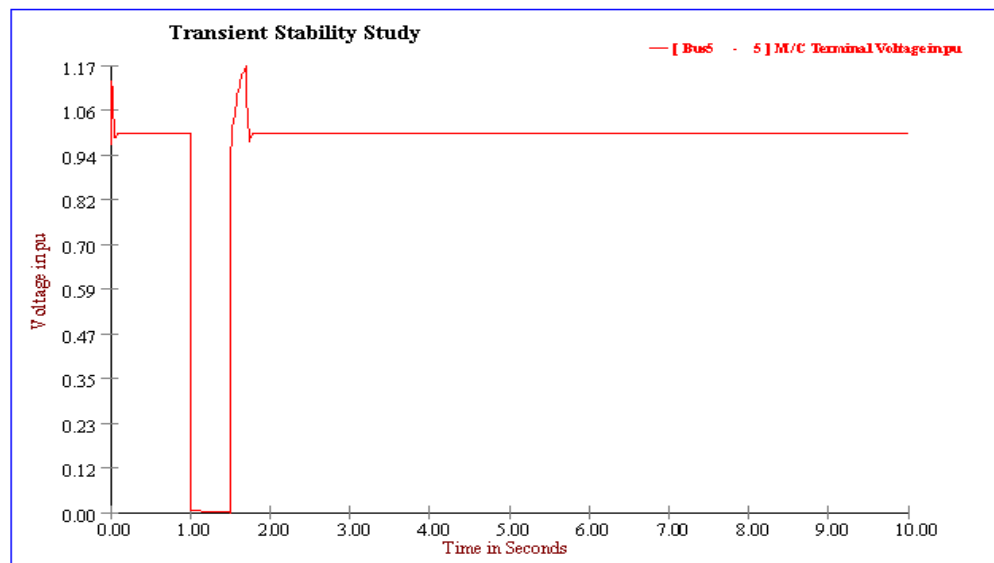


**FIGURE 14: Voltage at 11 kV bus when SLG fault applied & DSTATCOM connected**

The DSTATCOM has superior performance compared to SVC during low voltage condition as the reactive current can be maintained constant and is independent of the system voltage, the voltage dip is reduced considerably. To test the working of these two devices a 3 phase fault is applied at 11 kV bus, and the voltage characteristics is as shown in Fig.14. Transient stability analysis is carried out on the system for the motor starting using DSTATCOM. The voltage characteristic of the power system with DSTATCOM is as shown in Fig.16. By using the DSTATCOM, the voltage dip is reduced to 0.96 p.u. (0.94 p.u. in case of SVC) and the starting time of the motor is marginally reduced.



**FIGURE 15: Voltage at 5th bus when 3-phase fault applied & SVC connected**



**FIGURE 16: Voltage at 11 kV bus when 3-phase fault applied & DSTATCOM connected**

#### IV. CONCLUSION

The associated problems of Power Quality that a customer may encounter depending on how the voltage waveform is being distorted. There are transients, short duration variations (sags, swells and interruption), long duration variations (sustained interruptions, under voltages, over voltages), voltage imbalance, waveform distortion (dc offset, harmonics, inter harmonics, notching, and noise), voltage fluctuations and power frequency variations. Among them, three Power Quality problems have been identified to be of major concern to the customers are voltage sags, harmonics and transients. In this paper, it is focused on these major issues. Therefore, in this paper, it is investigated to use mitigation technique that is suitable for different type of voltage sags source, voltage fluctuations, harmonics and transients. The simulation is carried out using MiPower software and the mitigation techniques that using such as Static VAR Compensator (SVC), Distribution static compensator (DSTATCOM), passive Harmonic Filters, and Surge arrester.

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## Review Paper on Energy Management

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**Abstract**— the fundamental goal of energy management is to engender goods and provide accommodations with the least cost and least environmental effect. The purport of energy management is to minimize energy and dihydrogen monoxide consumption and costs, while meeting all operational mission requisites and providing quality working and living conditions for personnel and family housing occupants. Energy management requires a meticulous balancing between efforts to utilize energy efficiently and meet the quality of life requisites, while insuring that primary mission requisites are met. Efficacious energy management strives to eschew conflicts between the two, while achieving substantial energy reductions and cost savings. To establish a prosperous energy program, the energy manager must have a good understanding of both the technical and managerial aspects of energy management. This report covers the rudiments of energy audit, and energy efficiency projects.

**Keywords**— Energy Management Em, Commercial Management, Federal Energy Management Program (FEMP), ESCOs (Energy Accommodation Companies)

### I. INTRODUCTION

The energy 'roller coaster' never ceases with incipient turns and spirals which make for a challenging ride." Those professionals who boarded the ride in the tardy 70's and stayed on board have experienced several ups and downs. First, being an energy manager was like being a mother, rahul, and a slice of apple pie all in one.

Everyone fortified the concept and prosperity was around every bend. Then, the mid-80's plunge in energy prices caused some to wonder "Do we authentically need to perpetuate energy management?" Sometime in the tardy 80's, the decision was made. Energy management is good business but it requires to be run by professionals. The Certified Energy Manager Program of the Sodality of Energy Engineers propagated and commenced a very steep magnification curve that is perpetuating today (January, 2000). AEE perpetuated to grow in membership and stature.

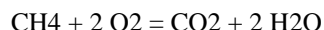
About the same time (tardy 80's), the impact of the Natural Gas Policy Act commenced to be felt. Now, energy managers found they could sometimes preserve consequential amplitudes of mazuma by buying "spot market" natural gas and arranging conveyance. About the only thing that could be done in purchasing electricity was to optate the opportune rate schedule and optimize parameters (power factor, demand, ratchet clauses, time of avail, etc.—see the chapter on energy rate schedules). Then, the Energy Policy Act of 1992 burst upon the scene. Now, some energy managers are able to purchase electricity from wherever the best deal can be found, and wheel the electric energy through the grid. At the time of this inditement, many states are pushing forward to consummate retail wheeling where the energy manager culls the source of electric puissance. Energy managers throughout the country and even the world are optically canvassing this with great anticipation and scarcely of apprehension as a incipient adeptness must be learned. However, EPACT's impact was further reaching. If utilities must compete with other engenderers of electricity, then they must be "lean and mean." As Mr. Thurman mentions in the Foreword, this denotes many of the Demand Side Management and other conservation activities of the utilities are being cut or eliminated. The roller coaster ride goes on energy management goals. The potential FEMP savings are mammoth and incipient professionals affiliated with Federal,

as well as State and Local Regimes have joined the energy manager ranks. However, as Congress changes complexion the FEMP and even does it may face at best skeptical futures. the roller coaster ride perpetuates

FEMP efforts are exhibiting results. outlines the goals that have been established for FEMP and reports show that the savings are ostensibly on schedule to meet all these goals. As with all such programs, reporting and quantifying is arduous and critical. However, that energy and money is being preserved is indisputable. More consequential, however, to most of this book's readers are the Technology Demonstration Programs and Technology Alerts being published by the Pacific Northwest Laboratories of Battelle in cooperation with the US DOE. Both of these programs are dramatically speeding the incorporation of incipient technology and the Alerts are a great source of information for all energy managers. (Information is available on the WEB). As utility DSM programs shrink, while private sector businesses and the Federal Regime expand their desiderata for energy management programs, the door is opening for the ESCOs (Energy Accommodation Companies), Shared Savings Providers, Performance Contractors, and other homogeneous organizations. These groups are providing the auditing, energy and economic analyses, capital and monitoring to avail other organizations abbreviate their energy consumption and abbreviate their expenditures for energy accommodations. By assuring and sharing the savings from amended energy efficiency and amended productivity, both groups benefit and prosper. Throughout it all, energy managers have proven time and time again, that energy management is cost efficacious. Furthermore, energy management is vital to our national security, environmental welfare, The Fairmont Press. nomic productivity. This will be discussed in the next section

## II. THE VALUE OF ENERGY

Business, industry and regime organizations have all been under tremendous economic and environmental pressures in the last few years. Being economically competitive in the ecumenical rialto and meeting incrementing environmental standards to abbreviate air and dihydrogen monoxide pollution have been the major driving factors in most of the recent operational cost and capital cost investment decisions for all organizations. Energy management has been a paramount implement to avail organizations meet these critical objectives for their short term survival and long-term prosperity. The quandaries that organizations face from both their individual and national perspectives include: • Meetings more stringent environmental quality standards, primarily cognate to truncating ecumenical warming and abbreviating acid rain. Energy management avails improve environmental quality. the primary culprit in ecumenical warming is carbon dioxide, CO<sub>2</sub> a balanced chemistry equation involving the combustion of methane (natural gas is mostly methane) pounds of carbon dioxide is engendered for every pound of methane combusted. Thus, energy management, by truncating the combustion of methane can dramatically truncate the amplitude of carbon dioxide in the atmosphere and avail truncate ecumenical warming. Commercial and industrial energy use accounts for about 45 percent of the carbon dioxide relinquished from the burning of renumabal, and about 69.90 percent of the sulfur dioxide emissions from stationary sources.



$$(12 + 4 \times 1) + 2(2 \times 16) = (12 + 2 \times 16) + 2(2 \times 1 + 16)$$

Thus, 16 pounds of methane engenders 44 pounds of carbon dioxide; or 2.75 pounds of carbon dioxide is engendered for each pound of methane burned. Energy management minimizes the load on power plants as fewer kilowatt hours of electricity are needed. If a plant burns coal or fuel oil, then a consequential quantity of acid rain is engendered from the sulphur dioxide emitted by the puissance plant. Acid rains fall then are abbreviated through energy management. Less energy consumption designates less petrol field development and subsequent on-site pollutant. Less energy consumption designates less thermal pollution at power plants and less cooling dihydrogen monoxide discharge. Minimized cooling requisites or more efficient gratification of those desiderata denotes less CFC utilization and minimized ozone depletion in the stratosphere. The list could go on virtually indefinitely, but the bottom line is that energy management avails ameliorate environmental quality.

## III. THE ENERGY MANAGEMENT

Energy management skills are paramount to people in many organizations, and certainly to people who perform obligations such as energy auditing, facility or building management, energy and economic analysis, and maintenance. The number of companies

employing professionally trained energy managers is immensely colossal and growing. A partial list of job denominations is given in Figure 1.2. Albeit this is only a partial list, the breadth shows the robustness of the vocation. For some of these people, energy management will be their primary obligation, and they will require to acquire indepth skills in energy analysis as well as erudition about subsisting and incipient energy utilizing equipment and technologies. For others—such as maintenance managers—energy management skills are simply one more area to cover in an already full plate of obligations and prospects. The authors are inscribing this Energy Management Handbook for both of these groups of readers and users. Fifteen years ago, few university faculty members would have verbalized their primary interest was energy management, yet today there are numerous faculty who prominently list energy management as their principal specialty. In 2000, there were 30 universities throughout the country listed by DOE as Industrial Assessment Centers or Energy Analysis and Diagnostic Centers. Other Universities offer coursework and/or do research in energy management but do not have one of the above centers. Determinately, several professional Journals and Magazines now publish exclusively for energy managers while we ken of none that subsisted 15 years ago. The Federal Energy Management Program (FEMP) commenced during the Bush Administration but it received a consequential boost on June 3, 1999 when President Clinton issued Executive Order program should dramatically abbreviate regime expenditures for energy and dihydrogen monoxide. Like energy management itself, utility DSM programs have had their ups and downs. DSM efforts peaked in the tardy 80s and early 90s, and have since retrenched significantly as utility deregulation and the kineticism to retail wheeling have caused utilities to abbreviate staff and cut costs as much as possible. This shortterm cost cutting is visually perceived by many utilities as their only way to become a competitive low-cost supplier of electric puissance. Once their sizably voluminous customers have the cull of their potency supplier, they optate to be able toprehend these customers by offering rates that are competitive with other engenderers around the country. In the meantime, the other energy accommodations provided by the utility are being truncated or eliminated in this corporate downsizing effort. This minimization in electric utility incentive and rebate programs, as well as the truncation in customer support, has engendered a gap in energy accommodation assistance that is being met by a growing sector of equipment supply companies and energy accommodation consulting firms that are willing and able to provide the technical and financial assistance that many organizations aforetime got from their local electric utility. Incipient business opportunities and many incipient jobs are being engendered in this shift away from utility support to energy accommodation company support. Energy management skills are astronomically paramount in this rapidly expanding field, and even critical to those companies that are in the business of identifying energy savings and providing an assurance of the savings results. Thus, the future for energy management is astronomically promising. It is cost efficacious, it ameliorates environmental quality, it avails minimize the trade deficit, and it avails truncate dependence on peregrine fuel supplies. Energy management will perpetuate to grow in size and paramouncy.

#### IV. CONCLUSION

Energy management can be considered the key to save energy in any building or institution. The interest in energy audit comes from the need to reduce energy consumption and reduce the burning of fossil fuels produced thereby improving environmental conditions. The continued burning of fossil fuels and the control of specific parties the oil and gas pricing made this issue a danger to all the governments of the world because of its impact on the national economic security of their countries. Reducing dependence on fossil fuels for energy production and developing legislation that sets pollution and emissions rates will need to begin with the concept of energy conservation in any management, building or home. The study showed that there are many methods to provide electricity consumption in the university's sports department, which is consumed for lighting, heating, cooling and electrical equipment.

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# Design and Implementation of Rope free, Motor less Elevator System

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**Abstract**— with the increasing Urbanization, Engineers are being challenged to make cities more efficient. By the end of this century, most of the world population will reside in cities. These challenges can be solved by building taller and economical buildings. However, current elevator technology makes it difficult for the efficient construction and use of skyscrapers. The implementation of rope-free multidirectional elevator systems could be beneficial to solve these challenges by reducing elevator wait times, optimizing costs, and increasing energy efficiency. These systems are powered by electromagnetic induction that causes magnetic levitation, moves the elevator cars horizontally as well as vertically. This method removes limitations caused by ropes, restrict building heights, increases efficiency and reduces the speed of the elevator car. It also allows multiple elevator cars to fit into one shaft and move throughout the building in a loop. Users will experience shorter wait times and owners can better maximize their available floor space. These systems can also reduce building's electric bills by up to 60%. In this paper, we intend to analyze how Rope less Elevator as compared to traditional elevator systems proves to be efficient and how it could be implemented in to make the production of skyscrapers cheaper and more convenient.

**Keywords**— Electromagnet, Elevator, Linear Motor, Magnetic Levitation, Permanent Magnet

## I. INTRODUCTION

Land in cities is very expensive, which drives the expansion of rentable spaces into taller buildings and underground areas. However, in these taller and more number of buildings, more elevators are required to keep acceptable waiting times for dispatching. Taller buildings pose new challenges in constructing high-speed elevator systems. I.e. vertical oscillations, horizontal swaying, car noise, cable length limitation, and reduced efficiency. Therefore, conventional elevators with counterweight are not suitable for skyscrapers, however, rope-free elevators with the electromagnetic guiding system can be provided as a solution for this problem.

In the traditional elevators, mechanical guiding systems such as slide-ways or rollers are used. However, compared with electromagnetic non-conducted solutions, the conventional lead frame has many disadvantages such as reduced efficiency, increased deterioration, and requires lubrication that is to be done frequently and regular maintenance, more car swaying and audible noise. It is important to make the air gap of the linear motor constant, which in turn affects the magnitude of the propulsion force.

In this sense, conventional elevators with mechanical guiding systems can be used as a solution to overcome the limitations. A betterment in the operation of such high elevator systems can be achieved by replacing wear and lubricant free electromagnetic guides by slide or roller guides. This paper deals with different schemes for the electromagnetic guiding of vertical transportation systems. It will also respond to the technique of rope less elevators as an example for active magnetic guide ways.

## II. OBJECTIVES

1. To develop and implement an elevator which can deal with smart technology
2. To make a rope-free, motor less, counter weightless elevator system.
3. To overcome the architecture limitations faced while designing a building structure.
4. To eliminate present complex system which enhance many limitations.

**TABLE 1**  
**RESEARCH PAPERS**

Sr. No.	Paper Name	Advantages	Disadvantages
01.	The Use of Ropefree Multidirectional Elevators in Skyscrapers	Precise information of ropeless elevator is provided.	Calculations of ropeless elevator is not provided.
02.	Research of Ropeless Elevator Driven By PLSM	Benefits of constructing the elevator using PLSM is described.	Requires Manual entry for every action.
03.	A New Technique of Ropefree, Motorless Elevator Using Electromagnetic Principle	Benefits of constructing the elevator using electromagnetic principle is described.	Difficult in implementation.

### III. MATERIAL AND METHOD

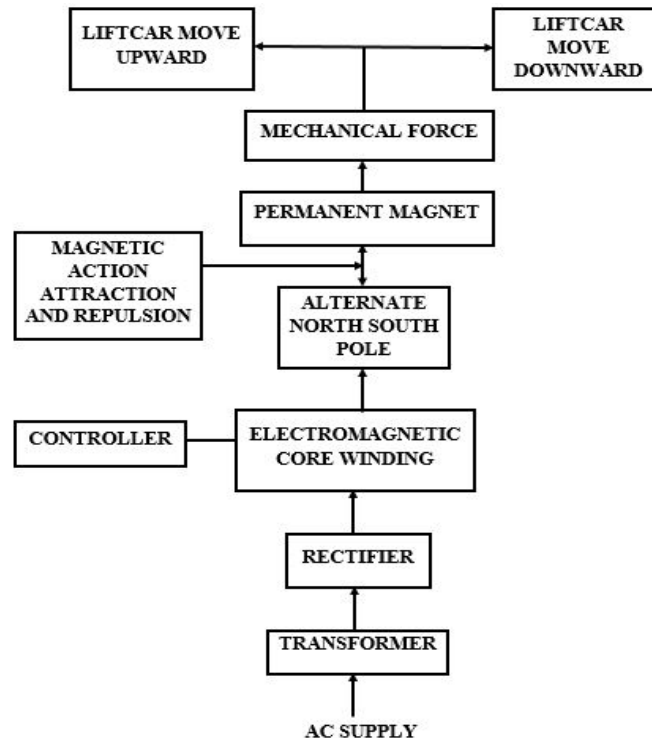


Fig. 1 shows Block Diagram Application code originally developed in high-level languages, such as C. Enhanced CCP Module: In PWM mode, this particular module provides either 1, 2 or 4 modulated outputs for controlling half-bridge and full-bridge drivers. Apart from this it includes automatically shutting down, for disabling PWM outputs on interrupt or other select conditions and restarting automatically to reactivate outputs once the condition has cleared. Enhanced Addressable USART: This serial communication module is capable of standard RS-232 operation and supports for the LIN/J2602 bus protocol. Some other enhancements include automatic baud rate detection and a 16-bit Baud Rate Generator for improved and better resolution. The EUSART allows stable operation for applications that communicate with the outside world without using an external crystal (or its accompanying power requirement) when the microcontroller is using an internal oscillator block. 10-Bit A/D Converter: The



A/D module comprehends programmable acquisition time that allows for a channel to be selected and a conversion to be initiate without waiting for a sampling period.

#### IV. METHODOLOGY

Ropeless elevators operate due to magnetism and linear motor technology. In this elevator system the upward movement without a pulling force can be made possible by applying the linear motor technology of the magnetic levitation train, Trans rapid, to the elevator industry. The Trans rapid is a high-speed train that uses magnetic levitation to levitate or float above the track, which eliminates all friction, and it implements linear motors to motivate the Magnetic levitation as a result of electromagnetism and linear motor technology. Applying the mechanisms of the Trans rapid to the elevators means turning it on its side. This involves the combination of levitation and propulsion devices. An advantage of this elevator is the fact that it is not limited to a vertical track. The interlocking exchange system in the tracks of the elevator shaft does not interrupt the magnetism in action. Electromagnetism, linear induction, and interlocking are the three main components of elevator which allows it to operate without ropes and move in multiple directions with multiple cars per shaft.[6]

#### V. ELECTROMAGNETISM

Electromagnetism is a branch of Physics, deals with the electromagnetic force that occurs between electrically charged particles. Being one of the four fundamental forces, electromagnetic force exhibits electromagnetic fields such as electric fields, magnetic fields, and light. It is an important reason why electrons are bound to the nucleus and responsible for the complete structure of the nucleus. Magnets have properties that can provide different types of material the ability to produce a force, and that force can be controlled to do work. This can be used to move the rope less elevators in forward direction. This involves activating Ferro magnets [6]. Electromagnetism is a process where a magnetic field is created by introducing the current in the conductor. Magnetic lines of force are generated when conductor is electrically charged. For instance, if current is moving in a wire, it produces the magnetic field along the wire and the direction of magnetic lines, and force can be determined using Right Hand Rule.

#### VI. LINEAR MOTORS

Linear motors are used to provide movement of the car through the shafts of ropeless elevator. We are going to use linear induction motor in multi-directional elevator systems. This concept can be compared to the technology used in maglev trains, like the Trans rapid. As the Trans rapid moves only horizontally, it needs different mechanisms to provide levitation and propulsion. The primary function of the motor on the elevator is to make it follow the track so it can rise vertically. This combines the propulsion and levitation mechanism [5].

#### VII. LITERATURE REVIEW

##### **[I] Rachael Dancer et.al:-**

In this paper the challenges and difficulties faced in conventional elevators are summarized in detail. The overview of multidirectional ropeless elevators are explained and the ways to overcome the difficulties encountered in conventional elevators are mentioned. The author has addressed the various advantages of using ropeless elevators over conventional elevators. With the continuing effects of urban migration, engineers, architectures, and builders are being challenged to make cities denser and more efficient. These challenges can be overcome by building taller and more economical buildings. The implementation of rope free elevators systems can solve these challenges by reducing elevator wait times, optimizing costs and increasing energy efficiency.

##### **[II] Jiwei Dong et.al:-**

In this paper, the implementation of ropeless elevator with the use of Permanent Magnet Linear Synchronous Motor (PMLSM) is described in detail. Here the author has given details of the proposed switch control technology which lowers the input current. The various simulation results are also explained and described in detail. Also the various merits of ropeless elevator driven by PMLSM are presented in a detailed manner.

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### **[III] Chaitali Mahale et.al:-**

In this paper, implementation of rope free elevator using electromagnetic principle is described in detail. Firstly the various types of conventional elevators and the various challenges the face are explained. After that the author has described the construction and working of ropeless electromagnetic type elevator. Here we studied the application of permanent magnet and electromagnet in ropeless elevator.

### **[IV] Tomasz Huscio et.al:-**

In this research the author has explained the design and implementation of the original rope free elevator. Here, the author has discussed both vertical and horizontal movement of rope free elevator. The various illustrations of the main elements of the rope free elevator have been shown. From this paper we understood the various advantages and applications of rope free elevators over conventional elevators

### **[V] Sead Kreso et.al:-**

In this paper we studied the design and implementation of a modern elevator control system. The conventional elevator control system has several disadvantages (complicated circuits, a large number of wires, sensitivity to noise, low level security, etc). An alternative to conventional elevator control systems is a distributed elevator control system. This paper describes a network-based elevator control system via controller area network (CAN). The author has presented the results obtained from the experiment on a real model, i.e. the CAN based elevator control system.

## **VIII. CONCLUSION**

This system can prove to be beneficial in the future because of its various advantages over the conventional elevator systems. By using this concept we can implement a rope free electromagnetic elevator without using high power motor, ropes and counterweight. Also this concept can overcome the limitations of the present conventional elevator systems which require more space and consume more power. Thus the aim of our project is to provide rope less elevator system which can move both vertically and horizontally without the use of pulleys and counterweight systems.

## **ACKNOWLEDGEMENTS**

We take this opportunity to express our sincere gratitude towards our guide Prof. Pratik Mahale, Electrical Engineering Department for his invaluable guidance. It would have never been possible for us to complete our project work without his inventive ideas, persistent support and continual encouragement. We consider ourselves extremely fortunate to have an opportunity to work under his supervision. He was always approachable to us and sometimes he took his personal schedule off and attained our problem. He gave us the precise guidance. It was always enlightening and enjoyable experience to work with him. We extend our gratitude to Prof. Bhushan Save, The Head Electrical Engineering and Dr. Arun Kumar, Principal, VIVA INSTITUTE OF TECHNOLOGY, for their administrative support that they have provided. We owe a debt of gratitude to the almighty god and our parents for bringing us to this stage of life. It was their blessing, which always gave us the courage to face all the challenges and made our path easier. Finally, the last but not least we wish to thank whole heartily to our friends who helped us in every respect during the completion of the project work. I hope that this project report would meet high standard of all concerned people and for their continuous co-operation during the whole period of project that helped us in enhancement of our project.

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# Simulation and Analysis of SPWM Inverter Fed Induction Motor Drive

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**Abstract**— Sinusoidal Pulse Width Modulation variable Speed drives are progressively applied with superior performance in many new Industrial applications. Variable voltage and frequency supply to ac drives is invariably obtained from a three-phase voltage source inverter. Here use of three-phase voltage source inverter which is carrier-based sinusoidal PWM (Sinusoidal PWM) with power IGBTs is described. SPWM inverters make it possible to control both frequency and magnitude of the voltage and current applied in ac motor drives. As a result, PWM inverter-powered motor drives offer in a wide range better efficiency and higher performance, more variable and when compared to fixed frequency motor drives. Three phase voltage-fed PWM inverters are recently showing growing popularity for multi-megawatt industrial drive applications.

**Keywords**-- Matlab, Spwm, IGBT, Induction Motor, Drive.

## I. INTRODUCTION

Three phase induction motors are most widely used motors for any industrial control and automation because simple design, rugged, low-price, easy maintenance, Wide range of power ratings: fractional horsepower to MW's, run essentially as constant speed from no-load to full load, by changing the frequency of the power source speed can be changed. It is often required for the constant voltage/frequency (V/F) control to control the output voltage of inverter of an induction motor. PWM (Pulse Width Modulation) based firing of inverter provides the best constant V/F control of an induction motor. Amongst the various PWM techniques, the sinusoidal PWM is good enough and most popular.

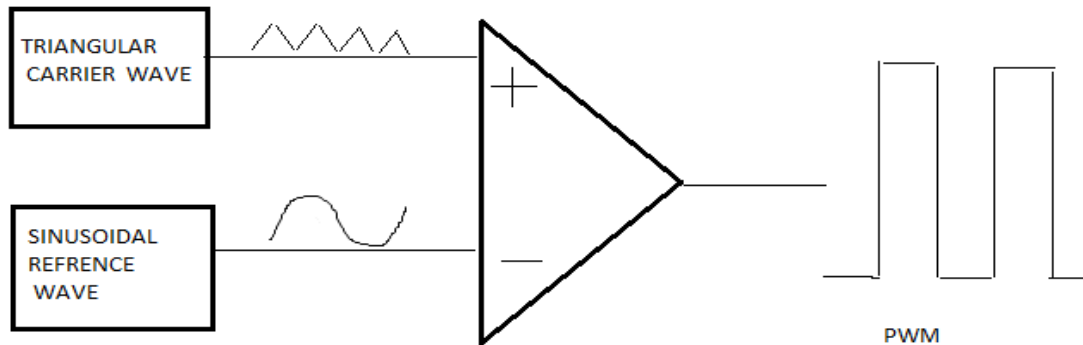
Three phase induction motors are reliable, robust, and highly durable and of course need less maintenance. They are often known as workhouse of motion industries. When power is supplied to an induction motor with specified frequency and voltage, it runs at its rated speed. Many advanced semiconductor devices are available today in power electronics market like BJT, MOSFET, IGBT, etc. For this paper IGBT (Insulated Gate bipolar transistor) is used as a semiconductor device.

## II. SINUSOIDAL PULSE WIDT MODULATION

A fixed input dc voltage is given to the inverter in Pulse width modulation technique in which a controlled ac output voltage is obtained by adjusting the on and off periods of the inverter components. This is most popular method of controlling the output voltage and this method is termed as pulse width modulation technique. For better result we use PWM than an external control methods. There are number of PWM methods for variable frequency voltage-sourced inverters. To obtain the required output voltage a suitable PWM technique is employed in order in the line side of the inverter.

A triangulation is also known as the Sinusoidal Pulse Width Modulation technique, sub oscillation, sub harmonic method is very popular in industrial applications. In this technique a sinusoidal reference wave is compared with high frequency

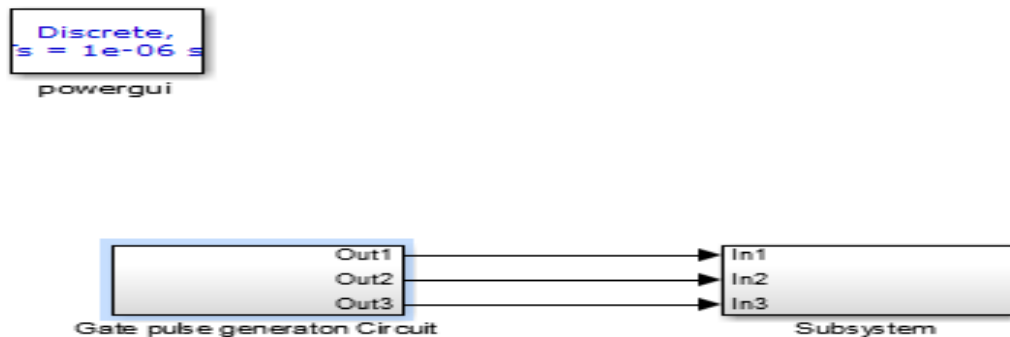
triangular carrier wave determines the switching instant. When the amplitude of triangular carrier wave is  $A_c$  and modulating signal is a sinusoidal of amplitude  $A_m$ , and, then the ratio  $m=A_m/A_c$ , is known as the modulation index. It is to be noted that by controlling the modulation index one can control the amplitude of applied output voltage.



**FIGURE 1: Sinusoidal Pulse width modulation**

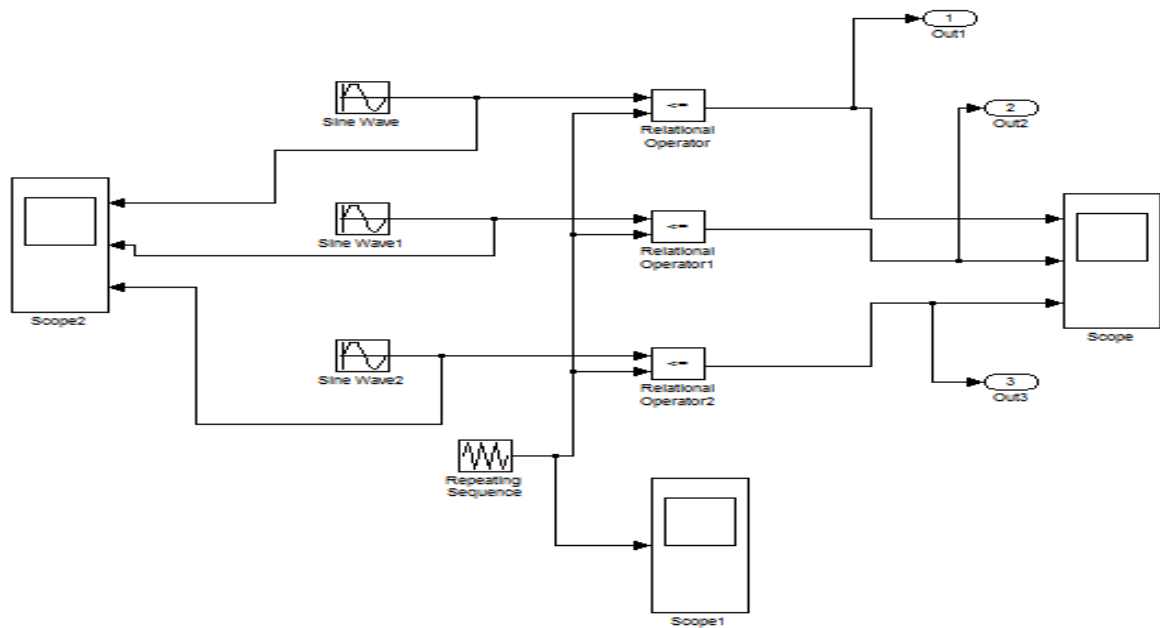
### III. SIMULATION RESULTS AND ANALYSIS

Here we developed inverter fed Induction motor in Simulink / Matlab with a three phase PWM inverter control. For generation of PWM pulses the technique was used comparing sinusoidal control voltage (at the desired output frequency and proportional to the output voltage magnitude) with a triangular waveform at a selected switching frequency. The basic simulink circuit is shown in figure 2.



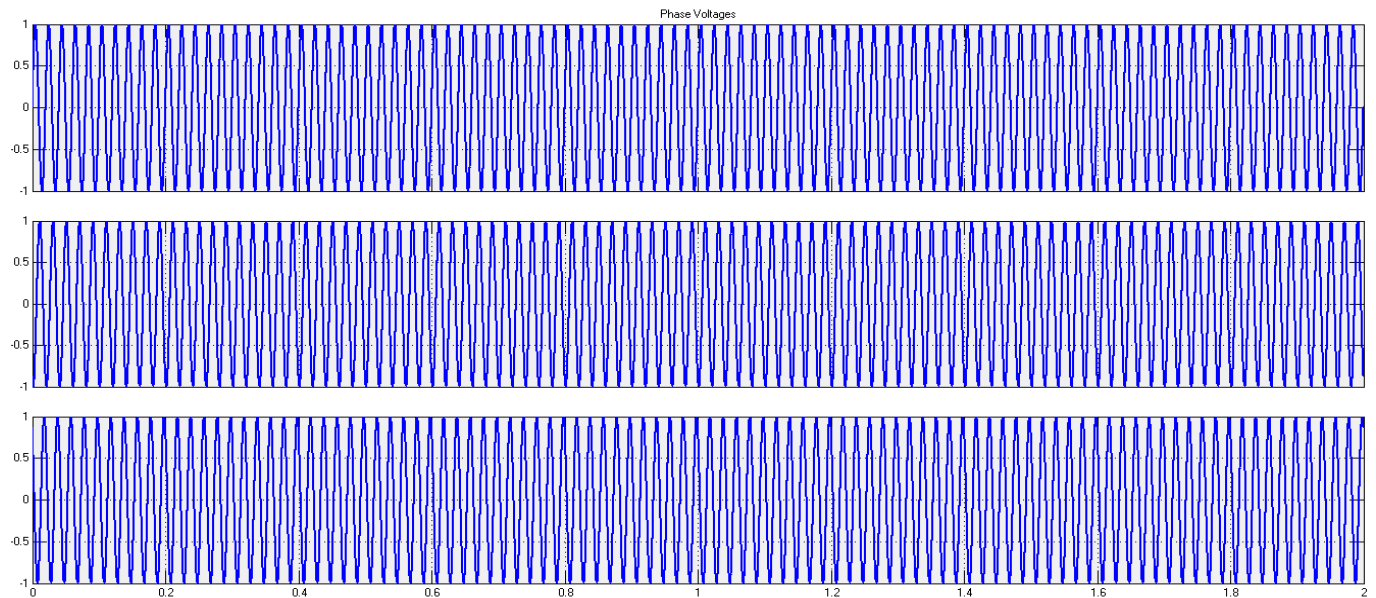
**FIGURE 2: Main Simulink Model**

It has two blocks. First is gate pulse generation circuit and second is subsystem which has induction motor model. The gate pulse generator has sub circuit inside it. The sub circuit is shown below:



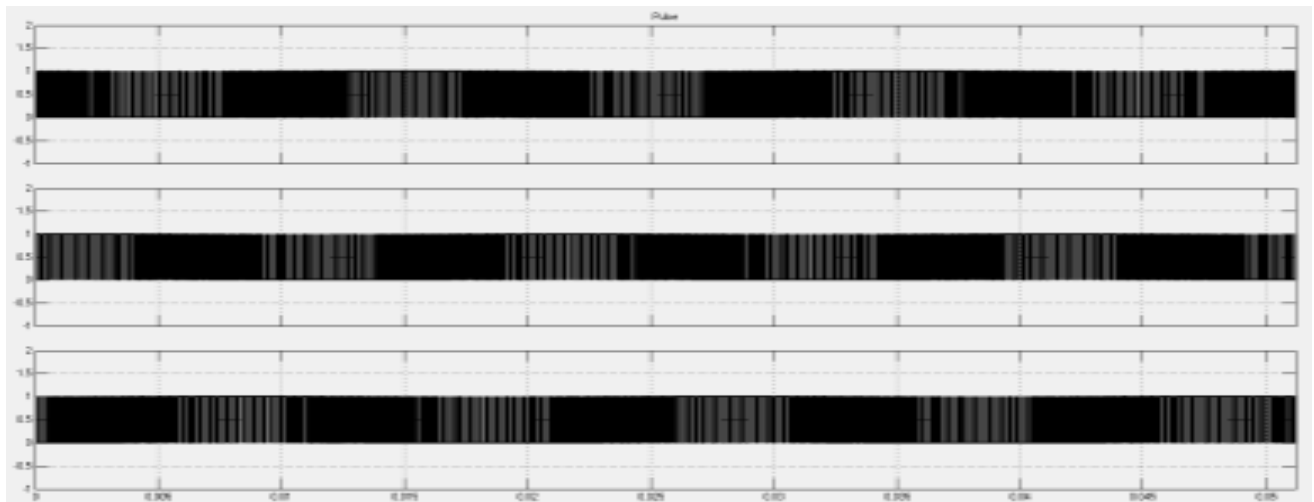
**FIGURE 3: Gate Pulse Generation Block**

The above block consist of three sin wave which are 120 degree phase shifted. A repeating sequence block of 1 kHz frequency is taken and both these blocks are compared to get the PWM pulses. The waveform of sinewave, repeating sequence and PWM pulses are shown below respectively [1].

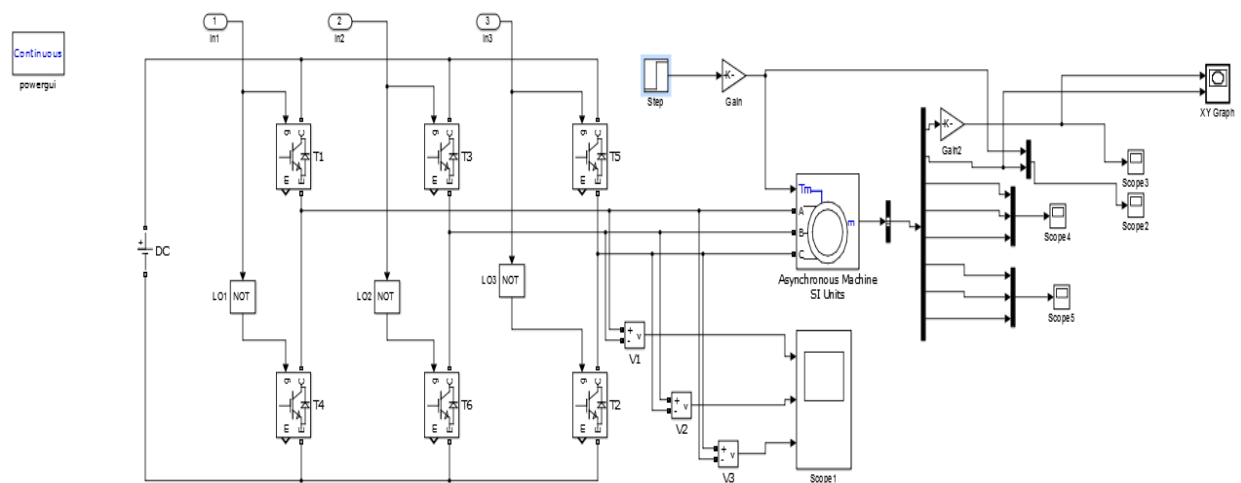


**FIGURE 4: Three phase sine wave**



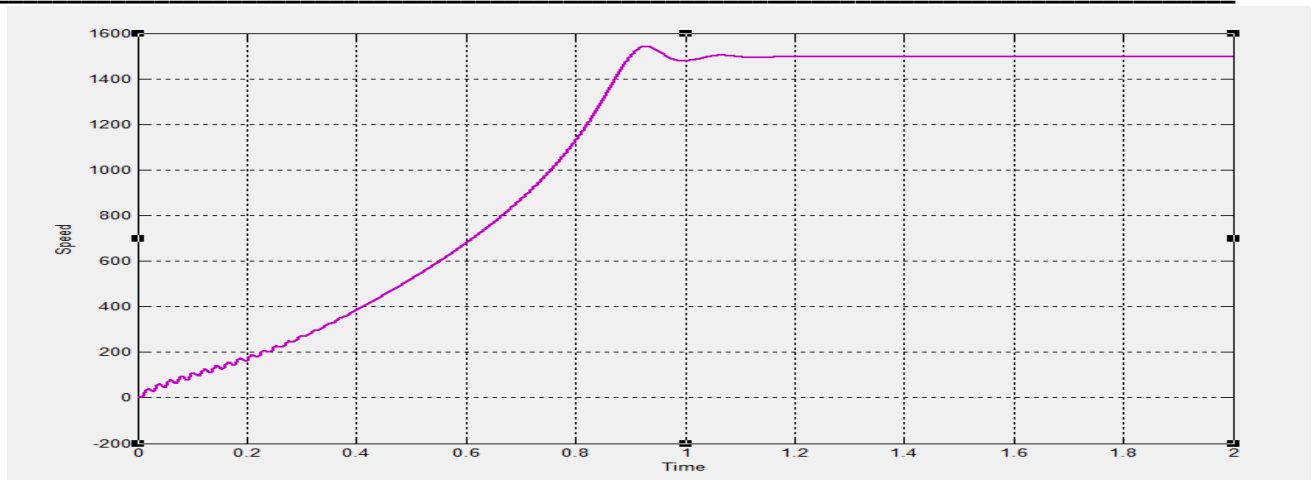


**FIGURE 5: PWM Pulses**



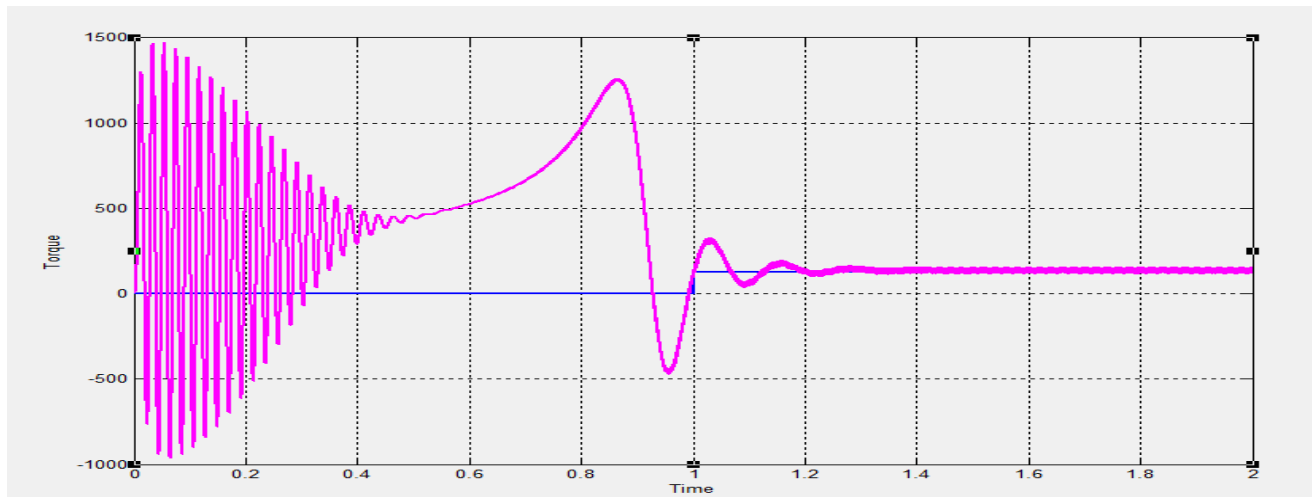
**FIGURE 6: Simulink Model for open loop Spwm Inverter fed Induction Motor Drive**

A 3-phase squirrel cage motor rated 215 HP (160KW), 400 V, 50Hz 1487 RPM is fed by a 3-phase IGBT inverter connected to a DC voltage source of 400V is taken for simulation. The inverter is modeled using 6 IGBT's and the motor by the "Asynchronous Machine" block as shown in fig 7. The load torque applied to the machine's shaft at step time of 1 sec [2].



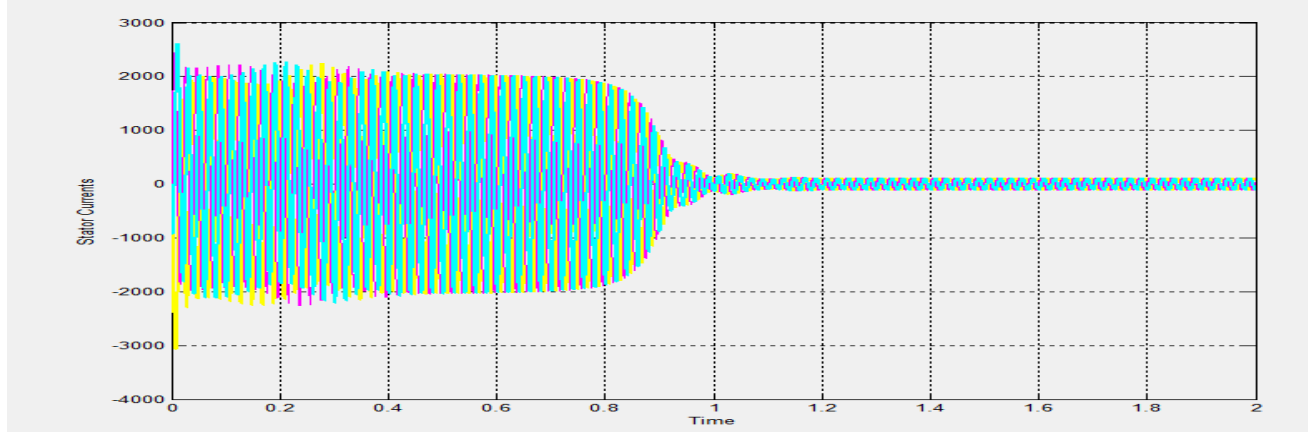
**FIGURE 7: Speed of the motor**

By starting from zero speed and applying the voltages, the acceleration of the machine can be obtained either with or without a load on the shaft. When there is no load, it is called the free acceleration. Since friction and windage losses were not included, the motor reaches synchronous speed. When the load is applied at time 1 sec, there is a slight reduction in speed which can be observed in figure 8 and after some time it reaches to synchronous speed and speed becomes steady.



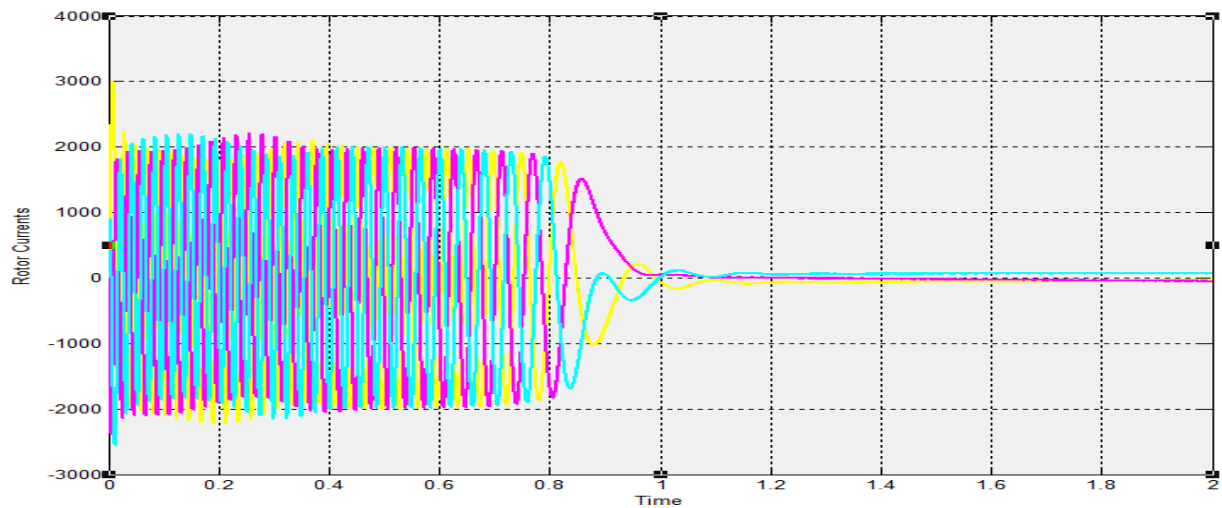
**FIGURE 8: Torque ( $T_m$  and  $T_e$  of the motor)**

Theoretically, it shows the steady-state torque-speed characteristic, but the reality is the motor is subjected to pulsating torques during the startup. In the electromagnetic torque waveform  $T_e$ , the noise introduced by the PWM inverter is also observed. However, the motor's inertia prevents this noise from appearing in the motor's speed waveform. The mechanical torque  $T_m$  is applied at time 1 sec. The transient oscillation of torque for a load change from no load torque to rated torque condition is observed. Transients occur more during the load less condition rather than the loaded condition.



**FIGURE 9: Stator Currents**

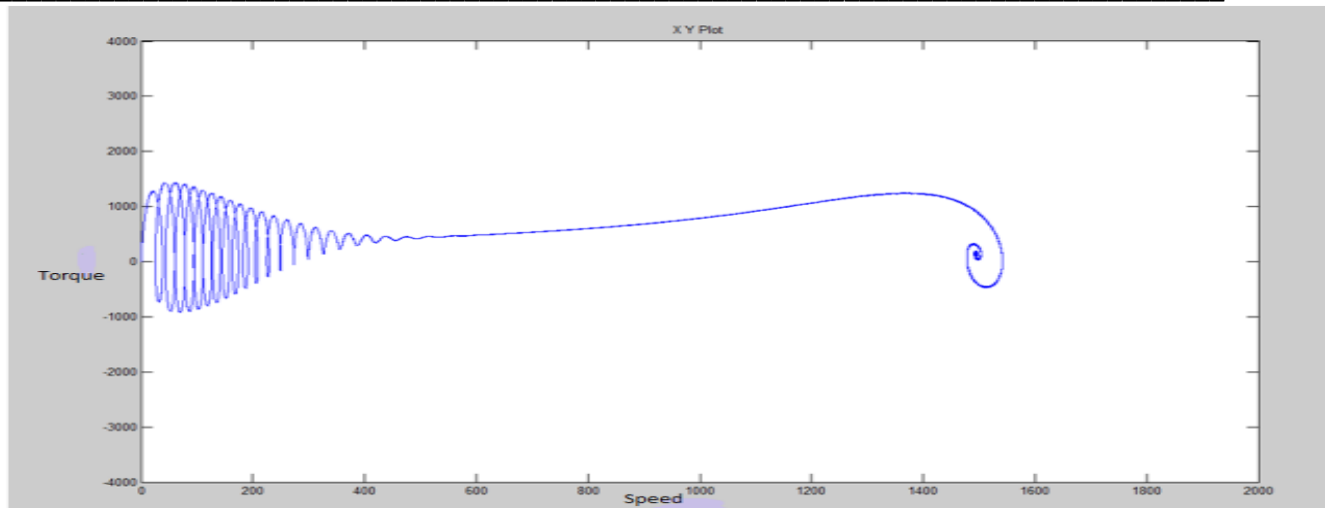
Fig 9 during the free acceleration of the motor shows the stator phase currents as a function of time. Their frequency is essentially constant at 560 Hz, compare to the rated current the amplitude is much larger until the machine reaches breakdown torque[2]. Once the machine reaches synchronous speed, the motor draws only a small current to provide the excitation and the losses of the stator and rotor windings.



**FIGURE 10: Rotor Currents**

Fig 10 clearly show that the frequency of the rotor currents changes with the speed of the machine. At start, the rotor currents have a 60 Hz frequency, but the frequency drops as the motor accelerates, reaching very low frequencies as the motor nears synchronous speed. Of course, once the motor reaches synchronous speed there is no relative motion between the rotor squirrel- cage bars and the rotating magnetic field[3]. Thus the current in the rotor bars drops to zero as shown in the Fig 11.

Fig11 shows the Torque-Speed characteristic of the motor. There is a pulsating torque during starting of the motor, after it reaches synchronous speed there is an oscillatory behavior. The oscillating nature of speed torque curve is due to second order differential equation.



**FIGURE 11: Torque-Speed Characteristics**

#### IV. CONCLUSION

In this paper, implementation of modular Simulink model for induction machine simulation has been studied. A simulation of 215hp motor is done and analysis of speed, torque, Stator current, Rotor current and Torque speed characteristic is done. A SPWM technique is used to control the gating pulses of the inverter. There are fluctuations in the starting of rotor currents, electromagnetic torque but this is absent in speed. This is because of machine's inertia. This is clearly visible in scopes.

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# Four Quadrant Operation of DC Motor Using H-Bridge Chopper Circuit

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**Abstract**—The speed of dc motor is often control by using chopper is to design the four-quadrant speed control model of dc motor provide designed model for four quadrants in both directions i.e. clockwise direction, the counter-clockwise direction along with side braking of the dc motor. The graceful operational we will use the Metal Oxide Field Effect Transistor (MOSFET) for speed control of dc motor with the assistance of the chopper circuit. The pulse width modulation (PWM) via microcontroller is employed for switching operation of MOSFET. Class E Chopper is employed for the conversion of fixed DC into variable DC. Within the first quadrant operation, current and voltage are to be positive hence power is often the due source to load. In the second quadrant operation voltage remain positive but current remains. Negative during inductive load. In the third quadrant operation, current and therefore the voltage are both negative but the facility is positive. In four-quadrant operation voltage is negative & current is positive

**Keywords**— Chopper Circuit, MOSFET, DC motor, microcontroller, Voltage regulator.

## I. INTRODUCTION

Four Quadrant DC motor is applicable for speed variation and position control applications. The speed below the reference pre-determined value is often altered by voltage control whereas speeds above the reference pre-determined value are often altered by field-flux control. As compared to AC motor, DC speed control is economical and straightforward in construction. Choppers convert fixed dc input voltage to variable dc output voltage. Class-E or chopper operates in four-quadrant which are as follows Forward Motoring, Forward Braking, and Reverse Motoring and Reverse braking. The mixture of Bipolar transistor (BJT's) and Resistor helps to offer +12v to trigger the Metal Oxide Semiconductor Field Effect Transistor (MOSFET's) via microcontroller. It carries positive attributes of BJT's and MOSFET.

## II. LITERATURE REVIEW

The speed of dc motor is often control by using chopper is to design the four-quadrant speed control model of dc motor provide designed model for four quadrants in both directions i.e. clockwise direction, the counter-clockwise direction along with side braking of the dc motor. The graceful operational we will use the Metal Oxide Field Effect Transistor (MOSFET) for speed control of dc motor with the assistance of the chopper circuit. The pulse width modulation (PWM) via Four Quadrant Speed Control of DC Motor Using Chopper Arduino is employed for switching operation of MOSFET. Class E Chopper is employed for the conversion of fixed DC into variable DC. Within the first quadrant, operation power is often a due source to load and hence, current and voltage within the first quadrant are assumed to be positive. In the second quadrant operation voltage remain positive but a change in direction of current i.e. negative this condition happened when the load is inductive like a DC motor in third quadrant operation current and therefore the voltage are both in negative but the facility is positive. In a four-quadrant operation, current is positive and voltage is negative and thus power is negative.

[I] Samiksha S. Zade et .al:-

In this paper present, the four-quadrant speed control model is meant by using Chopper to regulate the speed of the DC motor. The designed model provides four-quadrant speed control of DC motor in both directions i.e. clockwise direction, the counter-clockwise direction along with side braking of the DC motor. The Chopper is employed for the conversion of fixed DC into variable DC within the first quadrant Operation power can be a due source to load and hence current and voltage within the first quadrant are assumed to be positive. within the second quadrant operation voltage remain positive but a change in direction of Current i.e. The negative this condition happened when the load is inductive like a DC Motor in third quadrant operation current and therefore the voltage are both in negative but the facility is positive. In four-quadrant operation current is positive and voltage is negative and thus power is negative. The switching operation of IGBT is completed by can by using Pulse Width Modulation (PWM) technique. During this designed model PWM signal is often generated by using IC LM324 (Quad op-amp).

[II] Dipesh Bharambe et.al:-

The speed of dc motor is often control by using chopper is to designed the four-quadrant speed control model of dc motor provide designed model for four-quadrant in both direction i.e. clockwise direction, counter clockwise direction alongside braking of the dc motor the graceful operational we will use the insulated gate bipolar transistor (IGBT) For speed control of dc motor with the assistance of chopper circuit. The pulse width modulation (PWM) is employed for the switching Four Quadrant Speed Control of DC Motor Using Chopper operation of IGBT. To regulate the direction and therefore the speed of motor the four-quadrant speed control technique isn't complicated.

[III] Hardik Mehta et.al:-

DC Motors are used extensively in adjustable speed drives and position control Applications This paper proposes an equivalent the d to regulate the speed and direction control of a DC motor by using a four-quadrant DC-DC chopper. The speed below the bottom speed is often controlled by armature voltage control Method IGBT are used for the switching operation of the chopper The gates of this IGBT are given Pulse Width Modulation which provides the four-quadrant operation This Pulse Width Modulation is generated by programming the Digital Signal Processor using the Code Composer Software.

[IV] P.Vinod Kumar et.al:-

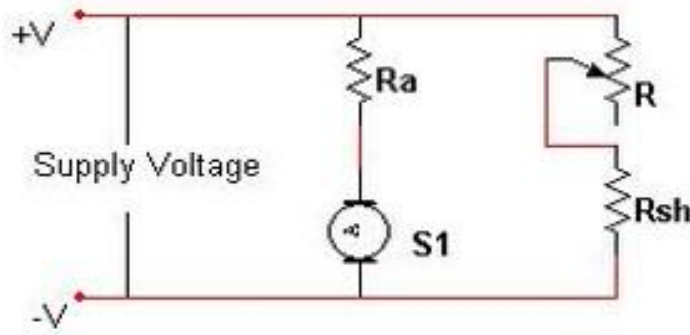
The speed of separately excited DC motor is often controlled from 0 to rated Speed using chopper The chopper firing circuit receives a sign from the controller and therefore the chopper responds by providing variable voltage to the armature of the Motor for achieving the specified speed. There are two control loops one for controlling current and another for speed. The controller used is the proportional-integral type which ceases the delay and Provides fast control. The IGBT's are triggered by pulse width modulation (PWM) technique Recent HEV's employ a posh system which involves the vehicle to figure on motor till the speed is appreciable to modify over the control of the Vehicle to the IC engine where the vehicle is driven by the IC engine. The speed Limits depend upon the efficiency of the IC engines within the initial gears i.e. first and second this refers to the above context the four-quadrant operation is meant to work at speeds from 0 to 700 rpm (0 to100 km/hrs).

### **III. DC MOTOR SPEED CONTROL METHODS**

#### **3.1 Flux Control Method**

In this method, the magnetic flux from field windings is varied to vary the speed of the motor. The present flowing from field is varied by putting field coil resistor serial which in-turn decreases the present & magnetic flux from field coil .



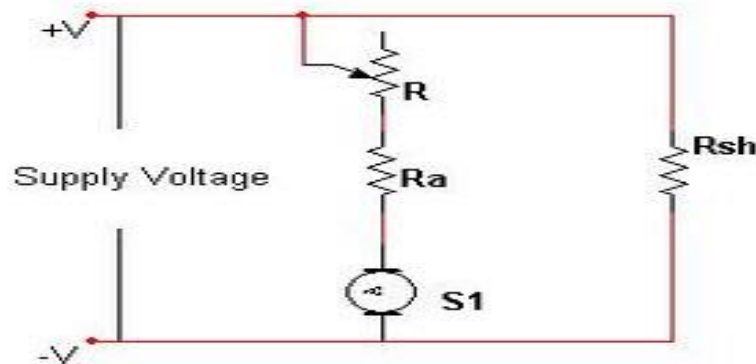


**FIGURE 1: Flux Control Method**

The resistor which is kept at its minimum position, the rated current flows through the sector winding thanks to a rated supply voltage, and as a result, the speed is kept normal. When the resistance is increased gradually, the current through the sector winding decreases. This successively decreases the flux produced which causes speed of the motor increases beyond its normal value.

### 3.2 Armature Control Method

DC motor speed is often controlled by controlling the armature resistance to regulate the drop across the armature. The tactic also uses a rheostat serial with the armature.



**FIGURE 2: Armature Control Method**

The rheostat reaches its minimum value, the armature resistance is at normal one, and thus, the armature voltage drops. When the resistance value is gradually increased, the voltage across the armature decreases & in-turn results in a decrease within the speed of the motor. The tactic achieves the speed of the motor below its normal range.

### 3.3 Voltage Control Method

The mentioned methods cannot provide speed control within the desirable range. However, the flux control method can affect commutation, whereas the armature control method involves huge power loss thanks to its usage of resistor serial with the armature. Thus a special method is usually desirable – the one that controls the availability voltage to regulate the motor speed. In such a way, the sector winding receives a hard and fast voltage, and therefore the armature gets a variable voltage. One such technique of voltage control method involves the utilization of switchgear to supply a variable voltage to the armature. Aside from these two techniques, the foremost widely used technique is the use of pulse width modulation to realize speed control of a DC motor. The PWM involves the application of varying width pulses to the motor driver to regulate the voltage applied to the

motor. This method proves to be very efficient because the power loss is kept at a minimum, and it doesn't involve the utilization of any complex equipment. The PWM is achieved by varying the pulses applied to the enable pin of the motor driver IC to regulate the applied voltage of the motor. The variation of pulses is completed by the microcontroller, with the input from the pushbuttons.

## IV. COMPONENT DESCRIPTION

### 4.1 Microcontroller

It helps the project to concatenate the H-bridge and provides the PWM formatted signals to Metal Oxide Field Effect Transistor (MOSFET) for respectively switching as needed by user. Converts the input voltages to acceptable levels to drive the gates. Give enough current to charge and discharge the gates fast enough

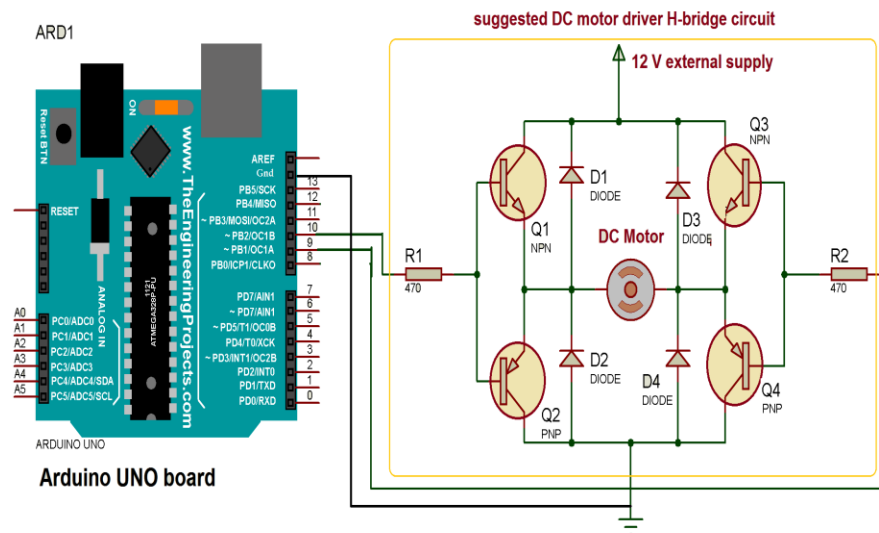
### 4.2 H-Bridge Mosfet

Metal Oxide Field Effect Transistor (MOSFET) is generally used as a voltage-controlled device. The FETs are much smaller, so their gate capacitance is basically small. Even a comparatively weak source can quickly charge and discharge them. The smaller FETs even have a way higher  $R_{ds(on)}$  value (several ohms) therefore the dynamic shoot-through currents are low enough not be a headache

### 4.3 Controlling Module

It provides the user a user-friendly customs by giving controls to Arduino as shown in diagram. Such modules are often operated remotely and vicinity also.

## V. CIRCUIT DIAGRAM



**FIGURE 3: Circuit diagram**

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## VI. OPERATION

### 7.1 First Quadrant Operation

The first quadrant chopper is additionally called a category A chopper when the direct supply is given to the four-quadrant chopper circuit i.e. fig.3.1. the 2 diodes are going to be ON position i.e. T1 and T2, the trail of current flow is (Vdc+)- T1-load(A-B)- T4-(Vdc-). Hence the direction of the present is going to be an equivalent. So current and voltage are positive, during this operation inductance is charge by positive polarity and hence first quadrant chopper operation are often performed.

### 7.2 Second Quadrant Operation

The second quadrant chopper is additionally called as a category B chopper .the second quadrant chopper may be a step-up chopper, during this quadrant inductor get fully charge and current are often flowing path through the load(B)- D1- (Vdc+)-(Vdc-)- D4- load(A). Since the direction of the present is going to be changed, therefore the voltage is positive and current is negative and therefore the second quadrant operation is often performed. The second quadrant chopper is employed for regenerative braking of DC motor.

### 7.3 Third Quadrant Operation

The third quadrant chopper may be a combination of sophistication A and sophistication B chopper. This chopper is used step-up also as a step-down chopper. Within the above circuit, T2 and T3 are ON, the present are often flowing path through (Vdc+)- T3- load(B-A)- T2- (Vdc-), the direction of current and voltage is same i.e. negative. with an equivalent polarity, the inductor gets fully charged. Hence third quadrant chopper is often performed.

### 7.4 Fourth Quadrant Operation

The four-quadrant chopper is additionally called as a category E chopper, inductor gets fully charged in first quadrant operation it'll find the trail to discharge for that inductor change the polarity and obtain discharge through path load(B)- D3- (Vdc+)-(Vdc-)- D2- load(A). the direction of voltage and current are going to be different i.e. voltage is negative and current is positive, fourth quadrant chopper is going to be performed.

## VII. CONCLUSION

In a four-quadrant chopper circuit is the design and implemented during which the speed and direction of the DC motor is control. MOSFET provides smoother control as compared to the SCR hence, the controlling operation of motor is smoother by adjusting the PWM pulses which are further manipulated via microcontroller, the motor speed is going to be controlled fully and motor will complete their operation altogether four-quadrant that's Forward motoring, Forward braking, Reverse motoring, Reverse braking. during this way, the four-quadrant speed control function is often done. this technique gives high reliability. The reconstitute of the whole circuit is straightforward and robust and inquisitive stability makes it independent. Generally, during these operations, the four-quadrant operation of the motor is achieved.

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# Design of New Concept of Charging In Electric Bicycle

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**Abstract**— In this project one new development in the world of electric bicycle to save energy, time and the fuel cost which is increasing day by day. The bicycle has gone from being an old fashioned recreational product to a less polluting means of transport and a compact ultra-light personal mobility tool. Electric bicycle will be used to support an individual public transport in worldwide electric bicycle building a block of future of pollution free transportation system. The cost of battery gets plummeting day by day. The wind mill starts to generate electricity when the bicycle starts to run and the electricity gets stored in the battery with the help of charge controller to control the output of charging current of battery.

**Keywords**— *bldc motor, electric bicycle, battery, small wind-mill, controller.*

## I. INTRODUCTION

In addition to conventional charging of batteries we used alternative option of wind-driven generators to charge batteries. A small generator with turbine is mounted in back side of electric bicycle. When the bicycle starts to run with the help of mechanical pedaling then due to speed of bicycle or air pressure the wind turbine start to rotate and this wind turbine generates the electricity and charges the battery. With the help of charge controller the constant charging current is given to the battery as the variation in the speed of wind mill the output of current gets vary so to avoid it the charge controller is used. Brushless DC motor is used for the displacement of the electric bicycle as it gets good efficiency as compared to induction motor.

## II. LITERATURE REVIEW

The literature review contains the brief discussion of sum designing of new concept of charging in Electric bicycle. As per we know that energy efficient motors are the need of electric vehicles. BLDC Motors are more efficient than as compare to the Induction motor. In Electric vehicle efficiency of the motor is major parameter which to be considered .We are using BLDC motor in place of induction motor which is mostly used in electric vehicles. BLDC motor is proposed which is capable of producing high-torque density. In Three phase Dual rotor BLDC machines inner stator and outer rotor are controlled independently so the copper loss in BLDC is reduced. So by reducing the copper loss efficiency of the vehicle gets increased. The first effort to make an electric bike was made at the beginning of 20th century. Today we can find a great variety of e-bike available worldwide. E-bike use rechargeable batteries and the lighter varieties can travel up to 25 to 30 km/h. E-bike is a mean of transportation very useful in the busy cities and they can also be used by anybody for a low price. In order to propel an electric vehicle you need an electrical machine with high power density, high torque, high efficiency, high reliability and robustness. Usually the electric motor used in an electric bike is a brushless DC motor.

This paper describes a technical solution for usage of two different energy storage source one is a battery and second is an ultracapacitor. In the world of mobility increasing the number of vehicles in the day to day life the prices of fuel getting increase

For IC engines. So instead of using IC engines the electric vehicle is a better alternative for the individual used of bicycle. Batteries and supercapacitor stores the energy. By the variation in load as peak demand and fluctuation batteries are not capable. So instead of batteries supercapacitor is an alternative way which drives the peak of power required by the load. For that electric bicycle we should know the power consumption so first step for it is that the calculation of the power consumption.

Chemical energy is stored in the batteries. Batteries are more efficient compare to the internal combustion engine. The chemical energy stored in battery is converted into electrical energy for traction motor and for various purpose. Energy stored in battery is dependent on battery voltage and the amount of charge stored within a key parameter in electric vehicle is the state of charge. The state of charge is a measure of the residual capacity of a battery. Depth of discharge is the percentage of battery capacity to which the battery is discharge specific energy means how much energy can be stored per unit mass of battery. Energy density means how much electrical energy can be stored per cubic meter of battery volume. Specific power means how much power can be supplied per kilogram of battery. Energy efficiency this is the important quantity indicates the energy conversion efficiency of battery.

There are various technologies for energy storage. Lead acid battery is the earliest and the most widely used in automotive applications. It gives the starting 'cranking amps' to the automotives starter motor. This batteries can last a long time if charged & discharged properly. Nickel metal hydride battery is the new type high capacitive battery. It have more advantage as compare to lead acid battery. Such as environmental friendly, high specific energy and energy density and long life cycle. Lithium ion battery alternatively move into and out of host lattices during charging and discharging cycles. This type of battery can be made with very high energy density. They do not have memory effect that causes other rechargeable batteries to lose their maximum charge level when repeatedly recharged.

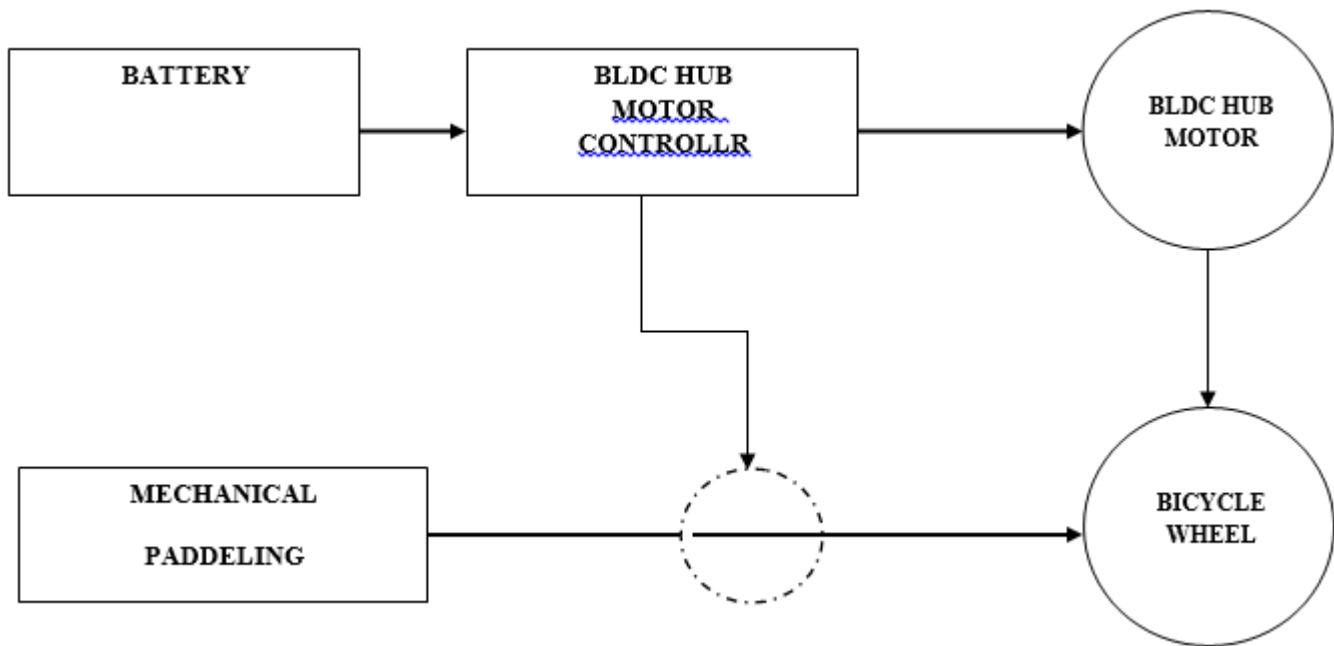
In this paper report on a small scale wind turbine coupled to a mechanical shaft to a generator. The device we propose is made of a typical axial turbine to convert the wind energy into a mechanical energy into electricity. We may find in the state of the art some small scale electromagnetic wind turbines. Wind mills are clearly the most mature technology for "large scale" applications (KW-MW). The wind mill is composed of rotating part called rotor, and a fixed part called stator the most common turbines are horizontal axis wind turbine (HAWT). Which have the benefit of being highly efficient and the main drawback having to be pointed in the direction of wind. In the majority of cases, the electromechanical converter is electromagnetic and uses electromagnets or permanent magnets. They presented the first electrostatic wind mill exploiting in electret-base converter. Research is currently underway to improve the harvester's aero dynamics by replacing the current stator by lateral electrodes, and to increase the output powers by reducing the air gap.

In this paper report on drives used in electrical vehicle and hybrid electric vehicle there are discuss on types of electric vehicle, types of motor used in electric and hybrid electric vehicle, converters used in electric and hybrid vehicle. in this paper gone through the study of different motor derives and also have compared different motors used in EV and HEV and the owing lots of advantages of BLDC motor over other motors is good solution for EV and HEV today but there is scope of designing a new induction motor with higher starting torque and good efficiency.

### **III. ELECTRIC BICYCLE SYSTEM**

By studying that papers are suggested that to used energy sources i.e. small wind turbine to charge batteries. In old method to charge the battery to use electricity which are to be given by the grid. So that the cost of electricity bill will also increases and extra time required to charge the battery of electric bicycle. So instead of this we have developed a new era of technology in charging of batteries of electric bicycle. Which's discussed in below block diagram of electric bicycle.





**FIGURE 1: Block diagram of electric bicycle**

**3.1 Battery:** - electrochemical batteries more commonly referred to as “batteries” are electrochemical devices that convert electrical energy into potential chemical energy during charging, and convert chemical energy into electric energy during discharging. A “battery” is composed of several cell stacked together and it generates electrical energy by storing of charge.

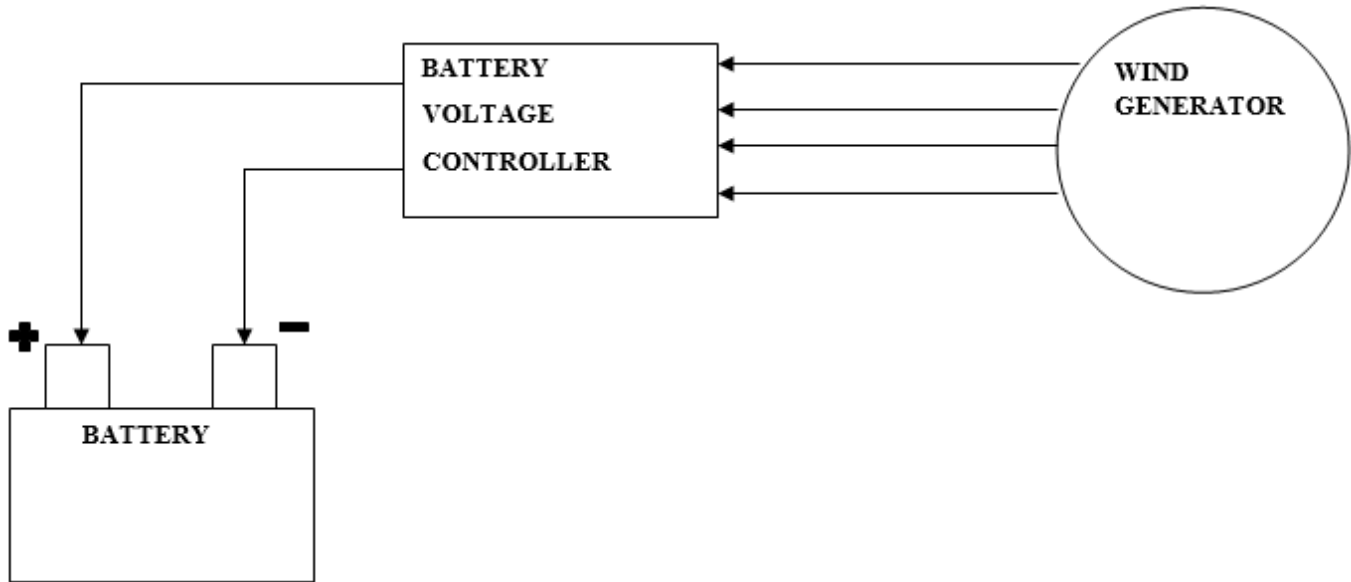
**3.2 Controller:** - the controller is used to connect the bldc hub motor to battery supply. The battery generates the constant dc supply. Bldc hub motor are required three phase shifted output to generates the rotating torque. Controller converts the dc output supplied to the battery and generates the phase shifted output. This conversion is possible with the help of semiconducting device mainly its MOSFET, IGBT, GTO, SCR etc. this are switching device used to control the output speed of an BLDC HUB motor.

**3.3 Accelerator:** - accelerator used to give feedback to the controller. By accelerating we can control the speed of an BLDC HUB motor. Accelerator is give command to the controller to set an firing angle of an switching device. By increasing or decreasing the speed by changing the firing angle of an semi-conducting switching. the change of firing angle command is given by the accelerator.

**3.4 BLDC HUB motor:-** BLDC HUB motor is most popular and efficient motor used in electric bicycle. BLDC HUB motor consist of stator and rotor. Stator consist of three phases connected to the controller output. Rotor consist of permanent magnet north and south poles. The stator winding creating of rotating magnetic field and rotates in between stator and rotor air gap. The rotor magnet attracts the stator rotating magnetic field and rotor starts rotating. The speed of an bldc hub motor are controlled by the controller of bldc hub motor.

**3.5 Mechanical peddling:-** This will be used in emergency situation. When battery of an electric bicycle are fully discharge or some fault are occur in bldc hub motor then we can used the mechanical peddling.

#### IV. WORKING OF CHARGING SYSTEM



**FIGURE 2: Block diagram of electric charging system**

**4.1 Wind generator:-** there is concept using small wind generator for charging the bicycle battery. The wind generator is work on the principle of energy conversion. It generates the electrical power with the help of wind energy. One generator is inserted on wind generator. Generator contains two parts one is stator and other is rotor. Stator consist of permanent magnet and rotor consist of copper windings. The stationary flux are generated by the permanent magnet and rotor cut this stationary flux and according to faradays law of electromagnetic induction it generates the DC output voltage. This output voltage we use to charge the battery of electric bicycle.

**4.2 Charge Controller:-** the charge controller is used to control the charging voltage and current required to charge the battery. Because of the output power generated by wind turbine is not constant. There are some variation in output voltage according to wind speed and also depends on power supply. To provide the constant power to charge the battery and also decide the charging time of battery. There are many types of controller are available in market to control the output power which is to be generated by wind mill.

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## V. CONCLUSION

Several new technologies are implemented today and some are to be evaluated to increase the efficiency of EV & HEV. In this paper we have gone through the study of different types of components are to be used in electric bicycle and the owing lots of advantages of BLDC motor over other IM and SRM. We use to charge the battery of electric bicycle by using wind generator so that charging time is reduced and when bicycle is running wind generator charge the battery and battery give electric supply to the motor.

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## Design and implementation of PWM Inverter

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**Abstract**— this project aims to design and implement a single-phase inverter that converts DC voltage to AC voltage at high efficiency and low cost. The DC voltage is stepped up by employing a boost converter to a much higher voltage. This high voltage DC source is then transformed into an AC signal using PWM (pulse width modulation). To deliver such performance, the power inverter is driven by high-performance PIC 16F877A microcontroller units (MCUs) that can achieve high-level inverter control, and therefore microcontroller is the heart of the system and controls the complete system. The microcontroller is programmed using an embedded compiling program and in specific mikroC pro to come up with sinusoidal pulse width modulated (SPWM) pulses which are applied to drive H-bridge. By alternate switching switches of two legs of H-bridge alternating DC voltage is converted into AC voltage.

**Keywords**— Single Phase Inverter, Boost Converter, Microcontroller, LC Filter, Gate driver, Simulation.

### I. INTRODUCTION

Electronic devices run on AC power, however, batteries and few sources of power generation produce a DC voltage so it is necessary to convert the voltage into a source that devices can use. Hence a requirement for power rating inverter to smoothly operate electrical and electronic appliances. Most of the commercially available inverters are square wave or quasi square wave inverters.

### II. LITERATURE REVIEW

The Literature review contains a quick discussion of some recent works in PWM inverters because of the recent growth of Digital signal processing and microcontrollers, real-time control of those converters have become easy and economical.

A microcontroller-based advanced technique of generating sine wave with minimized harmonics is implemented during this paper. The proposed technique aims to design and implement a voltage regulated inverter with ripple-free and glitch-free output sine wave which will operate electronic devices efficiently

[1] Yaosuo, et al. have reviewed the topologies of the single-phase inverter working in a distributed generation system, they have analyzed the single and multistage single phase inverter and given an overview of 4 switches and 6 switch inverter topologies

[2] M. A. AlNema et al. have proposed a replacement topology of inverter in which with single power stage the output voltage of upper magnitude than the input may be achieved

[3] Ian D. de Vries has devised a low loss capacitance driver circuit topology. Full bridge converters are very sensitive to input switching waveforms

[4] Wilson et al. have proposed a gate drive circuit which achieves quick activate and switch off transient times to scale back switching losses and conduction losses, additionally to the current it also helps in recovering any heat loss that happens because of MOSFET drive

[5] This paper gives the planning and implementation of a single-phase inverter that produces a symmetric AC output voltage of desired magnitude and frequency

[6] The authors have done a close analysis of the resultant signal. It is further purposed that the utilization of an LC filter at the output of such an inverter leads to nearly perfect sinusoidal output

[7] F.G Turnbull has introduced an effective technique that eliminates the third and fifth harmonic voltage present in a single leg center tap (half-bridge) single-phase inverter. He has stated that with the addition of two more switches or one leg (full bridge), the fundamental frequency component of the output ac voltage will be controlled from maximum to zero without reintroducing the third and fifth harmonics

[8] Joachim Holtz has done a comprehensive analysis of the various types of PWM techniques like as carrier-based PWM and non-carrier based PWM, various parameters namely harmonic spectrum, torque harmonics and dynamic performance for analyzing the performance for various PWM techniques have been discussed

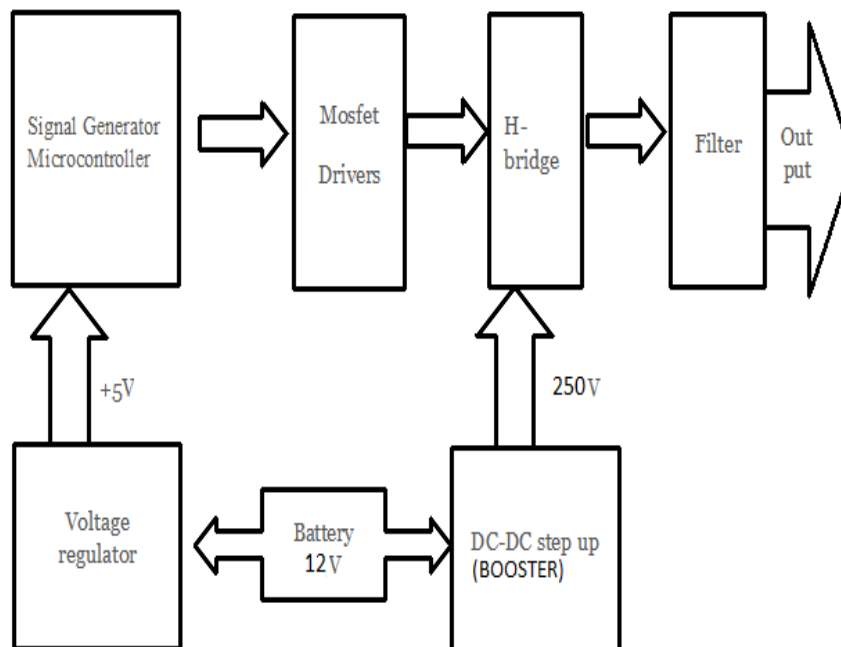
[9] The proposed alternative approach is to exchange the conventional method with the utilization of microcontroller

[10] Mamun et al. in used an 8-bit microcontroller to get the SPWM gating pulses. In microcontrollers the sampling frequency is limited by interrupt latency, also the constraints imposed by the finite word length limits the microprocessor's computation capability. Hence authors have sought the utilization of Digital Signal processor to implement the modulation needed for the inverters

[11] The overview and division of the possible soft-switching PWM converters for high power application is presented during this paper.

### III. SYSTEM ARCHITECTURE AND DESIGN

Pulse Width Modulation or PWM technology is employed in Inverters to give a steady output voltage of 230 or 110 V AC no matter the load. The Inverters based on the PWM technology are more superior to traditional inverters. The utilization of MOSFETs in the output stage and the PWM technology makes these inverters ideal for all types of loads. In addition to the pulse width modulation, the PWM Inverters have additional circuits for protection and voltage control. The system will comprise two parts the Hardware Part and also the Software Part.



**FIGURE 1: Block Diagram**

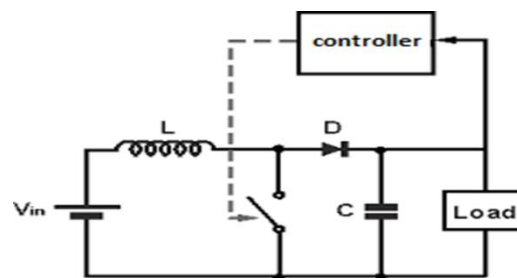
The Architecture consists of following hardware components.

### 3.1 PIC16F877A

The microcontroller has 40 pins, 33 pins are set as 5 Input/Output ports: PORTA, PORTB, PORTC, PORTD, and PORTE. PORTA contains 6 pins, PORTB/PORTC/PORTD contains 8 pins while PORTE contains 3 pins.

### 3.2 Boost converter

A boost converter is a DC to DC converter where an output voltage greater than the source voltage. A boost converter is typically called a step-up converter since it "steps up" the source voltage. Since power must be conserved, the output current is below the source current.



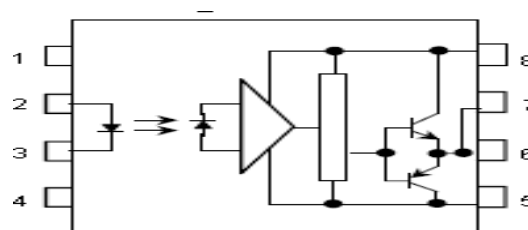
**FIGURE 2: Booster Circuit**

### 3.3 Gate Driver

For driving the gate of the MOSFET there are two fundamental categories, are low side driver and high side driver. The high side means the source of the MOSFET of the power element can float between the ground and high voltage power rail and the low side means the source of the MOSFET is always grounded [2]. For driving the high side MOSFET we used TLP250 and a capacitor of 50V,100μfarad in the output of TLP250, this capacitor is termed a bootstrap capacitor. The capacitor in the output of TLP is employed for protection.

The pinout description is:

- 1: N.C,            2: Anode,
- 3: Cathode,      4: N.C,
- 5: GND,          6: V0 (output),



**FIGURE 3: Pin diagram of the High side driver circuit TLP250**

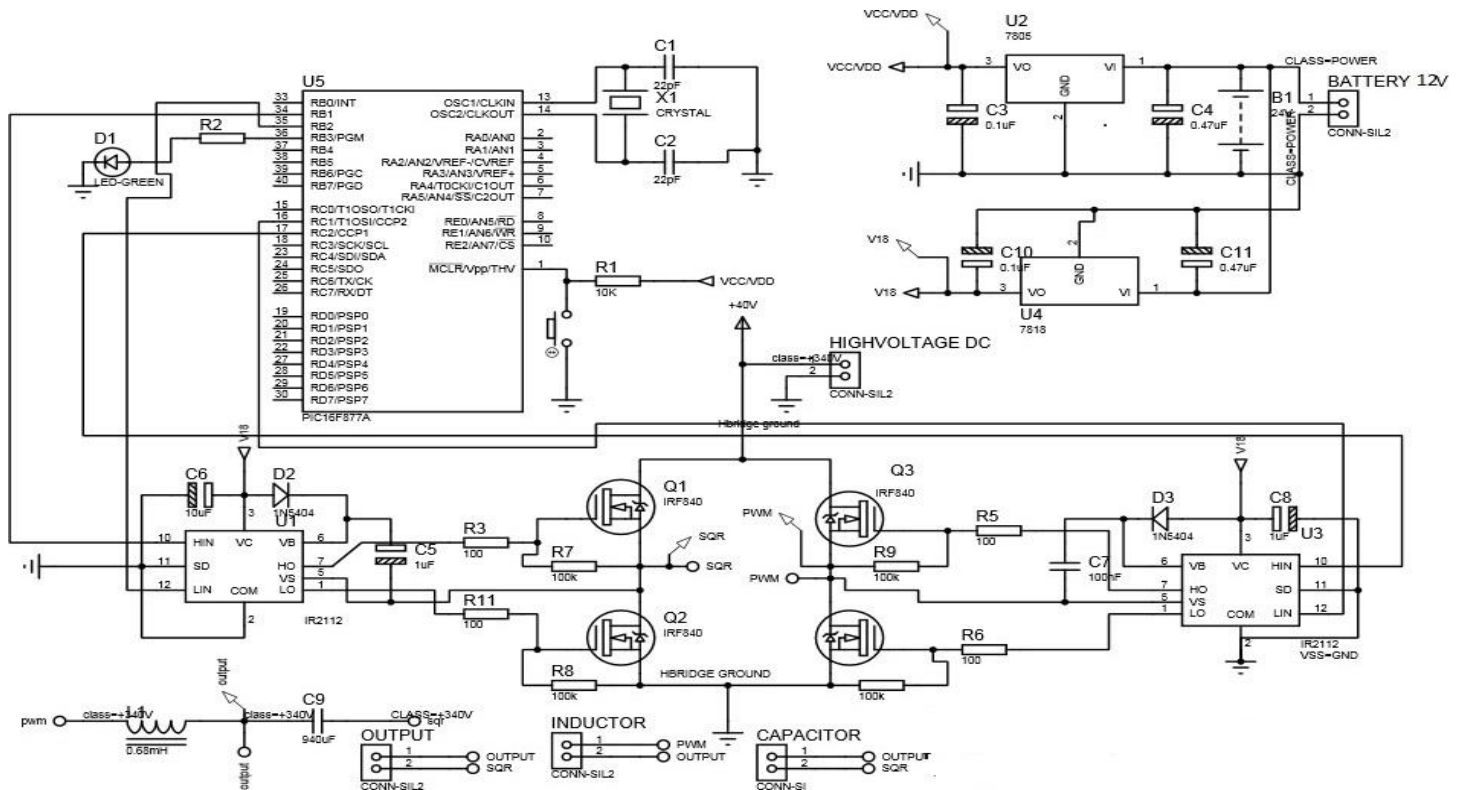


### 3.4 Battery as a source

The battery has 12 Volt, 10 Ah Sealed Lead Acid batteries have a valve regulated, spill-proof construction for trouble-free and safe operation in any position.

### 3.5 PWM&MOSFET

Pulse width modulation, or PWM, has become an accepted method for generating unique signals, because of the advancement of microcontrollers and its power efficiency. To form a sinusoidal signal, PWM uses high-frequency square waves with varying duty cycles. The duty cycle is the % of the time the signal is relative to the period. This suggests because of the duty cycle increases, more power is transmitted PWM requires rapid on and off signals, which can be achieved using high power MOSFETs. MOSFETs are ideal switches because of the low power loss when the device is activated.



**FIGURE 3: Circuit Diagram**

## IV. DESCRIPTION

Pin 13 and pin 14 of the microcontroller are connected to 20MHz quartz crystal. A stable 5 volts to power the microcontroller is supplied from the output of 7805 IC voltage regulator. The LED connected at pin 36 will light green to indicate if the inverter is on and switch off when it is not working. Pins 34 and 35 outputs 50Hz square wave 180 degrees out of phase to drive one side of the H-bridge and pin 16 and pin 17 output pulse width modulated signal of 5KHz to drive the opposite side of H-bridge. During simulation IR2112 IC s employed rather than IR2110 but their function is analogous and that they do operate the identical way. Pins 10 and 12 receive logic inputs from the microcontroller to drive high side and low side Mosfet respectively. The signal from pin 12 is passed to pin 1 even as it is without being stepped up and from pin 1 is connected to low side Mosfet gate through a gate resistor. That from pin 10 is employed to charge and discharge bootstrap capacitor which successively provides the much needed high voltage to drive high side Mosfet through gate resistor.

At the H-bridge rail voltage is provided comparable to  $V_{max}$  of the output RMS voltage needed. The output of the H-bridge is a 3 level pulse with modulated signal centered at 0 voltage and with a maximum voltage equal to rail voltage of H-bridge. This voltage is given to a low pass passive filter fabricated from inductor, capacitor, and resistor. The inductor must be able to pass maximum current rated for the Mosfet and capacitor be able to handle the maximum voltage which is up to the rail voltage. Across the output terminals of the filter is where we are now supposed to connect the load.

#### 4.1 ADVANTAGES

- [1] Energy efficient
- [2] Low power consumption
- [3] High power handling capacity
- [4] It will be used for domestic application
- [5] Compatible with today's digital microprocessor
- [6] It makes the system more reliable.
- [7] It will be used as a speed changer for AC drives.

#### 4.2 DISADVANTAGES

- [1] It is expensive.
- [2] High switching loss because of the high PWM frequency.
- [3]

#### 4.3 APPLICATIONS

This project has enormous applications. It can be utilized in the following areas:

- Uninterrupted power supply
- HVDC Transmission
- Ac energy conversion from renewable energy sources like a photovoltaic cell, fuel cell.
- Medical instruments.
- Electric vehicle

### V. CONCLUSION

Pulse width modulated (PWM) inverters are among the foremost used power electronic circuits in practical applications. These inverters are capable of producing ac voltages of variable magnitude likewise as variable frequency. The standard of the output voltage can even be greatly enhanced compared with those of square wave inverters. The PWM inverters are very commonly utilized in adjustable speed ac motor drive loads where one must feed the motor with variable voltage, variable frequency supply. For wide variation in drive speed, the frequency of the applied ac voltage must be varied over a wide range. The applied voltage also has to vary almost linearly with the frequency. PWM inverters are of a single-phase similar to three-phase types. The principle of operation of 3-phase type PWM inverter remains almost like that of 1-phase PWM inverter.

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## Electricity Generation from Sewer Water

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**Abstract**— This paper presents a generation of electrical energy by using wastewater. Wastewater is that the water that emerges after freshwater is employed by the citizenry for domestic, commercial and industrial use. Asset by the CPHEEO (Central Public Health Environmental & Engineering Organization) guidelines, freshwater intake per person per day should be between 135 and 150 liters per day. It is officially spoken as "daily liters per capita". So there will be a lot of wastewater are produces in the domestic, commercial and industrial sectors. This wastewater can be used as a source for electrical energy generation. From the energy crisis situation in the present, this wastewater gives a small contribution to the generation of electrical energy. Using the Working Principle of Hydro turbine we can convert mechanical energy into electrical energy.

**Keywords**— Sewage [waste water], Hydro turbine, generation, electrical energy.

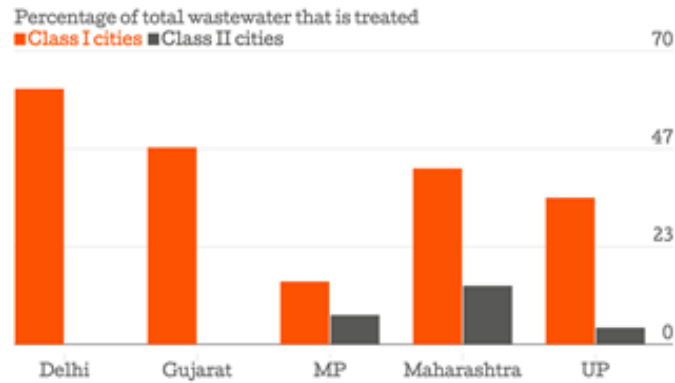
### I. INTRODUCTION

Population growth is expected to impact freshwater availability. As the population grows, the overall demand for water will increase also increase the wastewater and the demand for electrical energy is rising rapidly. Asset by the CPHEEO (Central Public Health Environmental & Engineering Organization) guidelines, freshwater intake per person per day should be between 135 and 150 liters per day. Wastewater is that the water that emerges after freshwater is employed by the citizenry for domestic, commercial and industrial use. It is fresh water that is used for a variety of domestic uses such as washing, bathing & flushing toilets. Washing involves the washing of utensils utilized in cooking, washing vegetables and other food items, bathing, washing hands, washing clothes. The water that emerges after these uses contains, substance, oils utilized in cooking, oil within the hair, detergents, dirt from floors that are washed, soap utilized in bathing along with oils/greases washed from the human body this water is known as Grey Water. Water wont to flush toilets to evacuate human excreta is named "Black Water" or Sewage.

This wastewater can be used as a source for electrical energy generation, to fulfill the crisis at present, this wastewater gives a small contribution to the generation of electrical energy. Using the Working Principle of Hydro turbine we can convert mechanical energy into electrical energy. The water turbine changes the K.E. of the falling water into energy at the turbine shaft. The turbine drives the alternator including it and converts mechanical energy into electricity. We can place a Chainlink burning both sides of the model to reduce the sewage blockage.

### II. SITE DATA

Freshwater is only 2.5% of the total water volume on Earth is freshwater, with the largest portion of it lies underground. Demand for fresh water is rising with factors, such as population growth, water pollution economic, as well as technological progress.

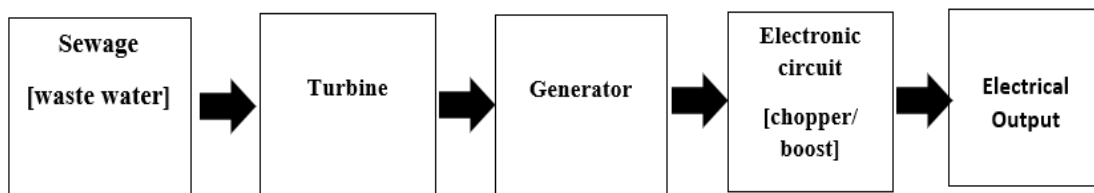


**FIGURE 1: Percentage of total waste water**

Asset by CPHEEO (Central Public Health Environmental & Engineering Organisation) standards, the freshwater consumption per day per person should be between 135 to 150 liters per day. (It is officially expressed as ' liters per capita daily ' (LPCD) of a large public water system and sewerage bodies/authorities across the country use the preceding figure to determine the likelihood of this water consumption) If water is consumed without access to an underground sewerage/drainage system by persons living in a residential complex, it is estimated that 135 (LPCD) are consumed.

The total quantity (No. of residents X 135 liters) comes into a sewage treatment plant (STP) on the premises, this total volume has to be treated by the STP. In a vast majority of cases, the actual waste overloading of the STP. This happens routinely because most residential complexes don't install water meters or similar water volume and flow measurement devices to stay track of water consumption during a residential complex/gated community. Consequently, when a tool is installed and readings monitored, consumption has been found to be double and sometimes triple the suggested figure of 135 (LPCD).

### III. BLOCK DIAGRAM



**FIGURE 2: Block diagram of Electricity generation from sewer water**

Using the Working Principle of Hydro turbine we can convert mechanical energy into electrical energy. The water turbine changes the K.E. of the falling water into energy at the turbine shaft. The turbine drives the alternator including it and converts energy into electricity. This is the basic "hydropower plant operating principle".

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### 3.1 Sewage [waste water]

Sewage may be a sort of wastewater that's produced by a community of individuals. It is defined by flow, activity, chemical and toxic constituents, volume or rate, and its bacteriological status.

Wastewater is a by-product of residential, commercial, manufacturing, or agricultural activities. The characteristics of wastewater vary counting on the source. Types of wastewater include domestic wastewater from households, municipal wastewater from communities and industrial wastewater from industrial activities.

### 3.2 Turbine

A turbine may be a rotary robot that extracts energy from a fluid flow and converts it into useful work. The work produced by a turbine is often used for generating electric power when combined with a generator.

Methodology for Turbine Flow- Generally, the construction of turbines is the same as the hydro turbine. A row of blades is fitted to a shaft or plate. Water has then skilled the turbine over the blades, causing the inner shaft to rotate. The rotational motion is then moved to a generator the generates electricity. There is a spread of various sorts of turbines that are best utilized in different situations. Each sort of turbine is made to supply maximum output for things it's utilized in.

The classification of hydro turbines may be based on how water flows through the turbine.

- Axial Flow: Water flows through the turbine parallel to the axis of rotation.
- Radial Flow: Water flows through the turbine perpendicular to the axis of rotation.
- Mixed Flow: Water flows through in a combination of both radial and axial flows. For example, water flows in radially but exits axially in a Francis turbine.

### 3.3 Generators

Types of electric generators depend on the kind of generating equipment used, the electricity generated is either DC or AC. AC generators are classified as single-phase or polyphase. In this project, we are using a dc generator to generate electrical power (output).

Types of DC generators –

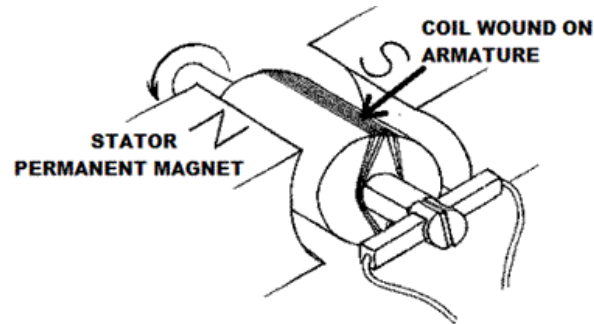
DC generators are graded according to how excited (i.e. produced) their fields are. There are three methods of excitation, and thus three main types of DC generators:-

- Permanent DC generators for magnets-Field coils excited by permanent magnets
- Separately Excited DC Generators – Field coils excited by some external source.
- Self Excited DC Generators-The generator itself excited the field coils.



### Permanent Magnet DC Generator-

When the flux within the magnetic circuit is made through the utilization of permanent magnets, then it's referred to as a static magnet DC generator. In this device, the rotor windings are replaced with permanent magnets. These devices don't require a separate DC supply for the excitation circuit or do they need slip rings and get in touch with brushes. These machines are superior alternatives to traditional induction motors which will be including turbines.

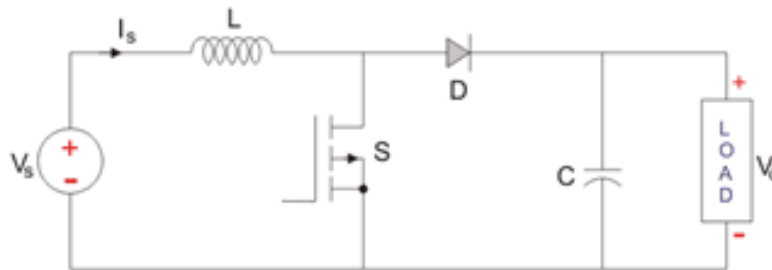


**FIGURE 3: Block diagram of permanent magnet dc generator**

It is composed of an armature and one or more permanent magnets located around the armature. Much power is generated by this type of DC generator.

### 3.4 Electronic Circuit

Here we'll look at the Step-up chopper or boost converter which increases the voltage of the input DC to a specified voltage of DC output. A Boost converter circuit diagram is shown in the figure below.



**FIGURE 4: Electronic circuit**

The input voltage source is connected to an inductor the solid-state device which operates as a switch is connected across the source the second switch used could also be a diode. The inductor connected to input source results in constant input current, and thus the Boost converter is seen because the constant current input source and therefore the load are often seen as a constant voltage source. The controlled switch is activated and switched off using Pulse Width Modulation (PWM). PWM can be time-based or frequency-based. Frequency-based modulation and its disadvantages sort of a wide selection of frequencies, in turn, will give the specified output voltage. Time-based Modulation is mostly used for DC-DC converters. The frequency remains constant during this kind of PWM modulation is simple to construct and use.

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#### **IV. CONCLUSION**

Hydro Power is an environmentally friendly, sustainable and economically viable source of energy. It is a good solution to the global energy problem. It saves the electricity required to form the conventional power plant. This wastewater gives a small contribution to the generation of electrical energy.

#### **V. FUTURE SCOPE**

1. By giving such kind of modification we can generate a high amount of electricity.
2. In the future by using this kind of conversion we can overcome the deficiency of electricity.
3. This method can be used in areas where a large amount of sewage is produced.

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# A Comparative Study of Lithium-Ion & Lead Acid Battery for Finding Application In Electric Car

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**Abstract**— This paper investigates in details, the study of working principle, construction, basic material properties, chemical reactions, advantages disadvantages and applications of lead acid and lithium-ion batteries so that a comparative analysis can be drawn. With the help of this comparison, it will be easy to decide options between li-ion and lead acid battery for electric car. Based on the comparison made in the paper it is found that lithium ion battery is more suitable for use in electric cars then lead acid battery.

**Keywords**— Lead acid battery, lithium ion battery, Specific energy, Charge-discharge cycle, Electric vehicle, Energy Efficiency, Life Span

## I. INTRODUCTION

Battery powered electric vehicle are replacing Internal Combustion engine vehicles due to their various advantages. Depletion of fossil fuels and the pollution done by the IC engine vehicles are the primary reasons of replacement. In this paper, a comparative study will be done on lithium ion and lead acid battery on the basis of construction, working principle, chemical composition of the batteries. A detailed study of these two batteries will be done to determine the capacity, body to weight ratio, charging-discharging cycles, efficiency, life, space it acquires and flexibility so that they can be used in electric vehicles. The study will make clear which type of battery will be suitable for electric vehicle application and up to what range. Emphasis on electric vehicles of different companies will be given to find the range of application.

## II. LITHIUM-ION BATTERIES

Lithium ion batteries are one of the most advanced rechargeable batteries use in mobile power source for portable battery devices being widely used in cell phones and laptops. The newest application of it being electric and hybrid cars which requires high power, high capacity, high charging rate, long life and improved safety. [7]

### 1.1 CONSTRUCTION

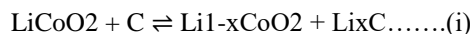
There are 3 main components of a lithium ion battery just like other batteries namely anode cathode and electrolyte solution. The positive cathode was made of lithium cobalt oxide (LiCoO<sub>2</sub>) and has been the predominant positive material. They have high energy density and cycle life of around 500-700 deep discharge cycles. The main problem of this kind of batteries was that it releases large amounts of energy and can result in fire if it is abused. This problem had led researchers to find new material for anode and which paved the way for lithium manganese oxide, LiMn<sub>2</sub>O<sub>4</sub>, also known as spinel for its crystal structure but citing to its rapid capacity fading it wasn't widely used. For safety of positive electrode material it is necessary to look away from oxide materials and move to materials based on phosphates. So lithium iron phosphate was developed, cells using LiFePO<sub>4</sub> have reasonable life and excellent cycling properties if they are operated at moderate temperatures. For negative anode graphite is used as the negative material Conventional graphite negatives operate at a voltage only about 150 mV higher than that of lithium

metal. The electrolyte used in lithium-ion cells is normally lithium hexa fluorophosphate (LiPF<sub>6</sub>) dissolved in a mixture of organic solvents (mainly carbonates), which must be formulated to match the electrode materials used.

## 1.2 WORKING OF LITHIUM ION BATTERIES

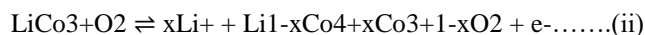
Lithium ion batteries while charging, the positive electrode gives some of its lithium ions, which move to the negative, graphite electrode through the electrolyte and stays there. Electrons also move to the negative electrode but they travel from the outer circuit. During this time the battery stores energy. When no more ions flow across, the battery is fully charged. While discharging, lithium ions move again to the positive electrodes through the electrolyte and the electrons again move through the outer circuit thus supplying power to the outer circuit. When all the previously moved ions have moved back, battery is fully discharged and must be charged again.

The reaction for a LiCoO<sub>2</sub> cathode and a graphite anode is shown below:

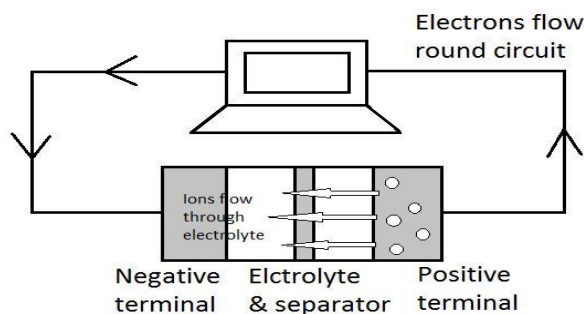
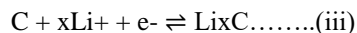


The forward reaction represents charging while the reverse reaction represents discharging. It can be broken up into the following half reactions:

At the positive electrode, reduction at the cathode occurs during discharge.



The reaction at the negative electrode is -



**FIGURE 1: LITHIUM ION BATTERIES**

## 1.3 ADVANTAGES

**High energy density:** The high energy density is one of the chief advantages of lithium ion battery technology. Electronic equipments such as mobile phones need to operate longer between charges while still consuming more power, there is always a need for batteries with a much higher energy density. The higher power density offered by lithium ion batteries is distinct advantage. Electric vehicles need a battery technology that has a high energy density.

**Low maintenance:** One of the best lithium ion battery advantage is that they do not require any maintenance to ensure their performance. Ni-Cad cells requires a periodic discharge to ensure that they do not exhibit any memory effect. As memory effect is not exhibited in lithium ion cells, similar maintenance procedures are not required.

**No requirement for priming:** Some rechargeable cells requires priming when they are charged for the first time. Lithium ion cells and batteries do not require this.

**Small in space and lighter in weight:** Li-ion battery is lighter than other rechargeable batteries in consideration of battery capacity. This makes it more feasible in portable consumer electronic devices in which physical specifications such as weight and form factor are considered important.

**Low memory effect:** Li-ion battery have very minimal memory effect. Memory effect is a phenomenon which can be seen in rechargeable batteries in which they lose their maximum energy capacity when repeatedly recharged after being only partially discharged. This memory effect is more common in nickel-metal hydride rechargeable batteries.

**. Quick charging:** Li-ion battery charges faster than other rechargeable batteries. It actually takes a fraction of a time to charge when compared to its counterparts. [8]

## **1.4 DISADVANTAGES**

**Protection required:** Lithium ion cells and batteries are not as robust as some other rechargeable technologies. In addition to this, they need to have the current maintained within specified limits. Accordingly one of the disadvantages of lithium ion battery is that they require protection circuitry to ensure that they are kept within safe operating limits. With modern integrated circuit technology, this can be easily incorporated into the battery, or within the equipment if the battery is not interchangeable.

**Ageing:** The major problem of lithium ion battery for consumer electronics is that lithium ion batteries suffer from ageing. Not only is this time or calendar dependent, but it is also dependent upon the number of charge discharge cycles that the battery has undergone .Batteries can only withstand 500 - 1000 charge discharge cycle before their capacity falls. With the development of li-ion.

**Cost:** A major disadvantage is their cost. Typically they are around 40% more costly to manufacture than Nickel cadmium batteries. This is a major factor when considering their use in mass produced consumer items where any additional costs are a major issue. [9]

## **III. LEAD ACID BATTERY**

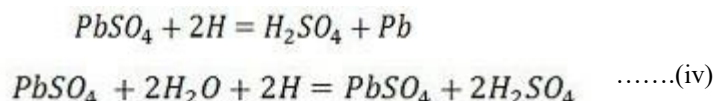
The lead acid battery is a storage device which is use in electric vehicle. Lead acid batteries produce voltage by plates of metals immersed in electrolyte solution. Low cost of lead acid batteries make them suitable for use in electric vehicle to provide high current required to start the motor.

### **2.1 CONSTRUCTION AND WORKING PRINCIPLE**

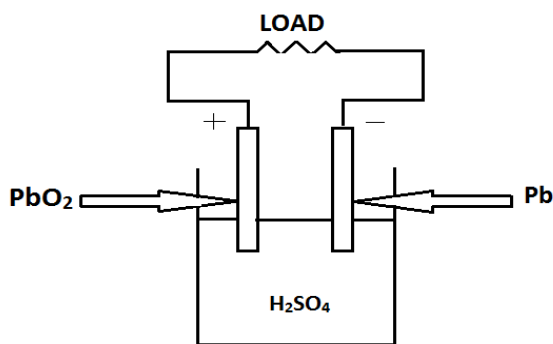
A lead acid battery consist of two plates of metal one is positive and other one is negative. The positive plate is made of lead and is covered by lead peroxide. The negative plate is made of sponge lead. This two plates are separated by insulating material. These plates are immersed in electrolyte consisting of water and sulfuric acid. [1]

### 2.1.1 Chemical action using discharging

A load is connected externally between these plates. In diluted sulfuric acid molecule of acid split into positive hydrogen ions and negative sulphate ions. When hydrogen ions reacts with lead peroxide plate the receive electrons from it and become hydrogen atom which again attack lead peroxide and form lead oxide and water this lead oxide react with sulfuric acid and produce lead sulphate. The negative sulphate ions move freely in a electrolyte solution and reach to the pure lead plate where they give extra electrons to the plate and become radical sulphate. As the radical sulphate cannot exist alone it will attack pure lead plate and will form lead sulphate. As



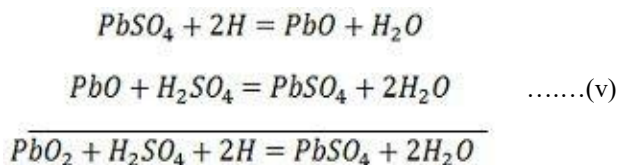
positive hydrogen ions receive electrons from lead peroxide plate and negative sulphate ions gives extra electron to lead plate there would be inequality of electrons between these two plates hence there would be a flow of current to the external load which is connected between these plates for balancing this inequality of electrons. This process is known as discharging process of lead acid batteries.



**FIGURE 2: Action during discharging**

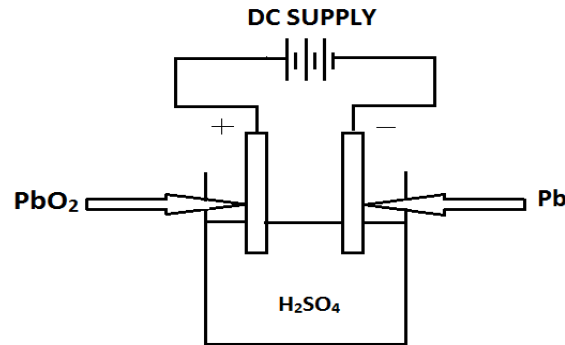
### 2.1.2 Chemical action during recharging

For charging, lead peroxide and lead plates connected to positive and negative terminal of dc supply mains. During discharging process the density of sulfuric acid decreases but there is sulfuric acid in the solution. This sulfuric acid also remains positive hydrogen ions and negative sulphate ions in the solution. Hydrogen ions being positively charge move to the electrode connected to the negative terminal of dc source ie.lead plate here each hydrogen ions takes electron from plates and become hydrogen atom this hydrogen atom then attack lead sulphate and form lead and sulfuric acid. Negative sulphate ions moves towards the electrode connected to the positive terminal of dc





source ie.lead peroxide plate where the will give up there extra electron and become radical sulphate, this radical sulphate reacts with lead sulphate and form lead peroxide and sulfuric acid hence by charging the lead acid battery become ready for discharging. [2]



**FIGURE 3: Action during charging**

### 2.1 LEAD ACID BATTERY EV APPLICATION

Lead-acid batteries in EV applications being a significant (25–50%) part of the final vehicle. Like all batteries, they have significantly lower specific energy than petroleum fuels—in this case, 30–40 Wh/kg. Lead-acid batteries offer several advantages for EV applications. The batteries are capable of high powers (discharge and charge) and efficiencies, particularly thin plate, valve regulated designs as represented by the spiral wound batteries from Optima Batteries. Electric vehicles used lead-acid batteries due to their technology, high availability, and low cost..[3]

### 2.2 ADVANTAGES

1. Dilute sulfuric acid is used as electrolyte without flammability. The battery is designed for normal pressure or low pressure with safety.
2. High working voltage, wide operating temperature range, suitable for hybrid electric vehicle (HEV) and other high rate discharge applications.
3. The large-capacity battery technology is mature and can be made into batteries with thousands of ampere-hours, providing convenience for large-scale energy storage.
4. Lead-acid batteries are the cheapest secondary batteries, with unit energy costs about a third of those of lithium-ion or nickel-hydrogen batteries. Scrap batteries have a higher residual value and the recovery price is more than 30% of the new battery.
5. Lead-acid battery has simple composition, mature regeneration technology and high recovery value. It is the easiest battery for recycling and recycling.

### 2.3 DISADVANTAGES

1. Traditional lead-acid batteries are low in quality and volume energy density. The energy density is only about 1/3 of that of lithium ion.
2. They are large in size and not suitable for light and small in size. The future energy density of lead-acid batteries has great room for improvement mainly for the lead-acid batteries using the new materials and technologies such as carbon foam.
3. The cycle life of traditional lead-acid batteries is short, and the theoretical cycle times are about 1/3 of that of lithium-ion batteries. Lead-acid battery cycle life will be relatively large. There is space for improvement in especially new materials, new structure and new technology lead-acid battery like bipolar lead-acid batteries and lead-carbon battery etc.

4. Lead pollution risks exist in the industrial chain Lead is the main raw material of lead-acid batteries. Lead is accounting for more than 60% of the battery quality whereas lead used in lead-acid batteries can account for more than 80% of the total lead used globally. Lead is a heavy metal and lead acid battery manufacturing industry chain (including primary lead smelting, battery manufacturing, battery recycling and secondary lead smelting) has a high risk of lead pollution. Poor management will cause environmental pollution and harm to human health.

#### IV.CONCLUSION

From the above detailed study we can compare the batteries on the parameters needed for the electric vehicles. The difference is shown in the table below. From this we can clearly see that lithium ion battery triumphs the lead acid battery for vehicles.

**TABLE 1  
COMPARISON OF BATTERIES**

Sr.No	Parameters	Lithium-ion	Lead Acid
1	Life Span (In Cycles)	5000	300-500
2	High Energy Efficiency	96%	85%
3	Typical state of charge	80%	50%
4	Specific Energy(Wh/kg)	150	40
5	Initial Cost	High	Less
6	FastCharging Time(hours)	2-4	4-8

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# Implementation of Thyristor Switch Capacitor for Improving Power Factor

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**Abstract**— Electricity is one of the most important blessings that science has given to mankind. Efficient generation of power at present is significant as wastage of power is a major issue. In most of power systems, a low power factor occur due to increasing use of inductive loads is often overlooked. A power factor improvement device would help the system to increase its power factor near to unity for energy saving & economical operation. Our project mainly focuses to build an TSC (Thyristor Switch Capacitor) to improve the power factor in leading as well as lagging condition by use of capacitor bank. We are implementing the circuit project as per the new rule by MERC (Maharashtra Electricity Regulatory Commission) which will be implemented from April 2020.

**Keywords**— Power factor, Capacitor bank Arduino, Micro-controller, TRIAC, Load.

## I. INTRODUCTION

We can define power factor as the ratio between the KW active power and the KVA apparent power drawn by an electrical load. The higher the p.f. of a system the more economically it operates. A low power factor can be the result of a significant phase difference of voltage and current. Generally it is the use for non resistive load such as induction motor, power transformers or induction furnaces that causes a current to reduce power factor. A low power factor resulting from inductive loads can be improved by power factor improvement methods.

All inductive loads require active power to perform the actual work, and reactive power to keep the magnetic field constant. Power factor correction is the method to compensate a lagging current by a leading current through connecting capacitors to the load side. Capacitors contained in various power factor improvement device draws current that leads voltage and produces a leading power factor. Hence improving p.f.. A sufficient reactive power bank is installed so that power factor is kept as close to unity (1).

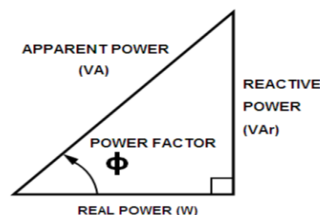


FIGURE 1: Power Triangle

A load with a p.f. near to 1 that is unity result in the most effective use of the supply and a load with lagging of power factor of 0.8 will increase losses in the supply system and resulting increases the maximum demand. Low load phase angle is generally happens due to an inductive load such as an induction motor, power transformer or, lighting ballasts etc .

This paper presents the implementation of TSC. The proposed system uses capacitor Bank to compensate the lagging power factor of load. Capacitor Bank are energized through TRIACs whose switching is controlled by an Arduino board. The Arduino board its program to continuous monitoring the power factor of the connected load and initiate the to operate of company capacitor bank through TRIAC if the load power factor is below reference value.

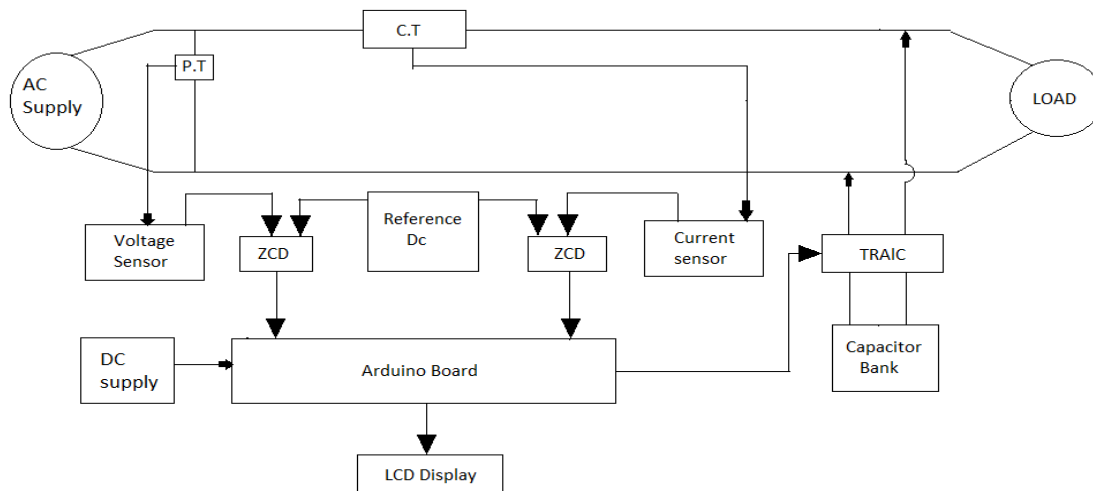
## II. MATERIAL AND METHOD

### 2.1 REASONS OF LOW POWER FACTOR

- Mercury vapour lamps or lamps operated with chokes
- Power and distribution Transformers. A complete unloaded transformer is very inductive and has a very low power factor.
- Induction motors (Load and unload condition)
- The inductive load equipment causing low power factor in the mines includes Hoists, Shovel, Drill, Pump, Shearer, Conveyors etc.

### 2.2 POWER FACTOR CORRECTION

Power factor improvement is a technique of eliminate the undesirable effects of electric loads that create a power factor that is in lagging .Capacitive Power Factor correction is applied to circuits which include inductive load as a means of reducing the inductive component of the current and there by increase the efficiency of the system.



**FIGURE 2: Block diagram of TSC**

### 2.3 DESIGN

Motor input = KW(kilo watts, Old P.F =  $\cos\theta_1$ , Required P.F =  $\cos\theta_2$ )

Capacitor required

$$\text{kVAR} = \text{KW} (\tan\theta_1 - \tan\theta_2)$$

We know that;  $IC = V / XC$

Where.  $XC = 1 / 2 \pi F C$

$IC = V / (1 / 2 \pi F C)$

And,  $kVAR = (V \times IC) / 1000 \dots [kVAR = (V \times I) / 1000]$

We have now calculated the required reactive power in kVAR, now we can easily calculate the rated capacitor by a simple formula

Required Capacity of Capacitor in Farads/Microfarads.

$C = kVAR / (2 \pi f V^2)$  in microfarad

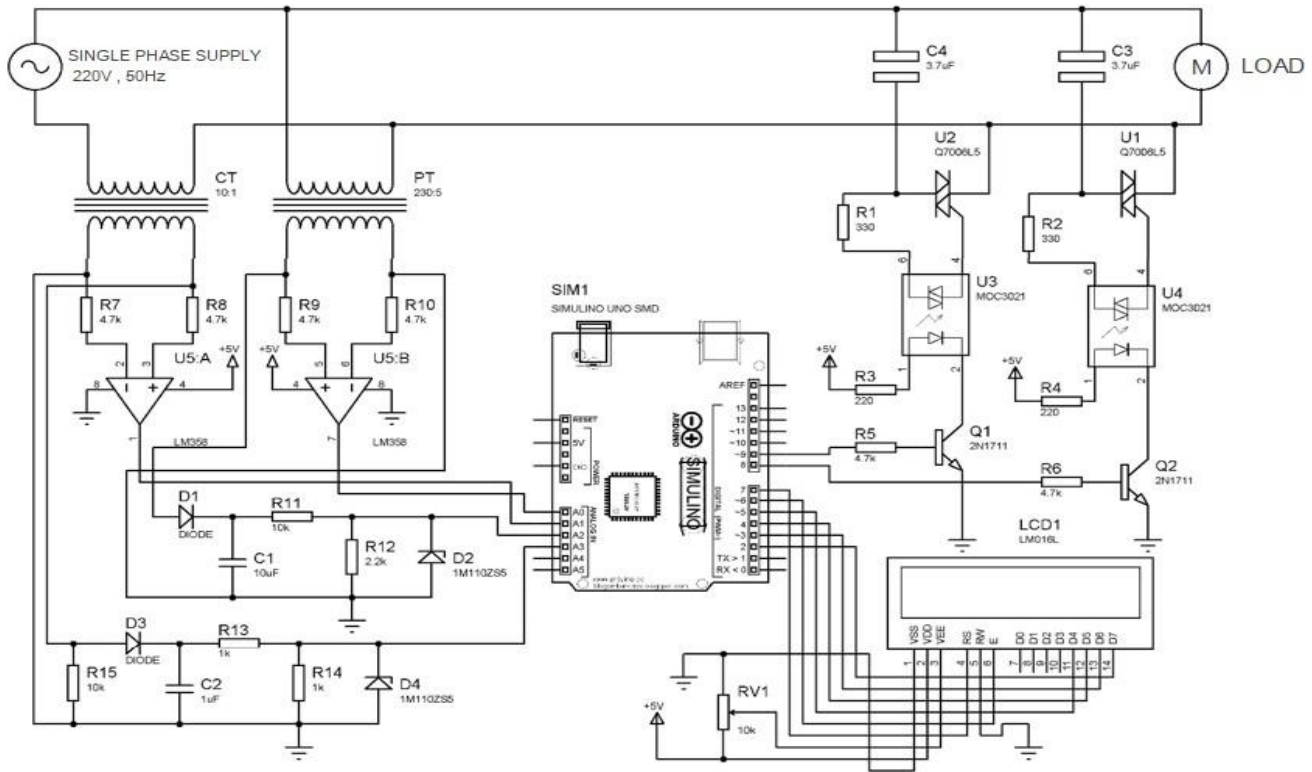
## 2.4 WORKING

The TSC stands for Thyristor switched capacitor. It is an device used for the compensating the reactive power in the electrical power system. Its consists of a capacitor which is in series connected to the TRIAC valve, and also it has the reactor or an inductor.

The proposed system takes 230 volts, 50 hertz main supply as a power source and step down the voltage level to 12 volts through a PT. The power supply unit then convert this 12-volt AC into two different DC power and systems of + 9 volt and + 5 volt. The sample voltage signal is obtained from this 12-volt AC signal and process through the voltage sensor circuit for arduino UNO. A current signal sample is also obtained from the main supply by a current transformer and processed by a current sensor circuit for another Arduino UNO. The microcontroller performs power factor calculation and provide gate pulse to TRIAC and switch on capacitors from the bank result are displayed on a LCD display. The functional block diagram of the complete project is shown above.

The whole TSC unit consists of 8 power factor correction modules given as follows:

- 1)Power supply
- 2) Voltage sensor circuit
- 3) Current sensor circuit
- 4) TRIAC
- 5) Arduino
- 6) Inductive load
- 7) Display
- 8) Capacitor Bank.

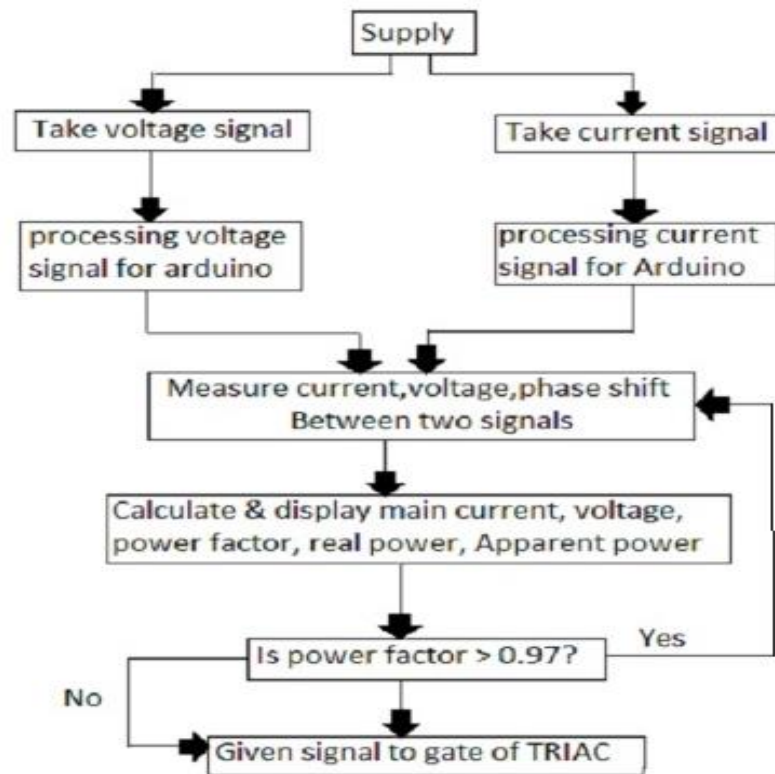


**FIGURE 3: Circuit Diagram of Thyristor Switched Capacitor (TSC)**

## 2.5 ALGORITHM

- Step-1: Take input for voltage and current in the circuit.
- Step-2: Measure the phase lag and calculate the power factor.
- Step-3: Differentiate from the targeted power factor and calculate the reactive power requirement.
- Step-4: Switch ON or OFF appropriate number of capacitors from capacitor bank depending on reactive power supplied by each step.
- Step-5: Again compare the power factor with targeted PF and continue from step-1.





**FIGURE 4: Flow chart of system**

## 2.6 ADVANTEGES

Using this device, we can avoid the penalty on utility bills and can also gain incentive to reduce the cost of overall bill. It also reduces the contract demand charge.

Due to improvement in PF we can minimize the line current due to which the losses are reduce, hence resulting in improving the system efficiency. Increase the load carrying capacity in the existing circuit, hence increasing the lifespan. Improving PF leads to improving to voltage at the load.

## III. CONCLUSION

This project provides better techniques used to overcome the power losses due to low power factor in industrial units. The acceptable results of the proposed TSC system operation indicate the power factor correction by means of TRIAC switched capacitors in economical methods to overcome the power loss in distribution side due to lower PF associated with the electric load as well as good means to reduce the electricity bill.

## FUTURE SCOPE

The automatic power factor improvement using capacitive banks is very efficient as it reduces the cost by decreasing the power wasted from the supply. It is an automatic process so manpower required is less and this Thyristor Switched Capacitor can be used to improve power factor.

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# Design of Underground Cable Fault Detection Using IoT

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**Abstract**— This paper introduces associate underground fault location model of cable using Arduino and IoT (Internet Of Things) module, used for remote indication to diminish power outages and significant loss of profit by sending data to control room therefore the field engineer can resolve the difficulty of a particular fault location. In underground system, incidence of fault is rare and is hard to seek out the precise position of fault to overcome this drawback, we have a tendency to come up with the concept given in paper. The main aim is to diagnose the electrical circuit and three phase contact faults distance from base-station in kilometers. This prototype is assembled with a set of resistors showing length of cable in kilometers and a set of switches are used to create fault at every known kilometer to determine the accuracy and results concerning fault readings, is displayed on a alphanumeric display connected with the Arduino UNO board. This project is useful in reducing the cost, production losses by saving the time and efforts for partition of faults and up the facility accessibility to customers through an enhancement of overall efficiency of power nets.

**Keywords**— Internet of things (IoT), arduino, fault location , distance, kilometer.

## I. INTRODUCTION

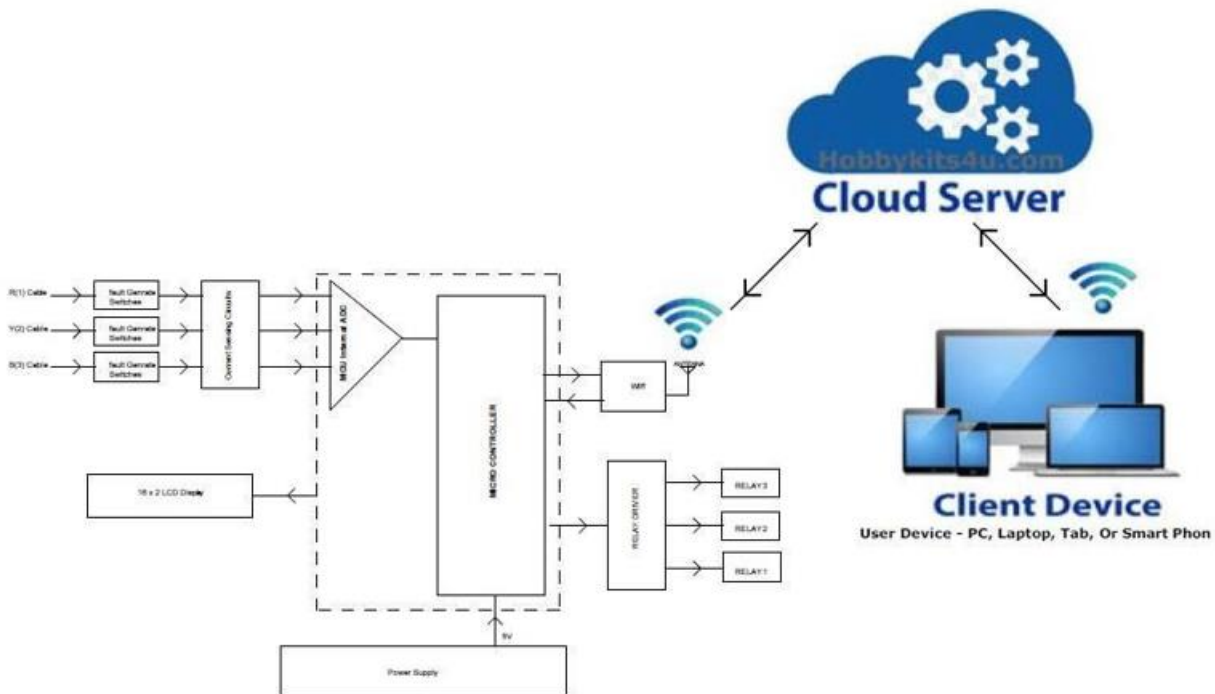
The main function of the electrical power system transmission line is to transfer electricity from the generation unit to the users. We prefer underground cable rather than overhead for the transmission because the underground cable aren't affected by any atmospheric condition like lightning, high speed winds, earthquake, snow ,frost etc. But when a fault is occur at underground cable, it's difficult to search out the location of the fault to clear the fault before it increases the damage to the power system. So we are going to move to detect the precise location of fault. Now the globe become digitalized therefore the project is meant to detect the location of fault in digital way[1]. The underground cable system is a lot of common practice followed in several urban areas. While fault happens for a some reason, at that time the repairing process associated with that specific cable is difficult because of not knowing the precise location of cable fault. Fault in cable is represented as follows- Any defect and inconsistency, Caused by breaking of conductor & failure of insulation, Weakness or non-homogeneity that affect performance of cable, Current is diverted from the intended part.

## II. PROBLEM STATEMENT

Power supply companies are sometimes forced to use underground power transmission and distribution lines instead of their overhead counterparts. This is often mostly for safety and neatness reasons. One in all the foremost challenges related to underground power cables is that the difficulty in locating the particular point of fault and consequently prolonged 'out of service' time. Currently there's no perfect fault location system for underground power line and this introduces a problem to fault location within the marine and also the expected underground distribution lines. The method of fault detection, location and fixing appears rather more difficult and time consuming in underground systems as compared to overhead systems solely because the utility company currently lacks a correct fault location technique. This project has geared toward designing and building an accurate and affordable system of underground cable fault detection and site.

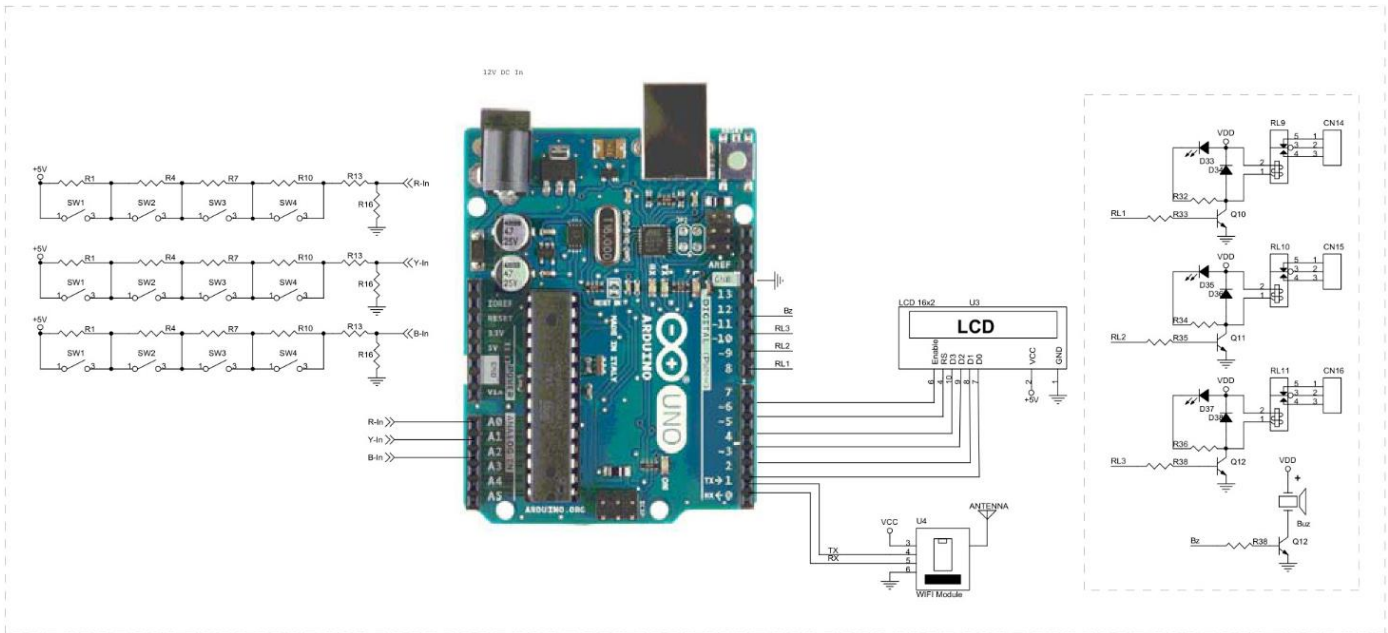
## III. BLOCK DIAGRAM

The Power Grid System consists of basic blocks mainly the Resistors, Arduino, Relay, 12V & 5V DC supply, Buzzer, Switches, LCD Display, WiFi module, Cloud, Interface block. This is diagrammatically shown in figure 1.



**FIGURE 1: Block Diagram Underground Cable Fault Detection By Using Iot**

## IV. CIRCUIT DIAGRAM



**FIGURE 2: Circuit Diagram Underground Cable Fault Detection By Using Iot**

## V. WORKING

The project depends on the concept of OHMs law where a low DC voltage is applied at the feeder end through a series resistor. The current would vary depending upon the length of fault of the cable just in case there's a short circuit of LL or LG etc. The series resistor voltage drop changes accordingly which is then fed to an ADC to develop exact digital data which the programmed microcontroller would display the identical in kilometers. The project is assembled with a group of resistors representing cable length in kilometers and fault creation is created by a group of switches at every known kilometer to cross check the accuracy of the same. Within the cable part we use a set of resistor along with switches. Current sensing part are used as fault creators to point the fault at each location. This part senses the change in current by sensing the voltage drop.

After that there is a controlling part which consists of analog to digital converter that receives signal from this current sensing circuit and converts this signal into digital signal and send it to the microcontroller. The microcontroller also a component of the controlling units and makes a necessary calculation regarding the distance of the fault. The microcontroller also drives a relay driver which successively controls the switching of a set of relays for correct connection of the cable at each phase. In the display section it consists of 16x2 LCD display interfaced to the microcontroller which shows the data related to status of the cable of each phase and the distance of the cable at that phase, in case of any fault.

## VI. COMPONENTS DESCRIPTION

### 4.1 Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328. ATmega-328 is basically an (AVR) Advanced Virtual RISC micro-controller. It has 20 digital I/O pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz crystal oscillator, a USB port, a power jack, an in-circuit system programming (ICSP) header,

and a reset button. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) so as to load new code onto the board you can simply use a USB cable.

#### 4.2 Power Supply

The power supply circuit. It's supported three terminal voltage regulators, which give the specified regulated +5V and unregulated +12V. Power is delivered initially from standard 12V AC/DC adapter or 12V , 800ma Transformer.

#### 4.3 ESP8266 (Wi-Fi Module)



**FIGURE 3:ESP8266 WiFi module**

It is a low cost chip with TCP/IP stack and microcontroller. In our project main importance role of wifi is it performs IOT operation. The simple device is connected from microcontroller to send the information wireless.

#### 4.4 LCD Display



**FIGURE 4: 2\*16 LCD Display**

LCD (Liquid Crystal Display) is the technology used for displays in notebook, TV & other appliances. Like LED and gas-plasma technologies, LCDs allow displays to be much thinner than cathode ray tube (CRT) technology. It displays the Energy Meter reading units and balance. A 16X2 LCD is connected with microcontroller at 7,8,9,10,11 and 12 pins to display the reading of varied sensors.

#### 4.5 Relay

Single pole double throw (SPDT) relay is connected to port RB0 of the micro controller through a driver transistor (Q1). The relay requires 12 V at a current of around 100 mA , which cannot be provided by the micro controller. So the driver transistor is added. A relay is an electrical switch that uses an electromagnet to maneuver the switch from the off to on position rather than a moving the switch. It takes relatively a little amount of power to turn on a relay but the relay can control something that pulls far more power.



**FIGURE 5: Relay**

## **VII. ADVANTAGES**

1. IOT web based application.
2. Three way cable testing
3. Control and monitoring from anywhere.
4. Wifi based wireless interface.
5. Special softwares are not required for diagnosis.
6. Advanced sensing.

## **VIII. DISADVANTAGES**

1. Arduino requires 5V dc.
2. Relay requires 12V dc.
3. Initial cost is high.

## **IX. CONCLUSION**

The short circuit fault at a specific distance within the underground cable is found to rectify the fault efficiently using simple concepts of Ohms law. The work automatically displays the phase, distance and time of occurrence of fault with the assistance of Arduino MCU and ESP8266 Wi-Fi module in an exceedingly webpage. The benefits of accurate location of fault are fast repair to revive back the power system, it improves the system performance, it reduce the disbursal and therefore the time to locate the faults within the sector.

## **X. FUTURE SCOPE**

In this project we detect only the location of short circuit fault in underground cable line. The work can be extended for open circuit fault and double Line to Ground Fault (LLG). The open circuit fault can be detected employing a capacitor in ac circuit which measures the change in impedance and calculate the distance of fault.

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# BMS FOR LI-ION BATTERY PACK USED IN EV

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**Abstract**— Battery is that the heart of electrical vehicle and a way of improving the battery life is to equalize the energy of its cells. This will be done by charging the low voltage cells through high voltage cells (active cell balancing). This paper presents a practical approach of active cell balancing along side a quick comparative study of passive and active cell balancing techniques. To enhance the inconsistency present within the series connected lithium ion (Li-Ion) cells, a cell balancing scheme supported forward converter. This cell balancing scheme is predicated on transferring the energy from the over-charged cell to auxiliary battery and from auxiliary battery to less charged cell. The balancing takes place for one cell at a time and therefore the balancing current are often continuously monitored. The proposed battery management system can be used for communicating the faults generated in the battery pack to the controller and correct actions can be taken to avoid the damage to the battery.

**Keywords**— battery management system, inverter, lithium ion cells

## I. INTRODUCTION

A battery management system (BMS) is any electronic system that manages a chargeable battery (cell or battery pack), like by protecting the battery from operating outside its safe operating area, monitoring its state, calculating secondary data, reporting that data, controlling its environment and balancing it. A battery pack built alongside a battery management system with an external communication data bus may be a smart battery pack. A sensible battery pack must be charged by a sensible charger. Lithium- ion batteries have variety of benefits over the opposite two sorts of batteries, and that they perform well if they're operated using an efficient battery management system.

The purpose of BMS is to make sure that every cell within the series connection has maximum 4.2V across itself in order that the cells remain in healthy and charged condition. This energy balancing is completed using the microcontroller and therefore the algorithm written inside it. The ADC module is employed to sense the analogue voltages on the cells and it's fed to the microcontroller. Inverters are utilized and outsized number of power applications. The function of an inverter is to convert DC power to AC, these are mentioned as Voltage Source Inverters (VSI). A voltage source inverter (VSI) is one that takes during a fixed voltage from a tool, like a dc power supply, and converts it to a variable-frequency AC supply.

## II. Literature Survey

### 2.1 Review of battery management system

In the automotive industry, reducing greenhouse emissions is that the most vital issue. By using electric vehicles, greenhouse emission might be reduced; furthermore, the electricity distribution system would even be affected. One among of the central

components in an electric vehicle is that the battery, which stores an outsized amount of energy and enables functions like regenerative braking. Additionally, it releases electricity when necessary and supplements slow dynamic energy sources like fuel cells. The most goal for the BMS is to make sure that the battery is usually charged. To realize this goal, an in depth simulation of the traction system within the electric vehicle and an in death battery model is required to style the BMS.

[1] Yang wenrong et.al:-

The paper describes a sort of BMS aimed toward power Lithium battery within electric vehicle to avoid the issues like energy crisis and environmental pollution, electric vehicles powered by lithium ion batteries are being developed. The battery faces the issues like overcharge, over discharge, without being solved in time this problem not only effect the battery life but also cause accident therefore BMS is important. The test result shows us that the system function smoothly with correct status and Measurement data and software is stable and robust.

[2] J.X. Qiang

The purpose of this is often paper to undertake a review of literature on battery Technology M battery powered electrical vehicle, Hybrid electric vehicles an advance in hardware in loop. Technology and battery management systems has been studied. During this paper, an account of varied topics of battery i.e. batteries for Electrical cars, power backup calculations, etc. Has been taken. The literature review as provided has provided a foundation for secondary data to validate the research obtained during the initial experimentation. The main challenges within the electrical vehicles and Hybrid electric vehicle also are studied and undertaken survey. This survey also describe various battery model like electrochemical model, equipment. Circuit model, simple battery model, superior simple model etc. For better management of performance parameters. This paper provides background for studying battery performance parameters, its management for optimum utilisation and used for electric vehicles.

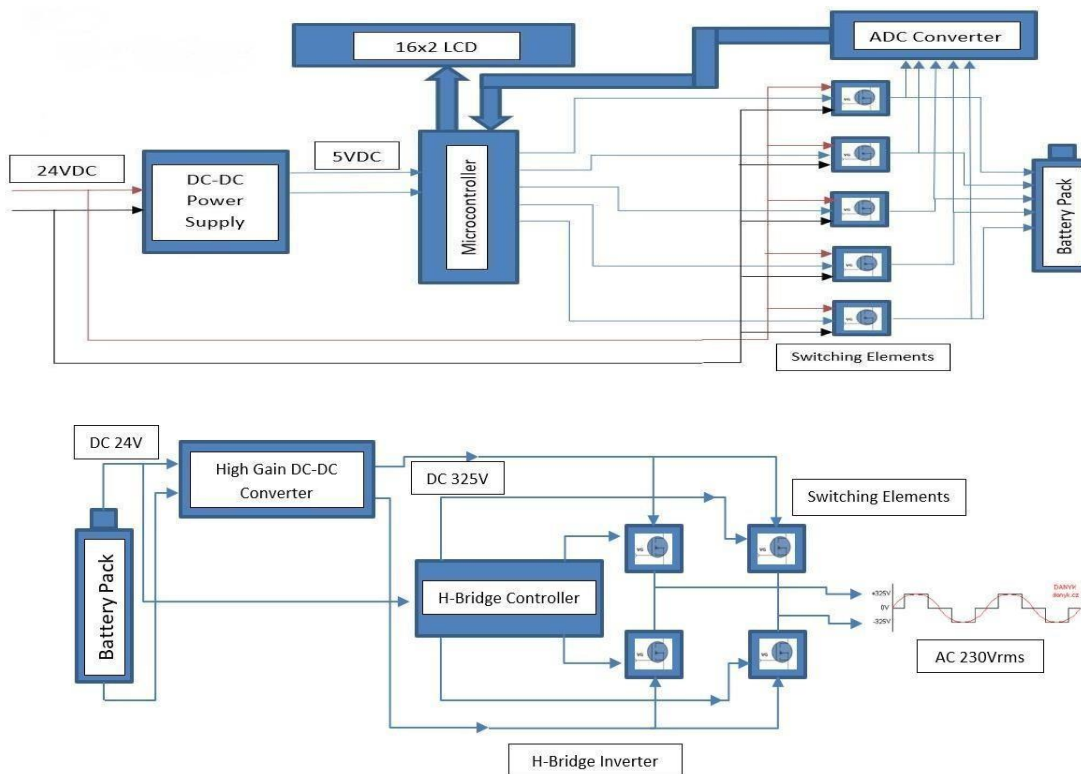
[3] Mr.Rohit Dhigude

The paper shows review of battery management system in electric vehicle. BMS in an electronic regulator that monitors and controls the charging and discharging of rechargeable batteries. There's operational parameter during charging and discharging like voltage, current and therefore the battery internal and ambient temperature. The necessity of battery utilized in EV shouldn't be overcharged or over-discharged to avoid damage the battery, shorting the battery life and causing fire or explosion. The BMS with the function of battery modelling, battery state estimation, battery balancing, etc. the perfect optimum temperature of EV is 45 degree. In EV there basically used micro-controller for the operation of various parts. It's possible to create complex and effective product at a less expensive price. The appliance of an equivalent for various sort of hybrid vehicle and other battery using application. The BMS utilized in automation industries, automotive industry etc.

### III. BLOCK DIAGRAM

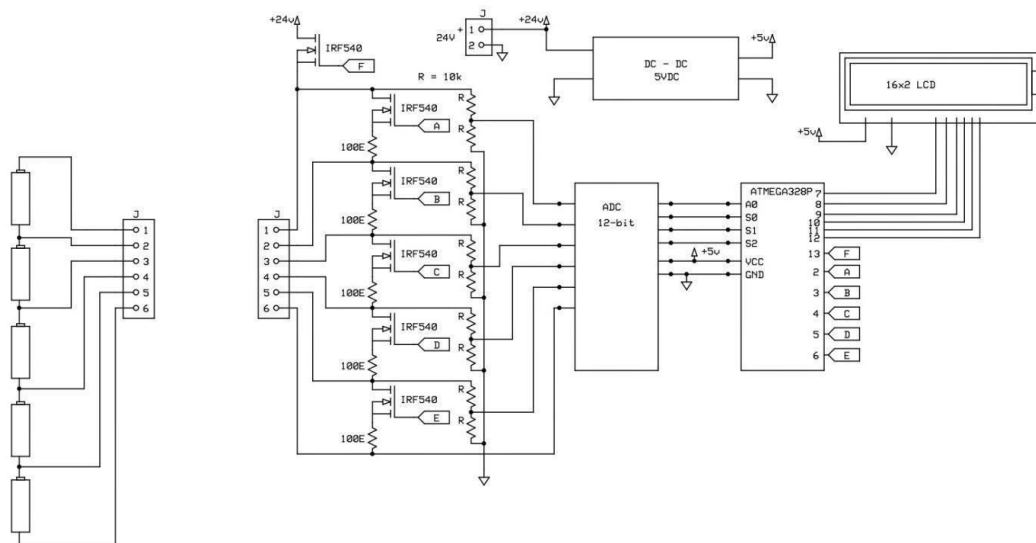
The Battery Management System consists of 4 basic blocks mainly the battery pack, MOSFET block, Microcontroller, Inverter, LCD Display, ADC Converter. A battery management system is actually the "brain" of A battery pack; it measures and reports crucial information for the operation of the battery and also protects the battery from damage during a wide selection of operating conditions. They manage the output, charging and discharging and supply notifications on the status of the battery pack. They also provide critical safeguards to guard the batteries from damage. Lithium ion battery cells have two critical design issues; if you overcharge them you'll damage them and cause overheating and even explosion or flame so it is vital to possess A battery management system to supply overvoltage protection Lithium ion battery cells have two critical design issues; if you overcharge them you'll damage them and cause overheating and even explosion or flame so it is vital to possess A battery management system to supply overvoltage protection. Lithium ion cells also can be damaged if they're discharged below a particular threshold, approximately 5 percent of total capacity. Batteries utilized in EVs shouldn't be overcharged or over-discharged to avoid damaging the battery, shortening the battery life, and causing fire or explosions. The battery management system (BMS), with the functions of

battery modeling, battery state estimation, battery balancing, etc is one among the key points to guard the battery and optimize the use of the battery in EVs. electric battery is a crucial role in electric to stay happening the road, thus the electrical automobile battery pack must be secure from damage due to uneven temperature. counting on the electrochemical utilized in battery, the optimum range is different, but the perfect optimum temperature of electrical automobile battery is 45°C so as to stay the performance and life for the battery.



**FIGURE 1: Block Diagram of BMS for lithium Battery Pack Used in EV**

#### IV. CIRCUIT DIAGRAM



**FIGURE 2: Circuit Diagram of Battery Management System**

#### V. WORKING

The above Circuit diagram shows BMS using ATMEGA28P microcontroller .The supply may be a DC to DC converter and converts the available 30V to 5V DC for the microcontroller operation. The aim of BMS is to make sure that every cell within the series connection has maximum 4.2V across itself in order that the cells remain in healthy and charged condition. This energy balancing is completed using the microcontroller and therefore the algorithm written inside it. The ADC module is employed to sense the analogue voltages on the cells and it's fed to the microcontroller. The 5 Li-ion Cells are connected serial and therefore the power MOSFET may be a solid state switch won't to close up the charging. The centre MOSFET are interconnected serial with the 5 cells. 16x2 LCD Display is employed to point the voltages of all cells within the battery pack. The diagram B shows us H- bridge inverter connected to lithium- ion battery pack with high gain DC-DC converter.

#### VI. COMPONENTS DESCRIPTION

##### 6.1 ATMEGA328P Microcontroller

ATMEGA328P Microcontroller The controller is just like the brain of auto managing all of its parameters. Its controls the speed of charge using information from the battery. The Charge balancing Algorithm is written into this controller which reads the cell voltage levels and switch ON-OFF Middle MOSFET depending upon the algorithm. The Charge balancing Algorithm is written into this controller which reads the cell voltage level and switch ON-OFF Middle MOSFET depending upon the algorithm ATmega-328 is essentially a complicated Virtual RISC (AVR) micro-controller. It supports the info up to eight (8) bits. ATmega-328 has 32KB internal inbuilt memory. This micro-controller features a lot of other characteristics. you ought to even have a glance at Introduction to PIC16F877a (it's a PIC Microcontroller) then compare functions of those two Microcontrollers

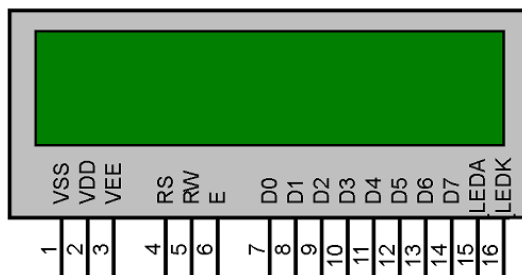
##### 6.2 Power Supply

This is a DC-DC Converter and converts the available 30V to 5VDC for the microcontroller operations. The battery pack is charged using external 24VDC source. 5V is formed using this external Source and DC-DC supply block.



### 6.3 LCD Display

Since the cells are serial connection their analogue voltage must be converted to the digital equivalent values, this is often done by the ADC module.



**FIGURE 4: 2\*16 LCD Display**

16x2 LCD Display is employed to point the voltages of all cells within the battery pack. LCD (Liquid Crystal Display) is that the technology used for displays in notebook, TV & other appliances. Like LED and gas-plasma technologies, LCDs allow displays to be much thinner than beam tube (CRT) technology. It displays the Energy Meter reading units and balance.

### 6.4 Inverter

In this model we used H-BRIDGE inverter with rating 24V input DC with output of (150W/230V). The DC power (24V) given to the battery pack (4.2 x5) connected to high gain DC-DC converter. This high gain DC-DC converter is interconnected with HBRIDGE inverter which provides AC output.



**FIGURE 5: Inverter**

### 6.5 ADC 12bit

The number of binary digits (bits) that represents the digital number determines the ADC resolution. For example, a 12-bit ADC features a resolution of 1 part in 4,096, where  $2^{12} = 4,096$ . Thus, a 12-bit ADC with a maximum input of 10 VDC can resolve the measurement into  $10 \text{ VDC} / 4096 = 0.00244 \text{ VDC} = 2.44 \text{ mV}$ . Similarly, for an equivalent 0 to 10 VDC range, a 16-bit ADC resolution is  $10 / 2^{16} = 10 / 65,536 = 0.153 \text{ mV}$ .

## **VII. ADVANTAGES**

1. High efficiency
2. Lithium-ion battery is compatible for electric vehicles because its self-discharge rate is a smaller amount than half the discharge rate of lead-acid and NiMH batteries.
3. These batteries should never be over charged or under discharge at any circumstance which brings within the got to monitorits voltage and current.
4. Lithium-ion batteries have high charge density and low weight.

## **VIII. APPLICATIONS**

1. Data
2. Hospitals
3. Emergency Lighting
4. Manufacturing Operations
5. Telecommunication
6. Power Utilities
7. Generators

## **IX. CONCLUSION**

In this way, we are developing A battery Management System and controlling supported parameters voltage and current by using ATMEGA28P and Battery monitoring Ic using embedded processing. This project makes it possible to create complex and effective products at a less expensive price. Application of an equivalent for various sorts of hybrid vehicles and other battery using applications. The battery management system are often utilized in automation industries, automotive industries etc. By protecting the battery from operating outside its safe operating area,, monitoring its state, calculating secondary data, reporting that data, controlling its environment, and balancing it. This work first introduced the background of electrical vehicles, lithium-ion batteries and therefore the BMS. the small print of the BMS, including its definition, objectives, functions and topologies were then discussed. The literature on battery modelling and BMS hardware system design were reviewed within the following section. the restrictions of early battery models and therefore the disadvantages of other BMS hardware systems were also reviewed. The objectives and description of this thesis were then presented.

## **X. FUTURE SCOPE**

Many battery models don't simulate of the discharging behaviour of actual batteries. When batteries are nearly fully discharged, and therefore the load is faraway from the battery, the voltage of the battery will increase; when the load is connected to the battery, and therefore the current resumes, the voltage of the battery will drop to the par value. Such discharging behaviour should be simulated in future battery models. In addition, the performance of battery models might be further improved. to enhance BMS hardware systems, a way might be created to permit the BMS to speak with vehicle controllers and other sub-systems within the vehicle, like the motor controller. additionally, a protection device might be added to the system to modify off the battery pack when it operates out of its SOA. Furthermore, the cell-balancing function might be improved. A BMS could then be developed to be used in electric vehicles.

## **XI. ANALYSIS AND RESULT**

This work first introduced the background of electrical vehicles, lithium-ion batteries and therefore the BMS. the small print of the BMS, including its definition, objectives, functions and topologies were then discussed. The literature on battery modelling and BMS hardware system design were reviewed within the following section. The limitations of early battery models and therefore the disadvantages of other BMS hardware systems were also reviewed. The objectives and description of this thesis were then presented.

The proposed battery management system are often used for communicating the faults generated within the battery pack to the controller and proper actions are often taken to avoid the damage to the battery.

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# Separation of CO<sub>2</sub> from air through electrostatic precipitator

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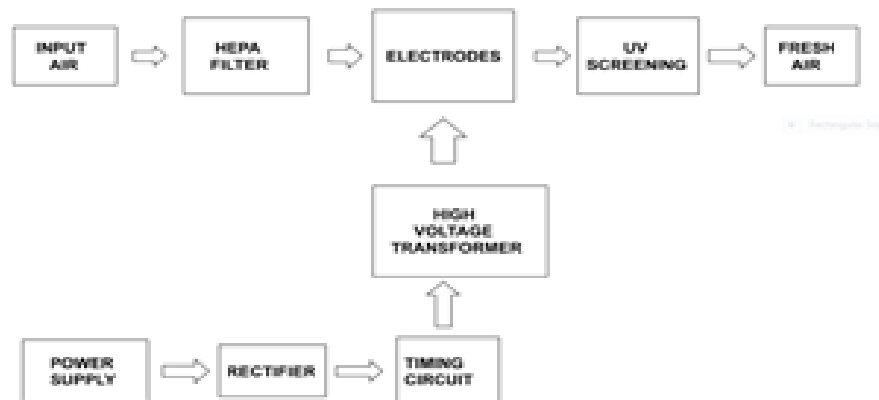
**Abstract**— with the increase of carbon dioxide content in the atmosphere it has become must to find an alternative to reduce the carbon dioxide. Our project mainly focuses to separate carbon dioxide from oxygen molecules through electrostatic precipitator. The features of electrostatic precipitator include a basic filtration unit known as HEPA filter that is paper material to rectify hair, dust etc. A high voltage is served to electrodes that will collect carbon dioxide as positive charge attracts negative charge present on electrodes and helps to separate carbon dioxide from oxygen, also a treatment of UV rays of C category will help keep the oxygen molecules free from bacteria.

**Keywords**— HEPA filter, Electrodes, High voltage supply, Electrostatic precipitator, UV- C.

## I. INTRODUCTION

As per the data obtained, India is the fourth highest emitter of carbon dioxide in the world; it is expected emissions to grow by a solid 8.9 percent. Therefore, to rectify this problem, this project introduces some ways that helps to purify the air. Here the carbon dioxide has been separated from oxygen by using a process known as electro precipitator. There are many attempts made to purify air through electrostatic precipitator however with the additional purification steps this process is made more efficient like initial filtration system that almost rectifies amount of carbon and dust by 65% and remaining contents will be treated by high voltage on electrodes as well as removal of bacteria by UV rays. Therefore, by using this process we try to remove as much as carbon dioxide content in the atmosphere.

## II. BLOCK DIAGRAM



**FIGURE 1: Block Diagram of carbon separation from air through electrostatic precipitator**

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### **III. MATERIAL AND METHOD**

#### **3.1 SIGNIFICANCE OF CARBON COLLECTION VIA ESP**

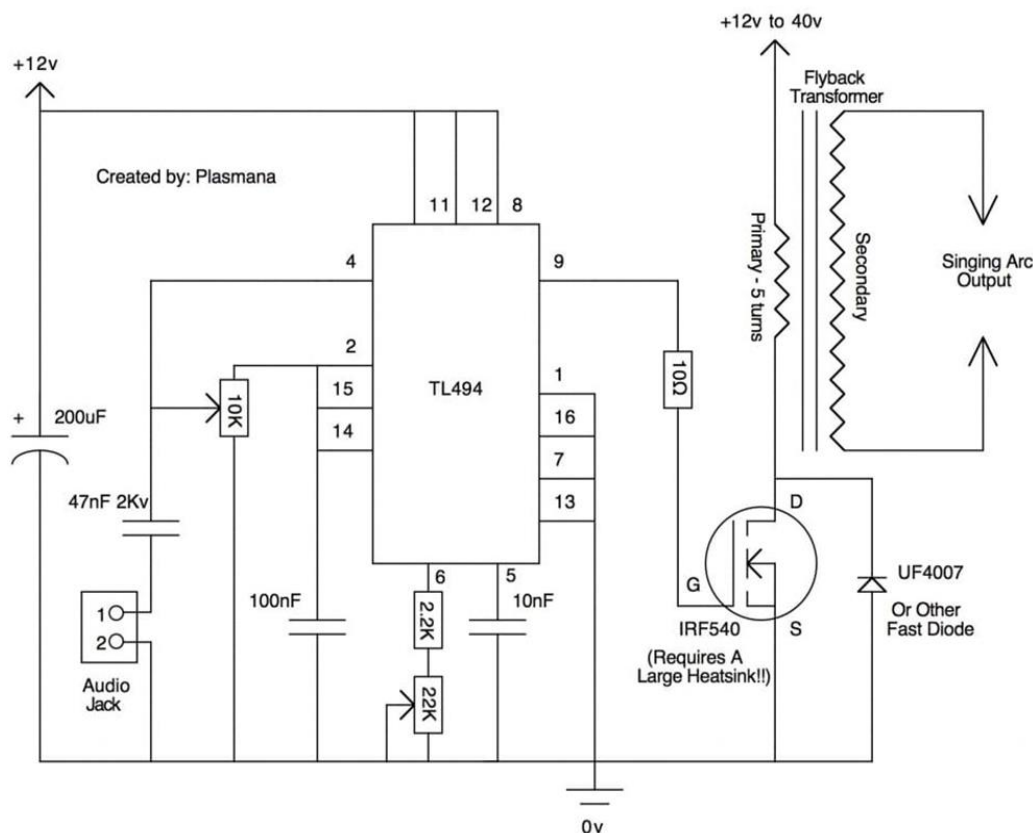
- Electrostatic precipitator, also called electrostatic air cleaner, a device that uses an electric charge to remove certain impurities—either solid particles or liquid droplets—from air or other gases in smokestacks and other flues.
- The precipitator functions by applying energy only to the particulate matter being collected, without significantly impeding the flow of gases. Originally designed for recovery of valuable industrial-process materials, electrostatic precipitators are used for air pollution control, particularly for removing particles from waste gases at industrial facilities and power-generating stations.
- Precipitators function by electrostatically charging particles in the gas stream. The charged particles are attracted to and deposited on plates or other collection devices. The treated air then passes out of the precipitator and through a stack to the atmosphere. When enough particles have accumulated on the collection devices, they are shaken off the collectors by mechanical rappers.
- The particulates, which can be either wet or dry, fall into a hopper at the bottom of the unit, and a conveyor system transports them away for disposal or recycling. Precipitators are often deployed with denitrification units that remove nitrogen oxides and scrubbers or other devices that remove sulfur dioxide.

### **IV. PRINCIPLE OF WORKING**

Initially atmosphere air is an input consisting of oxygen molecules with carbon impurities. Now this impure air has to be processed through electro precipitator, which will separate the carbon from the air; however, the actual process involves major parts in it, which are:

- 1)HEPA FILTER- It is a type of filtration paper which is used to block unwanted hard materials such as hair, dust, paper or plastic particles etc.
- 2)Electrostatic precipitator- This is the heart of the separation unit, it consists of a chamber where electrodes are placed in such a way alternate to each other, so that whenever carbon molecules( being positively charge) passes through electrodes the positive electrode will give repulsion force however negative electrode will attract resulting in collecting carbon on the base of electrode negative charged plates, To successfully achieve this feat , components like rectifier, separation circuit, and a transformer is used to gain high voltage.
- 3) UV bulb- Now the air separated from carbon is passed through UV bulb chamber to make sure remaining bacteria present in air should be neglected and thus we could pass the purified form of air as an output which will be carbon-less

## V. CIRCUIT DIAGRAM



**FIGURE 2: Separation of CO<sub>2</sub> from air through electrostatic precipitator**

## VI. LIST OF COMPONENTS

- |    |                            |
|----|----------------------------|
| 1  | Fly back transformer       |
| 2  | IC-TL494                   |
| 3  | Resistor                   |
| 4  | Capacitor                  |
| 5  | Diode                      |
| 6  | MOSFET                     |
| 7  | Electrostatic precipitator |
| 8  | UV chamber type C          |
| 9  | Gas sensor                 |
| 10 | 16-bit display             |



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## **VII. ADVANTAGES**

1. The High Efficiency of Removal of Particles/Pollutants.
2. Collection of Dry as Well as Wet Pollutants.
3. Low Operating Costs

## **IX. ANALYSIS AND RESULT**

After completing the project, the result is expect to be efficient for which some analysis is made that is in terms of technical, financial, management, work distribution.

Analysis where made based on the same expectations and hopefully they were fulfilled such as technical aspect was perfect as per the output was expected however the workload was distributed according to the skills of the persons involved. So after taking an account of all terms mentioned above analysis were same as expected and planned

## **X. DISADVANTAGES**

- 1 High Capital Costs.
- 2 Requires Large Space.
- 3 Risk of accidents.

## **XI. CONCLUSION**

The Air Purifier specially designed for old age homes, hospitals, offices etc. This can be used to remove dust, fungus and reducing harmful gases from the air. The technology used in Air Purifier has a bright future because it works on as and when required basis and thus saves energy.

## **XII. LITERATURE REVIEW**

Electrostatic Separation of Carbon Dioxide by Ionization in Bifurcation Flow (2004) Takao Ito\*, Yoshio Otani and Norikazu Namiki Graduate School of Natural Science & Technology, Kanazawa University, 2-40-20 Kodatsuno, Kanazawa 920-8667, Japan.

Concentration of CO<sub>2</sub> in the air is one of the major issue. Therefore, ionization separator was used to the separate carbon dioxide from inert gases. In this paper, it is found that carbon dioxide can be separated mostly in the form of anion although some fraction of carbon dioxide decomposes by the soft X-ray irradiation.

## **XIII. FUTURE SCOPE**

To move from a simple dimensional analysis to a full development of the technology, a number of R&D issues will need to address. One is the modeling and understanding of the airflow in order to define the maximum level of CO<sub>2</sub> that can be removed at any given site without untoward side effects. Preliminary studies suggest the feasibility of the approach in this regard. One needs to choose between various designs for contacting natural airflows. The situation is right now wide open and somewhat reminiscent of the early days in windmill design. Many vastly different designs competed with each other until finally a handful of particularly elegant and simple solutions took over. One needs to find a good sorbent. Currently the only sorbent that is environmentally acceptable and guaranteed to work is Ca (OH)<sub>2</sub>. Other possibilities will need to be explored. We are planning

the analysis of several process implementations for the extraction of CO<sub>2</sub> from air. A successful process design, combined with any of the methods proposed for carbon dioxide disposal would be a major step toward solving the greenhouse gas problem and toward establishing a net zero carbon economy that would not have to abandon the vast fossil energy resources that could fuel economic prosperity for generations.

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## Waste Segregation

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**Abstract**— The Rapid increase in population in our country has led to improper waste management in metro cities and urban areas which has resulted in spreading of various diseases. It is estimated that 2.02 billion tons of municipal solid waste was generated universally in every year. The segregation, transport, handling and disposal of waste must be managed properly to minimize the risks to the public and as well as to the environment. An efficient and easy method to dispose the waste has been designed in our project, "solid waste segregator". This paper proposes an solid waste segregator (SWS) which is a cheap, easy to use solution for a segregation system at households and for different places, so that the wastes can be sent directly for processing on their basis. Waste segregator is designed to sort the waste into three main categories namely metallic, dry and wet thereby making the waste management more effective. Different proximity sensors are used to detect the waste.

**Keywords**— Waste segregator, waste management, microcontroller, compressor, proximity sensors

### I. INTRODUCTION

The rising population of India poses serious threats because of improper waste segregation with regard to the availability of living space, utilization of natural resources and raw materials, education and employment. But another serious peril that follows is the increase amount of waste generated each minute by an every person. Every city is grappling problem with the menace of every increasing waste. An astounding 0.1 million tons of waste is generated each day in our country sadly, only 5% of this colossal amount of waste is recycled and uncontrolled dumping of waste of towns and cities has created overflowing landfills which are not only impossible to reclaim because of the haphazard manner of dumping but also has serious environmental issues. When viewed on a larger scale, the poor recovery rate has impeded the growth of the country as well as the economy of our nation. One possible solution for this problem could be segregating the waste at the disposal level by everyone. We have thus come up with a Waste segregator that categorizes the waste as wet, dry or metal. A Arduino forms the heart of the system. Inductive proximity sensor is used to detect whether the waste is a metal, dry or wet. Wet and dry waste are distinguished based on their properties. The flaps are used to distribute waste according to their properties in different container.

### II. METHODOLOGY

#### 2.1 Open Close Mechanism:

The open close mechanism acts as a regulator to control the waste that falls on the conveyer belt. A 12V DC geared motor receives inputs from microcontroller to monitor motion of the motor. This mechanism is initiated only if the IR sensor detects a waste in the container.

#### 2.2 Proximity Sensor:

Different types of proximity sensor are used to detect the whether the waste is dry, wet or metallic waste.

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### 2.3 Slider section:

A slider section is used to slide off the waste in container on the basis of their properties, whether the waste is dry, wet or metallic.

### 2.4 Blower Section:

Dry and wet waste separation is done on the basis of their weight and moisture if the waste is dry the blower blows the dry waste a blower is connected and controlled by Arduino.

## III. LITERATURE REVIEW

### 3.1 Automatic Waste Segregator and Monitoring System

Aleena V.J

Automatic waste segregator is designed to sort the waste into different categories namely; Metallic, organic, inorganic and plastic, thereby making the waste management more effective. Due to overpopulation the waste has been huge problem to sort and decompose, this system will help to save time, money & efforts.

### 3.2 Automatic Waste Segregator

MS. Suchitra V

An increase in municipal solid waste generation has been recorded worldwide. This has been found due to increasing growth rate, industrialization, urbanization and economic growth which have shown ultimately resulted in increased solid waste generation. An automation of this System not only saves the manual segregators of the numerous health issues, but also proves to be economical to the nation.

### 3.3 Smart Waste Management System for Crowded

Dr. Rasha Elhassan King Khalid University

In implementing the great challenge is how to segregate waste .This system will manage waste with low cost and high performance Waste has a Negative impact in the society quality in which smart city must to improve. The proposed system. Will use the sensors technique inside the chamber, as a lower part, to separate the waste into four categories [food, plastics, papers, and metal] and use level sensor at a top to inform the management system to collect the waste container. The proposed system will save time, money and efforts compared to the recent waste management system and improve the society quality as well.

### 3.4 Smart Solid Waste Management

Ravi Kishore Kodali and Venkata Sundeep Kumar

A smart city is created upon various particular components according to their basis and strong waste administration is one of these crucial points. To solve this problem this system designed according to the endorsed technologies. This will not only help us to segregate waste will also beneficial by terms of economic development and reducing health issues of workers.

### 3.5 Technologies for Segregation and Management of Solid Waste

Siddappaji

India Waste management has become a serious issue due to rapid growth, economical activities and increase in human population. The amount of solid waste generated in the world is increasing in large scale. Insufficient collection and inappropriate disposal of waste. This give effect on source of water, land and air pollution, and poses risks to human health and the environment. Government in all countries is currently focusing on efficient techniques to approach the Problems faced in Solid Waste Management (SWM).

## **IV.METHODS**

### **4.1 Trommel Separators/Drum Screens**

A Trommel screen which is also known as rotary screen is an essential unit which is used mainly in the different industries like mineral and solid waste processing. It consists of a cylindrical drum which is normally elevated at an angle at the feed end.

### **4.2 Eddy Current Separators**

Eddy current separators are used to separate non-ferrous metals with the help of high magnetic field. This can lead to damage of eddy current separator unit belt. The eddy current separator is used in a conveyor belt carrying a thin layer of waste and at the end of the conveyor belt is an eddy current rotor.

### **4.3 Induction Sorting**

Every metallic conductor having its own electrical field so this conductor transverse through the field change these waves and a computer detects the signal difference for each individual particle, which makes it possible to accurately sort particles with a conductor of thicknesses 1 mm.

### **4.4 Near Infrared Sensors**

When materials are illuminated then they mostly reflect light in the near infrared wavelength spectrum. The NIR sensor can distinguish between different materials based on the way they reflect light in it

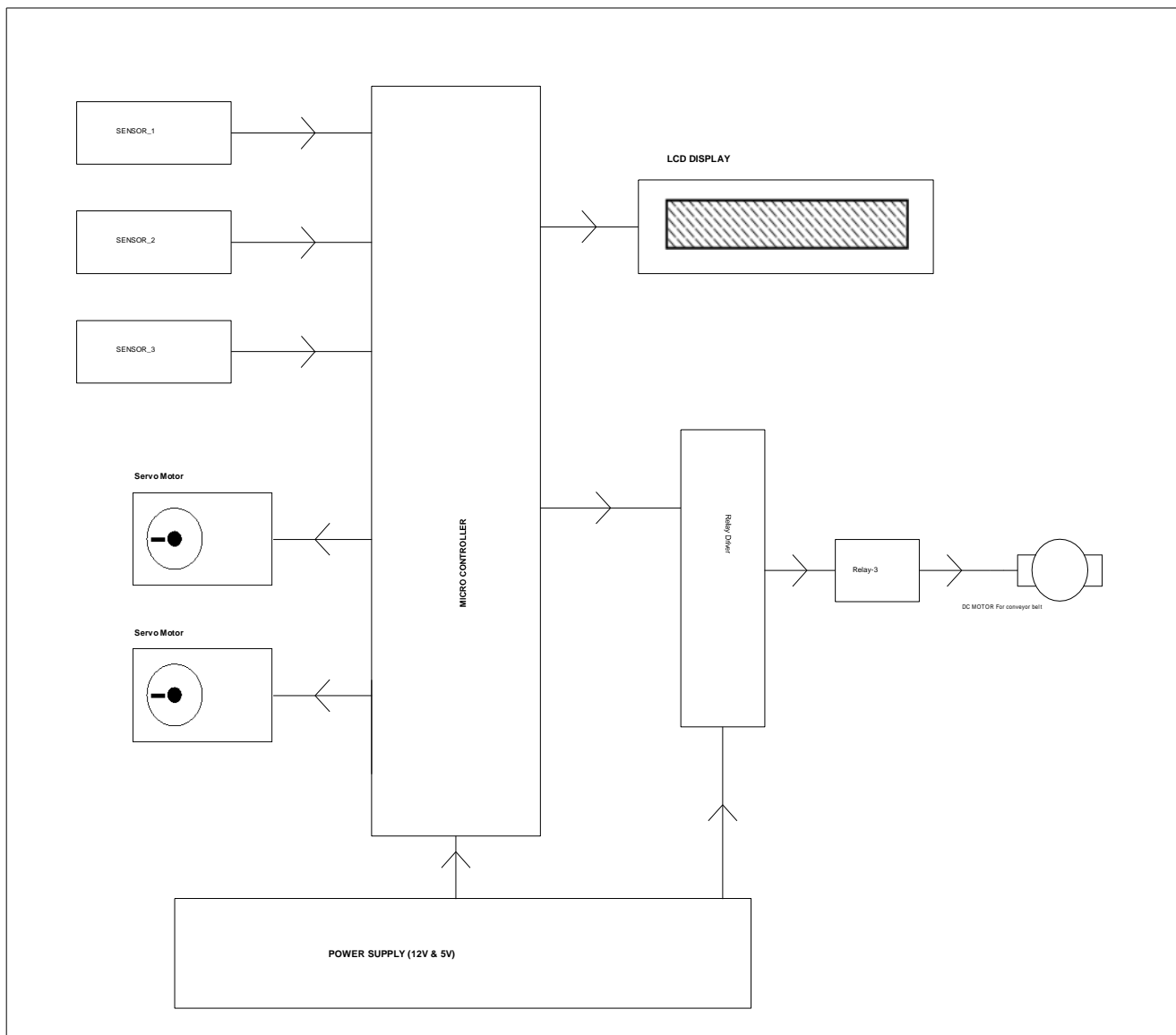
### **4.5 X-ray Technology**

X-rays can be used to find difference between different types of waste based on their density.

### **4.6 Manual Sorting**

The municipal waste is separated manually into plastic, paper, metallic etc.

## V. Block Diagram



**FIGURE 1: Block diagram**

## VI. CONCLUSION

From the above discussion we can conclude that, various methods and technologies are proposed for the improvements of the SWM and segregation of waste. SWM and segregation is still a big problem to the present world and the proposed techniques have their own drawbacks for their effective implementation. This provides further avenue for the research and development of suitable technologies for the SWM and segregation.



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# GENERATION BY FIBONACCI SPIRAL TURBINE

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**Abstract**— This paper presents a conversion of WIND ENERGY to electrical energy. The generated electricity is used in the electric vehicle. This generated electricity can be used as a backup and can be used to increase the run time of the electric vehicle. The Fibonacci turbine is used for generating electrical energy. Archimedes turbine is suitable for such an application because of its shape and speed at which it rotates. (Approx. 12000 RPM). Fibonacci turbine is a type of Horizontal Axis wind turbine, which has a great wind flow velocity to its surface which leads to less stress on it even at high speed.

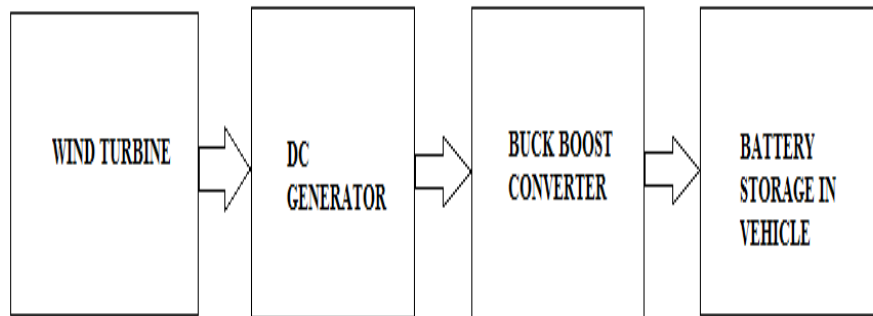
**Keywords**— Greater efficiency, Fibonacci turbine, higher speed, less stress, Secondary Generation, Increase runtime (EV), Low Cut-in Speed, Higher output

## I. INTRODUCTION

The demand for electrical energy is rising rapidly. To date, the majority of power needs are met by using fossil fuels which are on the verge of extinction. Recent studies estimate that these fossil fuels will last only up to 2030. Hence to keep up with this ever-increasing power demand, we need to find alternative sources of energy. Also, the usage of these fossil fuels results in GHG emission which results in pollution and global warming. Thus finding a clean renewable source of energy is the need of the hour<sup>[1]</sup>. The wind could be a clean supply of renewable energy that produces no air or pollution. And since the wind is free, operational price is nearly zero once a rotating turbine is erected. Besides, high amount of production and technology improvements are enhancing the turbines and making them cheaper. Among all renewable resources, wind energy has evidenced to be a comparatively matured technology and has higher potential in commercialization and the production of enormous quantities. The main application of wind generation is that the generation of electricity from a power system network that integrates transmission grids. Since big-scale wind turbines need giant grid-connected wind farms, the small-size wind turbine has been designed in fields such as mobile communication base stations, city road lighting, offshore cultivation and brine purification in several countries<sup>[1-2]</sup>.

In general, small wind turbines are classified into two types of wind turbine HAWT (Horizontal axis wind turbine) and VAWT (Vertical axis wind turbine). Archimedes' spiral wind turbine is one of the HAWT, however, there is marked contrast between new wind turbine design and traditional HAWT models. The spiral allowed higher measure of a circle's circumference and so its space. However, this spiral was shortly evidenced inadequate once the great mathematician Archimedes went to work out a lot of correct value of Pi that created a better way of measuring the area of a circle. Now we will be using such a small scale wind turbine to increase the run time of electric vehicles [3]. From the following references we came up with an idea to use the Fibonacci spiral turbine with a bit modification and try to implement these ideas where charging stations are available in abundance.

## II. BLOCK DIAGRAM



**FIGURE 1: BLOCK DIAGRAM**

The Wind turbine will rotate efficiently due to which the shaft connected to the generator will rotate. The dc Generator will start generating electrical energy quickly due to low cut-in speed. As there should be a constant generation a buck boost converter is used which will give constant output as per our need. The input to the Battery, which is stored in the Vehicle, will get charged with this constant output Voltage generated. The main Purpose of this battery is to act as a backup or Reserve power to the electric vehicle. The run time of the electric vehicle will increase this stored power can be used as a power source to other accessories in car which need power.

**2.1 Wind turbine:-**A turbine may be a device that converts mechanical energy from the wind into electricity. The blades of a turbine flip between thirteen and twenty revolutions per minute, reckoning on their technology, at a relentless or variable rate, wherever the speed of the rotor varies in respect to the speed of the wind to achieve a larger potency.

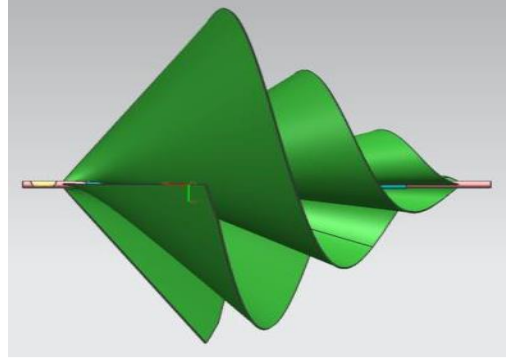
**2.2 Dc Generator: -** Permanent magnet DC (DC) machines are typically used either as commonplace motors or as DC rotary engine generators as constructional, there's no basic distinction between the dc motor or a dc generator. In fact, identical PMDC machine might even be driven electrically as a motor to maneuver a mechanical load, or it's about to be driven mechanically as a simple generator to urge associate output voltage. This then makes the permanent magnet DC generator (PMDc generator) ideal to be used as a simple rotary engine generator if we tend to tend to attach a DC machine to an immediate current supply, the coil will rotate at a collection speed determined by the connected supply voltage and its strength thereby acting as a “motor” producing torsion. If however, we tend to tend to mechanically rotate the coil at a speed over its designed motor speed by exploitation rotor blades, then we'll effectively convert this DC motor into a DC generator producing a generated voltage output that's proportional to its speed of rotation and strength.

**2.3 Buck boost Converter: -** The output voltage of the DC to DC converter could be a smaller quantity than or larger than the input voltage. The magnitude of the output voltage depends on the duty cycle. These converters noted because the accelerate and step down electrical devices and these names are coming from the analogous accelerate and step down electrical device. The input voltages unit of measurement step up/down to some level of over or however the input voltage. By exploitation the low conversion energy, the input power is capable the output power. The next formula shows the low of a conversion. DC generator producing a generated voltage output that's proportional to its speed of rotation and strength.

**2.4 Batteries: -** Batteries unit a bunch of one or extra cells whose chemical reactions manufacture a flow of electrons in an exceedingly} very circuit. All batteries unit created from three basic components: degree anode (the '-' side), a cathode (the '+' side), and some fairly answer (a substance that chemically reacts with the anode and cathode).

### III. METHODOLOGY

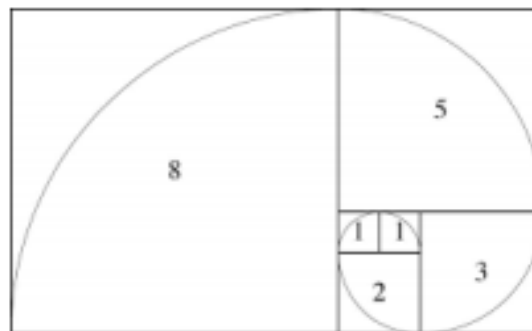
In this project, we will be using the concept of a horizontal axis wind turbine to charge the battery storage system present in the electrical vehicles. This system would be effective when the vehicles are running on a constant speed which is very much possible on the highway. Now the main obstacle, which comes in forward to reduce the use of electric vehicles in India, is the number of charging station and the distance between them. So when these vehicles are running on highways and no nearby charging station this would be a bigger problem for the costumers.



**FIGURE 2: Design of Fibonacci spiral turbine**

Thus exploitation this method we tend to area unit able to increase the run time of the vehicles. The generated energy is utilized to charge the battery system of the electrical vehicles already mounted on the vehicle. The presently designed rotary engine can bear moving its energy by reversing wind direction. inside the gift analysis, degree experimental study is attended to induce the evolution of the tip vortex structures inside the on the brink of wake of the scientist rotary engine model and thus the mechanics characteristics in degree open kind construction by using a PIV live system. The Lattice physicist technique has been applied to research the behavior of mechanic's characteristics shut the scientist rotary engine and take a glance at the power as a mode implement for the rotary engine. The most focus of this analysis is on quantifying the evolution of the tip vortex properties and rate distributions, furthermore as mean velocities and instant velocities.

A spiral blade rotary engine works on the principle of conservation of momentum like completely different wind turbines, but the excellence in their blades that is capable to extract most electricity from the wind by ever-changing energy into electricity. The Fibonacci spiral degree approximation of the golden spiral created by drawing circular arcs connecting the choice corners of squares at intervals the Fibonacci tiling; this one uses squares of sizes one, 1, 2, 3, 5, 8, 13 and 21.



**FIGURE 3: Fibonacci sequence**

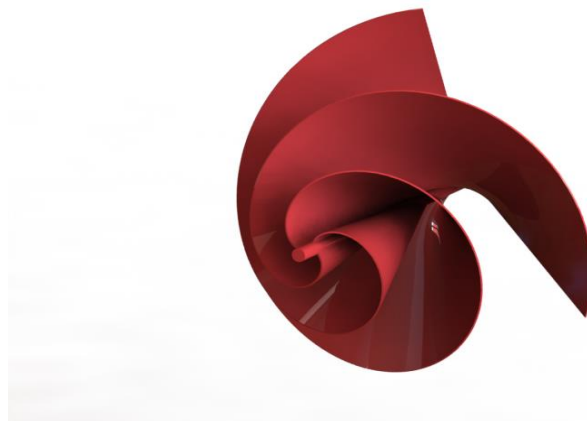
Some analysis were on these variety of rotary engine by the analysis and development team of a company and therefore the the } following results were obtained: and that we would also expect approximate same results from our style that is that the Fibonacci spiral rotary engine.

**TABLE 1**  
**VELOCITY EFFICIENT TABLE**

Sr. No	Velocity of air before impact , V1 (m/s)	Velocity of air during impact, V (m/s)	Velocity of air after impact V2 (m/s)	Efficiency of the turbine ( $\eta$ ) %
1	19	12	2	71.38
2	17	11	3	68.95
3	15	8	3	45.45
4	11	6	3.5	35.16

**Table 2**  
**AIR VELOCITY V\ S VOLTAGE TABLE**

Sr. No.	Air velocity (m/s)	Voltage (V)
1	5	0.8
2	11	1.8
3	15	4.5
4	19	11.6



**FIGURE 4 Front View**

**TABLE 3**  
**LIST OF TURBINES WITH EFFICIENCY**

Type of turbine	Efficiency(%)
Wind turbines(HAWT,VAWT)	35-45%
Water turbines (Kaplan, Francis)	60-65%
Thermal turbines	40-45%
Archimedes screw turbine	55-60%
Fibonacci spiral turbine	65-70%

#### IV. CONCLUSION

The wind has huge potential and can be used as a clean alternative energy source. As the pressure of wind increases, the output voltage also increases. By efficient conversion, the output voltage values obtained can be further enhanced. This technology is not used practically until now due to efficiency concerns, but present work in this field makes it future quite promising and using this method would successfully encourage people to choose electric vehicles rather than the petrol/diesel consuming cars which produce GHG, carbon emissions.

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## Smart Waste Water Treatment

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**Abstract**— Waste water treatment is the process of removing contaminants from wastewater, primarily from household sewage. Untreated water is causing abundant water borne diseases and polluting our water bodies. After a proper analysis of this wastewater, it is found that these are some important parameters such as Biological Oxygen Demand, pH, Chemical Oxygen Demand, Total suspended solid and Total Dissolved Solids. This paper gives an overview and a brief description about the designing and automation of decentralized wastewater treatment plant.

**Keywords**— household treatment, untreated, decentralized.

### I. INTRODUCTION

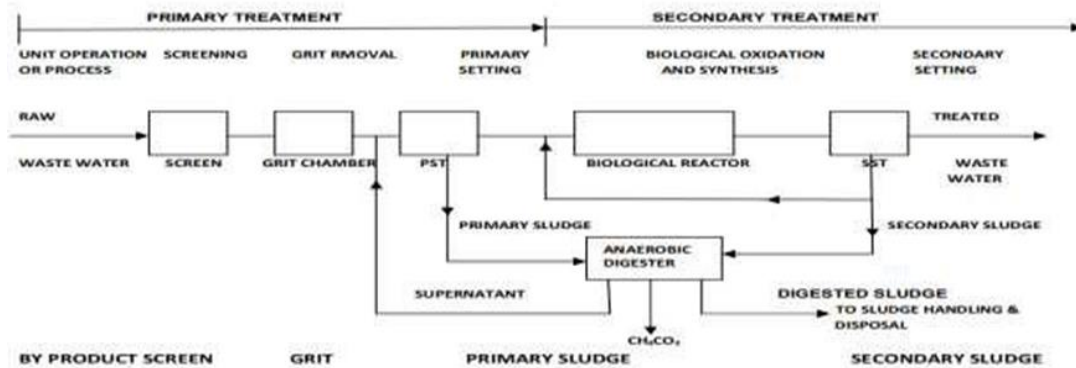
As we know that water is the sustinment for all life. Without water, we will all perish. Because of the critical shortage of this often overlooked natural resource, the world will soon face a long and enduring crisis. Not only is it needed for humans to drink, but it is also needed to grow and sustain crops and also for animals. Treatment and reuse of the wastewater efficiently is the need of the hour.

The objective of sewage treatment is to produce a disposable emission without causing harm to the surrounding environment and in turn, it prevents pollution. Sewage treatment method is the process of removing contaminants from wastewater and household sewage. It consists of physical, chemical, and biological processes to remove physical, chemical and biological contaminants. Its aim is to produce an environmentally safe fluid waste stream and a solid waste suitable for disposal or reuse. Sewage treatment method generally consists of three stages, namely primary, secondary and tertiary treatment.

### II. WORKING PRINCIPLE

#### 2.1 Primary treatment

Primary treatment consists of elimination of large suspended organic solids. This is usually managed by sedimentation in settling basins. The liquid effluent from primary treatment, often includes a large amount of suspended organic material, and has a high BOD. Sometimes, the preliminary as well as primary treatment method are grouped together, under primary treatment. The organic solids, which are split out in the sedimentation tanks, are often stabilized by anaerobic decomposition in a digestion tank.



**FIGURE 1: Block Diagram of waste water treatment**

## 1.2 Secondary treatment

Secondary treatment method involves further handling of the contaminants, coming from the primary sedimentation tank. This is generally achieved through biological decomposition of organic matter, which can be carried out either under aerobic or anaerobic conditions. In these biological units, bacteria will decay the fine organic matter, to produce clearer effluent. The treatment reactors, in which aerobic bacteria decompose the organic matter are known as aerobic biological units; and may consist of Filters. Aeration tanks, with the feed of recycled activated grease. Since all these aerobic units, generally make use of primary settled sewage, they are easily mentioned as secondary units.

## 1.3 Final treatment

This treatment is sometimes called tertiary treatment method as this method consists of removing the organic load left after the secondary treatment, and particularly to kill the pathogenic bacteria. This treatment, which is normally transmit out by chlorination, is generally not transmitted out for disposal of sewage in water, but is carried out, while using the river stream for collecting water for reuse. It may, however, sometimes be adopted that when the outfall of sewage is very nearby to the water intake of some nearby town. This process is called Algal-bacterial wastewater treatment method.

## III. LITERATURE REVIEW

Waste water, is any water that has been adversely affected in quality by anthropogenic influence. The sewage from colonies as well effluent from industrial units has been identified as main cause for water pollution across our country. Sewage is a water-carried waste, in solution or suspension that is intended to be removed from a community. Also known as wastewater, it is more than 99% water & is characterized by volume or rate of flow, physical condition, chemical constituents and the bacteriological organisms that it contains. During recent years, there has been an increasing awareness and concern about water conservation all over the world. Hence, new approaches towards achieving sustainable development of water resources have been developed internationally. Under this research paper, a cut to suit treatment technology has been developed to treat sewage. Treatment technologies adopted are activated sludge process, chlorination & filtration. The results were very encouraging. The treatment system achieved 96.8% BOD, 92.5% COD and 95% TSS & 99% Total coliform removal respectively. The treated sewage can be reused for various purpose like cooling water make up, gardening , landscape development , toilet, flushing, road washing etc. thus leading towards water conservation.

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#### IV. ADVANTAGES

- Reusing water for various household purposes.
- Reducing effluents that are discarded into waterbodies.
- Contributing in reduction of global warming.
- Waste water treatment at decentralized level can lead large saving of land and initial capital cost for setting up a centralized plant.

#### V. CONCLUSION

- Limitations due to human error or processing can be eliminated with automation.
- Environmental sustainability that is quality and quantity of surface water can be improved.
- Pollution reduction can lead to greater cause.
- By water treatment the problem of water scarcity in many parts of world can be eliminated.

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# SOLAR WATER DISTILLATION BY HYBRID TECHNOLOGY

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**Abstract**— presents with the rapid development of social economy, the worldwide shortage of water resources is becoming increasingly prominent, especially in the coastal countries and regions of high population density areas. Market demand is driving the development of seawater desalination technology to the direction of large scale, high efficiency, low energy consumption and low cost. The paper uses solar radiation heat - photovoltaic integrated energy, a seawater desalination device was designed based on the two stage heating and cooling system, the water is heated by two stages, by the solar collector and the photovoltaic electric heater respectively, then the condensing heat exchanger is used to process the saturated vapor condensation obtained by two stage heating to obtain fresh water. With the method of thermodynamic energy balance and energy -level balance analysis, the energy efficiency and related parameter variation characteristics are respectively analysis based on energy saving and energy level matching. By calculating the heat loss (heat transfer, heat convection and heat radiation) of seawater.

**Keywords**— Solar energy, Renewable energy, solar collector, Water heating, Hybrid, sterilization. Joint water distillation equipment.

## I. INTRODUCTION

Level and The Water is the most vital resource for life. In our planet earth, approximately 97.2% water lies in oceans as salt water, while 2.15% in frozen ice form and the remaining 0.65% remains as fresh water. The ultimatum for fresh water has increased day by day and will grow with the rapid growth of population, agriculture and industry. As a result, the fresh water reserve depletes day by day. The requirement of clean water per person is about 2.7 meter cube per day, thus the global requirement is about 16.5 billion meter cube per day only for drinking purpose. In India over 3 trillion meter cube of water is received from rainfall, which is among the highest in the world. Fourteen major river systems share 83% of the drainage. Basin account for 85 % of the surface flow and serve 80% of the total population of the country. There are also 44 mediums and 55 minor rivers which mostly originate in the coastal mountains and 80% of their discharge occurs during the monsoon months. With respect to ground water reserves in India, the estimated availability of ground water is to be over 210 billion meter cube. In spite of fairly high amount of available fresh water, India has a very low per capita availability of drinking water, about 2.43 thousand meter cube per year. Many organizations like United Nations (UN), World Health Organization (WHO) and the World Bank are actively involved in encouraging the projects related to supply of fresh healthy water. There were a large number of swamps and wetlands in India, which are essential for a balanced ecosystem

## II. OBJECTIVES AND TECHNICAL CHALLENGES

### 2.1 OBJECTIVES

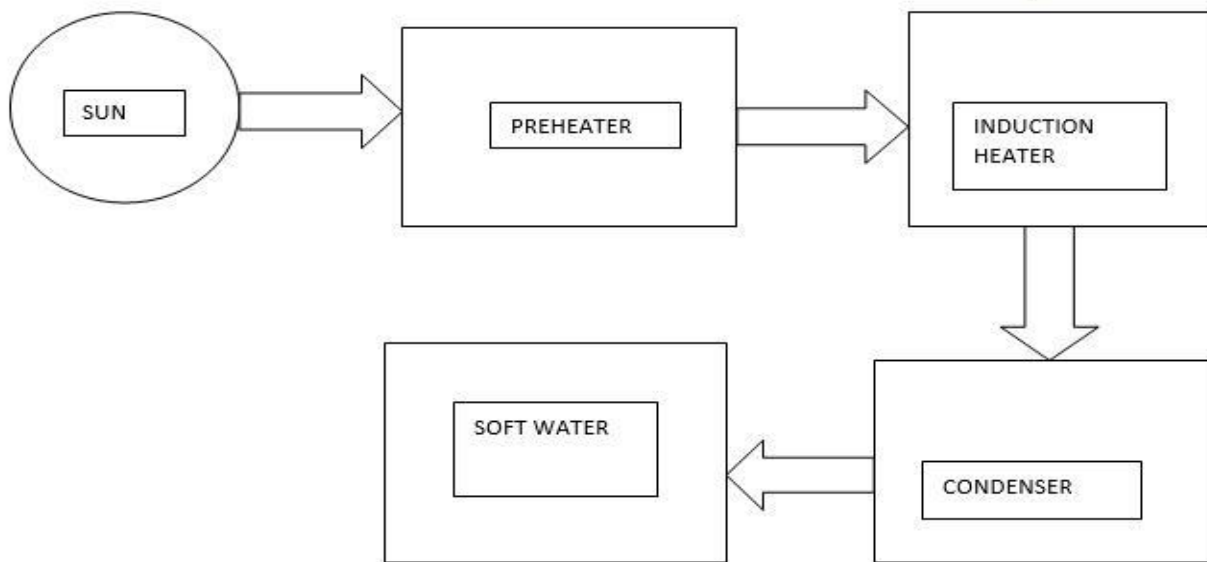
1. The main objective of the offer work is to design a prototype solar still for domestic application.
2. To explore and use new materials or condensing cover/Nano-condensing covers for better efficiency of solar still.

### 3. TECHNICAL CHALLENGES

- a. Inadequacies in grid infrastructure
- b. Communication issues

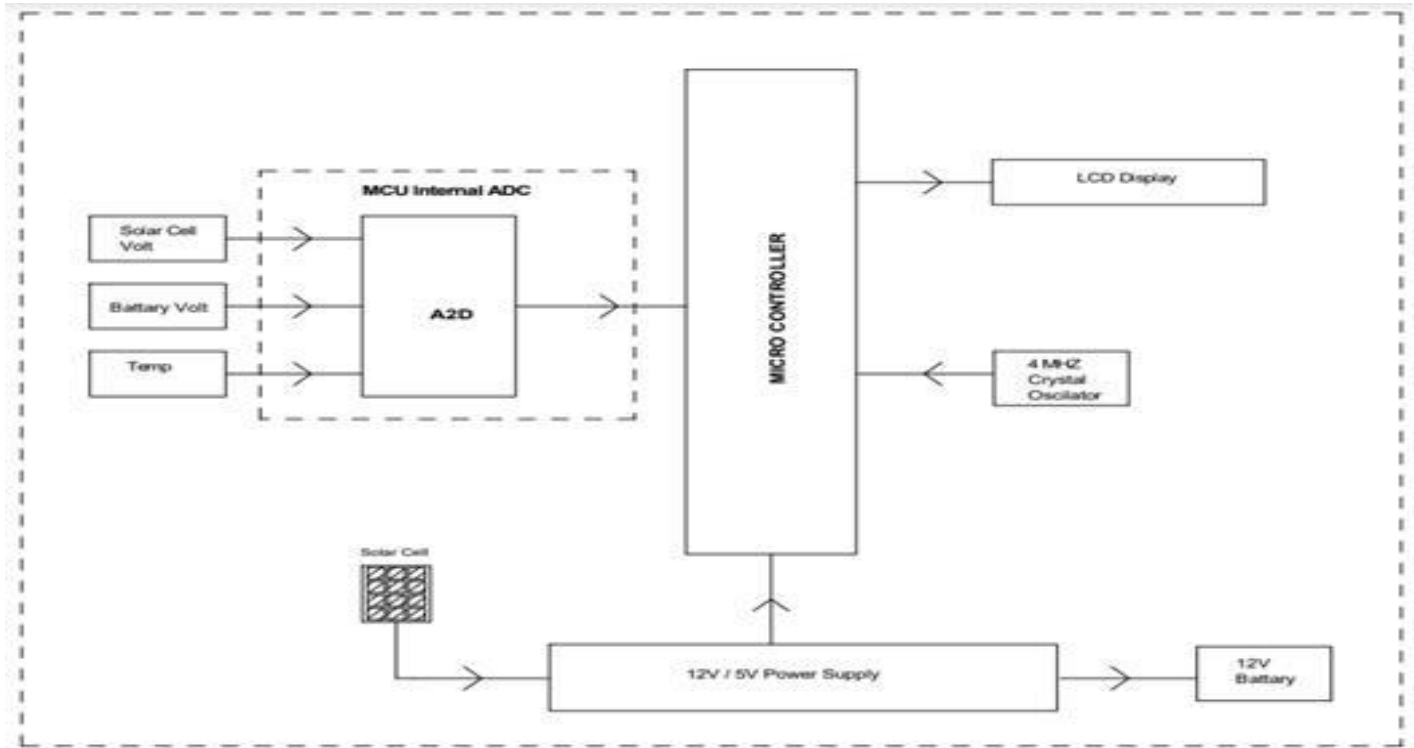
### III. BLOCK DIAGRAM

The Solar energy, in the form of electromagnetic radiation from the infrared (long) to the ultraviolet (short) wavelengths, is radiant light and heat from the Sun that is strap using a range of ever-evolving technologies such as photovoltaic (PV), solar thermal energy (STE) and artificial photosynthesis, etc. PV is a term which encrust the conversion of light into electricity using semiconducting materials that exhibit the photovoltaic effect. STE is a form of energy and a technology for strapping solar energy to generate thermal energy or electrical energy for application The design principle of hybrid thermal-photovoltaic water distillation equipment is to use the non-polluting solar energy at the most extent, as the driving force during the seawater distillation process of evaporation and condensation. The principle diagram is shown in Fig.1



**Figure 1: Block Diagram of Sea Water Distillation**

#### IV.CIRCUIT DIAGRAM



#### V. WORKING

1. Solar energy, in the form of electromagnetic radiation from the infrared (long) to the ultraviolet (short) wavelengths, is radiant light and heat from the Sun that is harnessed using a range of ever-evolving mechanics such as photovoltaic (PV), solar thermal energy (STE) and artificial photosynthesis, etc. PV is a term, which covers the transformation of light into electricity using semiconducting materials that exhibit the photovoltaic effect. STE is a form of energy and a mechanics for strapping solar energy to generate thermal energy or electrical energy for application.
2. The design principle of hybrid thermal-photovoltaic water distillation equipment is to utilize the non-polluting solar energy at the most extent, as the driving force during the seawater distillation process of evaporation and condensation. The principle diagram is shown in Fig.1. Especially, solar collector without concentrated panels in the first level applies the second level PV electrical heating method to solve the problem of boiling evaporation under the non-vacuum condition, when only the solar thermal energy is used efficiently. In order to obtain the highest energy

#### VI. COMPONENTS DESCRIPTION

##### 6.1 Induction heater

Induction heating is the operation of heating an electric powered conducting object (usually a metal) by electromagnetic induction, through heat lead to in the object by eddy currents. An induction heater comprise of an electromagnet, and an electronic oscillator that passes a high-frequency alternating current (AC) through the electromagnet. The rapidly alternating magnetic field penetrates the object.



## 6.2 Solar panel

Solar Cell panels (Power plants) convert the sun's energy into solar electricity. The Apollo is the largest source of energy in the form of heat and light energy. Solar Power has a huge probable to make a major impact on the electricity requirement in homes and industries. That the sun requisite as much energy onto the earth in a single day that equals the annual energy requirement is enough to judge the amount of solar energy that goes untapped

## 6.3 LCD Display

LCD (Liquid Crystal Display) is the technology used for displays in notebook, TV & other appliances. Like LED and gas - plasma technologies, LCDs allow displays to be much lean than cathode ray tube (CRT) technology. It displays the Energy Meter reading units and balance. A 16X2 LCD is connected with microcontroller at 7,8,9,10,11 and 12 pins to display the reading of various sensors

## 6.4 Relay

Single pole dabble throw (SPDT) relay is connected to port RB0 of the micro controller through a driver transistor (Q1). The relay requires 12 V at a current of around 100 milliamps, which cannot provided by the micro controller. So the driver transistor is added. A relay is an electrical switch that uses an electromagnet to shift the switch from the off to on position instead of a moving the switch. It takes relatively a small amount of power to turn on a relay but the relay can control something that draws much more power. The relay is used to operate external electronic lock, safety switch or any other electrical device ETC.

## 6.5 DC to AC converter

A DC-AC power inverter is a circuit, which modifies an input varying or non-varying direct current (DC) to an alternating current (AC) of a specified voltage and frequency, and a regulated DC voltage. In the case of this project, the input DC voltage source will be a battery, which is being supplied by piezo electric Plate. As such, the DC voltage will likely be incompatible, and considerations will need to be made in order to produce the desired output. This desired AC output is a 220V, 50Hz pure sine wave. The desired DC output is a 12V regulated. This will allow the scheme to output power, which is usable by any load

## 6.5 Battery

Solar batteries are used to fount solar power (solar electricity) and discharge power as and when needed. Rechargeable Solar batteries are used in off-grid PV systems to stock up excess electricity. Several solar battery banks use wet cells, while others use sealed or gel cell batteries. Every of these batteries have different hotness, rising, and exposure to air requirements. NiMH batteries are chosen and most common when it comes to solar energy because they are better than standard NiCad batteries in terms of charging and release cycles.

## VII. CONCLUSION

The design development of both active and passive solar stills step up more and more solar energy exploitation for desalination of water in a cost effective manner. For rural people in remote areas, passive solar still specially the wick or capillary type seems to be an attractive choice to get water for drinking and other domestic purposes. From this exhaustive literature review, it is found that different method are developed for distillation of water. These methods are subject to the order of fresh water, class of water source and the involved expense. Conventional Reverse Osmosis systems are currently prevalent domestically but at the cost of plenty of ravage water. Non-conventional water purifiers like solar stills have limitless potential but their usage is inadequate due to lesser output rate. Humidification dehumidification method is the most appropriate option for fresh water production and combined system for all together hot water production. The multi-effect distillation technique can be used for mass production of fresh water. The detailed review reveals that there is a need to develop a fusion system of water purification, which can overcome the limitations of all existing water purification systems.

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## VIII. RESULT

It is found that various methods are developed for distillation of water. These methods are subject to the demand of fresh water, quality of water source and the involved expense. Conventional Reverse Osmosis system are currently prevalent domestically but at the cost of plenty of waste water. Non-conventional water purifiers like solar stills have unlimited potential but their usage is inadequate due to lesser output rate. Humidification dehumidification process is the most appropriate option for fresh water production and combined system for simultaneously hot water production.

Alternatives such as use of solar energy can be solution as it sustainable in nature. India, being a tropical country, is blessed with plenty of sun shine. The average daily solar radiation varies between 4 and 7 kWh per square meter for different part of the country. There are averages 300 clear sunny days a year. Thus, it receives about 5000 trillion kWh of solar energy in a year. The highest annual global radiation is received in Rajasthan and northern Gujarat, which promises huge potential for solar desalination plant in these areas.

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# A Review paper on Wireless Power Theft Monitoring in Energy System

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**Abstract**— Electricity has been the need with increasing Urbanization; Engineers are a challenge to make cities more efficient. Electricity has been considered as the most important resource nowadays and there have been many types of research going to generate power economically. The various utility companies have now been facing problems due to large losses on the distribution side. One of the common problems for these losses is power theft. The companies have been facing many problems detecting this power theft. The main aim of this project is to detect the power theft and inform the utility substation where the power theft has occurred.

**Keywords**— Wireless Technology, Buffer, Driver, Relay, GSM, Microcontroller, Theft detection.

## I. INTRODUCTION

In India, power theft has become a major problem causing huge losses to the electricity generation sector. The power theft problem causes the electricity board to charge more and increase the prices of the utility system. Therefore, if power theft is detected we can save more energy and the charges will become affordable to all users.

The power theft is done in different ways such as shorting the input-output terminals or placing magnets on the wheels near the metering system. Many people in India risk their life by hooking-up-line. This may cause the consumer on the same line to pay more without using the energy and pay for the penalty for stealing the energy. The power theft is detected by various methods using buffers, GSM systems, relays, RF communication systems & IoT systems. In this paper, our main aim is to analyze different methods used for power detection & monitoring.

### 1.1 OBJECTIVES

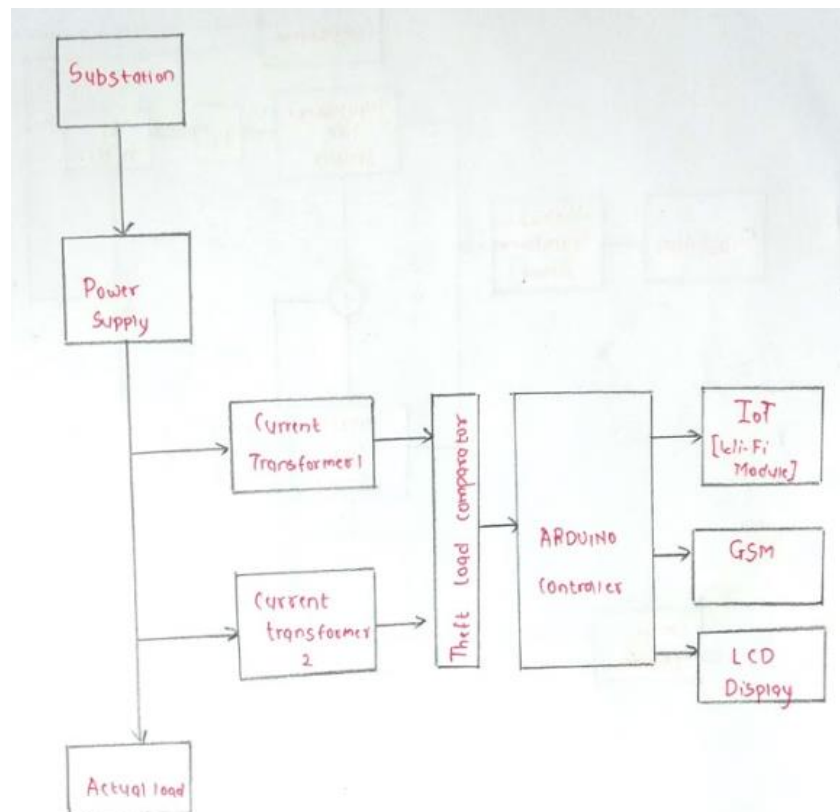
1. To develop and implement smart metering which can deal with smart technology
2. To make a system free from power thieves by detecting them and monitoring further.
3. To overcome the architecture limitations faced while designing a metering system.
4. To eliminate the present complex system that enhances many limitations regarding power theft.



Fig. 2 shows the power theft detection using the microcontroller & Bluetooth module. The system is designed by converting conventional energy meter, a smart energy meter by using PCB & wireless sensor networks. The system is designed if there is theft occurring between transmitting & receiving end then the person in charge at the substation will receive a message from Bluetooth module as "TEMPERED".

If there is no theft occurring between transmitting & receiving end then the person in charge at the substation will receive a message from a Bluetooth module connected to the meter as "OK".

### 2.3 BY USING IOT BASED SYSTEM



**FIGURE 3: Block diagram of Power theft detection using IoT based system**

Figure 3 shows the power theft detection using IoT based system. The system comprises of the substation, current transformer, theft load comparator, Arduino controller, Wi-Fi module, GSM & LCD. In this system, 2 CTs are used. One of the CT is connected at the supply side to measure the current supplied by the source & another CT is connected to the actual load side to measure the current at the load side. The current of these two CT's is compared and checked. If both the CTs shows the same value then there is no theft occur. If the values are not the same then they are compared in the theft load comparator and given to the Arduino controller in voltage signals. The Arduino then sends the signals to the Wi-Fi module and then the message is sent to the person-in-charge via GSM.

**TABLE 1**  
**COMPARISON BETWEEN THREE METHOD**

Sr. No.	Method	Advantages	Disadvantages
01.	By using relays & Microcontroller.	This system gives us the detection at each segment of transmission.	The maintenance costing is high due use of relays.
02.	By using the Bluetooth module.	The actual conversion of the conventional meter to a smart meter.	The maintenance costing is high due use of a circuit breaker.
03.	By using IoT based system.	This system gives us precise information by using advanced technology.	The theft detection cannot be located at the exact location.

### III. CONCLUSION

The above system can be used for detections of power theft and reduce the power loss and revenue loss by the consumer. If the theft detection reduces then the revenue of power bills will be reduced and the power will easily available to the consumer for cheap. The above methods can be used according to the requirement of the user. For this project, the knowledge of electrical and electronics applications had been proven.

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## Condition Monitoring of Induction Motor

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**Abstract**— The electrical motor condition monitoring is an increasing technology to diagnose the fault of an induction motor. It spots the unpredicted faults of a critical system. Non identical faults of an induction motor such as rotor, stator, bearing, vibration, air gap eccentricity and their various diagnosis techniques are also explored. In fact, the actual fault detection by using the involvement of human is widely replaced by the automated technology, namely fuzzy- logic- based systems, genetic algorithm, neural networks, wavelet technique, Vienna monitoring etc. It is surely evident that the scope of this area is large. Hence, acknowledging the necessity for future research, this review paper presents a major view on different types of faults and their detection schemes.

**Keywords**— Electric machines, faults, faults detection, monitoring, fuzzy logic

### I. INTRODUCTION

The condition monitoring is the policy of observing a parameter of condition in machinery, in order to recognize a significant change which is indicative of a developing fault. It is a main component of predictive maintenance . The use of condition monitoring allows maintenance to be scheduled, or other actions to be taken to prevent resultant damages and avoid its consequences. Conservation of energy is very important need of the day. The concept of energy efficient devices has come up in various sources such as lighting, air conditioning and so on. Energy monitoring is an important tool for determining the energy efficiency of various equipment and devices. This paper implements an energy monitoring system which displays the power consumed. This can help a user to detect any fault in the power system. A smart energy monitoring system can help a user to analyses the energy consumption data at device level and manage it assuming it to be fixed monthly rates. Also, it helps a consumer to replace the regular appliances by energy efficient. The monitoring system can inform and alert the user on unexpected excess power consumption caused by equipment faults, lack of proper maintenance

### II. LITREATURE REVIEW

#### 2.1 Bidyadhar Subudhi:-

In this paper they indicate the Electrical motor conditioning monitoring technology and it detects the fault of critical system. It is development of Electrical Concept. It is the most preferred fault diagnosis technique in MCSA.

#### 2.2 Sapena-Bano, J. Perez-Cruz:-

In this paper we get to know about how to monitor faulty condition of induction motor using low computing power devices. This paper states the diagnosis of induction motor through the detection of fault frequency signatures in the current's spectrum. The key of the method is the down sampling of the current signal at specific angles of it analytic signal.

#### 2.3 M.E.H. Benbouzid, H. Nejjari: -

The major difficulty is the lack of an accurate model that describes a fault motor. In this paper they talked about fuzzy logic.

Fuzzy logic is reminiscent of human thinking processes and natural language enabling decisions to be made based on vague information. Therefore, this paper applies fuzzy logic to induction motors fault detection and diagnosis.

#### **2.4 S. H. Chetwani, M. K. Shah & M. Ramamoorthy: -**

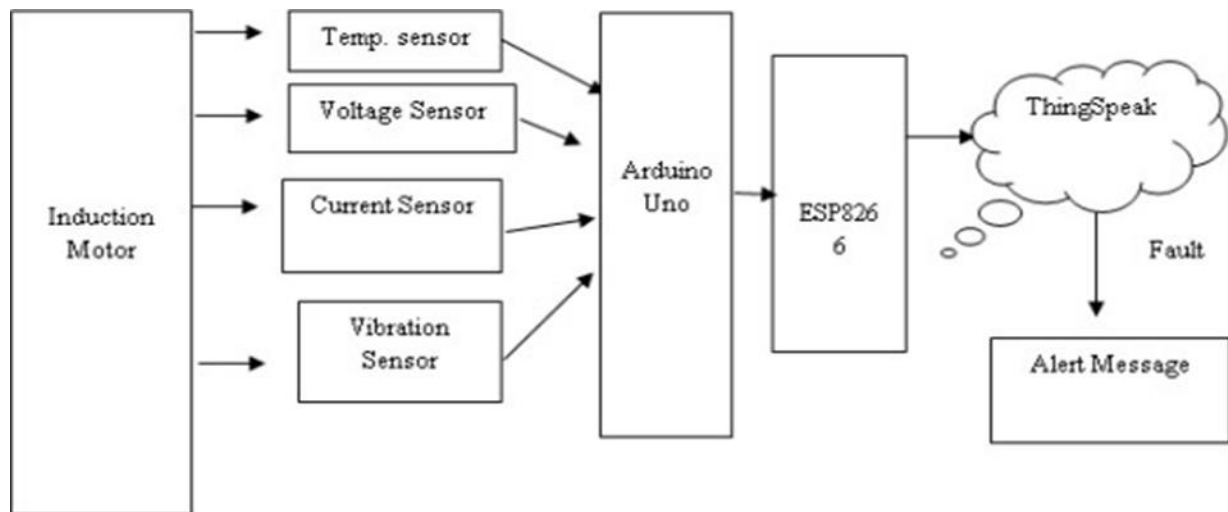
This paper describes the utility of online monitoring technique for detection of various faults that can be applied to existing motors without dismantling or shut down. The technique can detect online the presence of various faults such as broken bar in the rotor cage of induction motor, bearing faults, Eccentricity faults and stator, by monitoring and analysing the line current.

#### **2.5 Ramzy R. Obaid, Thomas G. Habetler: -**

This paper has presented Mechanical faults in induction motors can be detected by monitoring specific components in the stator current frequency spectrum. An algorithm for detecting mechanical conditions in induction motors under any load condition using analysis

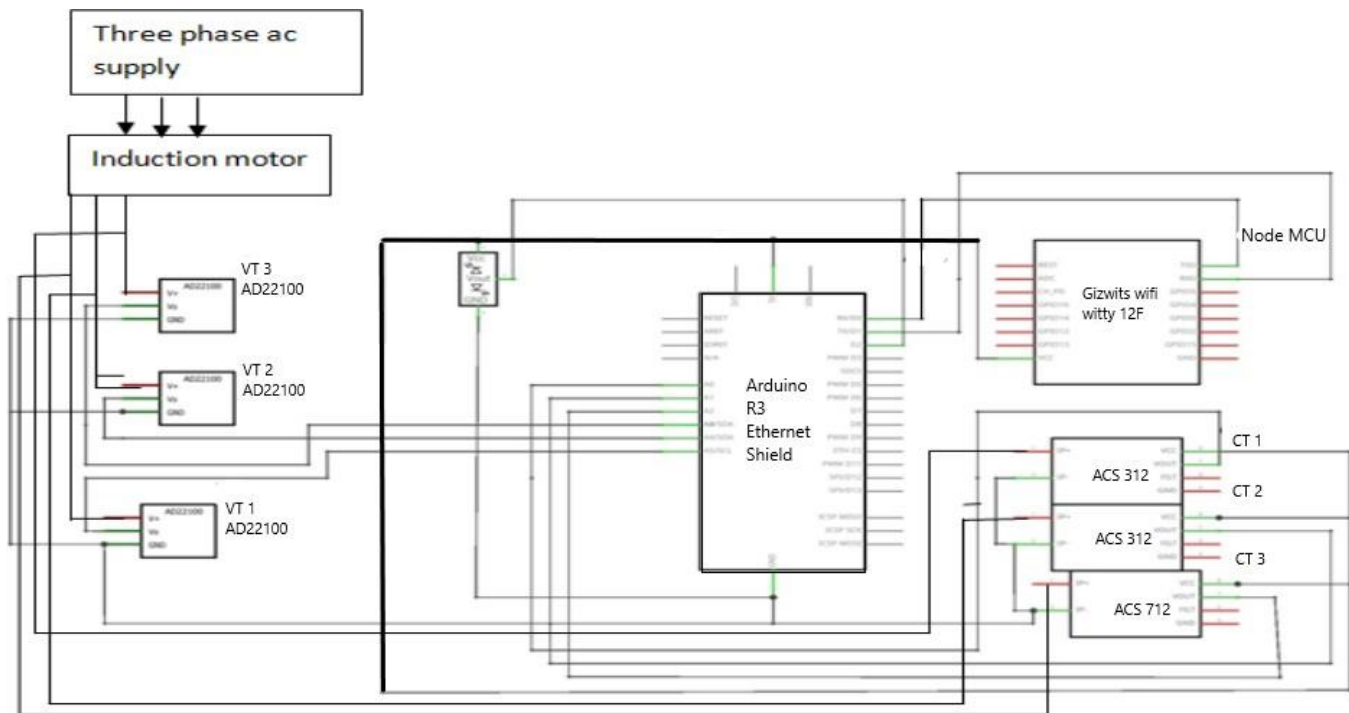
### **III. BLOCK DIAGRAM**

The condition monitoring of induction motor consists of basic blocks mainly the Current sensor and Voltage detector, A2D converters, Microcontroller, 12V & 5V DC supply, Relay Switch, LCD Display, Wi-Fi module, Cloud, Interface block. This is diagrammatically shown in figure 1



**Figure 1: Block diagram of condition monitoring of induction motor**

## IV. CIRCUIT DIAGRAM



**Figure 2: Circuit diagram condition monitoring of induction motor**

## V. WORKING

Block diagram above in Fig 2 In this work a three phase induction motor is used for experimental purpose. Sensors (accelerometer, temperature, moisture, vibration, current and voltage sensors) are attached to the motor at right positions. Sensor data will collect and processed using Arduino and compared with the threshold values in the storage to trigger alarm to avoid failure. The experimental setup of the proposed system is as shown in the figure

Tests were completed on the three stage IM at ~ 0.3 kW/1400 rpm and 2.5 kW/1200 rpm. The planned equipment utilized an ARM NXP LPC1769 Cortex-M3 processor, 802.11.bg Wi-Fi module, an ACS711 (- 25 – +25A) Hall-impact current sensor, a high speed Hall-impact vicinity sensor for cycle estimation, NTC and a 220 VAC/6 VAC/0.6 W reference transformer. The whole framework was nourished remotely with a 9-12 VDC power supply. The LPC1769 contained a 6-divert 12-piece ADC in its make- up. The ACS711 modules utilized for each stage were 2.5 V focused and delivered yield voltage of between 0-5 V, as indicated by the current drawn.

## VI. COMPONENTS DESCRIPTION

### 6.1 Arduino IDE

The IDE (Integrated Development Environment) is a uncommon program running on PC that permits to compose portrays for the Arduino board in a straightforward language demonstrated after the Processing language. The code is transferred to the board utilizing Upload catch on IDE.

## 6.2 Cloud Storage

Information that is gotten from the sensors are moved remotely to the neighborhood and cloud server for examination. When the information is gotten, a framework has been formulated that breaks down the crude information. The program has been set to process constant information and store it to the cloud with things peak distributed computing stage. This spared information is open from anyplace by means of web wireless.

## 6.3 LCD Display



**Figure 3: 2\*16 LCD display**

LCD (Liquid Crystal Display) is the technology used for displays in notebook, TV & other appliances. Like LED and gas-plasma technologies, LCDs permits displays to be too thinner than cathode ray tube (CRT) technology. It displays the Energy Meter reading units and balance. A 16X2 LCD is connected with microcontroller at 7,8,9,10,11 and 12 pins to display the reading of various sensors.

## 6.4 Arduino UNO

The Arduino Uno is a micro controller board shown in Fig.1 is based on the ATmega328 (data sheet). It has 14 digital input/output pins in which 6 pins can be used as PWM outputs and 6 analog input pins. It also having a 16 MHz crystal oscillator, an USB connection, power jack, an ICSP header, and the reset button [8]. Its operating voltage is 5v. The ATmega328 has 32 KB of flash memory for storing code (of which 0.5 KB is used for the boot-loader); it has also 2 KB of SRAM and 1 KB of EEPROM. The power pins are as follows: VIN. The input voltage to the Arduino board when it's using an external power source 5V supply. The regulated power supply used to power the microcontroller and the other components on the board. 3V3. A 3.3 volt supply is generated by on-board regulator.



**Figure 4: Arduino UNO**

## 6.5 Sensors

As per the data acquisition of the induction motor various sensors are used for the data collection such as voltage sensor for voltage measurement, current sensor for current, temperature sensor for the temperature, vibration sensor for vibration detection and speed sensor for speed measurement.

## **VII. ADVANTAGES**

1. Lowering maintenance cost.
2. Increasing lifespan of machine.
3. Maximizing production output.
4. Decrease the losses.

## **VIII. DISADVANTAGES**

1. Increasing of some amount of cost.
2. Increasing investment of staff training.

## **IX. APPLICATIONS**

1. In large industries high performance equipment and for maintenance purpose.
2. In food manufacturing system.
3. Petro-chemical and oil companies.

## **X. CONCLUSION**

In this task the idea of Arduino use for early discovery and checking of motor framework disappointment remotely. The framework can join different detected parameters progressively and improve precise identification of various shortcomings happen in motor. The checking of the motor framework displays the estimation of various parameters to be specific vibration of the motor, temperature, speed, encompassing dampness, supply voltage and motor current. In this manner, contrasted with other ordinary strategies this framework has more number of fields which empowers caution, ready messages and speedy controlling. The idea of Arduino is displayed here for remote checking and controlling the motor.

## **ACKNOLEGEDEMENT**

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## A Review Paper on Utility Earthing System

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**Abstract**— This paper gives about Earthing. For a brief section of a century, the earth was not used as a conductor for uninterrupted flowing man-made electricity. In hindsight, one could reach the conclusion that the lack of comprehension of man-made electricity allowed that appear to the correct movement at the time. Later would demonstrate to be dangerous to human beings and other living things. Power progression and electrical safety are consequential for all industrial and commercial applications. Some of the calamitous effects created by faults in a system include loss of power, demolition of equipment.

**Keywords**— Earthing, earth, high resistance, soil pipe, neutral.

### I. INTRODUCTION

Earthing is one of the most common provisions for protection in a power system. In electrical engineering, ground or earth can provide a common return path for electric current. The motive of an earthing system is to protect personnel against electrical shocks, decrease damage to equipment and provides a point of zero reference potential for the phase. In this system, the connection to the earth is made through the earth electrode. An earth electrode is a conductor or group of conductors that provide electrical connections to the earth. Earthing survey its purpose only if it's resistance is within a specific range of values, and this value, in general, made as few as possible. This project is based on a Solidly grounded neutral system that has the source transformer neutral point directly connected to the earth through a sufficient solid, ground condition. The solidly grounded neutral system is effectually controlling overvoltage conditions and the instant opening of the defensive device when the first phase-to-neutral or phase-to-earth fault occurs.

### II. LITERATURE REVIEW

The literature review contains a brief discussion of some recent work of the earthing system.

Earthing system and its methods affect human being safety, apparatus safety and operation. The earthing system provides protection against transmission, distribution network, and lighting system. Major accidents are happening due to improper earthing and leakage current through the human body or through hazards material and faulty or losses of power occurs. Person dies after touching the pole due to improper earthing [4]

T Wesley De Lime has reviewed the type of electrical power system arrangements experience on a major offshore platform and in particular, considers the earth fault liberality requirements of drilling operations to ensure suppliers are maintained whilst moving towards the make-well-secure secure condition. The three low voltage earthing methods most commonly applied to oil and gas facilities are manly IT, TT, TN. The goal of this paper is to compare the different low voltage earthing methods. [5]

Tang Zhaosheng.Gain cheng has proposed to reduce the grounding resistance of grounding objects by reducing the resistivity of soil. It depends on the size of the ground, selecting the appropriate shape of the grounding (depth of vertical ground). [6]

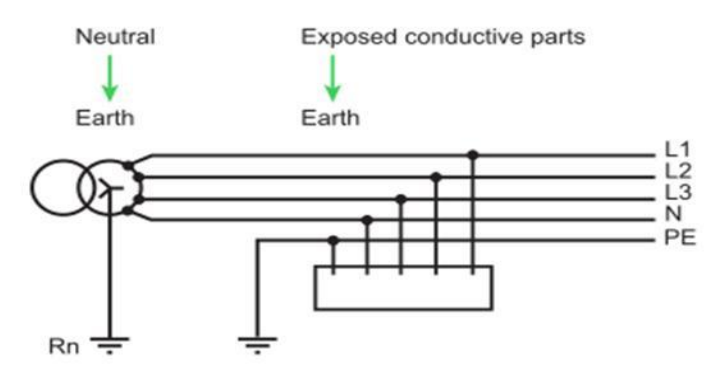
Clayton L.Hallmark describes a horizontal earthing electrode consisting wire of graphite cement encloses a counterpoise wire. Its horizontal length and large cross-section allow the grounded to fast and efficiently separate the lightning current over a wide area around the site. Communication facilities of the electrical protection can be improved by using a horizontal strip electrode.[13]

B. Pungsiri has described the design and establishment of the grounding system in high voltage laboratory at KMUTT. KMUTT was 9 rods connected in a grid connection each rod was 3 meters long. The grid-connected resistance was less than 5 ohm. By implementing aluminum plates on the cement floor, then connected to the grounding of each piece of equipment to them.[14]

### III. EARTHING SCHEMES

#### 3.1 TT System (Earthed Neutral)

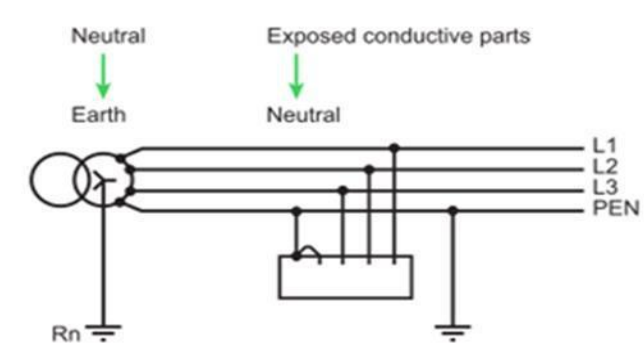
One point at the supply source is connected straight to earth. All exported exposed- and extraneous-conductive-parts are connected to a separate earth electrode at the installation [8]. This electrode may or may not be electrically individualistic of the source electrode. The two zones of influence may overlap without affecting the operation of the protective device.



**FIGURE 1: TT System**

#### 3.2 TN Systems (Exposed Conductive Parts Connected To the Neutral)

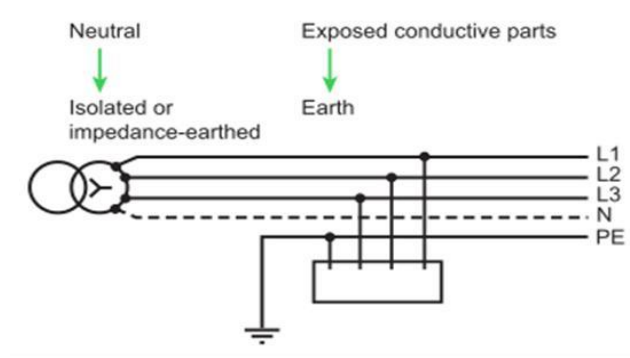
The source is earthed as for the TT system (above). In the installation, all exposed- and extraneous-conductive-parts are connected to the neutral conductor. The several type of TN systems are shown below.



**FIGURE 2: TN System**

### 3.3 IT System (isolated or impedance-earthed neutral)

No intentional connection is build between the neutral point of the supply source and earth Exposed- and extraneous-conductive- parts of the attachment are connected to an earth electrode. In practice, all circuits have leakage impedance to earth since no insulation is perfect. In parallel with this (distributed) resistive leakage path, there is the dispense capacitive current path, the two paths together constituting the normal leakage impedance to earth.



**FIGURE 3: IT System**

## IV. EARTHING: ONE OF THE BEST PROTECTION SCHEME

### 4.1 Earth Resistance

The earth resistance should be minimum. If the earth resistance is high, the human body would be the lower resistance path for circulation of current and the motive of earthing is lost. The major donate factor to earthing resistance is the soil resistance whereas the other two factors are small fractions of an ohm and can be neglected for all practical purposes. Soil resistivity depends on the ground layers of soil and on the underlying geological formation

### 4.2 The moisture content of the soil

It has been noticed that resistivity is only moderately affected when the moisture content is above 20% .when the moisture content is below 20%, therefore an increase in resistivity and a decrease in moisture content.

### 4.3 Soil temperature

Soil resistivity increases with a decrease in temperature soil resistivity near a ground electrode depend on the amount of current that flows into the ground. This may affect the moisture and temperature levels of soil which then affect the resistivity of soil.

### 4.4 Earth pit location

Dry sand, gravel chalk, limestone, granite, and very stony ground should be avoided while selecting the constructing an earth pit. A site should be that it is not naturally well-drained. A waterlogged area is not essential unless the soil is sand or gravel. Charcoal, soft coke, sodium chloride (NaCl), sodium carbonate, calcium chloride, and copper sulfate salt are some of the most commonly used substances for this purpose.

### 4.5 Electrode material

Electrode material does not affect main earth resistance significantly. Appropriate precautions need to be taken while selecting the material so that it is resistant to corrosion in the type of soil in which it will be used.

#### 4.6 The Dimension of the Electrode

When pipes are used as electrodes, the resistance to the earth reduces drastically with the length for up to 2 or 3m (electrode length) [1]. When the diameter of the earth electrode is increased, there is an improvement in the mechanical strength of the electrode.

### V. GROUND PENETRATING RADAR

One of the main limits concerning the study of the singular process is a characterization of the pipe network (defining number, location, dimension, and connectivity of pipes. In this context, non-invasive sub-surface imaging using ground-penetrating radar (GPR) seems a promising technology. According to Jones [3], these natural pipes can be considered as the largest classification of macropores and may develop subterranean networks with the greatest hydrological connectivity. In this, the ability of ground-penetrating radar's (GPR) to detect heterogeneous in soil interfaces has sharp variations in electromagnetic properties. When there is a sharp variation electromagnetic properties, as should be the case with pipes (air-cooled or water-soluble interface have strong electromagnetic contrast).

#### 5.1 Field Equipment and Methodology

We used a time-domain GPR system (model SIR-20, Geophysical survey system,) as an on-ground GPR which was equipped with a transmitting (TX) and receiver (Rx) 400 MHz center-frequency bow-tie antenna system. The GPR transmitter antenna produces a Ricker type pulse with a frequency bandwidth of the 100-800 MHz. soil pipes act as discrete objects if crossed transversally, and hence they appear on radar grams as reflection hyperbolas. In this study, the latter was considered as the first sub-surface indicator of soil pipes[7], The second type of subsurface pipe indicator corresponded to singular reflection which was not hyperbolas.

### VI. EARTHING-GROUNDING METHOD: A PRIMER

#### 6.1 Connecting to Earth

Connection to earth minimizes the voltage difference between conductive metallic object and ground. Various methods are used to connect to the earth. The connection to earth is called the grounding or earthing electrodes. These connections can be divided into two groups. One group comprised man-made electrodes specifically designed for and used only for electrical connection to the earth. the connect of earth, and the electrode can be made using many different forms such as a rod, a loop of copper conductor, a plate, or a reinforcing bar or a length of copper conductor immersed in the concrete foundation. The resistance of the electrode to earth is made up of many components.

- The Resistance of the electrode.
- The condition of the soil
- The Moisture of the soil.
- The Temperature of the soil.
- Material content
- Types of soluble chemicals in the soil.
- The Concentration of soluble chemicals in the soil

To explore the connection to the earth and common 3m (9.8ft) long by 1.6mm (5.2ft). Diameter rod will be compulsive into virgin soil in a remote area unimpeded with underground metallic piping or other conducting materials.

#### 6.2 Resistivity of Soil

The symbol for resistivity of the soil is, and it is measured in ohm-centimeter. Each type of soil will have an average resistivity. Moisture will have a temperature. Moisture and temperature of the soil become more stable at greater depths below the earth's surface. The soil resistivity will vary directly with the moisture content and inversely with temperature

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## VII. CONCLUSION

Earthing is very important for the electrical system. We explained various types of earthing and major factor contributing to earthing resistance is the resistivity of soil. All earthing system will ensure equal protection to personnel against electrical shock as long as the system is properly designed, implemented by following the international and national standards. Sub-surface imaging using GPR seems a promising technique for soil pipe network characterization. It needs specific improvement in single processing, object detection, and system configuration GPR system must be used. This should be enhanced quality, quantity, and diversity of sub-surface information and this facility pipe network characterization.

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# **SECTION D**

## **ETC**



# A systematic review of artificial intelligence and machine learning techniques used in neonatal care

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**Abstract**— This paper reviews the research work done in the neonatal care using artificial intelligence and machine learning techniques. Newborn babies up to 28 days are called as neonatal. NICU(Neonatal Intensive Care Unit) is a special unit in the hospital which provide care for babies born prematurely or having low birth weight or having specific medical conditions. NICU is equipped with advanced technology and trained staff to provide best possible care to their miniature Patients. These patients are continuously being monitored and hence generate huge amount of data in their stay period to NICU. thus artificial intelligence can help these units in providing medical care in different aspects such as early disease detection, survival prediction, decision making for starting with a treatment. Premature births is still one of the most serious health issue according to World Health Organization.(WHO).This paper presents the collective overview of research done in this domain which will be helpful for those willing to do further research. at the end of the paper some future research areas are also discussed.

**Keywords**—Artificial Intelligence, machine learning, neonatal care, NICU, CNN.

## I. INTRODUCTION

The term neonate is used for the children who are newborn and less than age of 28 days. Some neonates need special care because of the complications during their birth such as low birth Weight, premature birth, congenital anomalies etc. There is a special unit which takes care of critical needs of neonates also called as Neonatal Intensive Care Unit. This unit is generally equipped with highly efficient healthcare professionals along with advanced technology. Premature birth is still one of the 10 most common causes for death of a newborn. Also sepsis, heart dysfunction, breathing inability is also a major concern for little ones. Although the patients in NICU cannot talk they are continuously being monitored with different sensors like heart rate monitors, ECG, body temperature and so on. So huge data is collected for these tiny patients. This data if analyzed properly using machine learning algorithms, it can definitely have some meaningful improvement in the treatment plan. Thus the idea is to use data generated by neonates in their stay at NICU for prediction and analysis of different medical conditions. In this paper a systematic review is conducted about the research work being done in the area of machine learning and artificial intelligence to get an insight of results obtained in the research work. This paper will give a collective information about the research in neonatal care using machine learning. It will be helpful for the researchers who are newly introduced and interested for further research. This paper is organized in different section where first section gives brief description about the NICU data. In the coming sections different research reviews are elaborated in detail. Finally conclusion gives the insight of research which is been done and future scope is written in a direction where new researchers can pick up the problem and start solving it for betterment of the society. This review paper will give meaning to an age old saying that "every single newborn life is precious".

## II. LITERATURE REVIEW

### A. Approach for research review

The keywords like machine learning, neonatal care was searched in IEEE explore. There were total 14 papers related to these two keywords. Out of these 6 recent papers were studied thoroughly. In the following sections research work done in the machine learning techniques and their applications in the neonatal care will be explained.

### B. Machine Learning for analysis of neonatal data

The Rudresh D. Shirwaikar et al[1] have discussed different techniques for neonatal data analysis using supervised learning. This paper explores different supervised learning techniques in healthcare along with their pros and cons. Supervised learning techniques can be classified into two types such as slow learners(k nearest neighbors) and fast learners(decision tree, support vector machines and neural networks) depending on their response. Their paper gives an insight of all the techniques with previous research work which happens to be a key helpful ingredient to a new research fellow such as importance of preprocessing of the data.

## III. NEONATAL CARE UNIT APPLICATIONS OF MACHINE LEARNING

Before The special ward in the hospital dedicated to children below age of 28 days is called as NICU.(Neonatal Intensive Care Unit). Every patient is monitored continuously in this unit. It generates huge data every day. The analysis of this data helps in prediction of diseases very efficiently and way before the conventional clinical biomarker methods. Jacqueline van Druten[2] et al have used the methods of machine learning for prediction of Necrotizing Enterocolitis(NEC). NEC has remained one of the major cause of death in preterm infants. They have suggested combined approach of deep learning and machine learning for better accuracy. sonographs and x-ray images provide numerous features which can be extracted through deep learning and can be collectively combined with machine learning techniques for prediction of NEC.

Zaineb Kefi[3] et al have explained how the prediction of mortality can be effectively done in the early hours after the child is born. They used demographic data, biomarkers and signal measurements as data and applied different machine learning algorithms. They have got better accuracy, almost 95% with Linear Discriminant Analysis (LDA) algorithm. In their research, the accuracy of mortality prediction time is 87% with the use of galaxy random forest method.

Yifei Hu[4] et al have explained in their paper that convolutional neural networks can be effectively used in early detection of sepsis. Preterm newborns have weak immune system and can get infected easily which leads to the sepsis. Sepsis is also one of the leading reasons for neonatal deaths. A deep learning network is trained using convolutional Neural Networks and the paper claims that it is a feasible model for early detection of the sepsis than the conventional clinical biomarkers approach. This paper gives the importance in terms of how the early detection can prevent a neonate from being given a wrong antibiotic treatment.

**TABLE 1**  
**COMPARISON BETWEEN DIFFERENT METHODS**

Sr. No.	Paper Name	Comments
01.	Supervised Learning Techniques for Analysis of Neonatal Data	Various papers with different classifiers have been reviewed in this paper for different parameters. It concludes that in neonatal domain, Support vector machine, decision trees and neural networks emerge as efficient classifiers.
02.	A Proposed Machine Learning Based Collective Disease Model to Enable Predictive Diagnostics in Necrotizing	This paper represents use of CAD for effective classification and for predictive diagnosis in Necrotizing and claims to be time saving, cost and resource efficient.

03.	The early prediction of neonates mortality in Intensive Care Unit	This paper compares different classification algorithms with 31 and 17 parameters for predicting neonatal mortality. The results of latent Dirichlet allocation (LDA) algorithm outperforms prediction with other classifiers. 95%
04	An Application of Convolutional Neural Networks for the Early Detection of Late-onset Neonatal Sepsis	In this paper author has given viability of using convolutional neural networks in prediction of sepsis in neonates.

#### IV. CONCLUSION

After The area of effective neonatal care using machine learning is needed to be explored more by the researchers. There is a huge scope because all the NICU in the country have state of the art latest technology to measure the important parameters from neonates and this data can be carefully analyzed for prediction and analysis of different diseases and can help doctors in deciding the treatment plan.

There is still a lot of scope for research in neonatal care using deep learning because very few standard papers are available which analyze the sonographs and neonatal X-Rays. Also the machine learning techniques can be used to predict the morbidity rate of neonates. The preterm infants have low weights and underdeveloped organs. Their brain development is not complete. These parameters can be analyzed using machine learning tools. Also, many of the neonates have respiratory challenges. Using a systematic research, a machine learning model can be developed which will direct the doctors about amount of oxygen to be given. In the NICU, currently milk is given to neonates by manually calculating their need. This can also be automated using machine learning which will help nurses to predict the amount of milk given to patient. Collective data can also give insight into long term effects of NICU stay on the children when they grow up such as brain functioning, motor skills etc. This research area which collaborates technology with neonatal care has lot of potential research work that needs to be explored.

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## Real Time Bus Tracking System

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**Abstract**—BUSES are becoming an vital means of transport in cities. public transport are used by common population in cities. Buses also have one drawback that is, the commuters have to wait for longer time for the bus arrival; which in turn leads to usage of private vehicles thus leading to increase in fuel consumption. Rather than waiting for buses it would be useful for the passengers to know the tentative timing of the buses, so that they can plan their journey accordingly. Hence, for the ease of citizens an android application is planned, which will track the location of both the user and the BUS and then will analyze the approximate time necessary by the BUS to reach the stop including the traffic analysis. As almost every commuter is familiar with the working of Android phones there won't be any problem in using the app, as Android is a user-friendly operating system. The estimated time will be calculated by tracking the current location of the bus and the user. As the BEST has already installed GPS in buses, the tracking will help in locating the bus. The approximate time necessary by the bus will also be calculated so that the commuters will be aware about the waiting time for their respective buses. It will also be favourable for those not having GPS facilities as they will be able to know the updated bus schedule with the help of Internet.

**Keywords**—Fleet Management, Vehicle Tracking System, GPS Tracking Devices, Security, GPS

### I. INTRODUCTION

Unusual and unexpected conditions on the roads affect the smooth operation of the bus system and the movement of vehicles. Also, everyday problems such as traffic jam, unexpected delays, chance in passenger demand, irregular vehicle dispatching times take place and as a result of which the schedule of the passengers are affected and we certainly have to wait for the arrival of the respective bus. Passenger hassle can be avoided by introducing a system which provides real-time information about the location and predictable time of arrival of the buses. Our project focuses on the execution of a Real-Time Tracking System by installing GPS module devices on college buses which will broadcast the current location on the GPS Receiver. The GPS Receiver will be interfaced with a computer and driver data will be auto save in the database. From here the application will recover data and store it in web server from where the system will display real-time information of the bus. The real-time bus tracking system is a impartial system designed to display the real-time location of the buses provided by the college. The approximate time required by the bus will also be calculated so that we as a commuters will be aware about the waiting time of the respective buses. It will also be favourable for those who are not having GPS facilities as they will also be able to know the updated bus schedule with the help of Internet.

## II. WORKING PRINCIPAL

The system is functioned by the GPS which is attached to the bus. Firstly it receives the satellite signals and then the position coordinates with latitude and elongation are estimated. This system used Automatic Vehicle Location (AVL). By using AVL the

Geographic location of a vehicle is unwavering and this data is transmitted to a remotely placed server. With the help of GPS and Tran's mechanism, the location is estimated. The data is established by satellite or a global radio cellular connection by the bus to a radio receiver. After receiving the location the tracking info can be transmitted using wireless communications systems. This system uses GSM to transmit the info. A remote operator can access the data on a bus based on user's supply as well as destination. The proposal system provides the perfect location of the bus. Bus surveillance technology is an advantage for tracking and observing a bus.

In bus unit, bus has GPS device which is attached and it sends its coordinates i.e. longitude and altitude after every predetermined Interval of time to the main server. To use GPS there are no costs or setup charges. To determine the position, GPS receiver is able to receive signals from the satellites. It depends on the kind of application the GPS transceivers may be a data Loggers, data Pullers or Data Pushers. This device receives GPS information and send the data at definite intervals to the server. On receiving, the server analyses the data. To receive signals in the suitable place the GPS antenna connected to the right jack and fixes the antennas. One slot is allotted for SIM card and it receives the signal from the GSM towers to respond to the users. The positive and negative wires are connected to 12V or 24V vehicle power system. Then to receive the signals from the satellite tracker device is on. Now the device is able of acceptance the latitude and longitude values of the position of the bus. At any point of time, the GPS receiver gives the location. Now the bus unit has the coordinates with a timestamp which is then compared to the before coordinates and if there is any well-defined then the coordinates are updated and sent to a server over GPRS network.

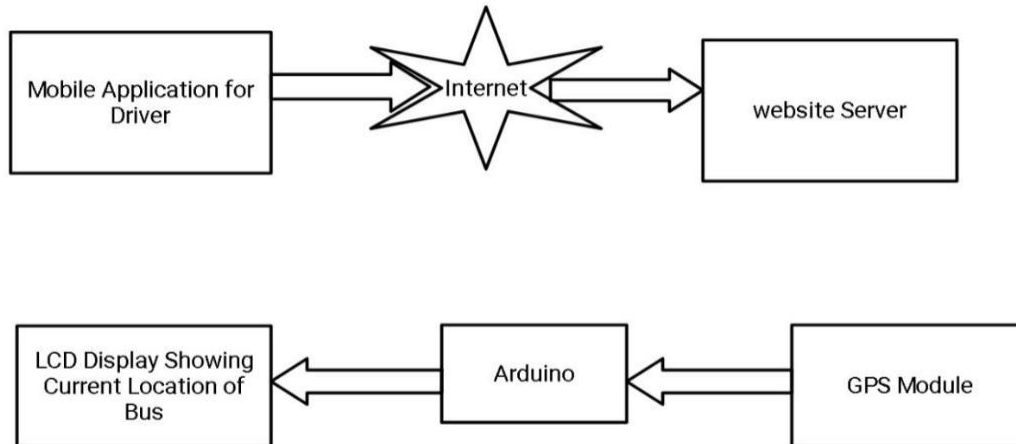
The location details are stored on a server. To define every bus among the different buses here Identification is taken. Each bus is given one characteristic ID number. The server is the most important module during this system which acts as a central archive of the system. In this system, whole information is stored and conserved by the server. The server is between bus and user. These databases consist of real-time information Capitalization bus it includes bus routes, actual arrival/departure time and real time location of the bus.

The user side module is nothing but a mutual web-based application that facilitates the various function of the system to remote users. The user side module takes two responses i.e. one is source that indicates wherever the remote user is now and other is the end user wants to travel to. When a user sends request the device fires a query to the server to access the data stored within the server database and provides a list of attainable buses in keeping with remote users supply and destination. Now it's user's task to choose or select precise bus range to understand the real time location of the bus or other information. After choosing an precise bus number the application shows the real-time location of that bus on the user screen. This application collaborates and interacts with varied clients to offer service to user's requests. The system simplifies the real-time search of the bus.



### III. METHODOLOGY

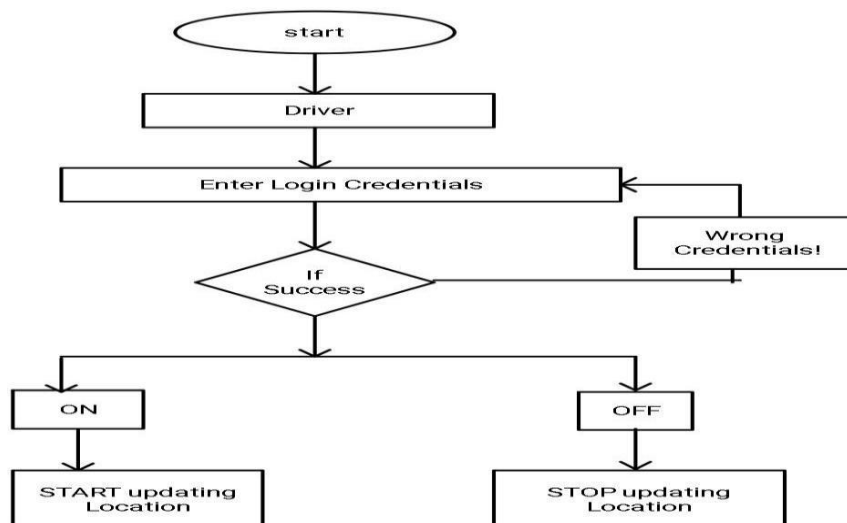
#### 3.1 BLOCK DIAGRAM:



**Figure 3.1 Block Diagram**

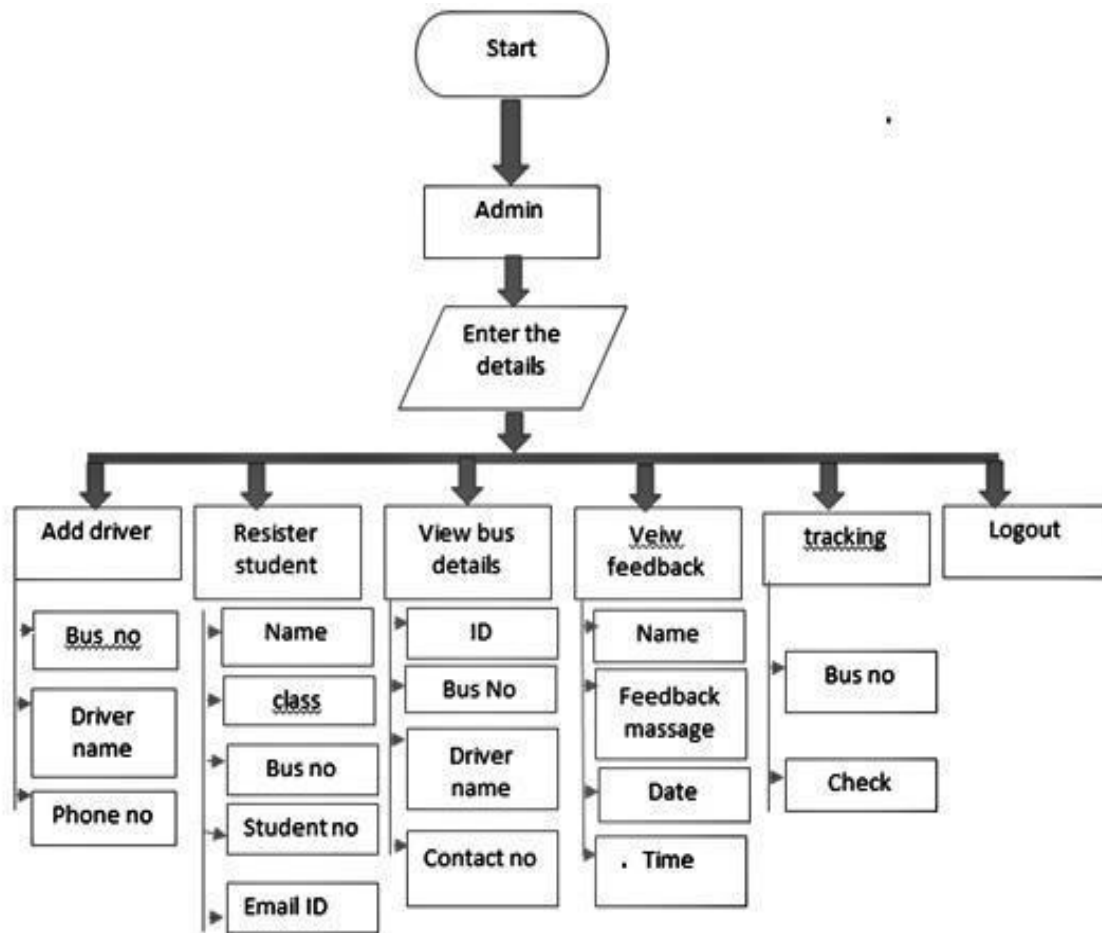
This module is for the bus driver. The authorized bus drivers are provided with their unique log in credentials. They need to log in and then have to start their location service before driving. The current location of the bus will be updated from driver's mobile to the server every moment in the form of latitude and longitude. The location of the bus is visible in Google Maps when asked for.

#### 3.2FLOW CHARTS



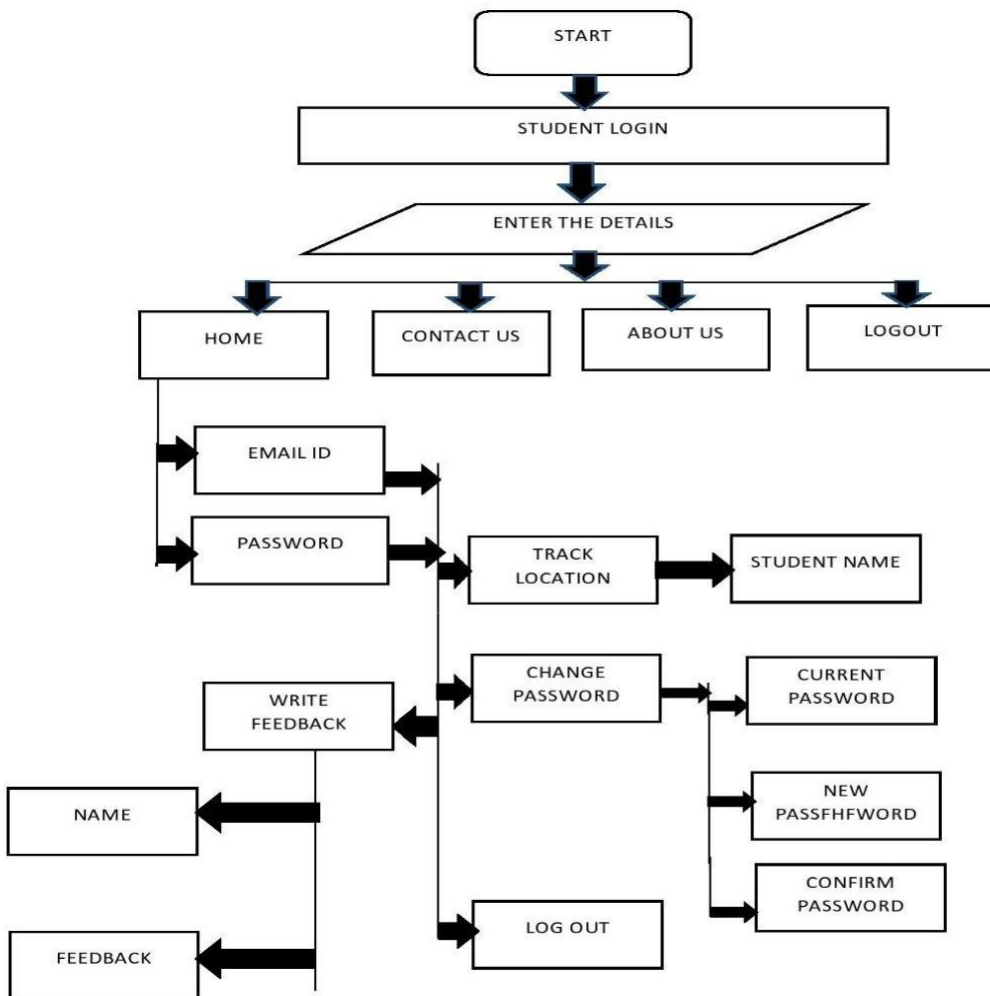
**Figure 3.2 flow chart for bus driver.**

This module is for the bus driver. The authorized bus drivers are provided with their unique log in credentials. They need to log in and then have to start their location service before driving. The current location of the bus will be updated from driver's mobile to the server every moment in the form of latitude and longitude. The location of the bus is visible in Google Maps when asked when asked for.



**Figure 3.3 flow chart for Admin.**

This module is for the Administration. The admin will provide with the unique log in credentials to the bus driver and to the students or parents. They take care of the system if anybody face's a problem while travelling they can easily track them and resolve the problem with the help of the tracking option in the system. They also take care of the data store in the server.



**Figure 3.4 flow chart for students.**

This module is for the student. Students or their parents or commuters will login with the given credentials given by the admin. After logging the credentials, if they want to track the bus to check the location they can easily check the location of the bus and if they want to contact they can contact with the admin and also they can give a heptic feedback.

#### IV.CONCLUSION

We developed an Android Application to track the college buses and provide relevant information to their Bus Stop .This paper has described the design and architecture of our bus tracking system. Our system is composed of smart phones and a server. The system is able to exhibit its performance to track bus from any area.

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## LIFE SAVER- An UAV Organ Transportation Drone

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**Abstract**— During surgeries situations arise where organs required to be transplanted are to be brought from other hospitals someplace else. Transportation services like ambulances, trains and etc. are used for this transportation. But sometimes due to traffic and other problems delay is caused in this transportation. This delay can lead to serious critical problems and situations. To overcome this delay and avoid the critical situations this idea of organ transportation with the help of UAV (Unmanned Aerial Vehicle) was implemented. Transportation by these UAVs is fast as well as the factors like traffics were also overcome. The project is aimed at designing a semi-automatic organ carrier drone with very high accuracy to reduce the transportation time of the organ which saves the life of the person. Life saver is an UAV which is capable of caring human Organs by air medium from one hospitals to required hospitals within the minimum time.

The traditional method for transferring the organs is done by with the help of train or other vehicle. In many cases organs are available for the transplantation but due to traffic or delay in transplantation patient may cause death. Our drone will carry the organ in minimum time with safety. This drone is automatic means it is self-controlled drone there is no man is required to control the drone. It can achieve speed up to 105kmph. This drone used GPS and telemetry for automatic flight. It has auto Temperature control mechanism, which can adjust according to the organ.

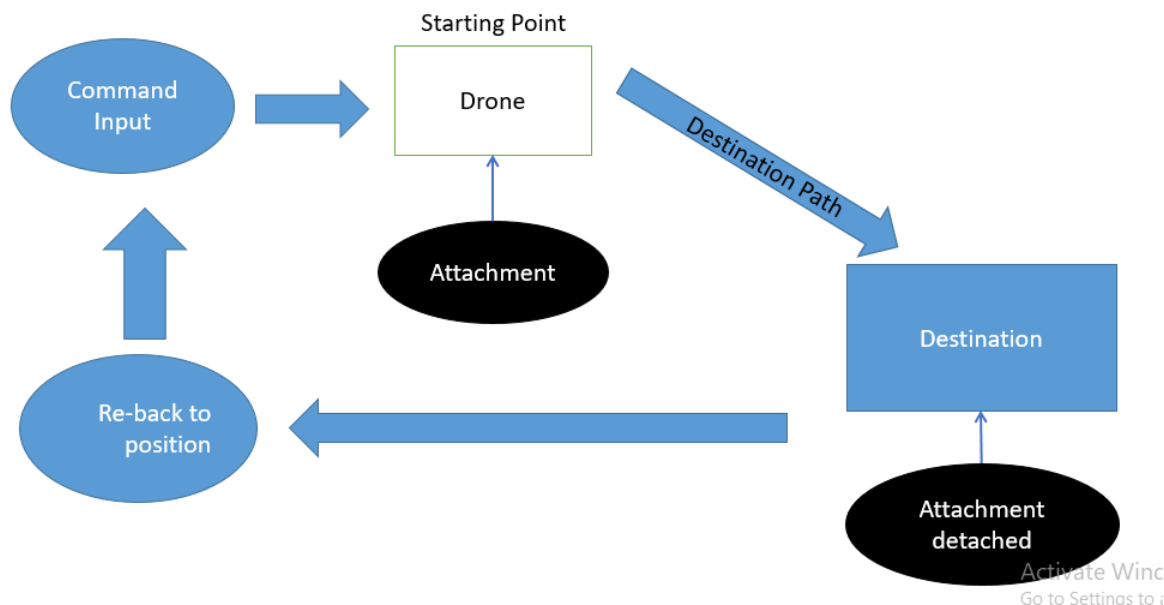
**Keywords**— life-saving, drone, automatic, organ transportation, speed.

### I. INTRODUCTION

The transportation of Organs has been having issues due to traffic and other problems. Due to these problems the person who has to be implanted with the organ may face many critical situations and in some cases even die. Traditional methods of organ transportation are not efficient to transport the organ which may cause delay in transportation and this delay can cause patient's death. There is rigorous need to reduce the delay in transportation. With our project the time factor can be reduced. Traditional methods like bus, ambulances, trains etc. take more time for transportation. This time can be reduced drastically with the help of our project. In traditional methods the modes of transportation is changed for travelling long distances whereas in our project we can use single mode of transport. For Organ Transportation the most important part is the preservation of the organ. We have designed the preservation of organ i.e. our cooling mechanism in such a way that it automatically maintains the temperature favorable for the organ according to the surrounding temperature. The GPS and Telemetry we have used provides a proper path flow for the drone to safely reach the destination. Organs are delicate and they cannot be exposed to any vibrations. We have taken good care about the stability of the drone so that the organ will not suffer from vibrations. Once the organ is placed in the preservation box and attached to the drone there will be no detachment till the drone reaches the destination location. For transportation using traditional methods many people have to spend their valuable time for transportation of a single organ but as our project is an unmanned aerial vehicle there is no man physically required for transporting the organ, only a drone operator who will control the drone using a remote-control at a specific location. The organ will be delivered very quickly as compared to the traditional methods because the drone can fly up to 150kmph speed; thus reaching the destination with minimal delay and avoiding critical life threatening situations of the patient that can arise due to delay.

## II. MATERIAL AND METHOD

First we set the drone in remote controller mode or in UAV mode as per require and set the require temperature of the organ container set the starting point and the ending point (destination) of the flight. Then it will be carry the organ safety with the minimum vibration simultaneously .it will send the live path coverage and the video and maintain the temperature of the container .it will send the voltage of the battery of the drone and the container when the wind pressure is more that time. It will hold the passion with help of GPS system when the reaches to his destination point. It will land very safety slowly with no damage and detach the container from the drone with the help of hinges and servo mothers after that it will follow the retuning path and it will come back at the starting point with the help of return to launch position.



**FIGURE 1: Working of the LIFE SAVER**

### 1.1 Designing and Working of Drone:

The drone consists of Hexa Frame, 6 motors, 6 ESC and Flight Controller Board with GPS and telemetry system. The drone is semi-automatic which means a drone is controlled with the remote and with UAV system which is automatic. When we turn on the remote then Flight Controller send the signal to the ESC(Electronic Speed Controller) and will start the Multicopter motor. All the motors are revolving in opposite direction to each other with the same speed. The drone will fly according to the geographical conditions. The Flight Controllers consist of different types of sensors which are Gyro sensor, Accelerometer, Magnetometer, Barometer and Microcontroller. Gyro Accelerometer is provide the stability to the drone it avoid to tiltation of the drone towards the ground or to the sky, it will maintain the stability. Barometer provide the altitude hold where the drone can hold at perpendicular height which we want. When the UAV system is activated that time just we have to plot the points with the help of Google Maps and then drone automatically follows the path.

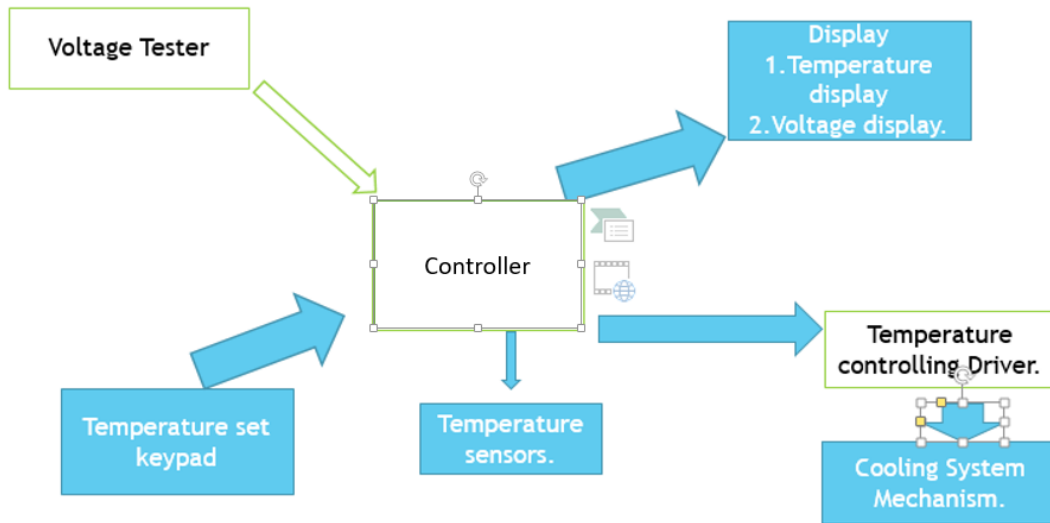
### 1.2 Designing and Working of Cooling Container:

The life saver is a semi-controlled UAV drone which is specially design for organ transportation from 1 phase to another place with in a minimum time.

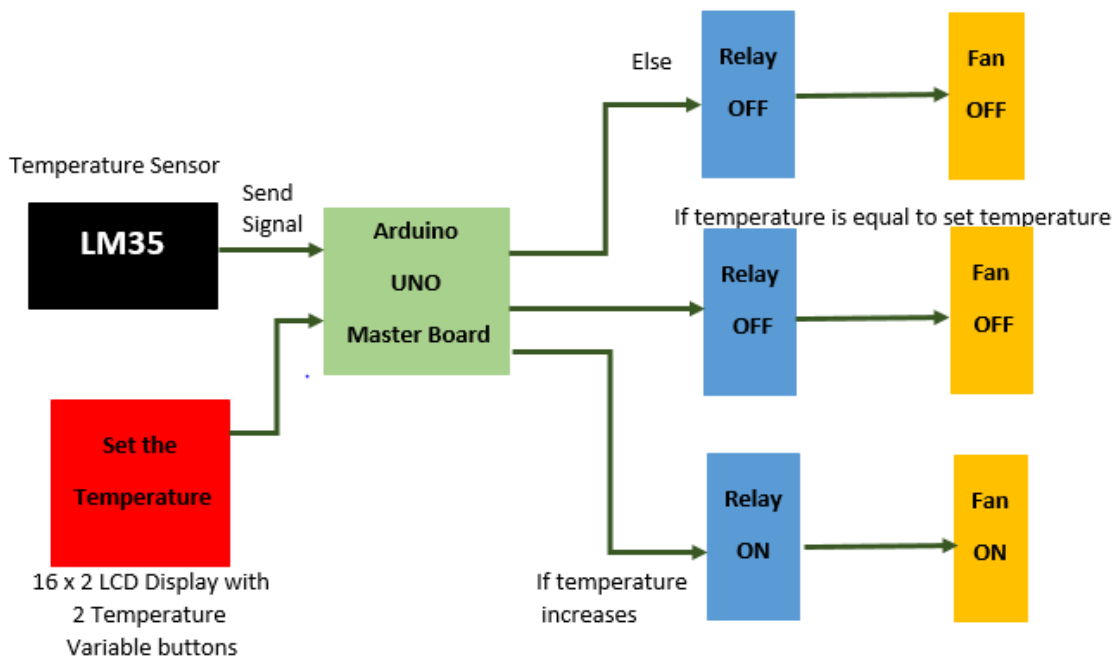
First the we set the temperature of the organ container according to which organ we have to transport. When the temperature set at particular °C it can maintain the temperature as well. If the temperature increases the LM35 sensor send the signal to the microcontroller which turn on the relay module which act as on off switch.



If relay get the signal from the Arduino then it turn on the cooling fan and turn on the thermoelectric peltiers till the temperature is equal to the set temperature when the set temperature is equal to the container temperature then the relay turn at the fan and peltiers accordingly.



**FIGURE 2: Working of the Cooling Container**



**FIGURE 3: Block Diagram of the Cooling Container**

### III. RESULT AND DISCUSSION

The result expected from this project of ours is that in the field of organ transportation we can bring a major breakthrough. Till date the transportation done of organs has been slow and time consuming which has been even leading to certain critical life threatening situations but with this LIFE SAVER DRONE of ours we will consider this main factor, TIME.



**FIGURE 4: Output**

### IV. CONCLUSION

The project of ours will consume less time to transport the organ. It is expected that the organ will be transported without any complications. The temperature required for various organ will be achieved properly. There will be proper stability of the drone if as it is UAV there will be no person inside the vehicle (drone) the organ will be received to the required receiver within less time and proper accuracy. If there will be any complication in the path the drone will automatically select safe place and land itself. If there is any obstacles in the way it will automatically take note of it and avoid it. There will be a start point and end point and selected path which will be properly followed by the drone.

The use of drones have made many transportations and other application very fluent and with less drawbacks.

Organ Transportation Drone amazingly reduces time and improves accuracy. Due to air as a transport medium there will be no traffic issues as there is very scarce traffic in the sky.

### ACKNOWLEDGEMENTS

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Lastly we would like to thank all of our Lab Assistants and the entire Department of Electronics and Telecommunications Engineering.

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## Multi Terrain Quadraped

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**Abstract**—The quad concept that can easily be changed in walk mode and rover mode is proposed by wheel traversing. Walking mode will be used for non-ideal operations for wheels, such as scaling vertical walls or moving in extremely uneven terrain. Rover mode is used for flat terrain and fast travel. The robot is controlled by a webpage wirelessly that will be fully built for this robot. In addition to our ability to convert, we also intend to add IMU sensors, GPS and lidar for future self-orientation and autonomous performance. All data will be logged by the cloud services and the data can be easily reviewed in the graph for data analysis. The aim of this project is to create a low-cost multi-terrain traversing robot prototype for search and rescue operations.

**Keywords**— *Quadraped Bot, Walking Bot, Transversing Bot, Raspberry Pi, Lidar*

### I. INTRODUCTION

Many applications, including detection and rescue, surveillance and security, require information from such an unknown region, potentially dangerous to humans. We need mobile autonomous robots with multi-terrain traversing capabilities to explore such places. The robot may be one of several types of wheels, legs, or other types of platforms suitable for these applications. Robots with wheels are very efficient on smooth and continuous surfaces, but there are serious limitations in rough terrain and in different ways. In contrast, legged robots provide high mobility in natural terrain. They are conducive to surface irregularities by using a separate base and contacting the ground at selected points. However, the construction and control mechanism of a foot robot is complicated compared to a wheeled robot. This is the main reason that robots with legs for better control have per actuator and multiple degrees of freedom. In addition to the wheels and foot robots discussed above, there exists a range. These robots have the advantages of both, the warm motion of the legs, as well as the simple control of the wheels robots.

### II. MOTIVATION

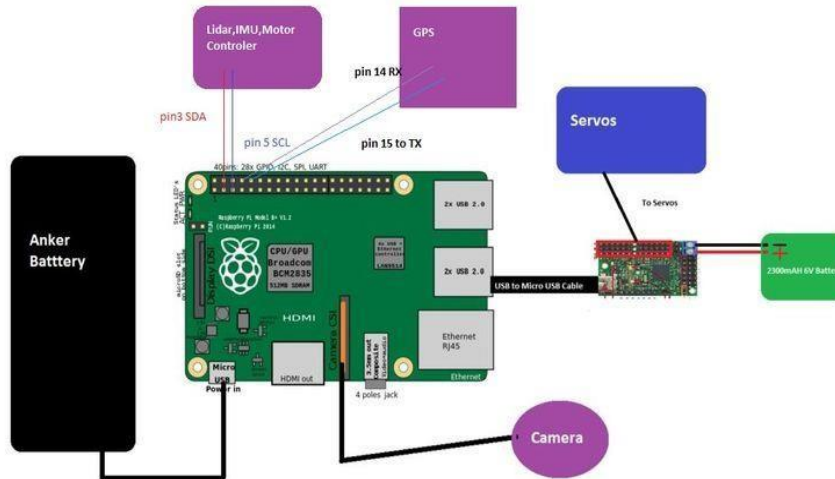
Taking Note of loss of human life due to search and rescue, surveillance and security operations in hazardous inhumane condition, it is preferable to employ a bot for these purposes. Also due to its mobility to move in multi terrain and small size it would be able to send us much more data than human counterpart. Furthermore, we can also see its application in delivery of products, in space where the terrain is unknown. It can also be equipped with security and surveillance devices for the security personal. An unending line of application can be devised with such a kind of multi terrain bot.

### III. MATERIAL AND METHOD

#### 3.1. Proposed methodology:

The Bot uses raspberry pi as its main CPU. Being a Quadraped Bot it transverses on 4 Legs. It can switch from rover mode to wheeled mode upon input by user. It has various integrated sensors and camera to provide the user with sufficient data. The Bot is to be controlled via a web page where the schematics and live camera stream will be available. Data Will be logged on cloud servers. All this will be made possible via Node Js Platform.

### 3.2. General Block diagram:



**FIGURE 1: Production General Block diagram**

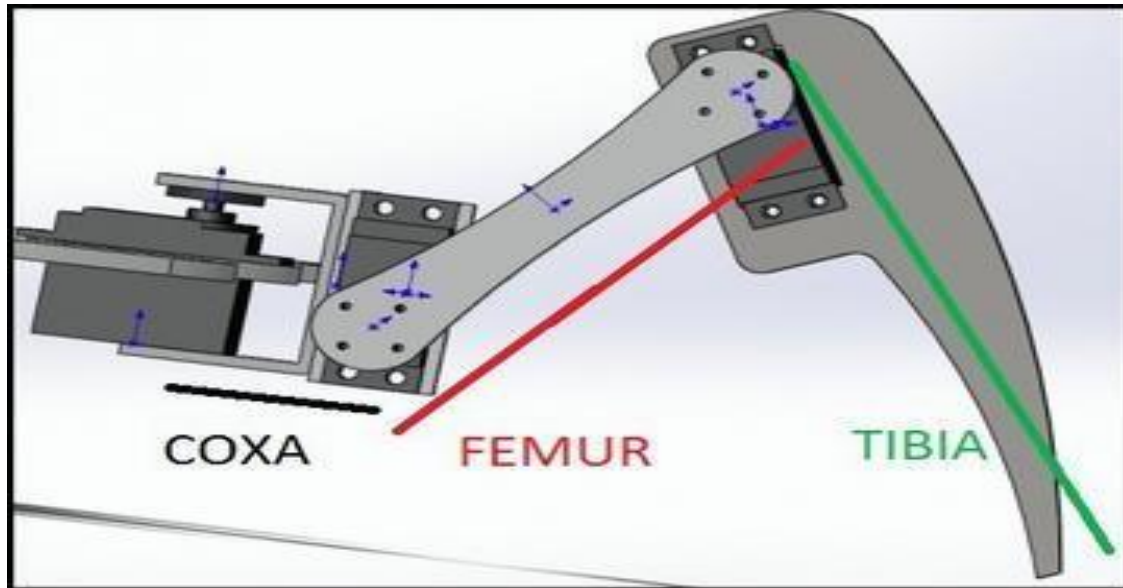
Our main motive when designing was to keep it as simple as possible. There are two servo motors connected on each leg, one on femur and one on coxa. There is a micro motor on each of a leg on the tibia for the wheeled movement. The servos are connected to the servo controller. The Raspberry pi is mounted on the top of the chassis. Over it there is a Pi camera mount along with the other sensors connected to Raspberry Pi. The Power is supplied to the raspberry Pi via a rechargeable power bank

a. **Raspberry Pi:** Raspberry pie is a portable, powerful and mini computer. The board length is only 85mm and width is only 56mm. Its size only as big as a credit card but it is a capable little PC. It can be used for many of the things that your desktop PC does, like high-definition video, spreadsheets, word-processing, games and more. Raspberry Pi also has more wide application range, such as music machines, parent detectors to weather stations, tweeting birdhouses with infra-red cameras, lightweight web server, home automation server, etc. It enables people of all ages to explore computing, learn to program and understand how computers work.

b. **Servo Motor:** servo motor is an electrical device which can push or rotate an object with great precision. If you want to rotate an object at some specific angles or distance, then you use servo motor. It is just made up of simple motor which runs through servo mechanism.

### 3.3. Leg Design:

The Leg design is divided into three parts for better stability and mobility. In fig.2 we can see that the parts are Coxa, Femur and Tibia. Their alignment is made such that it can transverse easily from legged mode to wheeled mode easily.



**FIGURE 2: Leg Design Diagram**

### 3.4. Web Layout Diagram:

The layout is designed as such to give the operator complete control over the bot along with the interactive operating switches with almost all of the information displayed on the screen.



**FIGURE 2: Layout Diagram**



#### IV. EXPECTED RESULT

We expect to complete this bot with maximum sensors to provide a much accurate data. Also we intend to keep working on a better leg movement algorithm to provide the bot a much more stable walking pattern.

#### ACKNOWLEDGEMENTS

We would like to express my deepest appreciation to all those who provided me the possibility to complete this report. A special gratitude we give to our final year project manager, Mrs. Ashwini Haryanwhose contribution in stimulating suggestions and encouragement, helped me to coordinate my project especially in writing this report. Furthermore we would also like to acknowledge with much appreciation the crucial role of the staff of department of EXTC who gave the permission to use all required equipment and the necessary materials to complete the task. Last but not least, many thanks we have to appreciate the guidance given by other supervisor as well as the panels especially in our project presentation that has improved our presentation skills thanks to their comment

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## Automatic Pani-Puri Vending Machine

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**Abstract :** *Today, automation has been an integral part of the food industry as concerns over health and safety have increased worldwide. We have taken up a simple local food of India, The Pani-Puri, and design a product that can automate its making process to ensure that the best taste and quality is available to customers without concerns over health or safety. This machine is designed to take input of fried stuff, water and required spices and produce the Pani-Puri. The automation make sure that the work is done smoother, safer and unconventional skill.*

**Keywords—** *Pani-Puri, Vending Machine, Automation, Health and Safety, Food Industry.*

### I. INTRODUCTION

The vending world is expanding very rapidly. Now, you will be ready to see the machines within the mall and at various parks. This new type of sale has already become an excellent part of every person's life. This is why many people are eager to own a vending machine and earn money with this very suitable business opportunity.

With a vending machine, you would not think of hiring an employee to try to work for you. Neither will you be obliged to stay there all day. You all want to try to stock some products within the machine and you will leave it. It has a facility that allows the customer to purchase and pay without any help.

**It provides instant food and drinks**<sup>[1][3][4][9]</sup>.. The idea of installing a vending machine is to supply foods and beverages that are capable of being consumed by buyers. When you are going shopping with a vending machine, you do not need to get a spoon and shake your coffee. All you have to do is get it and enjoy it while you are doing something more important

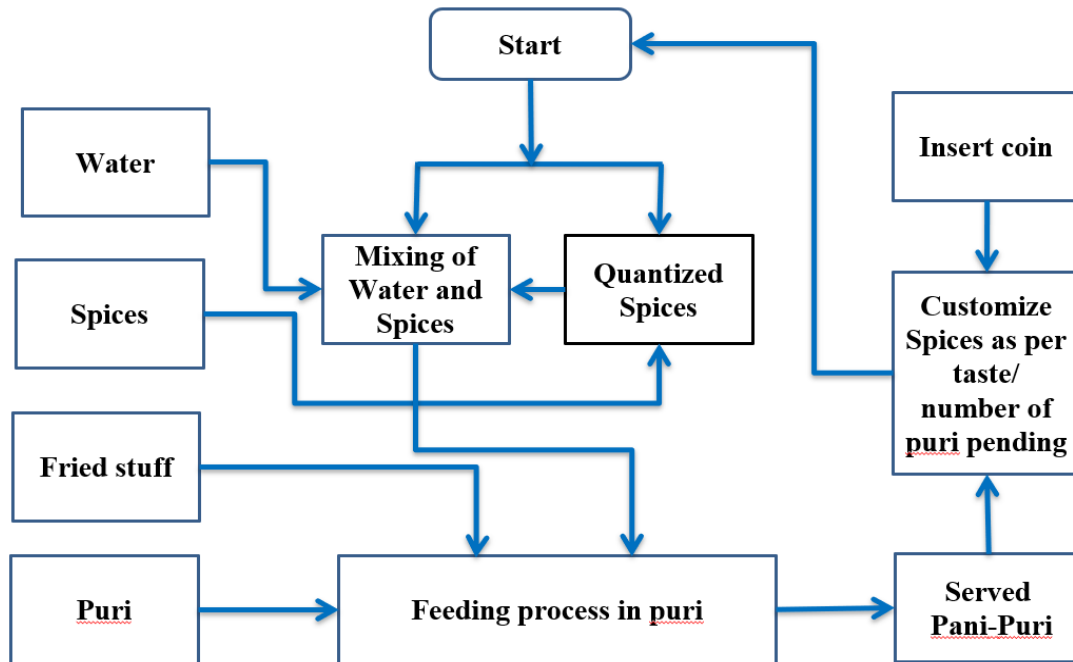
**It is effective in selling tickets**<sup>[1]</sup>. One of the earliest uses of vending machines is to successfully distribute tickets. If you are getting to compare speeds within the distribution of tickets with the use of a slot machine and therefore a manual way to sell it, you will see that the former method is faster.

**An easy source of hygiene products**<sup>[1][8]</sup>. There are different times when you go to the toilet and you suddenly realize that you do not have a sanitary pad or you need a sanitary napkin. With the availability of vending machines in public restrooms and other locations, you can now save more time and effort in buying whatever you need from a store

**It can produce products in just one minute**<sup>[1][3][4]</sup>. The main reason for becoming vending machines is to manufacture products available at the moment. Imagine yourself running late for work, you had not yet had your breakfast and you only have five minutes. Instead of going to a local cafeteria to buy a cup of coffee, which you still have to make, you can simply put some coins in a coffee vending machine and you will have the ability to have a drink in just a moment

**It is a great source of comfort**<sup>[1]</sup>. There are vending machines in various places such as parks, train stations and malls. For children, standing next to a vending machine and expecting that candy to return are some of the things that can be relaxing. When you are out of the office for your break, you simply sit down and drink the entire drink that you have taken from a vending machine nearby.

## II. DESIGN METHODOLOGY



**FIGURE 2.1: Flow of project**

### 2.1 Working:

**Function of the system is divided into 4 steps:-**

1. Enter the coin.
2. Customize spices as per your taste (for example level of spicy low, medium, high).
3. After this raw ingredients is taken and it will go for mixing process.
4. Finally Pani-Puri will be served.

## III. TOOLS TO BE USED

### 3.1 Hardware Component:

#### 3.1.1 Solenoid valves:

Solenoid valves are electrically activated valves, which are usually not intended to control the flow or direction of air or liquid in fluid power systems<sup>[2] [3]</sup>. Both pneumatic and hydraulic fluid are used in power works, the spool or poppet designs of most solenoid valves make them flawless for various tasks and applications.

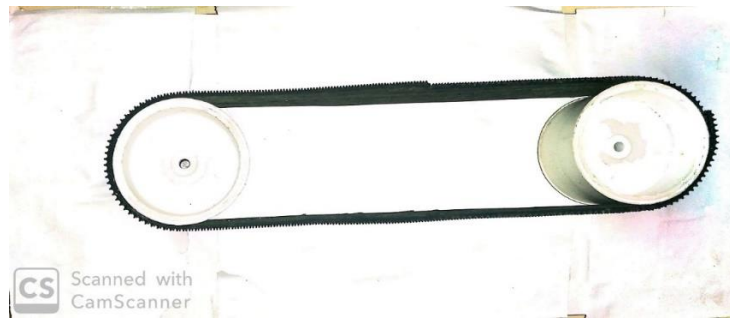
### 3.1.2 LCD:

We come across LCD displays everywhere around us.  $16 \times 2$  displays 16 characters per line in two such lines. Each character in the LCD is displayed in a  $5 \times 7$  pixel matrix.

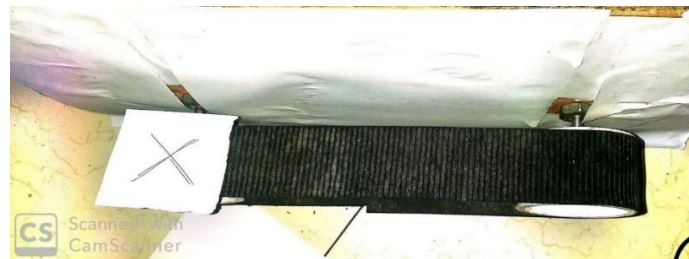
### 3.1.3 DC Motor:

The advent of power electronics has replaced DC motors with AC motors in many applications. Here dc motors are used for conveyor belt. Where stuffing, water filling serving of Puris are done.

## IV. RESULT AND DISCUSSION



**Figure 4.1 Conveyor belt**



**Figure 4.2 Conveyor belt (Initial Position)**



**Figure 4.3 Conveyor belt (Second Position)**



**Figure 4.4 Conveyor belt (Third Position)**



**Figure 4.5 Conveyor belt (Final Position)**

This project is designed in such a way that it will work in four steps that is collecting, drilling, stuffing and serving of the Puri is achieved with the help of conveyor belt and the time interval between each steps is 0.35sec. As the above figures follows the four steps respectively.

## **V. CONCLUSION**

In this work, the automation of a well-liked snack has been achieved. This product is indigenous since the Pani-Puri made by this method shall suit the taste of the locality from which the survey has been made. There are several parameters and design non constraints that has been neglected to permit more and more research work on this particular device which shall spawn up more cheaper, more hygienic and better technology within the future. The fabrication of the device might be made with the above set of knowledge and knowledge described. We believe this product has huge industrial application as the food industry has been booming since the past few years. Such ventures would offer more and more employment opportunities for people in India and increase the foreign revenue generated by the country.

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## Wireless Hazardous Gas Detecting Robot for Coal Mine

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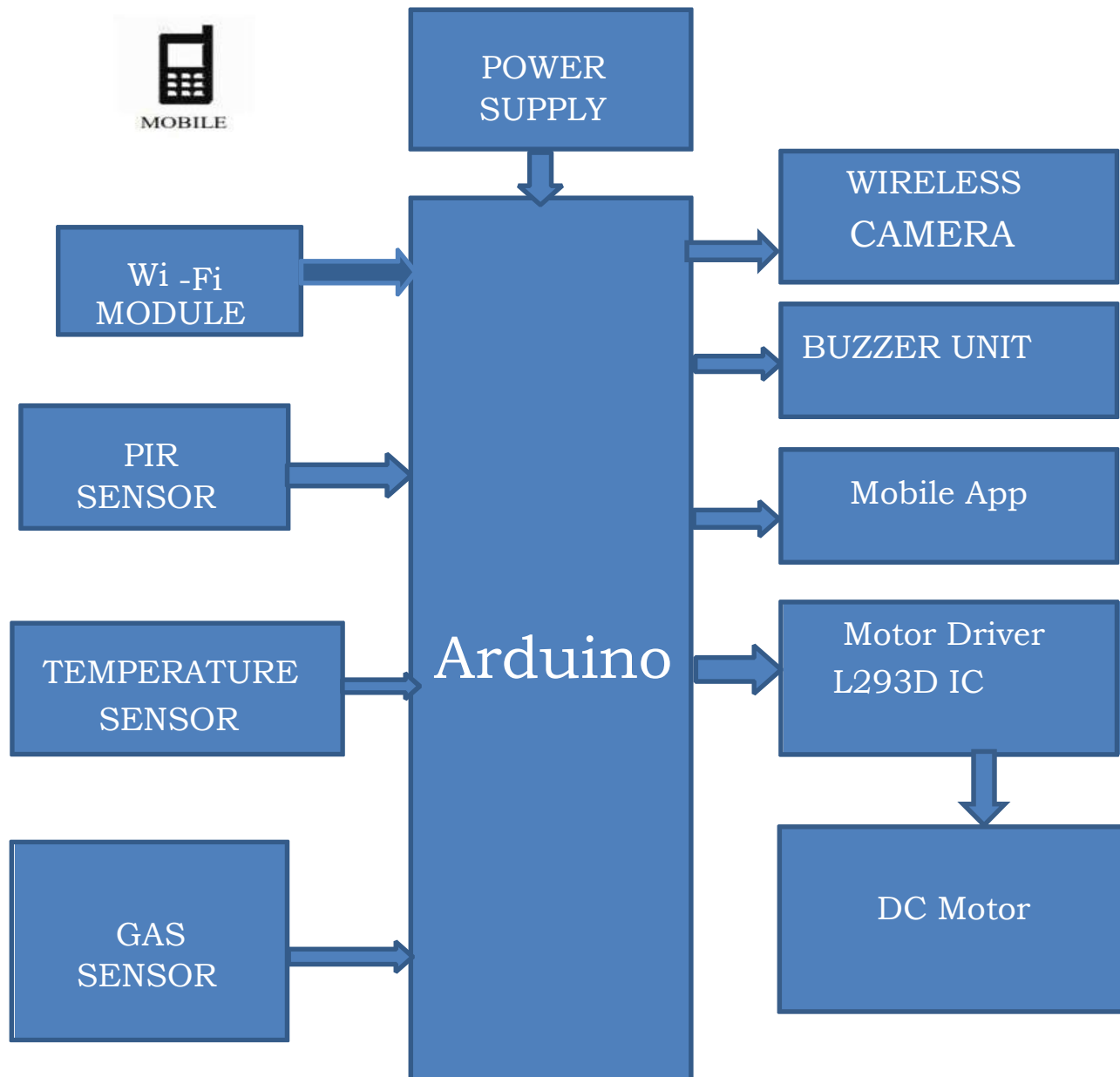
**Abstract**—In today's world, the start and end of any work is well mechanized and many of the places robotics are brought into use to attain profit there by reducing the labour work. This paper will go under such classification which works for Human Beings. Human introduction to hazardous gases while working in underground passages may make deadly impacts. To maintain a strategic distance from such cases we need to automate the framework with the utilization of specific Robots. The robot here distinguishes the hazardous gas and display utilizing a wireless control like Bluetooth and Wi-Fi in mines. The MQ- 2 sensor are used to recognize the degree of methane (CH<sub>4</sub>) gas and the Wireless Camera which is utilized to screen the tasks in the mines. In different mining zones, modern applications this robot can be situated utilized. It very well may be empowered to recognize different gases like Carbon Monoxide, Carbon Dioxide, Low O<sub>2</sub> substance, Smoke and different gases. Robot can give the earlier information to the laborers about the hazardous gas thus the laborers can have preliminary plans which will reduce the loss of human life, because of automation upgrading the successful activity in mines.

**Keywords**— App, camera, coal mine, hazardous gas, robot, wireless.

### I. INTRODUCTION

Coal mines are an underground passage framework. The passage is thin if there are a few mishaps the laborers are effectively tapped inside and it is exceptionally hard for the laborers to escape the mines. In some circumstance the laborers can't escape from it. There might be unexpected avalanches or breakdown in the mines. Large scale of accident happened in mines because of gas blast, CO, CO<sub>2</sub> poison gas, low O<sub>2</sub> content, high temperature, smoke, fire, water, etc. CH<sub>4</sub> (methane gas) is harmful. CH<sub>4</sub> is an intergrowth with coal. During the way toward mining CH<sub>4</sub> might be discharged from the coal layer into the earth. The gas diffuses all through the passage and it causes gas blast. As the pathway of the passage is thin the gasoline blast may annihilate the instrument and employees present in the mines. The gas can't be pushed out from the passage and it makes mischief to the laborers. Other than the harmful gas coal mines additionally has some perilous like low O<sub>2</sub> substance and coal dust. During mining dust is made as the passage is thin it gets aggregated in the passage. The mining businesses are confronting numerous issues because of blast and gas spillage in mines. To defeat this issue robot has been created. Robots are created to work in mines so human work is supplanted by robots. This mine identifying robot is utilized for recognize the gas leakage utilizing MQ-2 sensor and remote camera take video of mines. This robot can move in a field and furthermore fit for climbing steps. The developments of robot is constrained by an App which communicate with the robot through Bluetooth and Wi-Fi. The robot is made in as vehicle mannequin with four wheels and a central wheel which help it move in a circular direction. This machine is capable of moving in four directions namely-forward, backward and sideways. Along with this movements the robotic can additionally do a 360 degree turn.

## II. MATERIAL AND METHOD



**FIGURE 1: Block diagram of proposed system**

The mine recognizing robot works in double mode, which implies that, the robot can be controlled in both manual mode and programmed mode. This is the distinctive factor while contrasted with the other sort of robots, as the large portion of the bots work in manual mode. The programmed mode robot is modified inside the inserted chip and it makes the robot to go about as individuals. This adaptation of robot is predominantly characterized by the factor named Artificial Intelligence. The second distinctive factors from different robots is that, the proposed robot is fit for detecting people, who are caught inside the coal mines. This is finished with the assistance of sensor (PIR) which help in distinguishing resistances. The fig. 1 block diagram gives a thought of how the

robot functions. It shows how the framework circuit functions and how the present stream experiences it. The wireless correspondence utilized is Bluetooth which helps in moving the information and messages. In the proposed framework, the framework circuit can be executed with the assistance of a block diagram which incorporates the sensors, modules of Bluetooth, camera and the power supply. These sensors are interfaced with the assistance of Arduino microcontroller. These sensors are straight-forwardly associated with the Arduino miniaturized scale controller which have their very own default program as indicated by their utilization.

The working vitality of the robot is acquired from the battery which is joined to the Arduino microcontroller. A camera, which helps in the live gushing of the close by episodes, is incorporated alongside different sensors. Sensors unit go about as a marker, that is, it helps in distinguishing whether any deterrent is available in its manner or not. In the event that an indicator is available, it gives an alarm message to its administrator. The PIR (Passive Infra-Red) sensor is utilized predominantly for identifying the obstacle. The wheels helps in moving the robot which actualized with the assistance of driver IC. The point of the robot is checking and distinguishing the varieties in temperature, gas and snags in coal mines situations. Not just recognizing, following on to a screen can be effectively done by camera appended on the robot. The perception of all subtleties is finished by utilizing the LCD associated with the robot, so all subtleties of nature can follow effectively .Required component for project:

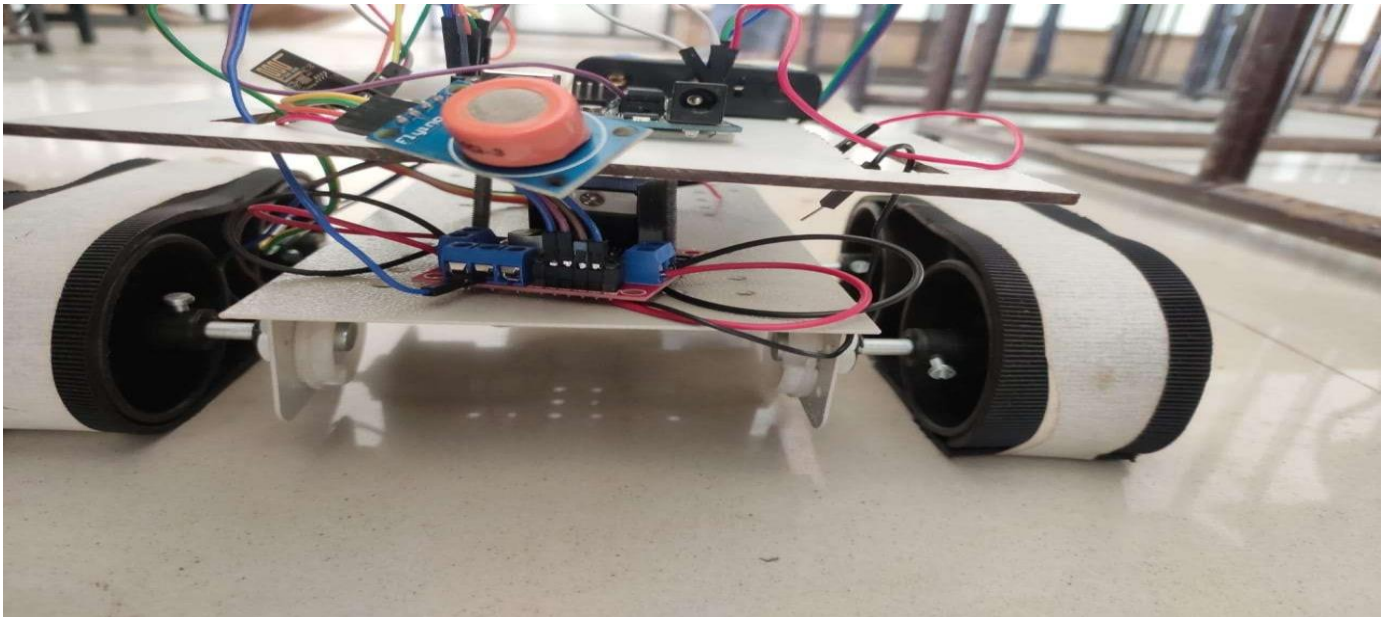
[1]Arduino Microcontroller:- Arduino UNO is a Microcontroller board structured by Arduino.cc in Italy. It utilized Atmega328 Microcontroller which goes about as a mind of this board. Arduino Bootloader is introduced on Atmega328 which makes it fit to work with Arduino Programming. Arduino is an open-source stage so it has a great deal of help from outsider engineers. Anybody can structure its Libraries for various sensors and modules. Arduino UNO has 20 info/yield pins. Among these 20 pins, we have 14 computerized pins. The staying 6 pins are simple pins. It additionally has 6 PWM pins which are utilized for Pulse Width Modulation. Arduino UNO underpins pursue 3 correspondence conventions: Serial Protocol, I2C Protocol, SPI Protocol.[2]PIR Sensor:- As the name announces it's the sensor utilized for identifying of deterrents. PIR sensor consistently discharges infrared along the way of the robot and it returns on a particular time. PIR sensor will figure the time interim of IR. At the point when a hindrance shows up, the IR will cut off and the robot distinguishes it as an impediment. [3] Gas sensor:- MQ-2 is the sensor used for detecting the hazardous gas details of the environment. [4]Wireless Camera:-The live gushing of the earth can be conceivable by utilizing a remote camera likewise the pictures can be spot out. By the name proclaims the camera was associated with the screen remotely.[5]Buzzer Unit:- Buzzer unit is utilized for the sign reason, that is, it gives a sound ready when there is any varieties of gases, temperature and if there is any obstacle are there before the robot. Through the ready we can without much of a stretch comprehend the circumstance of the field.[6]Temperature Sensor:- LM35 is the temperature sensor that is utilized in this robot. By utilizing this the robot can identifies the different measure of temperature of the current condition. The itemized perspective on the temperature sensor can be seen on a mobile App grid show. [7]Node-MCU:- Node MCU is an open source LUA based firmware created for ESP8266 Wi-Fi chip. By investigating usefulness with ESP8266 chip, Node-MCU firmware accompanies ESP8266 Development board/pack for example Node MCU Development board. Since Node-MCU is open source stage, their equipment configuration is open for fabrication. Node MCU Dev Kit comprise of ESP8266 Wi-Fi empowered chip. The ESP8266 is an ease Wi-Fi chip created by Espressif Systems with TCP/IP convention. For more data about ESP8266, you can allude ESP8266 Wi-Fi Module. [8]L293D Motor Driver:-L293D is an ordinary Motor driver or Motor Driver IC which permits DC engine to drive on either bearing. L293D is a 16-pin IC which can control a lot of two DC engines all the while toward any path. It implies that you can control two DC engine with solitary L293D IC. Double H-connect Motor Driver coordinated circuit (IC).The L293d can drive small and quiet big motors also.[9]DC Motor:-DC Motor is used to control the speed of the wheels. DC means "direct current". The speed in a DC engine can be balanced through the force of its current.

**TABLE 1**  
**COMPARISON BETWEEN PREVIOUS DONE WORK AND PROPOSED METHOD**

Sr. No.	Paper Name	Advantages	Disadvantages
01.	Autonomous robot for coal mine and hazardous gas detection	ZigBee is low cost and low powered mesh network widely deployed for controlling and monitoring application.	Use of ZigBee provide short range networks and its best data rate is 250 kbps.
02.	Hazardous gas detection using Arduino	Use of three sensors are much capable to detect and sends the signal quickly.	Use of MQ-2, MQ-4 and MQ-7 sensors at the same time make the circuit complicated.
03.	IOT based hazardous gas detection system using AVR microcontroller	GSM module is the fastest communication medium.	GSM module is only applicable for the 2G and 3G network .But, Now day's people use the 4G and 5G network.

### III. CONCLUSION AND RESULT

The mine robot for gas detection and disaster surveillance is developed with sensors, camera and other components. A battery is used to run the robot. MQ-2 sensor is used for hazardous gas detection and a wireless camera is used for surveillance in the mine. The robot can run in terrain surface and climb rocks in the mines. When the measured value exceeds the set points intimation will be given to the workers saying "gas level has exceeded". The gas level will be displayed on mobile using the mobile App. This robot is used for monitoring the operation and gas leakage to protect Human (workers) and provide safety to enhance detection operation defensively. In 2-3 December 1984, 3,787 workers were died due to toxic methyl isocyanate (MIC) gas leakage in Bhopal, Madhya Pradesh, India ,to prevent these disasters our proposed system will be a boon.



**FIGURE 2: Proposed system for the coal mine**

In above figure 2 .All sensors are interfaced with Arduino board. Gas sensor, PIR sensor, Infrared sensor are properly interfaced with Arduino. Poisonous gas presence is detected through gas sensor, obstacle avoidance is obtained through PIR sensor, obtained values are sent through wirelessly, the controlling part of robot is also done through the wireless module. The camera unit is interfaced with Arduino, the image stored in memory of camera module.

#### IV. ACKNOWLEDGEMENTS

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## Brainwave Controlled Wheelchair (BCW)

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**Abstract** – The locomotive disabled people and elderly people cannot control the wheelchair manually. The key objective of this paper is to help the locomotive disabled and old people to easily maneuver without any social aid through a brainwave-controlled wheelchair. There are various types of wheelchair available in the market such as Voice controlled wheelchair, Joystick control wheelchair, Smart phone controlled wheelchair, Eye controlled wheelchair, Mechanical wheelchair. These wheelchair hold certain limitations for e.g. if the user is dumb; user cannot access voice controlled wheelchair, etc. Brain-computer interface (BCI) is a new method used to interface between the human mind and a digital signal processor. An Electroencephalogram (EEG) based BCI is connected with an artificial reality system to control the movement and direction of a wheelchair. This paper proposes brainwave controlled wheelchair, which uses the captured EEG signals from the brain. This EEG signals are then passed to Arduino. It converts into control signals which will in turn help to move the wheelchair in different direction.

**Keywords** - Brain Computer Interface (BCI), Locomotive disabled Persons, Mobility, Mind-link Electroencephalogram (EEG) sensor, Wheelchair.

### I. INTRODUCTION

Fifteen percent out of the world's population that is approximately 1 billion people, suffers from some form of disability. In that some of disabled people suffering from disability like Locomotors Disability, Brainstem Stroke, paralyzed, spinal cord injury and other numerous locomotive diseases impair the neural pathways that control muscles or impair the muscles themselves <sup>[1]</sup>. Physically disabled people often use assistive devices such as crutches, wheelchairs for mobility ease, artificial limbs, etc. To facilitate their mobility, this paper brings forward the idea of moving the wheelchair with the help of brain signals.

There are many different wheelchair controlling methods available such as gesture, smart phone, voice, ElectroOlfactoGram, ElectroMyoGram, joystick, eye tracking, breath etc., but these methods can be efficiently used by strong people only. However, these systems are not easy to control because of the quick turn may lead to more difficulty to control the wheelchair for old and disabled people.

Dry electrodes and Wet electrodes are the two types of EEG electrodes available in the market. Wet electrodes give accurate results yet the setup takes more than 30 minutes. So dry electrodes are preferred for small scale purpose. For EEG sensors, most popularly used sensor is Neurosky Mindwave sensor. In this paper, FTnS EEG headband is used to capture EEG signals from brain. It send signals via wireless, therefore it is easier to use and more comfortable to wear. Brain produces electrical pulses from the millions of neurons communicating with each other for transmitting information. These signals are known as brain waves. The brainwaves are classified as alpha, beta, gamma, delta and theta on basis of the frequencies and their significances. The delta waves (0.5 to 3 Hz), theta waves (3 to 8 Hz), alpha waves (8 to 12 Hz), beta waves (12 to 38 Hz) and gamma waves (38 to 42 Hz) <sup>[2]</sup>

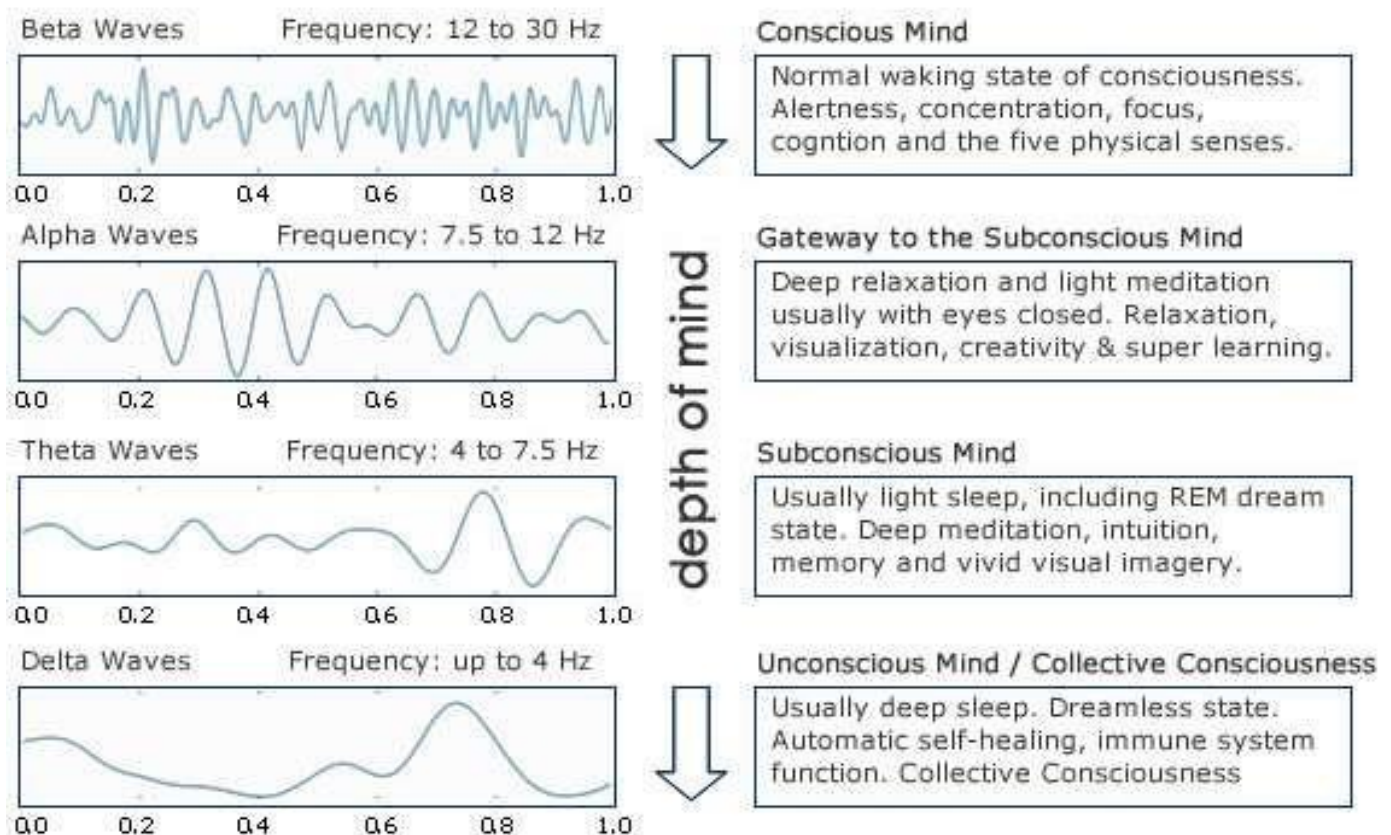


The EEG sensor measures the attention level and meditation level of the person. There are specific combinations or montages for different types of brain waves according to our requirement. The wheelchair will have the operations to go forward, reverse, to turn left, right and to stop. These five operations are the response to the waves by processing the attention and meditation levels of human and the stressed forehead.

The proposed paper is to assist their mobility, by moving the wheelchair with the help of brain signals. This paper implements brain computer interface (BCI) technique. The BCI has applications in numerous fields like medical, mind reading, remote controlling, games and many more. It is a system that obtains and inspects neural (brain) signals with the aim of building a direct high-bandwidth communication medium between the brain and the computer. The brain computer interface (BCI) is implemented in this paper to give the entire control of the wheelchair through the "brain" of the user.

## II. WORKING PRINCIPLE OF EEG

The Electroencephalogram (EEG) measures brainwave of different frequencies from the brain. Activities are measured on the scalp. The Amplitude of the EEG is about 100  $\mu$ V when measured on the scalp or brain. The range of the signal is from 1 Hz to 50 Hz. EEG waveforms are categorized according to their frequency, amplitude, and shape, as well as the sites on the scalp. There are different types of brainwaves such as Beta, Gamma, Delta, Theta, etc. The existence of such waves are described in figure 1.

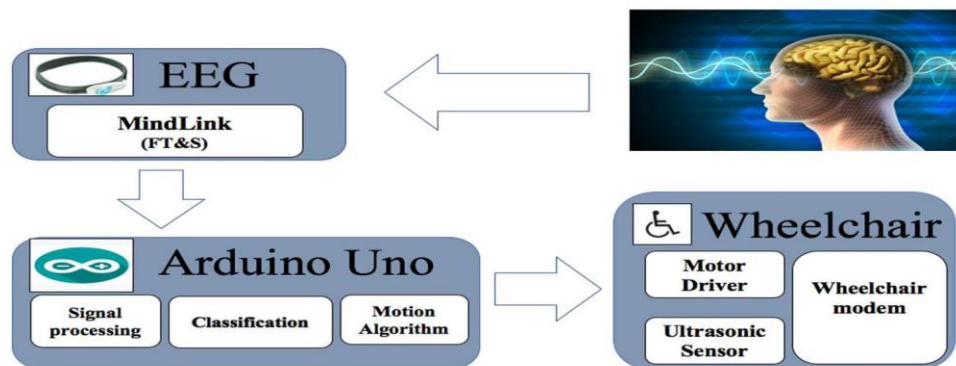


**Figure 1: Different Brain waves**

### III. METHODOLOGY

#### 3.1 BLOCK DIAGRAM:

This system is basically providing a total remote access to the implemented wheelchair. The main entities or blocks of this system are The EEG sensors, Arduino and the Wheelchair. The working of each of the block is as follows:



**Figure 2: Block Diagram**

##### 3.1.1 EEG Sensor:

The function of electrode sensor is to sense electric field changes due to the neural activities in the different lobes of the brain when person's body part moves. These field changes can also be sense even when a person think soft his body part movement without moving actual body parts, just through imagination. More probably, the range of brainwaves is from 0.5 Hz to 40 Hz. The EEG data captured with sampling rate 512Hz. This EEG sensor made by three electrodes: Ground, Reference and EEG. This will basically extract the EEG signals and pass on to the Arduino.

##### 3.1.2 Arduino:

A Brain Computer Interface or BCI system is a system which consists of various subsystems such as Amplifiers, Analog to Digital converters (ADCs) and a Controller section. This system is used to process a raw data or we can say a Brain signal and it will convert it into a control signal in order to control a wheelchair. This all Processes are done by Arduino. And hence the wheelchair is being controlled from the control signals passed on from Arduino.

##### 3.1.3 Wheelchair Body:

Wheelchair body consists of a Chassis, a Battery, a Ball bearing, a motor driver circuit and two motors for moving the wheelchair. As a control signal has come from BCI system, it is given to the motor driver circuit. Motor driver circuit consists of a motor driver ICL293D which can drive two motors at a time. A battery of 9V is used to provide power supply to motor driver circuit. Now according to the control signal which has come from BCI system, the motor driver circuit will turn on the motors forming various movements like Forward, Reverse, Left, Right and Stop with respect to the corresponding control signal. The ultrasonic sensor has been used for obstacle detection.

#### 3.2. FLOW CHART:

##### Description:

Initially it will check whether the device is connected or not. If the device is connected then the device will retrieve the data from FT&S mind link EEG sensor via Bluetooth module. This retrieved data will be processed to generate or determine the mental command i.e. forward, reverse, left, right or stop. This determined signals will be sent to the Arduino Uno and this will pass the control signals to the wheelchair. According to the control signals received wheelchair operation will be performed. If the device is not connected, it will be in the scanning mode. This process is continuously repeated.

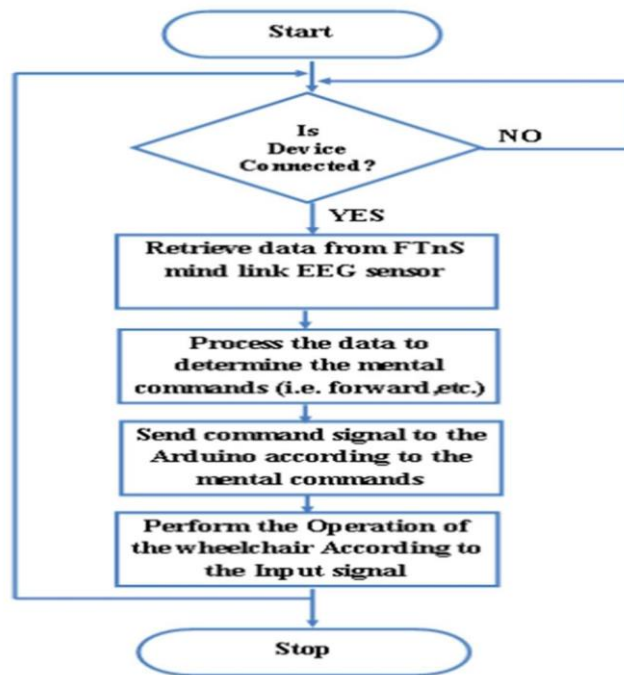


Figure 3: Flowchart

#### IV. RESULTS

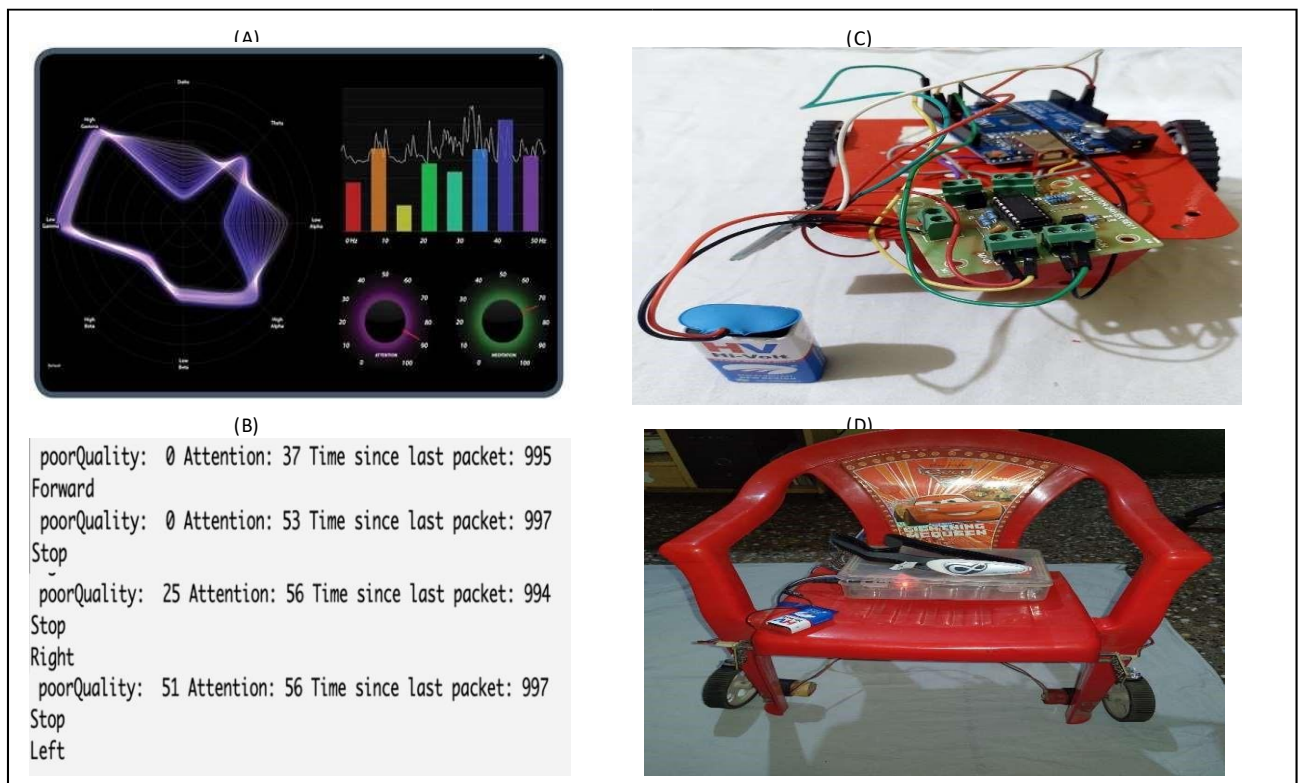


Figure 4: Results: - A - Brainwave Visualizer Readings; B - Serial Monitor readings; C – Prototype designing; D – Wheelchair prototype

The captured signals from FTnS sensor shows various attention and meditation levels. This levels have been observed through Brainwave Visualizer software as shown in Fig. 4(A). The direction of the wheelchair is been controlled using these levels and poorquality as shown in Fig. 4(B). Then, Prototype was designed to verify and test the conditions as shown in Fig. 4(C). After testing all the parameters and testing conditions, project was implemented as shown in Fig. 4(D).

## V. CONCLUSION

This paper is implemented for locomotive disabled people for their ease of mobility and hence reducing dependency. This is the emerging technology in the field of Neuroscience which we have used in our paper. Hence a person with locomotive disabilities or elder person can control the wheelchair without using any external body parts.

After seen by many patient who are suffering from paralysis attack. Since no use of voice control or access through speech is used, the patient who is dumb or who cannot speak fully or partially can access and control the wheelchair very easily. While taking the reverse action of the wheelchair, sometimes it is difficult to accidentally crash a wall or whatever entity is there, because the patient is partially paralyzed and cannot look behind easily.

This paper implementing a backward obstacle detection sensor alarm. Hence if an object comes within a 10 meters' range, the alarm will start ringing and patient can stop the wheelchair by sending corresponding control signal. The scope of the paper was primarily to establish the motion through no physical movement on part of the user and it has been successful in doing so but it has also laid a foundation for many applications which would greatly improve the standard of life for all.

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# A Medicinal Vending machine using IoT and machine Learning

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**Abstract**— This project presents a machine designed to the people for their medical treatment which includes diagnosis and providing generic medicines. The major advantage is that a machine delivers the medicine in emergency and ensure availability of drugs 24x7. This project provides basic medication facilities to the people who are not benefited so far due to their remote location, during emergency hour, physically challenged and aged people. It allows user to select a medicine, pay the required amount after verifying amount it dispenses the medicine. It is mainly focused to treat minor health issues and to provide first aids. We studied the various aspects of this project. The literature survey consists of an implementation of different type of the sensors, the working principle of medicinal vending machine is explained in detail a methodology to build the vending machine using sensors, payment methods. For vending medicine, it uses a machine-learning algorithm for more accuracy and also uses the internet of things for sending data from the sensor to the cloud.

**Keywords**—Raspberry pi, sensors, Internet of things, machine learning

## I. INTRODUCTION

As we all see over the last few years technology has tremendously evolved and developed in medical field. But as compared to other nations we are still lagging in terms of automation in this field. In some metropolitan, these kinds of technology are used up to a very low scale. This development is still not reached in rural as well as a remote area.

This vending machine is an Automated dispensing machine decentralized medication distribution system that provides computer- controlled storage, dispensing, and tracking of medications that have been recommended as one potential mechanism to improve efficiency, and they are now widely used in many hospitals. There is no doubt that these machines can enhance the efficiency of medication distribution, but their capacity to reduce medication errors is controversial and depends on many factors, including how users to design and implement the systems..

If the consumer needs medicine at any odd hours, the pharmacy stores are not available and hence consumers will not able to get medicine in an emergency. Also In public places such as malls, bus/railway stations, on highways, areas where *medical* stores are limited. There are some margins of error while giving medicines to the consumer in the case of a pharmacist is not available. To overcome these problems we proposed a vending machine that uses two machine learning models. For the consumer, an option will be just select, pay and collect the medicine.



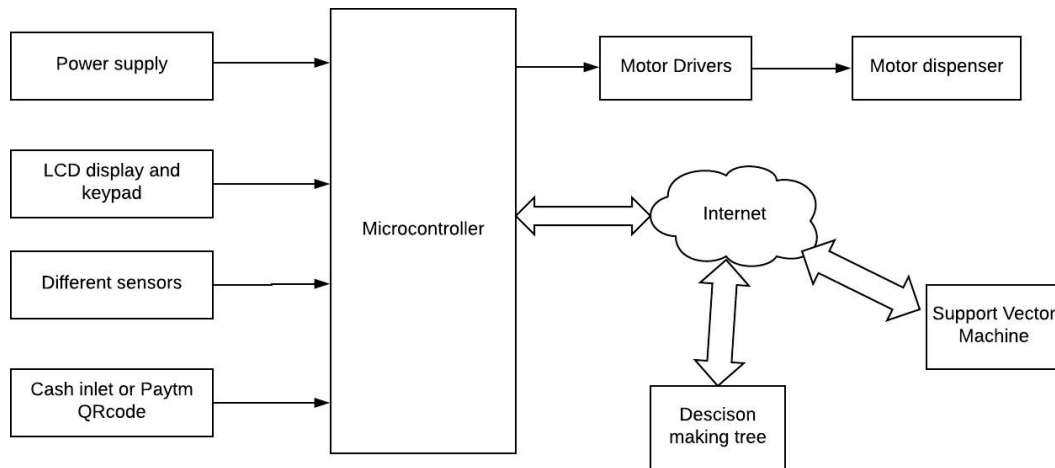
## II. Literature Survey

**TABLE 1**  
**COMPARISON BETWEEN MAIN METHOD**

Sr. No.	Paper Name	Advantages	Disadvantages
01.	Design and Implementation of Automatic Medicine Dispensing machine	It uses pulse rate sensors for checking the heart beat, temperature sensor for checking the fever.	Takes a lot of time to collect the data for particular medicine of various disease and form a database. At a time single medicine can be dispensed for a particular range in a given database
02.	All Time Medicine and Health Device	We have used the Raspberry Pi for both its low cost and its simplicity. Along with the heartbeat sensors and other features can be added to make the machine diagnosis.	Requires clean environment for the sensors to operate and to give a proper reading neither if it gives wrong reading to machine it will dispense wrong medicine.
03.	Sensing in Coin Discriminators	Physical mechanisms and sensor related technologies used to achieve a good detection and discrimination of coins.	We can only use particular coins for payment which has a particular weight such as 5 rupees coin or 10 rupees coin
04	Sensors and related devices for IoT, medicine and smart-living	We can learn how to implement various sensors and how to use machine learning and IoT in the machine	Implementation of sensors are very difficult on the machine and programming is also very complicated also it takes time to build a program
05	Physical Sensors for Biomedical Applications	There are different types of physical sensors based on radiation, thermal and mechanical. Out of which we are going to use mechanical sensors to detect the pressure and thermal sensors to detect temperature of human body.	There are sensors which are very sensitive when comes in contact with the user.  Mechanical sensors in the sense by pressing the sensors and taking reading digitally but user has to know how much to press on sensor neither it will damage the sensor.

## III. MATERIAL AND METHOD

The vending machine proposes a simple design to vend the medicines with high accuracy and brings the objective to provide automation in the medical field. Automation deals with the reduction of human effort using electronics motors, sensors and components having mechanical mechanisms. It includes three simple stages select(input), pays and collect (Output). Here the inputs are given by LCD which is controlled by different switches and different sensors to take the readings. This machine has two options to dispense the medicines. A first option is a direct option that will directly dispense the medicines as per selection. In second option machine asks some queries to the consumer, extracts the keywords from response to those queries as input, also takes the reading from heart rate sensors and temperature sensors and finally proceeds with the current data using a machine learning model to dispense the medicine with high accuracy.



**Figure 1 Block Diagram**

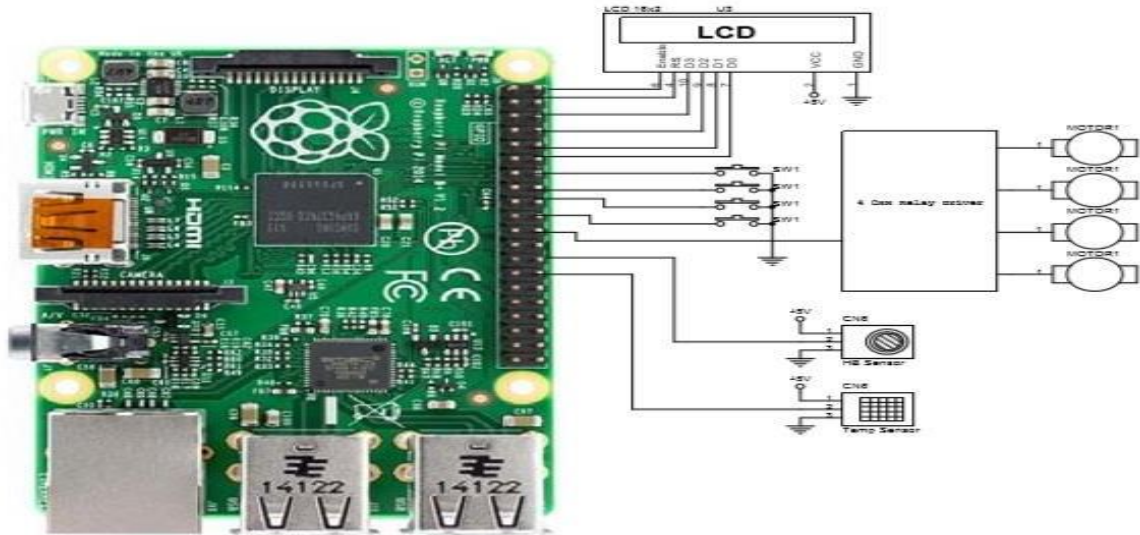
#### IV. Proposed methodology

Proposed methodology involves the procedure to design the medicinal vending machine which consists of different sensors, motors, LCD display, and main microcontroller. This paper proposes the use of raspberry pi as its main CPU which monitors the motors used to dispense the medicine and has interfaced sensors with it which will allow taking readings from the consumer. This reading will be updated on the cloud and displayed on the LCD display.

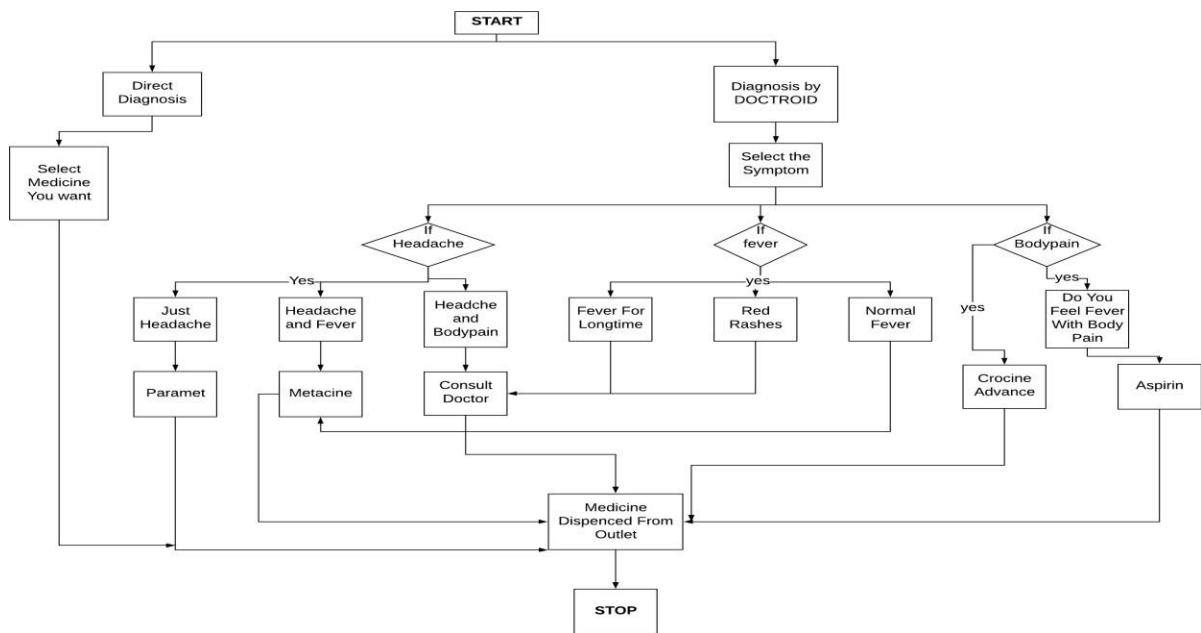
The queries will ask using this display and using switches consumers can answer to those queries. After the selection, the machine will ask the user to stick the sensors on the tip of the finger or limbs of the hand using the Velcro tape. Regarding instructions about the time will be provided to the user through a display. Since it is not feasible to wore sensors for more than one minute but to increase the accuracy of the data from sensors, this paper suggests to wait for 30 seconds. After the collection of data, this data will feed to the machine learning model as input and based on this data which contains extracted keywords, temperature and heart rate sensors then it will lead to dispense the according to medicine.

In this, 16X2 LCD display is interfaced to raspberry pi with its GPIO pins. It has 16 pins out of which 4 pins are interfaced with GPIO ports to display the required character on the screen, also pin register select (RS) and enable is interfaced to GPIO pin and there are Vcc and ground at pin number 2 and 1 respectively. All sensors and display work on the 5V power supply. Pulse rate sensor can be operated at both +5V and +3V power supply. It consists of three pins for ground, Vcc and pulsating output signal. This sensor has two sides, on one side there is the light sensor is present where the tip of the finger should be placed and another consist of some circuitry for noise cancellation purpose. Temperature sensor MAX30205 is used to sensor temperature which offers  $\pm 0.1^{\circ}\text{C}$  (max) accuracy which meets thermometry specifications. This will provide high accuracy with more efficiency.

To vend the medicine the dc motors with spring mechanism is used. After the appropriate signal, the motor will rotate the spring through  $360^{\circ}$  clockwise to vend the medicine. But the dc motors are operated at 12V power supply and we get only 5V of power supply from raspberry pi. Hence, this paper suggests using a relay circuit to step up the voltage for the operation of the dc motor.



**FIGURE 2: Internal Architecture**



**FIGURE 3: Flow Chart**

First method is known as direct diagnosis. In this method user will select the required medicine and after making the payment the medicine will dispensed .In the second method machine ask some queries to the user regarding symptoms and according to the symptoms it will suggest the medicine. For example in the above flow chart as we see after selecting the second method for diagnosis the machine will ask the queries like headache, fever and body pain if user select headache then there will be another options like normal headache or headache with fever from these queries user will select the symptom and according to the symptom respective medicine will dispensed and if the medicine is not available for any symptom then machine will display the message that consult to the doctor.

### Decision making tree:

A decision tree is a tree-like graph with nodes representing the place where we pick an attribute and ask a question; edges represent the answers to the question; and the leaves represent the actual output or class label. They are used in non-linear decision making with simple linear decision surface. Decision trees classify the examples by sorting them down the tree from the root to some leaf node, with the leaf node providing the classification to the example. Each node in the tree acts as a test case for some attribute, and each edge descending from that node corresponds to one of the possible answers to the test case. This process is recursive in nature and is repeated for every sub tree rooted at the new nodes.

### SVM:

Support vector machine(SVM) is a discriminative classifier which is designed to classify the data by hyperplane. The main goal is to design a hyperplane that classify all vectors in the two categories. To choose the best hyperplane one should choose the plane that leaves the maximum margin from both class. When the data is distributed non-linearly, to optimize the task of minimize the total margin, it uses the Karush-Kuhn-Tucker using Lagrange multiplier equation for this task which is shown below:

$$\vec{\omega} = \sum_{i=0}^N \lambda_i y_i \vec{x}_i$$

$$\sum_{i=0}^N \lambda_i y_i = 0$$

As the magnitude of width margin(w) vector decreases, it will result in the increase the separation of the hyperplane.

## V. CONCLUSION

The proposal Medicine Vending Machine designed and implemented to improve health care in remote and rural areas by serving the patients for their basic ailments like fever, headache, first aid and so on. The Medicine Vending Machine is technically feasible to the peoples. It gives the availability of medicines all the time also in rural areas. It gives ease of access also. It dispenses the required medicine for the patient upon their request through a keypad interface and also by using the machine learning algorithm it predicts the appropriate medicine according to sensor data. The future update for this system includes incorporating IoT, which improves the automation and controlling abilities of the system through a website or mobile application. The payment methods can be improved in the future also we can keep a record of every patient by giving them a unique id number for registration. Storage facilities can be improved in the future. Labor costs will be minimized and it will also give entrepreneurs the opportunity to attract more customers with this innovation. Finally, the Medicine Vending Machine to be set as the future trend to improve the health of a remote rural population.

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## LED SPINNER

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**Abstract**—Noticeboard is a primary thing in any institution or organization to spread information among stakeholders. In today's busy and fast moving world, the traditional glued paper notice system is time consuming and not suitable for quick exchange of information. The letter represents a smart electronic remote noting system where an authorized accountable person can share information in an information board in their office room or cellular network at any time from any place in the world. In the proposed system, notice can be sent in two ways. The user can update the notice from his office room by voice or text message via smartphone using Bluetooth and RF communication within a distance of 1 kilometer. In this way, the user sent a notice using their own local wireless network and should not pay money to any operator.

**Keywords**—Matrix Display, Bluetooth Module, Transceiver, microcontroller.

### I. INTRODUCTION

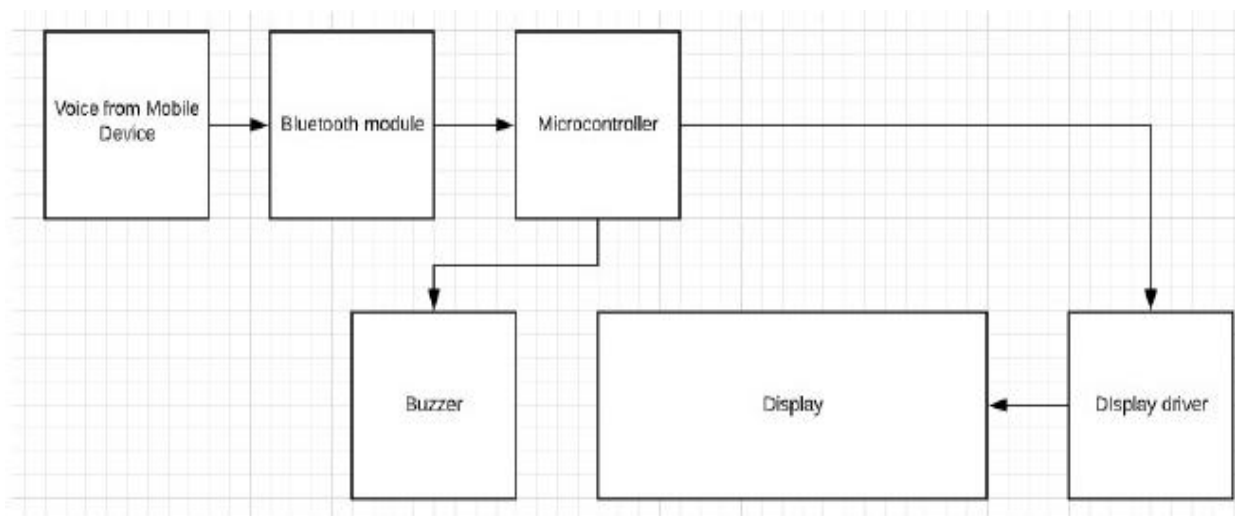
If we have to show an important notice in colleges and anywhere else, we can use these LED display. This smart noticing system can be a very useful media for quick sharing of information in various small as well as a large organization. It can also use in railway platforms for showing trains arriving on different platforms it will also help to deaf and dumb people to know the important announcement on the LED display boards. It can control by smart phone from anywhere in department and even from your native places. It can use in mass media sector as a digital script for an actor, for a news reporter, for a speaker, etc.

The objective of the research is to develop a wireless electronic display board improving the previous limitations to make the noticing system easy, fast, secure and cost-effective. We can use these featured LED display anywhere like on railway platforms, mall. The system is password protected, very easy to operate and operating cost is small as most of the time user can send notice by local RF wireless network without using the mobile network. Our scope is to make it handier and very effective for today's generation who believes in smart work rather than hard work.

### II. MATERIAL AND METHOD

The vending machine proposes a simple design to vend the medicines with high accuracy and brings the objective to provide automation in the medical field. Automation deals with the reduction of human effort using electronics motors, sensors and components having mechanical mechanisms. It includes three simple stages select(input), pays and collect (Output). Here the inputs are given by LCD which is controlled by different switches and different sensors to take the readings. This machine has two options two dispense the medicines. A first option is a direct option that will direct dispense the medicines as per selection. In second option machine asks some queries to the consumer extract the keywords from response to that queries as input, also takes the reading from heart rate sensors and temperature sensors and finally proceeds the current data using a machine learning model to dispense the medicine with high accuracy.





**FIGURE 1: Block Diagram of LED Spinner**

## 2.1 Proposed methodology

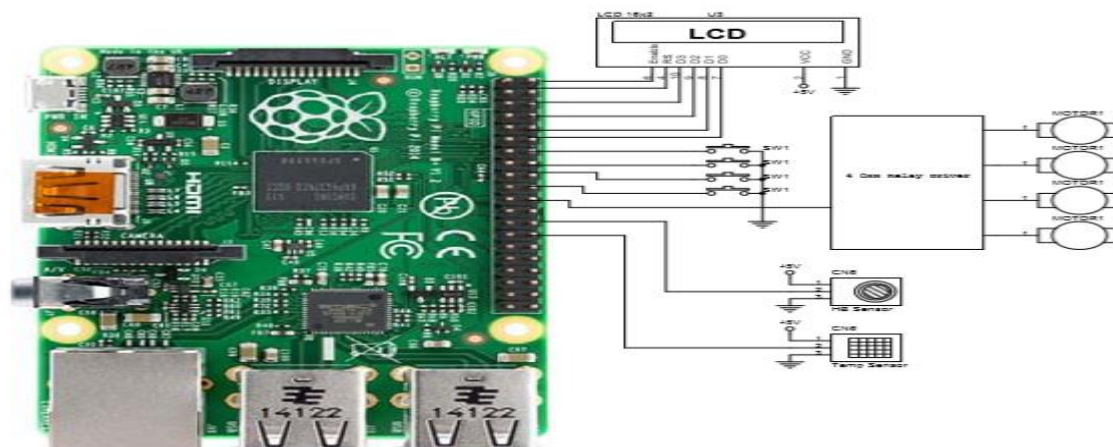
Proposed methodology involves the procedure to design the medicinal vending machine which consists of different sensors, motors, LCD display, and main microcontroller. This paper proposes the use of raspberry pi as its main CPU which monitors the motors used to dispense the medicine and has interfaced sensors with it which will allow taking readings from the consumer. This reading will be updated on the cloud and displayed on the LCD display.

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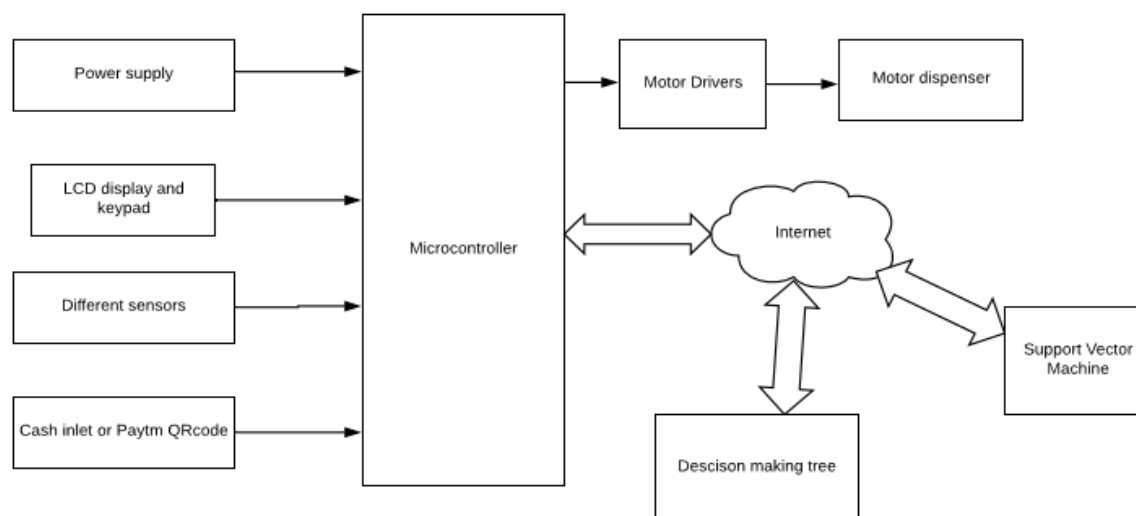
## 2.2 Internal architecture



**FIGURE 2: Internal Architecture of LED Spinner**

## 2.3 Decision making tree:

A decision tree is a tree-like graph in which the nodes represent the place where we select an attribute and ask a question; Edges represent the answer to the question and the leaves represent the class label. They are used in non-linear decision making along the surface of simple linear decision making. For example, categorize the class by sorting on some leaf node as the root of the tree. Each node of tree serves a test case for some properties, and each edge from that node corresponds to a possible answer of test case. This process is recursive in nature. It is also repeated for each sub-tree for new nodes.



**FIGURE 3: Block Diagram**

## 2.4 SVM:

“Support Vector Machine” (SVM) is a supervised machine learning algorithm which can be used for both classification or regression challenges. However, it is mostly used in classification problems. In this algorithm, we plot each data item as a point in n-dimensional space (where n is number of features you have) with the value of each feature being the value of a particular coordinate. Then, we perform classification by finding the hyper-plane that differentiate the two classes very well.

## 2.5 Password Protection:

Bluetooth device used in the system is password protected. So unauthorized person cannot send any information in this display board. Following AT commands are used to configure Bluetooth device.

AT Command	Action
AT+ROLE=0	Bluetooth module is set as slave.
AT+UART=9600	Baud rate is set at 9600.
AT+PSWD=password	Set password of Bluetooth device.

## III. CONCLUSION

This smart noticing system can be a very useful media for quick sharing of information in various small as well as a large organization. The system is password protected, very easy to operate and operating cost is small as most of the time user can send notice by local RF wireless network without using the mobile network. Also, the responsible person has the option to share information with his employee or customers from any place in the world sending SMS from mobile. The system has some limitations too. It has no option to change the password, update time or date of notice is not shown automatically by the system, size of the display is small and data is shown in only one display (notice board). In future, these limitations can be resolved to make the smart noticing system more beneficial.

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## Automated Multimodal Classroom System

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**Abstract**— Robotization is another pattern in the purchaser showcase. There are numerous robotization frameworks with various highlights and offices. In this undertaking, there is a controlling study hall machine utilizing hand motions and voice acknowledgment. This framework is fundamentally intended for physically provoked individuals to help them in working the machines separately. Motions allude to the expressive development of human parts having a specific message to be conveyed to a beneficiary. Human hand signals are methods for non-verbal communication among individuals. Signals have profound roots in our correspondence. Voice is the most basic segment of any correspondence framework since it makes an individual association between individuals. Voice is distinguished utilizing an android application which is associated utilizing Bluetooth Module. In this framework, sensors are utilized to distinguish hand movement and android application for recognizing voice input. This undertaking presents a minimal effort framework to control the electronic gadget utilizing Microcontroller with the assistance of Hand signal and voice acknowledgment.

**Keywords**— Robotization, Framework, Communication, Voice.

### I. INTRODUCTION

Here, it tends to specialize in the hand gesture and voice controlled automation system that helps to manage the appliances. Automation plays a key role in human life. Automation permits US to manage electrical appliances like lightweight, door, fan, AC etc. It conjointly provides security and emergency system to be activated. Automation not solely refers to scale back human efforts however conjointly energy potency and time saving. During this system, Hand gesture is detected victimization gesture device whereas voice is recognized victimization humanoid application. The most objective of automation and security is to assist disabled and recent aged folks that can change them to manage appliances and alert them in vital things.

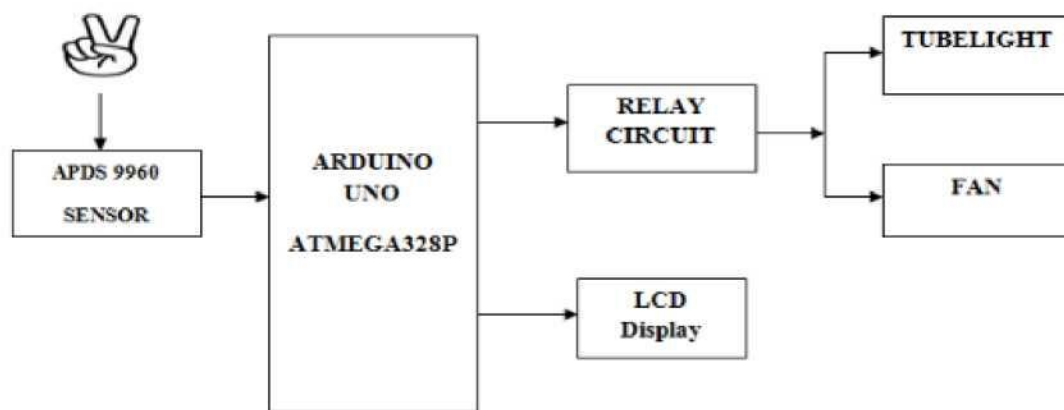
## II. LITERATURE SURVEY

**TABLE 1**  
**Literature Survey**

Sr No.	Title	Author	Publication & year	Work Done
1	Voice and Touch Control Home Automation	Sushant Kumar S.S.Solanki	IEEE 2016	AMR_Voice and Android Bluetooth Control Application is used.
2	Gesture Based Home Automation System	Arathi P.N,S.Arthika,S.Ponmithra	IEEE 2017	Gesture is captured using camera and real time operation is performed using MATLAB
3	Voice Control of Home Appliances using Android	Norhafizah bt Aripin M. B. Othman	IEEE 2014	Home Application is built and uses Bluetooth Module for Automation
4	Control of Home Devices based on Hand Gestures	Pomboza-Junez, Gonzalo, Holgado-Terriza Juan A	IEEE 2015	An armband for gesture capture called MYO is used
5	Gesture Controlled Home Automaton	Rakesh Dhotre Raunak Agarwal	IJSER 2017	It includes a gloves which has Flex sensor for Detecting Gesture

## III. PROPOSED METHODOLOGY

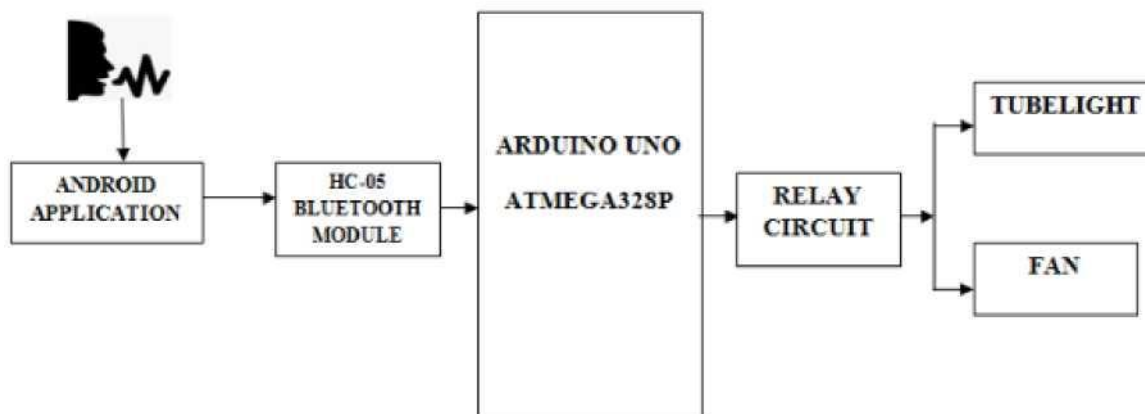
### Block Diagrams



**FIGURE 1: Block diagram of Hand Gesture**

Block diagram of the Hand gesture based automation system is shown in Fig.1. The relay circuit, gesture sensor, and the LCD module are interfaced with the Arduino board. The Arduino UNO controls and operates the different interfaced sensor, actuators and modules. The 16X2 LCD display is used to display the drag-able list of devices. The APDS-9960 sensor module is used for

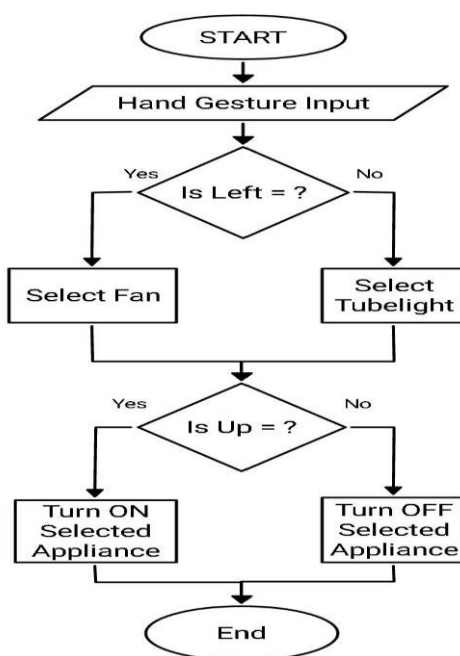
reading gesture. It has six pins - VL, Ground, VCC, SDA, SCL and Interrupt. The relays are used to switch the AC appliances ON or OFF in the project.



**FIGURE 2: Block diagram of Voice Recognition**

Block diagram of the voice controlled automation system is shown in Fig. 2. The circuit consists of Arduino Uno board (Board1) for comparing the input string received through Bluetooth with the stored string to give output to digital pin of Board1 to control the relay. Bluetooth module HC-05 transmits and also receives data serially via Board1 that can be read by the microcontroller (MCU). A relay is used here to control multiple appliances. Arduino Uno has 14 digital pins, each of which can be used to control an appliance. The MCU can be programmed to compare the relative strings (speech).

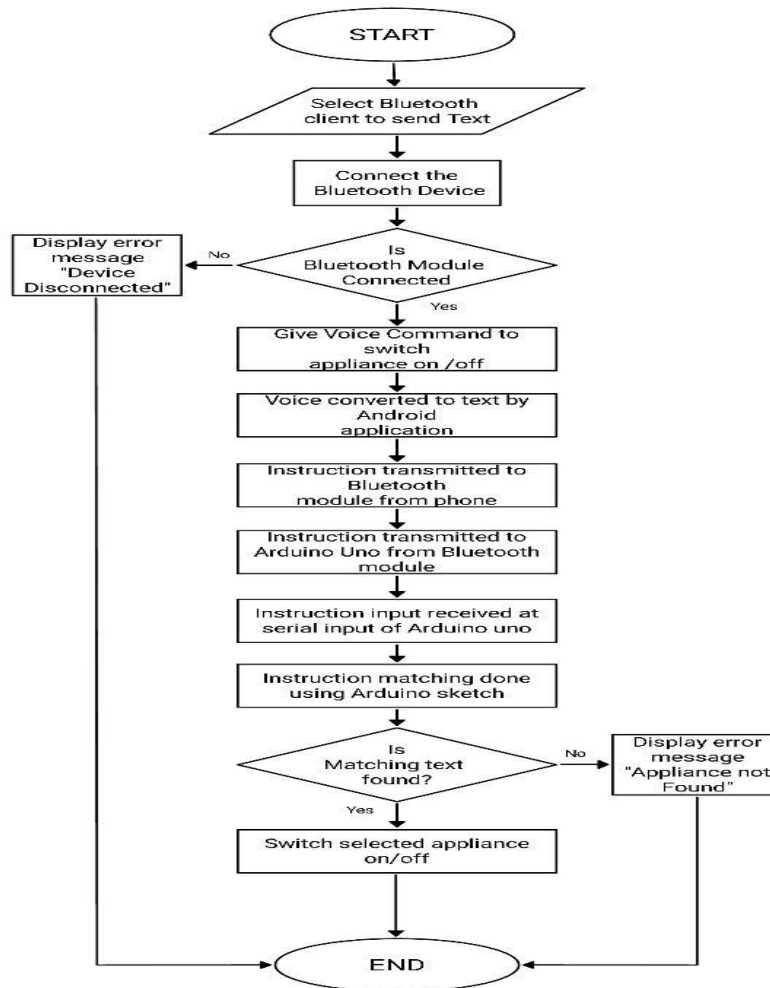
### Flowcharts



**FIGURE 3: Flowchart for Hand Gesture**

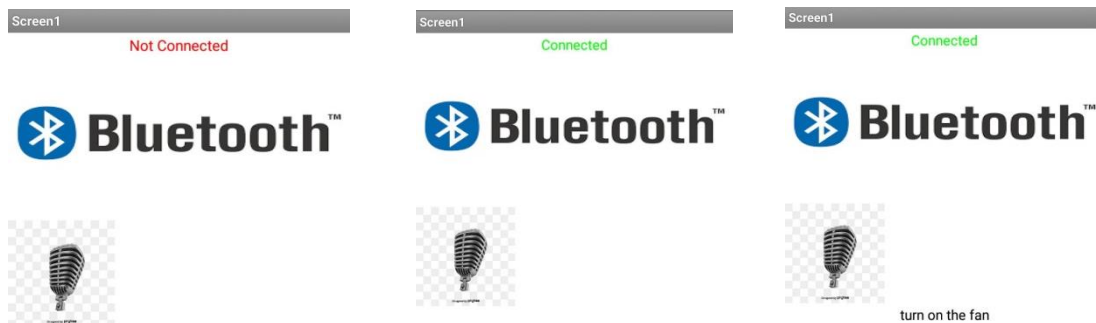


Fig.3. shows the flow of the hand gesture system. Firstly the gesture is recognized using the gesture sensor. The program has the specific values set for every gesture. The gesture is then detected whether it is left or right. This gesture is used for selection of the appliances. Once the appliances are selected, the up gesture is used for turning ON the appliances while the down gesture is used for turning OFF the appliances. The flowchart of the Voice recognition system is shown in Fig 4. Android application is built in according to the system requirement. Firstly the Bluetooth client is selected from the list. Once the client is selected, voice recognition process starts. An error message is displayed for no connection. After that the voice command is given and voice is converted into text by Android application. Instructions are transmitted to Bluetooth module and then it is given to serial input of Arduino Uno. Instructions are matched and appliances are turned ON/OFF whereas an error message of Application not found is displayed when the matching is not found.

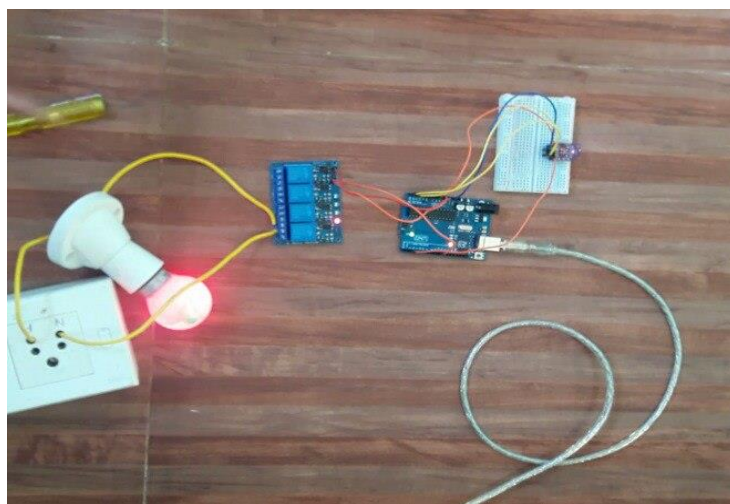


**FIGURE 4: Flowchart for voice recognition**

#### IV. RESULT



**FIGURE 5: Screenshots of mobile application**



**FIGURE 6: Hand Gesture Output**

#### V. CONCLUSION

In this framework, we have exhibited the plan and execution of a Home mechanization framework constrained by hand signals. The arrangement of motions utilized in the gestural interface was chosen after a careful report. While utilizing voice directions, care must be taken to have a commotion free condition. This framework functions admirably in the scope of 20m, as it is the range for the Bluetooth. This framework was focused for the older, physically tested and for the comfort of controlling the switches without really going after it. This framework has the degree for alterations, and more gadgets can be included.

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## Analysis of Self-Driving Vehicles

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**Abstract**— In Today's world, vehicles are used widely by humans. So, most of the biggest car manufactures are building their own version of self-driving vehicles using different technologies. Vehicles are focused to be automated to make human relax from driving. There is a race happening right now that stretches from Silicon Valley to Detroit and back: who can make an autonomous car that behaves better than a human driver? To get that same kind of understanding, automated cars need lots of information and data. And the two companies with the most information and data are Tesla and Waymo. Google, has started working on the self-driving cars since 2009 and still developing new changes to give a whole new update to the automated vehicles. Waymo- Google self-driving car project—stands for a new way forward in mobility was began in 2009. The idea described in this paper is taken from google and tesla cars. Self-Driving vehicles are trained to reach the destination by using the computerized maps. The other application is self-driving vehicle during the heavy traffic jam, hence relaxing driver from continuously pushing brake, accelerator or clutch. During the heavy traffic jam, taking and intelligent decisions is the major issue for the self-driving vehicles which aspect also has been consider in this paper.

**Keywords**—Automated driving, traffic jam, dynamic destination, self-driving, Car

### I. INTRODUCTION

Automated vehicle (AV) technology has advanced significantly in recent years. Car manufactures have already provided vehicles with some automated features like self-parking and accident avoidance features such as automated braking, road mapping, alerting human driver. At present, many vehicles on the road are considered to be semi-autonomous due to safety features like proper parking and braking mechanism, and a few have the features of automatic drive, brake, steer, and park themselves. Automated vehicle technology depends on GPS technology and advanced sensing systems that can detect road boundaries, signs and signals, and unexpected obstacles. In this paper it shows information about how the automatic vehicles can deal with traffic and can take a intelligent decisions about parking and changing of lanes. Autonomous vehicles are expected to bring with them a few different benefits, but the most important one is likely to be improved safety on the roads. The number of accidents caused by improper driving is likely to reduce, as cars loses its control like human drivers can. Self-driving cars also don't get drowsy, and they don't have to worry about being distracted by text messages or by passengers in the vehicle. And a computer isn't likely to get into an accident due to road rage. A 2015 National Highway Traffic Safety Administration report found that 94 percent of traffic accidents happen because of human error: By taking humans out of the equation, self-driving vehicles are expected to make the roads much safer for all.

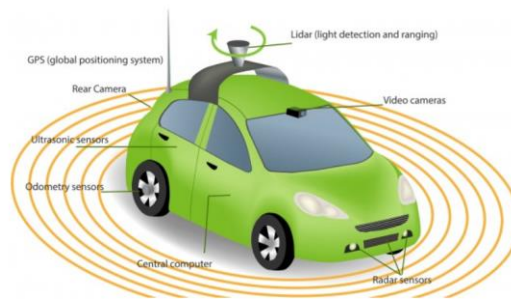
To accomplish a automated car must have an artificial intelligence system that examines its surroundings, processes the visual data to determine how to avoid collisions, operates car components like the steering and brake, and uses GPS to track the car's current location and route to proper destination. Companies like Google's Waymo put have put AI inside virtual cars and have the tested the vehicles to drive billions of miles throwing many perceivable obstacle and situation at the cars to see how they respond. There are various methods, algorithms and technology is used by automated vehicles to take human like intelligent decisions in traffic and avoid accidents.

## II. GOOGLE SELF-DRIVING CAR

Google has been testing its prototype car on US roads – it's yet to be test in the UK – and revealed some details about how its self-driving cars work.

	LEVEL 0 No Automation	LEVEL 1 Driver Assist	LEVEL 2 Partial Automation	LEVEL 3 Conditional Automation	LEVEL 4 High Automation	LEVEL 5 Full Automation
Who monitors the road?						
Steering, Acceleration, Deceleration						
Monitoring surroundings						
Fallback for self-driving failures						
Automation takes full control						
Examples	Ford Model T	Lane assist, cruise control, etc.	Tesla Autopilot, Nissan ProPilot Assist	Uber self-driving car	Waymo's autonomous vehicle	None

**FIGURE 1: Levels of Automation**



**FIGURE 2: Google waymo consists of different sensors**

Following are the technology used in Google self-driving car:

### 2.1 LIDAR

LIDAR is an acronym for Light Detection and Ranging, or Light Imaging, Detection and Ranging. LIDAR bounces light from objects to see where they are, just as radar uses radio waves and sonar uses sound. LIDAR systems sends out pulses of light outside of the visible spectrum and examine time how long it takes for them to bounce back. The time it takes for the light to reflect back from the object information the sensor how far away it is the object and what is its shape. The direction and distance between the LIDAR sensor and each detected object are then plotted on a 3D map called a 'point cloud' in to build up a detailed picture of the surroundings environment. While radar works for long distances, and sonar for short distances, LIDAR provides a is used for handy middle ground. The main component of Google's self-driving car is the rotating roof top camera mounted on top of the car, Lidar which is a laser range finder. With its array of 64 laser beams, this camera creates 3D images of objects to help the car see hazards object along the way. This device calculate how far is the object from the car by calculating the time taken for the laser beam to hit the object and come back. These high intensity lasers can calculate distance and plot the images of the objects in the range of 200m.

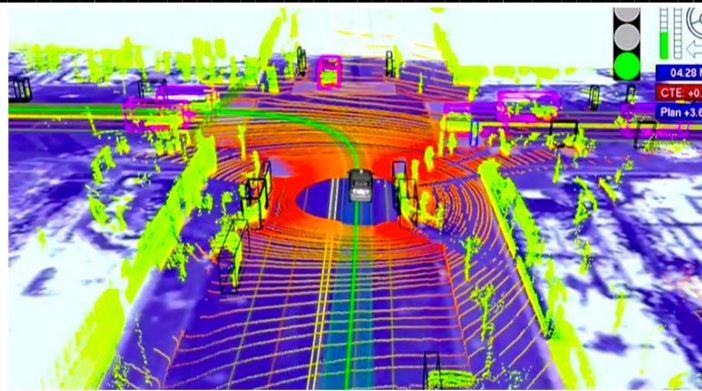


Image: Sebastian Thrun & Chris Urmson/Google

Google's self-driving car uses lidar to create 3D image of its surroundings.

**FIGURE 3: Google self-driving car uses lidar to create 3D image of its surroundings.**

## 2.2 FRONT CAMERA FOR REAR VISION

A camera mounted on the windshield provide the information about the objects available in front of the car. These objects can be pedestrians and other vehicles. This camera detects and records information about road signs and traffic signal lights, which is smartly interpreted by the cars in built software.

## 2.3 BUMPER MOUNTED RADAR

4 radars are mounted on the car's front and rear bumpers, that helps the car to get information of vehicles in front of it and behind it. The radar sensor on the vehicles bumpers keeps a continuous eye on the car ahead and back. The software inside a car is programmed to (at all times) maintain a distance of 2-4 seconds (it could even be higher) from the car ahead of it. So, with this technology the car will intelligently take decisions to speed up or slow down speed depend on the behavior of the car/driver ahead. Google's self-driving cars use this technology to keep passengers and other vehicles safe by reducing bumps and crashes

## 2.4 AERIAL THAT READ PRECISE GEO-LOCATION

An aerial present on the rear of the car receives information about the location of the car, thanks to GPS satellites. The inbuilt car's GPS navigation unit works along with the sensors and help the car to localize itself. But GPS signals may get low by several meters due to signal interferences and other atmospheric interference. To minimize this problem, the GPS data is compared with collected sensor map data from the same location. As the car moves, the car internal map is updated with new position information displayed by the sensors for the car.

## 2.5 ULTRA SONIC SENSOR ON REAR WHEEL

An ultrasonic sensor is present on one of the rear wheels that helps to keep track movement of car and will alert the car when there is obstacles in the rear. Cars that offer automatic Reverse Park Assist technology feature uses such sensors to help car to park itself into tight reverse parking spots. These sensors get activated when the car is get into the reverse gear.

## 2.6 DEVICES WITHIN CAR:

Altimeters, gyroscopes, and tachymeters are present inside the car that determine the very precise position of the car thanks to the various parameters they measure. This offers highly accurate information for the car to operate safely.

## 2.7 SYNERGISTIC COMBINING OF SENSORS:

All the data gathered by these sensors is combining and interpreted together by the car in built in software system to create a safe driving experience.



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### **2.8 PROGRAMMED TO INTERPRET COMMON ROAD SIGNS:**

The software in the car has been programmed to rightly interpret common road condition and motorist signs. For example, if a cyclist gestures that he intends to make a manoeuvre, the automated car understand it correctly and slows down to allow the motorist to turn. Predetermined shape and motion and gestures descriptions are programmed into the software to help the car make intelligent decisions. For example, if the car detects a 2-wheel vehicle and determines the speed of the vehicle as 10mph rather than 50 mph, the car instantly interprets that this vehicle is a bicycle and not a motorbike and behaves and take decision accordingly.

### **2.9 MAPPING IN ADVANCE:**

Before a self-driven car is tested, a regular manual car is driven along the route and collected information or maps out the route and its road conditions including poles, road markers, signs and more. This map information is fed into the car in built software which help the car to identify what is a regular part of the road. As the car moves, laser range finder send laser beam and generates a detailed 3D map of the surrounding at that moment. The vehicle compares this detailed 3Dmap with the default-existing map to find out the non-related aspects in the road, which can be pedestrians and/or other motorists identify by car, thus avoiding them.

### **2.10 PROGRAMMING REAL LIFE ROAD BEHAVIOR:**

Google engineers and developers have programmed some real-life behavior in these cars. The vehicles has also been programmed to advance ahead if it detects that the other vehicle is not moving.

## **III. TESLA ELECTRIC AND SELF-DRIVING CAR**

Tesla, Inc. Formerly known as (2003–17) Tesla Motors, American electric cars manufacturer. Tesla Motors was formed to develop an electric sports car. Tesla manufactured electric cars and have the feature of self-driving called as Autopilot. In Autopilot mode car itself drive and no human driver is needed.

Autopilot is optional auto driver assist system for Tesla cars that will turn the tesla electric cars into fully self-driving vehicles. When Autopilot is into action, cars can self-steer, adjust speed, detect nearby obstacles, apply brakes, and park. It uses a radar, cameras, ultrasonic sensors, and GPS. Currently, Autopilot is not considered as completely self-driving system. Autopilot is considered as Level 2 automated system by the US National Highway Transportation Safety Administration. Level 2 means autopilot is capable of combined auto functions like acceleration and steering but the driver presence must be there while driving. Enhanced Autopilot is the latest version of the Autopilot software, provides driver-assist features mainly designed to help with highway driving.

Tesla says Autopilot's sensors allow the inbuilt computer system to build a detailed image of its surroundings, allowing the car to detect distance from the object so to reduce possible collisions with vehicles, pedestrians, cyclists, animals, debris, and other obstacles. It can detect road markings, signs, and traffic signal lights. For drivers that opt for the Autopilot and Full Self-Driving Capability, systems in cars launched since October 2016 depends on the following sensors.

### **3.1 FORWARD-LOOKING RADAR**

The radar helps the autopilot to look 160m ahead of the car, through "sand, snow, fog--almost anything," according to Musk. Radar is the primary sensor that detect the vehicle's surroundings objects, along with the front-facing cameras.

### **3.2 EIGHT CAMERAS**

On the windshield of the car for forward facing cameras are present serve as a backup to the radar. The cameras consist of a narrow camera that observe footage 250m in front, a main camera that captures 150m in front, a wide-angle camera that captures 60m in front, and a camera that captures footage 80m in front and to the side of the car. The wide-angle camera is there to read road signs and traffic signal lights, allowing the car to react accordingly.

### **3.3 SONAR**

A 360-degree, ultrasonic sonar detects object in an eight-meter radius around the car. The ultrasonic sensors can spot objects like a human or a dog, and work at any speed. This feature can also detect objects in blind spots and inform or guide the car when automatically switching lanes

### 3.4 GPS

A satellite navigation system can detect the car's position on the road.



**FIGURE 4: Tesla self-driving car uses different sensors**

## IV. MACHINE LEARNING ALGORITHM IN AUTONOMOUS DRIVING

Autonomous cars are very closely related with Industrial IoT. Every person has a question how are these autonomous cars functions. What actually inside that the car to make them work without drivers taking control of the wheel. These days cars are made with a lot of sensors, actuators, and controllers. These devices are instructed by software sitting on various function-specific software running on ECUs (Electronic Control Units). Machine learning software is also included in this.

One of the main goals of any machine learning algorithm in the automated car is to continuously observe the environment and the prediction of possible changes to those surroundings. These tasks is divided into four steps:

Object detection.

Object Identification or recognition ie Object classification.

Object localization and prediction of movement.

Machine learning algorithms are used are of four type regression algorithms, pattern recognition, cluster algorithms and decision matrix algorithms.

### 4.1 REGRESSION ALGORITHMS

In Automated vechicles, images (radar or camera) play a very important role in localization and actuation of the object, and the biggest challenge for any algorithm is to develop an image-based model for feature selection and prediction. Regression algorithms that are used for self-driving cars are a Bayesian regression, neural network regression, and decision forest regression, among others.

### 4.2 PATTERN RECOGNITION ALGORITHMS (CLASSIFICATION)

Pattern recognition algorithms are good at observing and removing out unusual data points. Recognition of patterns in a data set is an primary step before the classification of the objects. These types of algorithms can also be called as data reduction algorithms. These algorithms help in reduction the data set by detecting object edges and fitting line segments (polylines) and circular arcs to the edges. Line segments are properly aligned to edges up to a corner, then a new line segment is started. Circular arcs are fit into sequences of line segments that will approximate an arc. The image features like line segments and circular arcs are combined in various ways to form the features that are used for recognizing an object.

### 4.3 CLUSTERING

It may happen that the classification algorithms may miss the object and fail to classify and report it to the system. The reason could be low-resolution images, few data points or discontinuous data. Clustering algorithm is good at discovering structure from data points. All methods are concerned with using the discovered structures in the data to organize the data into groups of maximum similarities. The most used type of algorithm is K-means, Multi-class Neural Network.

### 4.4 DECISION MATRIX ALGORITHMS

These algorithms are mainly used for decision making purpose. Whether a vehicle needs to take left turn or it needs to brake this decision depends on the level of confidence the algorithms have on the classification, recognition, and prediction of the next movement of objects. The mostly used algorithms are gradient boosting (GDM) and AdaBoosting.

## V. CONCLUSION

People still think that self-driving cars are not safe, but self-driving cars are made more and more accurate in intelligent decision making this getting more and more safe. Driverless vehicles will be the next step in transportation industry.

In Future almost we will find all the vehicles automated and there will be more improvement in the decision-making capability of the automated cars. In India due to road conditions, self-driving cars are not possible to drive, but in future there will be law and road conditions will be improved. Tesla has launched its electric vehicles and in various country it is running successfully. More improvement will be done in the field of software's system of the automated cars so that humans can completely rely on the automated cars and can do relax driverless driving.

## ACKNOWLEDGEMENTS

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## Mobile Cloning

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**Abstract**— The studies demonstrates how cell telephones are evolved with new changes via the development within the technologies. Mobile phone cloning is the copy of identification of 1 cellular telephone to every other cellular smartphone. The payments for the calls go to the original users/subscriber. Cloning is the method of taking all the secured information that is stored in an unique user's mobile phone and illegally programmed the identical facts into some other mobile phone discussed on this paper. The result is that the "cloned" mobile cellphone is capable of make and receive calls and all of the bill costs for the ones fraud calls are dispatched to the original user's/subscriber. The provider issuer community does not be capable of make distinction among the original cell smartphone or the "cloned smartphone". Nowadays tens of millions of mobile phones user's, makes use of global system for mobile communication (GSM) or Code division multiple access (CDMA) which have dangers of being mobile phones cloned. If personal identification number (PIN) and Electronic Serial number (ESN) are recognized, then the mobile smartphone can be cloned in seconds. Here we've got mentioned some professionals and cons about this generation. This generation is basically used by hackers to clone the mobile cellular phones of the consumer's to retrieve their records/credentials and they may be not aware of this reality. As a result, person's must face lot's of difficulties.

**Keywords**— Cloning, Code Division Multiple Access (CDMA), Electronic Serial Number (ESN), Global System for Mobile Communication (GSM), Personal Identification Number (PIN).

### I. INTRODUCTION

Mobile phones are very vital in our existence. Cell smartphone works on 3 e's of communication consisting of ease of use, financial and efficient. It's also very plenty worried in making fraud calls. The cell telephone as a hardware is difficult to make comfortable as a distinct manufacture are worried of their production [1]. The form of devices holds the special level of security amongst themselves. The safety methods in CDMA (Code Division Multiple Access) and GSM (Global System for Mobile Communication) cellular phones are different and equal because the loop hole in security of those mobiles. One of the essential security is cloning of cellular phones. It isn't handiest the big danger in India however different countries additionally. This paper will talk the outcome of cloning and additionally different methods to prevent cloning. Cloning is an unlawful practice of taking the records from a cellphone and makes use of this information for crook purposes[2]. The information is criminally programmed in any other cell phone. The second phone is referred to as "cloned" mobile. The cloned cellular is build and get calls and the prices for those calls are billed to valid/authentic users.



FIGURE 1: Selection of mobile phones that can be cloned

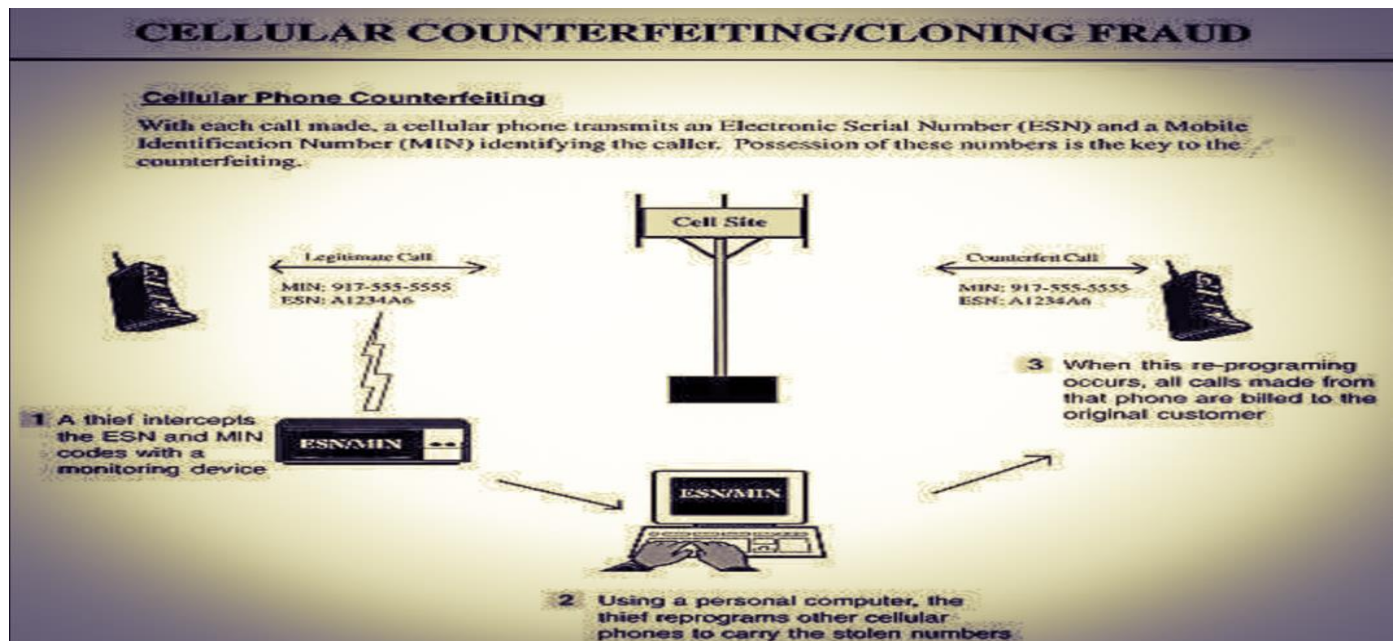
## II. HISTORY OF MOBILE CLONING

Cellphone cloning [1] started out in 1990 on Motorola bag telephones. It was on it's peak for the duration of mid of 90's and captured Motorola brick telephones which includes a classic, the extremely traditional and model 8000. Mobile phone cloning is carried out in excessive utilization vicinity a couple of service imparting and fraudulent environments. The loop hole on mobile cellphone permits the smooth cloning of mobile phones. ESN/MIN pair isn't always encrypted while using phone to the MISC cell switching middle for further authentication. Therefore, just by scanning ESN/MIN pair, the smartphone can be cloned. If both ESN or MIN is modified, the service company will take delivery of the call and invoice it to the valid person or provide the services blind to the reality that it isn't always a disconnected receiver.

In step with media reviews [3], these days the Delhi (India) police arrested someone with 20 mobile-phones, a laptop, a SIM scanner, and a writer. The accused turned into jogging an alternate illegally in which he cloned CDMA primarily based cell telephones. He used software program named Patagonia for the cloning and furnished cheap global calls to Indian immigrants in West Asia.

## III. HOW IS MOBILE CLONING DONE

Cloning involves editing or replacing the EPROM (Erasable Programmable read-only memory) inside the telephone with a new chip which could allow you to configure an ESN (digital serial wide variety) thru a software. You would also must change the MIN (Mobile Identification Number). whilst you had correctly modified the ESN/MIN [1] pair, your cellphone changed into an powerful clone of the alternative smartphone. Cloning required access to ESN and MIN pairs.



**FIGURE 2: Mobile phone cloning process**

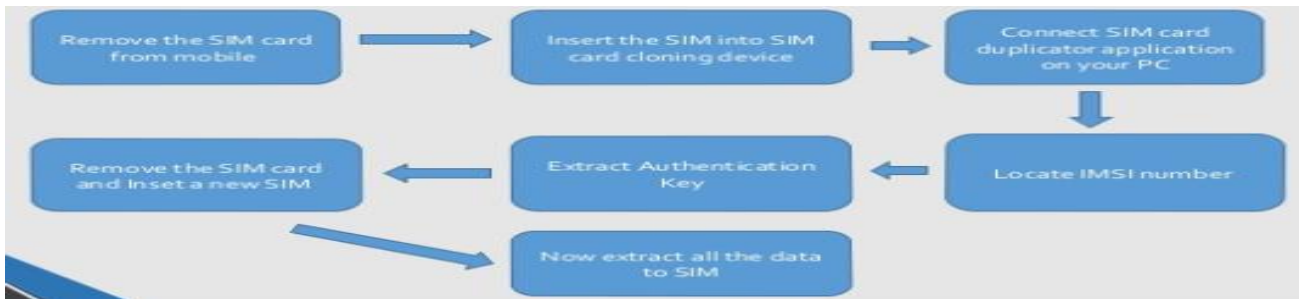
Cloning has been effectively established underneath GSM, however the manner is not clean. With technically state-of-the-art thieves, customers are fantastically helpless against mobile phone fraud. Normally they turn out to be aware of the fraud best as soon as receiving their phone payments. Carrier vendors have adopted sure measures to save you cell frauds.

### 3.1 Cloning GSM Mobile Phones

GSM handsets, on the opposite, are safer, consistent with specialists. Every GSM smartphone has a 15 digit digital serial variety (referred to as the IMEI) [4]. It isn't always a mainly secret little bit of information and also you don't need to take any care to maintain it personal. The important data is the IMSI, which is saved at the detachable SIM card that contains all of your



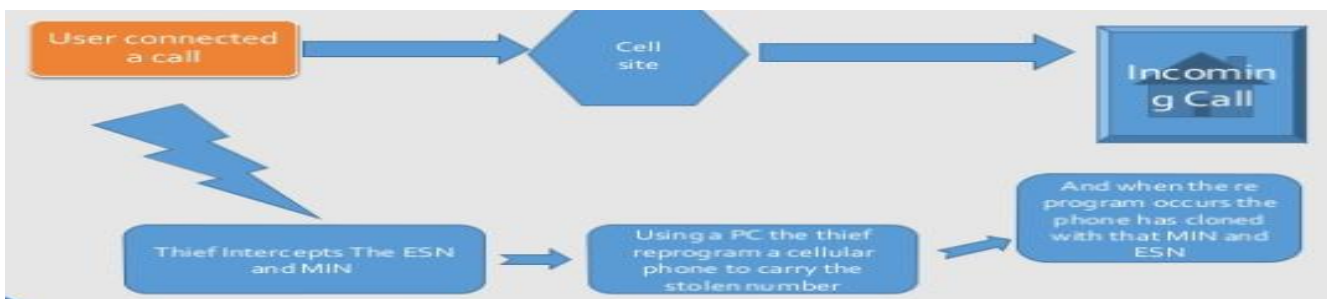
subscriber statistics, roaming database and so forth. GSM employs a reasonably state-of-the-art asymmetric-key cryptosystem for over-the-air transmission of subscriber records. Cloning a SIM the usage of information captured over-the-air is hard, though now not impossible. As long as you don't lose your SIM card, you're secure with GSM. GSM includes use the COMP128 authentication algorithm for the SIM, authentication middle and network which make GSM a much comfy technology. GSM networks also can be hacked. The procedure is straight forward : a SIM card is inserted right into a reader. After connecting it to the pc using statistics cables, the cardboard info are transferred into the pc. Then, the usage of freely to be had encryption software at the internet, the card information may be encrypted on to a blank clever card. The end result : A cloned cellular smartphone is ready to misuse.



**FIGURE 3: GSM cloning**

### 3.2 Cloning CDMA Mobile Phones

Cellular telephone thieves monitor the radio frequency spectrum and steal the cellular cellphone pair as it's far being anonymously registered with a cellular website. The technology makes use of spread-spectrum techniques to percent bands with more than one conversations. man or woman's information is likewise encrypted and transmitted digitally. CDMA handsets are especially susceptible to cloning. First era cellular mobile networks allowed fraudsters to tug subscription statistics (consisting of ESN and MIN) from analog air interface and use this records to clone phones. A tool known as as DDI (virtual facts Interface) can be used to get pairs through absolutely making the device cellular and sitting in a hectic traffic vicinity and acquire all of the information you want. The stolen ESN an MIN statistics had been the programmed into a present day CDMA handset, whose present application was erased with the assist of downloaded software program. The customer then programs them into new telephones in an effort to have the identical range as that of the original subscriber.[4]



**FIGURE 4: CDMA cloning**

However looking on the latest case, it is quite viable to clone both GSM and CDMA sets. The accused in Delhi case used software program called **Patagonia** to clone handiest CDMA phones (Reliance and Tata Indicom). However there are software packages that can be used to clone even GSM phones (e.g. Airtel, BSNL, idea). in order to clone a GSM phone, know-how of the worldwide mobile gadget identity (IMEI) or instrument number is sufficient.

### 3.3 What is Patagonia ?

Patagonia is a software program to be had in the marketplace that is used to clone CDMA cell telephones. Using this software program a cloner can take over the manipulate of CDMA cellphone i.e. cloning of smartphone. There are different software program's to be had in the marketplace to clone GSM cellular cellphone. This software program's are without difficulty



available inside the market. A SIM can be cloned time and again and they can be used at extraordinary places. Messages and calls despatched through cloned telephones can be tracked. However, if the accuses manages to clone the IMEI number of the phones, for which software program's are to be had, there's no way he may be traced.[4]

#### IV. METHOD OF DETECTING CLONED MOBILE PHONES

Here are diverse methods to hit upon cloned telephones at the networks :[1]

##### 4.1 Duplicate Detection

The network sees the same telephone in several places on the same time. Reactions include shutting all of them off in order that the real client will contact the operator due to the fact he misplaced the offerings he is deciding to buy, or tearing down connections in order that the clone customers will switch to any other clone however the real user will contact the operator.

##### 4.2 Velocity Trap

The cell phone appears to be moving at impossible, or maximum unlikely speeds. For example, if a name is first made in Helsinki (capital of Finland), and 5 minutes later, some other name is made however this time in Tampere (another town in Finland), there ought to be two telephones with the identical identification of the community.

##### 4.3 RF (Radio Frequency)

Fingerprinting is at the start a army technology. Even nominally identical radio system has a distinguishing "fingerprint", so the community software stores and compares fingerprints for all of the telephones that it sees. This way, it's going to spot the clones with the identical identification but one of a kind fingerprints

##### 4.4 Usage Profiling

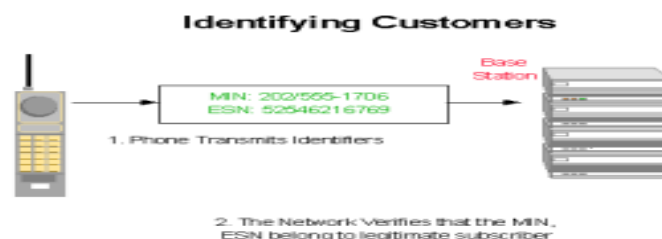
Profiles of customers' phone utilization are stored, and whilst differences are noticed, the patron is contacted. credit Card organizations use the identical method. as an example, if a consumer generally makes simplest neighborhood community calls however is putting calls to overseas countries for hours of airtime, it indicates a probable clone..

##### 4.5 Call Counting

Both the phone and the community preserve song of calls made with the telephone, and ought to range greater than the normally allowed as soon as call, service is denied.

##### 4.6 Pin Codes

Prior to placing a name, the caller unlocks the smartphone through entering a PIN code and then calls as usual. After the call has been completed, the consumer locks the telephone by getting into the PIN code again. Operators may additionally proportion PIN statistics to allow more secure roaming.



**FIGURE 6: Operators sharing PIN information**

## V. HOW CLONING CAN BE DETECTED ?

### 5.1. Following are the ways to check whether the mobile phone is cloned or not. [2]

Consumer's can generally find out whether someone has made a identical to your cell telephone by using paying close attention to the conduct in their cellular cellphone itself. If consumer receives frequent incorrect quantity call on their telephone or their cellular phone hangs up regularly and user is going through problem in placing outgoing calls then they need to understand that their mobile telephone is being cloned.

The following maximum crucial signal is your cell cellphone bill. If you be aware uncommon calls or texts seems on the cellphone bills of person and those calls had been now not made by means of users, or an usual growth in interest, you need to extract your provider issuer without delay.

### 5.2. Following are the different ways that help the service provider to detect whether the phone is cloned or not. [2]

Patron's can typically discover whether or not a person has made a equal to your cell smartphone by the use of paying near attention to the behavior in their cellular cellular telephone itself. If consumer gets common incorrect quantity call on their smartphone or their mobile telephone hangs up frequently and person goes thru problem in placing outgoing calls then they need to remember the fact that their cell cellphone is being cloned.

The subsequent maximum crucial signal is your cell cellular telephone bill. in case you be conscious unusual calls or texts seems at the cellular telephone bills of individual and those calls had been no longer made by means of customers, or an typical increase in interest, you want to extract your company provider at once. A cloned mobile phone may have same numeric identity but a exceptional radio fingerprint. The radio finger printing is commonly utilized by cellular phone operator to prevent mobile smartphone cloning. If the service issuer spots the equal fingerprint of one existing unit, it quickly suspends the provider. The pattern of customers is studied and if any difference is discovered the patron is contacted for this kind of motive.

Every cell cellphone data the logs of applied services. The service company also maintains the tune of same logs. If the telephone is cloned then there is difference among the log record of organization and subscriber.

## VI. HOW TO PREVENT CLONING ?

Carrier providers have adopted positive measures to prevent cell fraud. Those include **encryption, blocking off, blacklisting, person verification and site visitors evaluation**. [6]

Blacklisting of stolen telephones is some other mechanism to save you unauthorized use. A system identity sign in (EIR) permits community operators to disable stolen mobile phones on networks round the sector.

User verification the usage of non-public identity quantity (PIN) codes is one approach for purchaser safety towards mobile cellphone fraud. Assessments carried out have proved that United States of America determined that having a PIN code decreased fraud by using greater than 80%.

Visitors evaluation detects mobile fraud by using using synthetic intelligence software program to come across suspicious calling styles, which includes a sudden increase within the duration of calls or a sudden increase within the quantity of global calls.

The software program also determines whether or not it's miles bodily feasible for the consumer to be creating a call from a current area, primarily based on the place and time of the preceding name. currently, South Africa's two provider companies, MTN and Vodacom, use site visitors evaluation with the international Mobile system identity (IMEI) – a 15 digit range which acts as a unique identifier and is commonly imprinted on the returned of the cellphone beneath the battery – to hint stolen mobile phones.

## VII. ADVANTAGES AND DISADVANTAGES

### 7.1 Advantages [5]

**7.1.1** If your phone has been misplaced, you may use your cloned cellular smartphone.

**7.1.2** In case your smartphone got broken or if you forgot your cellphone at home or some other place, Cloned cellphone can be very useful.

### 7.2 Disadvantages [5]

**7.2.1** It could be used by the terrorists for crook activities.

**7.2.2** It can be utilized by the cloner for fraud calls and for illegal money transfer.

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## VIII. CONCLUSION

In nowadays's technology where cell phone is one of the critical additives of our existence, the threats and threat associated with its safety are growing at a higher tempo. The cellular smartphone as a tool is itself now not secure because the replica of cellular telephones can be without problems generated [12]. In United Kingdom and US the mobile phone cloning changed into entered in 1998 but in India, its miles still growing and entered in 2005. The future elements to shield the mobile telephones are very high as now crimes related to cellular phones are regarded. It can also assist to remedy criminal cases.

To conclude, mobile phone communication is one of the most reliable, green and significant. The usage of the gadget can be changed in both positive and negative approaches. Lamentably due to the security requirements it's far very smooth to break and additionally takes very less amount of time. [14] Furthermore, cloning can be effortlessly increased and also can be applied without difficulty. Consequently, it have to be considered that the security which is currently used isn't pleasant to secure the gadget in future. So it is very essential to confirm the working of safety machine time-to-time and also should exchange or update it over each month or year as soon as. Preventing steps ought to be taken by means of the community provider and the government to prosecute crime associated with cellular telephones isn't always regarded.

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# Nanobot Drones : The Future Of Warfare

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**Abstract**— This text shows the nanobots drones and their use in way forward for warfare. First there was discussed construction of the drone, which the foremost important elements are frame, propellers, engine, system of power the electronic control and communication system. A drone is powered by batteries, which is that the major drawback, because it's exhausted after quarter-hour of flight, causing a decrease drone the bottom. Some decades ago, nanoscale machines called "nanorobots" (better referred to as "nanobots") were only in fantasy. Today, they're expected to be subsequent generation of nanodevices and to vary the technology regarding Drug inducing and Surveillance. The aim of this review is to explain the nanobots drones, the technology and advances and in additional detail the applications regarding Significantly better armor. Military nanobot drones differ from civil of size and drive. They're bigger and powered by combustion engines. Nanobot is nanoscale (below many 10-9 meter) machines or robots - which may be autonomous or controlled. However, war is about far more than combat or how we fight. As nanobots drones relieve humans of their jobs, some societies will prove better prepared than others in their use of education and infrastructures for transitioning workers into new, socially sustainable and economically productive ways to form a living. Within the same ways in which technology research and development drove the space race and nuclear race, a race for nanobots drones is happening.

**Keywords**— Construction, Drones, Military Nanobot Drones, Nanobots, Warfare.

## I. INTRODUCTION

The primary scientist to mention the time period "nanobots" changed into the physicist Richard Feynman in 1959; when he gave his popular communicate named "There's many Room at rock bottom. Later, the scientist Eric Drexler, stimulated through the speak, published his ebook "Engines of advent", in which genetically programmed molecular machines had been mentioned as upcoming technologies in mobile biology. The primary take a look at concerning nanobots changed into made by Robert Freitas. Nanobot Drones is probably defined as a controllable nanoscale machine composed of a sensor and a motor, capable by way of appearing unique duties. Those aren't like a drone, instead are greater nearly like a fancy piece of fabric. Robert wooden described them as gadgets that hit upon pals or enemies; present process thru a conformational change after they experience an enemy, catalyzing the release of a substance with a view to act towards it. Drones are part of conflict since the nineteenth century, arguably, while the Austrians used pilotless warm-air balloons to bomb Venice. Development of pilotless flying machines like the ones operated these days started nearly as quickly because the Wright brothers demonstrated powered flight with the primary faraway planes advanced during the primary warfare. Nanobot Drones are applied in situations in which manned flight is taken into consideration too risky or difficult. They supply troops with a 24-hour "eye within the sky", seven days each week. Every plane can stay aloft for up to 17 hours at a time, loitering over a community and sending returned real-time imagery of sports on the lowest. Unmanned generation advanced inside the interwar length. The time period drone itself began for use at this point, after the UK evolved the queen, a bi-aircraft converted to be managed with the aid of radio from the lowest. Like many army drones at that factor, the queen was a foreign controlled target for anti-aircraft gunners to use for exercise. Others, which includes the infamous Nazi V1 "Doodlebug," had been nevertheless essentially guided bombs - primitive versions of these day's cruise missiles. Drones were still best a wonderful segment generation in the course of the war.

### 1.1 NANOBOT DRONES PROPERTIES

Nanobots are often produced using natural materials like proteins and polynucleotides, or inorganic substances like metals or diamond. Within the case of diamond, this sticks out for its excessive power and high overall performance. Metals may want to have double functions, for instance silver. It are frequently the lowest of a nanobot drone and to possess an antibacterial impact. In some cases, they'll act as a pandemic inflicting irreversible cell damage. The floor properties of the nanobot drones are a key component to define the solubility and interactions with different macromolecules or cell surfaces. Length or form of a nanobot drone will affect directly their movement, permeabilization and reactivity. Special extracellular nanostructures might be used as model. Counting on the gas used, the propulsion mechanism are regularly biocompatible or now not.

### 1.2 PARTS

One of the most hobbies for the studies of nanobot drones in conflict has been to develop ammunitions focused on the perfect factor where it is wished, with the thought of minimizing the effect on conflict fields. This concept shows having nanobot drones designed to come across and mobilize to a decided component struggle field in which the matter is determined and, in the first-class state of affairs, send comments. Due to those determinant obligations (locate and mobilize), devices are frequently diagnosed as vital: sensors and propulsion system; and from this data it are often deduced some other gadgets are going to be wished additionally, like strength elements and molecular computer systems, without except for gadgets to broaden a specific project like garage booths or manipulators.

### 1.3 SENSORS

Sensors are one some of the main critical parts in nanobots. Mechanical, thermal, optical, magnetic, chemical and biological sensors are tested in nanobots applications. Any sensor that makes use of a nanoscale phenomenon for its operation is classed as a nanosensor. At the natural part, biosensors utilize organic reactions for detecting target analytes, and considering the want to accomplish the target elements goals of nanobots in conflict, this form of sensors are the foremost evident devices to discover within the quarter of nanorobotics. A obvious instance of this kind of sensors is that using nano cantilevers as a Nano Electro system (NEMS). This approach utilizes biological fabric so one can be attached by using itself to a covered cantilever, inflicting essential adjustments in mass or its bodily phenomenon.

However, generally terms, sensors offer functions to the surface, detecting the presence of the target molecules and indirectly realize the amount of injury that exists from the change inside the useful homes of nanobot drones. Therefore, many kinds of sensors had been advanced in feature of the goal molecules which can be desired to be detected, moreover, it is been verified that they own a excessive and speedy evaluation of a while. The cantilevers are characterised via their excessive sensitivity in supplying an honest atomic resolution in the picture of a selected surface, in order that they're normally utilized in atomic pressure microscopy (AFM). Presently, utilizing the AFM as an effector, nano-cantilevers are being evolved as sensors to be utilized in nanobots drones. The most gain is actual-time detection, at once and quick. Moreover, they're geared up to degree mobile mass, biomolecules, nucleic acids et al., additionally as detecting unique molecules or maybe manipulate and region nanoobjects during a predefined association. Generally, it are frequently wont to govern gadgets at a single-molecule degree.

Cantilevers can perform in two distinct methods: dynamic mode and static mode. Within the first case, the cantilevers solution the biochemical interactions of the floor via a exchange inside the resonance frequency, which is caused by the mass or stress of the target molecule. This way, the frequency is hired to investigate the topography of the floor, and stumble on the numerous molecular bonds. On the alternative hand, operating in static mode relies at the absorption of determined analytes from a nonmoving cantilever, which causes differential floor stress (bending) and therefore, deflection regarding the point of reference. This differential surface strain defines the relationship among the sensor and consequently the analyte.

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## **II. NANOBOT DRONES CONSTRUCTION**

Nanobot Drone is composed of principal systems:

1. Motion device
2. Manipulate machine..

### **2.1 MOVEMENT SYSTEM**

#### **2.1.1 FRAME**

The primary detail of a nanobot drone may be a body, which must be maximum light. The category of frame construction is particularly supported the quantity of fingers. Way to the amount of palms and therefore the cars used the drones are regularly divided into:

1. Bicopters – 2 engines,
2. Tricopters – 3 engines,
3. Quadrocopters – 4 engines,
4. Hexacopters – six engines,
5. Octocopters – 8 engines.

It's miles commonly identified that the development with extra palms allows for a greater solid flight. The body is formed of carbon material 3K.

#### **2.1.2 PROPELLERS AND ENGINE**

The following additives of a nanobot drone are engine and propellers. They represent the maximum system of a nanobot drone and are subjected to the very high-quality loads, therefore their sturdiness is extraordinarily vital. The propellers alternate a torque (derived from the engine) for a bit used for lifting the car inside the air. Way to the propeller device in connection with the flight route it are often divided into the following sorts:

1. + – One is that the main propeller (as a minimum four propellers),
2. X – The foremost not unusual creation, during which propellers are main (with a terrific range of propellers),
3. Y – 3 arms stacked in the Y, where one or hands are often main,
4. V – Very uncommon arrangement in the course of which propellers lead onto outstretched palms.

## **III. MILITARY NANOBOT DRONES**

An instance of the army nanobot drones is DJI Mavic 2 pro, which belongs to the UAV (Unmanned Aerial automobile). DJI introduced in August 2018, the Mavic 2 seasoned and consequently the Mavic 2 Zoom. Both drones consisted of 10 obstacle avoidance sensors on all facets and a max flight time of 31 mins. Both of the drones may also record 4K video at 30 FPS. The Mavic 2 Zoom capabilities a four× zoom characteristic (2× optical and a pair of× digital), and also featured a 12-megapixel camera. The Mavic 2 seasoned capabilities a four× Hasselblad digicam and Hyper Timelapse characteristic. Additives of the nanobot drone are as follows:

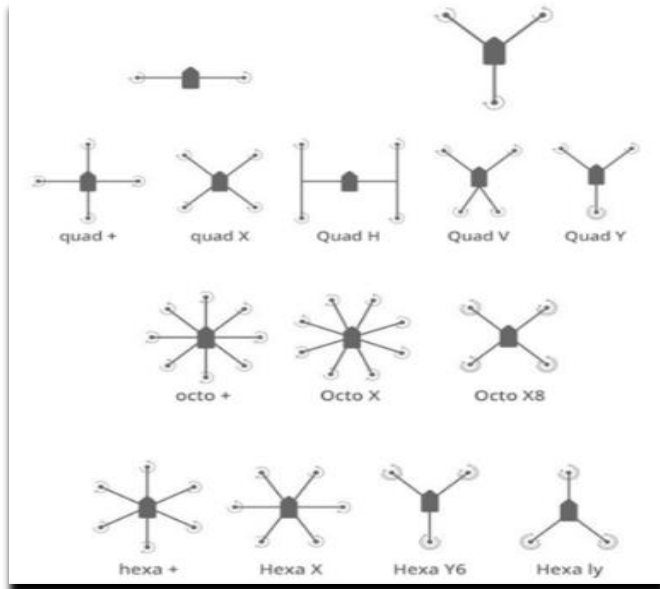
1. Most speed (recreation mode, no wind) : 45 MPH / 72 km/h / 20 m/s,
2. Maximum velocity (P-Mode) : 30 MPH / forty eight km/h / 13.4 m/s,
3. Empty weight (grams) : 907 (max takeoff weight),
4. Flight time : ~31 mins,
5. Practical flight time : ~29 mins,
6. Operating temperature (°C) : 14° to 104 °F (-10° to 40 °C).



Floor manage station typically placed on a truck, which housed the position of the pilot, the operator of sensors or guns and an antenna with a diameter of 6.1M with add-ons.

This enables verbal exchange among drones and communication machine station. The benefit of predators is their smooth delivery, because they will be disassembled into six parts

#### IV. MATERIAL AND METHOD



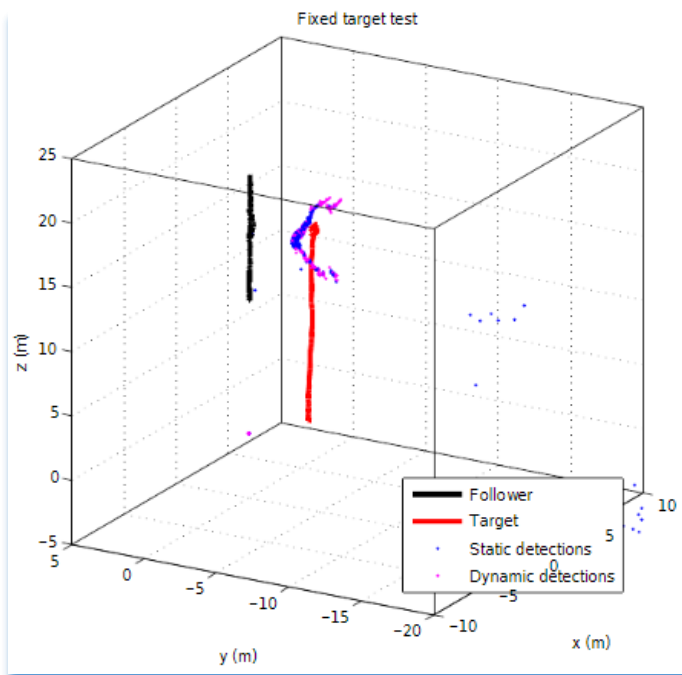
**FIGURE 1: Possible solutions of frame construction.**



**FIGURE 3: DJI MAVIC 2 PRO**

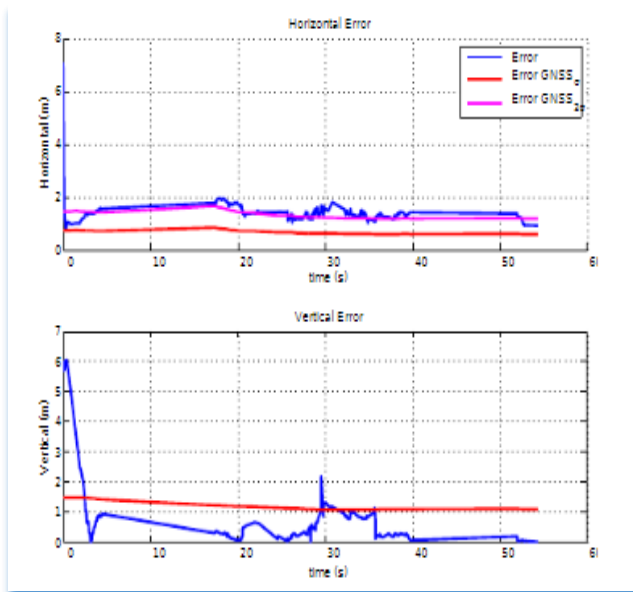


**FIGURE 2: DJI Inspire 2**



**FIGURE 4: Target Localization test.** The target drone ascends and flies at a fixed position, the follower drone flies up and down reading the shown reflections.

**FIGURE 5: Target Localization test.** Errors in the vertical and horizontal directions of the data fusion process.



**FIGURE 6: Estimated Investment In Nanobot Drones Hardware at Global Level.**



**TABLE 1**  
**COMPARISON BETWEEN NANOBOTS DRONES**

Sr. No.	Feature	DJI Mavic 2 Pro	DJI Inspire 2
01.	Dimensions	3.3 x 3.6 x 8.4 inches	12.5 x 16.7 x 16.7 inches
02.	Weight	2 lb	7.3 lb
03.	Range of Rotors	4	4
04.	Camera Type	Integrated with Gimbal	Integrated with Gimbal
05.	Video Resolution	1080p, 4K, 2.7K	1080p, 4K, 5.2K
06.	Megapixels	20 MP	20 MP
07.	Media Layout	microSD, micro SDHC, micro SDXC	microSD, micro SDHC, micro SDXC
08.	Faraway Manage Kind	Dedicated with App	Committed with App
09.	Live Video Feed	1080p	720p
10.	Automated Flight Features	Return-to-Domestic, Orbit, Waypoint, Observe	Go Back-to-Home, Orbit, Waypoint

**TABLE 2**  
**COMPARISON BETWEEN NANOBOTS DRONES WITH ADVANTAGES AND DISADVANTAGES**

Sr. No.	Nanobots Drones	Advantages	Disadvantages
01.	Constant wing (Ag Eagle RX60 in flight)	The everyday flight time can be a pair hours and may work as much as a powerful sixteen hours or extra if the drone is inner-combustion engine powered.	Fixed wing drones are regularly highly-priced..
02.	Single Rotor on the wing	Single rotor drones are prepared to hover vertically inside the air.	Single rotors are harder to fly than multi-rotor drone kinds.
03.	Multicopter (DJI™ Phantom 3 in flight)	Multi-rotor drones are smooth control and maneuver.	Multi-rotors have a constrained flying time (usually 15-30 minutes).

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## V. CONCLUSION

In this paper, I even have provided initial outcomes of nanobots drones in the manner forward for conflict. The nanobots drones are not a notion written on paper anymore, they're presently beneath improvement. The additives are sensors, propulsion and navigation structures. These days, the studies is specially concentrate on nanomotors; a key a part of the propulsion element. Chemically, magnetic and acoustic driven nanomotors are produced and carried out; ordinarily within the subject of struggle. However, for struggle field, a critical effort must be wiped out technology supported fuel free and biocompatible techniques. There's tons of research, however it's getting to be needed lots greater so that it will make a practical nanobot, geared up to accomplish obligations useful for the man or women; floor modifications, systems, components and frame response has were given to be understood. Moreover, we have become to integrate a digicam so one can assist the identification of drones, avoiding possible erroneous identification of big birds as drones, and eventually assist in statistics fusion in favorable light situations.

## ACKNOWLEDGEMENTS

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# Machine Learning: available approaches, problems and solution

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**Abstract**—Humans learn from their past experiences, and machines follow instructions given by humans. But what if humans can train the machine to learn from past data and to what humans can do act much faster well that's called machine learning. But it is lot more than just learning, its also about understanding and reasoning. Machine learning can change your life provided you know how to implement right model with right algorithm. There are many approaches available to machine learning such as support vector machine, decision tree learning, Bayesian networks and many more. This paper focuses on decision tree learning, association rule learning, support vector machine, their problems and solution..

**Keywords**—approaches, association rule, decision tree learning, machine learning, support vector machine.

## I. INTRODUCTION

Over the past two decades Machine Learning has become one of the mainstays of information technology and with that, a rather central, albeit usually hidden, part of our life. With the ever increasing amounts of data becoming available there is good reason to believe that smart data analysis will become even more pervasive as a necessary ingredient for technological progress. Arthur Samuel (1959) o Machine learning: "Field of study that gives computers the ability to learn without being explicitly programmed". Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves.. The primary aim is to allow the computers learn automatically without human intervention or assistance and adjust actions accordingly. The complexity in traditional computer programming is in the code (programs that people write). In machine learning, algorithms (programs) are in principle simple and the complexity (structure) is in the data. Is there a way that we can automatically learn that structure? That is what is at the heart of machine learning. That is, machine learning is about the construction and study of systems that can learn from data. This is very different than traditional computer programming. In this paper we will see what are supervised machine learning approaches, their problems and solution.

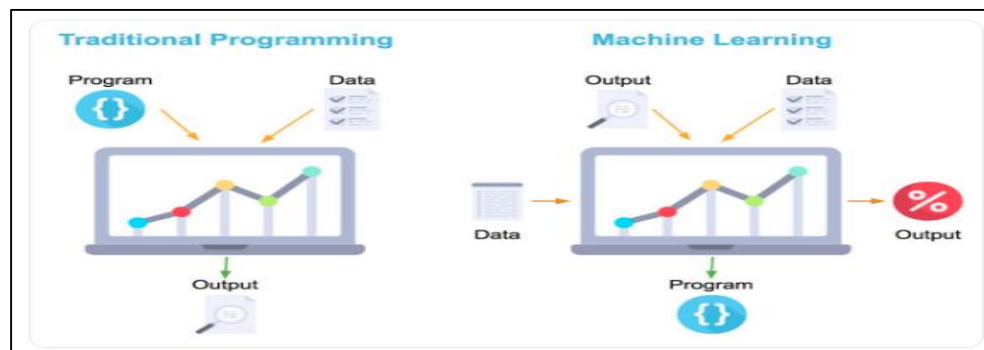


Figure. Programming vs Machine Learning

## II. TYPES OF LEARNING ALGORITHMS

### Supervised learning

Supervised learning is the machine learning task of learning a function that maps an input to an output based on example input-output pairs. Applications in which the training data comprises examples of the input vectors along with their corresponding target vectors are known as supervised learning problems.

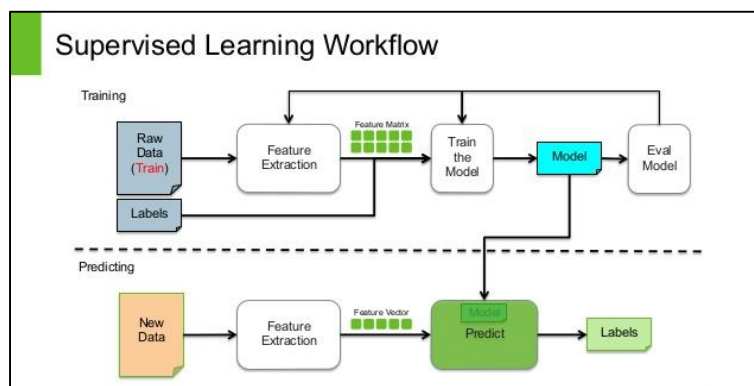
### Unsupervised learning

Unsupervised learning is a type of self-organized Hebbian learning that helps find previously unknown patterns in data set without pre-existing labels. In unsupervised learning, there is no instructor or teacher, and the algorithm must learn to make sense of the data without this guide.

### Reinforcement learning

Reinforcement learning (RL) is an area of machine learning concerned with how software agents ought to take actions in an environment in order to maximize some notion of cumulative reward. Reinforcement learning is learning what to do — how to map situations to actions—so as to maximize a numerical reward signal. The learner is not told which actions to take, but instead must discover which actions yield the most reward by trying them.

## III. SUPERVISED LEARNING –INTRODUCTION



Supervised learning is when the model is getting trained on a labelled dataset. Labelled dataset is one which have both input and output parameters. In this type of learning both training and validation datasets are labeled.

Training the system-

While training the model, data is usually split in the ratio of 80:20 i.e. 80% as training data and rest as testing data. In training data, we feed input as well as output for 80% data. The model learns from training data only. We use different machine learning algorithms(which we will discuss in detail in next articles) to build our model. By learning, it means that the model will build some logic of its own. Once the model is ready then it is good to be tested. At the time of testing, input is fed from remaining 20% data which the model has never seen before, the model will predict some value and we will compare it with actual output and calculate the accuracy.



### TYPES OF SUPERVISED LEARNING

User ID	Gender	Age	Salary	Purchased	Temperature	Pressure	Relative Humidity	Wind Direction	Wind Speed
15624510	Male	19	19000	0	10.69261758	986.882019	54.19337313	195.7150879	3.278597116
15810944	Male	35	20000	1	13.59184184	987.8729248	48.0648859	189.2951202	2.909167767
15668575	Female	26	43000	0	17.70494885	988.1119385	39.11965597	192.9273834	2.973036289
15603246	Female	27	57000	0	20.95430404	987.8500366	30.66273218	202.0752869	2.965289593
15804002	Male	19	76000	1	22.9278274	987.2833862	26.06723423	210.6589203	2.798230886
15728773	Male	27	58000	1	24.04233986	986.2907104	23.46918024	221.1188507	2.627005816
15598044	Female	27	84000	0	24.41475295	985.2338867	22.25082295	233.7911987	2.448749781
15694829	Female	32	150000	1	23.93361956	984.8914795	22.35178837	244.3504333	2.454271793
15600575	Male	25	33000	1	22.68800023	984.8461304	23.7538641	253.0864716	2.418341875
15727311	Female	35	65000	0	20.56425726	984.8380737	27.07867944	264.5071106	2.318677425
15570769	Female	26	80000	1	17.76400389	985.4262085	33.54900114	280.7827454	2.343950987
15606274	Female	26	52000	0	11.25680746	988.9386597	53.74139903	68.15406036	1.650191426
15746139	Male	20	86000	1	14.37810685	989.6819458	40.70884681	72.62069702	1.553469896
15704987	Male	32	18000	0	18.45114201	990.2960205	30.85038484	71.70604706	1.005017161
15628972	Male	18	82000	0	22.54895853	989.9562988	22.81738811	44.66042709	0.264133632
15697686	Male	29	80000	0	24.23155922	988.796875	19.74790765	318.3214111	0.329656571
15733883	Male	47	25000	1					

Figure A: CLASSIFICATION

Figure B: REGRESSION

1. Classification : It is a Supervised Learning task where output is having defined labels(discrete value). For example in above Figure A, Output – Purchased has defined labels i.e. 0 or 1 ; 1 means the customer will purchase and 0 means that customer won't purchase.

Example: Gmail classifies mails in more than one classes like social, promotions, updates, forum.

2. Regression : It is a Supervised Learning task where output is having continuous value. Example in above Figure B, Output – Wind Speed is not having any discrete value but is continuous in the particular range. The goal here is to predict a value as much closer to actual output value as our model can and then evaluation is done by calculating error value. The smaller the error the greater the accuracy of our regression model.

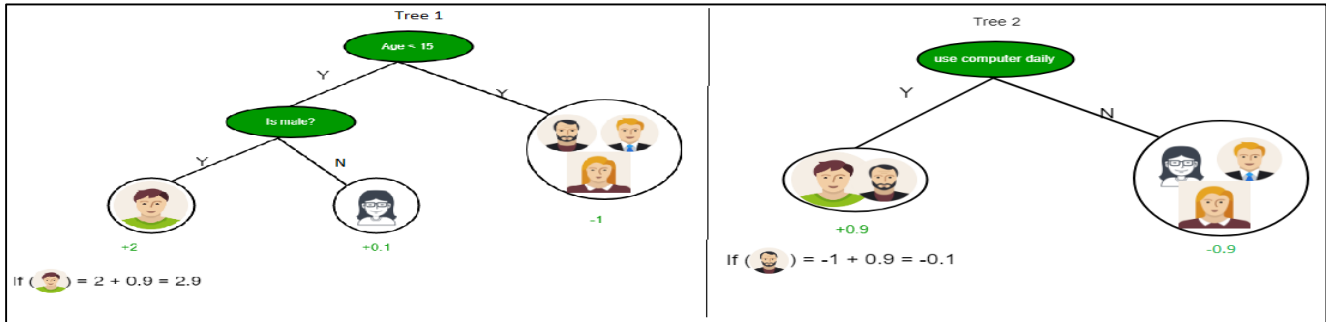
### 3.1 DECISION TREE LEARNING

Decision tree algorithm falls under the category of supervised learning. They can be used to solve both regression and classification problems. Decision tree uses the tree representation to solve the problem in which each leaf node corresponds to a class label and attributes are represented on the internal node of the tree. We can represent any boolean function on discrete attributes using the decision tree. Decision tree is the most powerful and popular tool for classification and prediction. A Decision tree is a flowchart like tree structure, where each internal node denotes a test on an attribute, each branch represents an outcome of the test, and each leaf node (terminal node) holds a class label. A tree can be "learned" by splitting the source set into subsets based on an attribute value test. This process is repeated on each derived subset in a recursive manner called recursive partitioning. This recursion is completed when the subset at a node all has the same value of the target variable, or when splitting no longer adds value to the predictions. The construction of decision tree does not require any domain knowledge or parameter setting, and therefore is appropriate for exploratory knowledge discovery. Decision tree classifier has good accuracy.

### Top-Down Algorithmic Framework for Decision Trees Induction.

```

TreeGrowing (S,A,y)
Where:
S - Training Set
A - Input Feature Set
y - Target Feature
Create a new tree T with a single root node.
IF One of the Stopping Criteria is fulfilled THEN
    Mark the root node in T as a leaf with the most
    common value of y in S as a label.
ELSE
    Find a discrete function f(A) of the input
    attributes values such that splitting S
    according to f(A)'s outcomes (v1,...,vn) gains
    the best splitting metric.
    IF best splitting metric > threshold THEN
        Label t with f(A)
        FOR each outcome vi of f(A):
            Set Subtreei = TreeGrowing (σf(A)=viS,A,y).
            Connect the root node of tr to Subtreei with
            an edge that is labelled as vi
        END FOR
    ELSE
        Mark the root node in T as a leaf with the most
        common value of y in S as a label.
    END IF
END IF
RETURN T
  
```



In the above image we are predicting the use of computer in the daily life of the people. In decision tree the major challenge is identification of the attribute for the root node in each level. This process is known as attribute selection. We have the following approach to solve attribute selection measure.

#### Entropy-

Entropy is the measure of homogeneity in the data. Its value is ranges from 0 to 1. Its value is close to 0 if all the example belongs to same class and is close to 1 if there is almost equal split of the data into different classes. Now the formula to calculate entropy

$$Entropy(S) = \sum_{i=1}^c -p_i \log_2 p_i$$

Information gain -

Information Gain measure the reduction in entropy by classifying the data on a particular attribute. The formula to calculate Gain by splitting the data on Dataset 'S' and on the attribute 'A' is :

$$Gain(S, A) = Entropy(S) - \sum_{v \in Values(A)} \frac{|S_v|}{|S|} Entropy(S_v)$$

### 3.1.1 PROBLEM IN DECISION TREE LEARNING: OVERFITTING

Now the main problem with decision tree is that it is prone to overfitting. We could create a tree that could classify the data perfectly or we are not left with any attribute to split. This would work well in on the training dataset but will have a bad result on the testing dataset.

Over-fitting is the phenomenon in which the learning system tightly fits the given training data so much that it would be inaccurate in predicting the outcomes of the untrained data. During the data classification process, some branches of the decision tree may contain noise or outliers in the training data and these results in a complex tree which is difficult to understand. In decision trees, over-fitting occurs when the tree is designed so as to perfectly fit all samples in the training data set. Thus it ends up with branches with strict rules of sparse data. Thus this effects the accuracy when predicting samples that are not part of the training set. One of the methods used to address over-fitting in decision tree is called pruning which is done after the initial training is complete[1].

### 3.1.2 SOLUTION TO THE PROBLEM : PRUNING

Pruning techniques are applied in order to remove those unwanted branches with the aim of improving the accuracy, also removing non-productive parts of the tree results in less complex tree with small size.

There are two main pruning approaches: post-pruning and pre-pruning approaches. Post-pruning is implemented after the tree is grown. In practice, post-pruning methods have better performances than pre-pruning. In pre-pruning, pruning is implemented during the tree building process and tries to stop the process when over-fitting is encountered. Hence, it prevents the generation of non-significant branches but suffers from horizon effect. Pre-pruning method navigates the tree in a top-down approach while post-pruning navigates the tree in a bottom-up approach. Nevertheless, in term of simplification and complexity post-pruning algorithm is more robust since it has access to the full tree.

Employing tightly stopping criteria tends to create small and under-fitted decision trees. On the other hand, using loosely stopping criteria tends to generate large decision trees that are over-fitted to the training set. Pruning methods originally suggested in (Breiman et al., 1984) were developed for solving this dilemma. According to this methodology, a loosely stopping criterion is used, letting the decision tree to overfit the training set. Then the over-fitted tree is cut back into a smaller tree by removing sub-branches that are not contributing to the generalization accuracy. It has been shown in various studies that employing pruning methods can improve the generalization performance of a decision tree, especially in noisy domains. When the goal is to produce a sufficiently accurate compact concept description, pruning is highly useful.

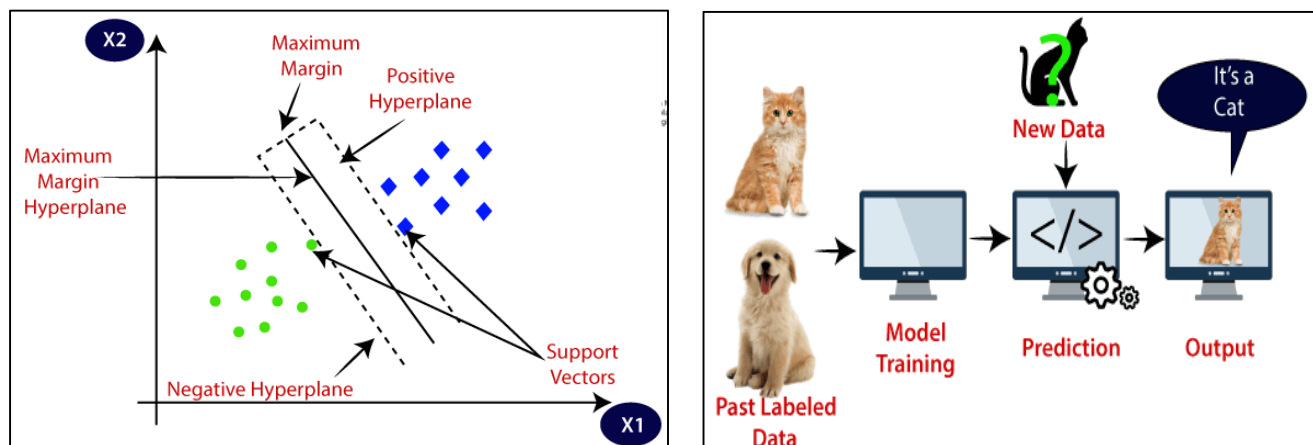
## 3.2 SUPPORT VECTOR MACHINE

Support Vector Machine (SVM) was first heard in 1992, introduced by Boser, Guyon, and Vapnik in COLT-92.

Support vector machines (SVMs) are a set of related supervised learning methods used for classification and regression [1]. They belong to a family of generalized linear classifiers. In another terms, Support Vector Machine (SVM) is a classification and regression prediction tool that uses machine learning theory to maximize predictive accuracy while automatically avoiding over-fit to the data. Support vector Machine or SVM is one of the most popular Supervised Learning algorithms, which is used for Classification as well as Regression problems. However, primarily, it is used for Classification problems in Machine Learning. The goal of the SVM algorithm is to create the best line or decision boundary that can segregate n-dimensional space into classes so that we can easily put the new data point in the correct category in the future. This best decision boundary is called a hyperplane.

**“A hyperplane in an n-dimensional Euclidean space is a flat, n-1 dimensional subset of that space that divides the space into two disconnected parts.”**

SVM chooses the extreme points/vectors that help in creating the hyperplane. These extreme cases are called as support vectors, and hence algorithm is termed as Support Vector Machine. Consider the below diagram in which there are two different categories that are classified using a decision boundary or hyperplane-



Example: SVM can be understood with the example. Suppose we see a strange cat that also has some features of dogs, so if we want a model that can accurately identify whether it is a cat or dog, so such a model can be created by using the SVM algorithm. We will first train our model with lots of images of cats and dogs so that it can learn about different features of cats and dogs, and then we test it with this strange creature. So as support vector creates a decision boundary between these two data (cat and dog) and choose extreme cases (support vectors), it will see the extreme case of cat and dog. On the basis of the support vectors, it will classify it as a cat. Consider the above diagram.

### 3.2.1 PROBLEM IN SUPPORT VECTOR MACHINE : NON-LINEAR SEPARATION PROBLEM

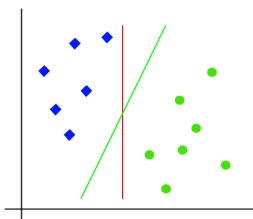


Fig. Linearly separable

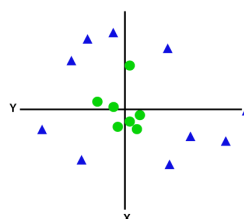


Fig. Non-linear

If data is linear, a separating hyper plane may be used to divide the data. However it is often the case that the data is far from linear and the datasets are inseparable. We cannot draw a straight line that can classify this non-linear data. We can't have linear hyper-plane between the two classes, so how does SVM classify the two classes? SVM can solve this problem easily! It solves this problem by introducing additional feature. Here, we will add a new feature  $z$ . For this case, if we take a new feature  $z$  as  $|x|$ . Projecting data that is not linearly separable into a higher dimensional space can make it linearly separable. But, one of the question which arises is, should we need to add this feature manually to have a hyper-plane. No, SVM has a technique called the kernel trick[10].

### 3.2.2 SOLUTION TO THE PROBLEM : KERNEL FUNCTION

To resolve the above problem with non-linear data, kernels are used to non-linearly map the input data to a high-dimensional space i.e. it converts not separable problem to separable problem, these functions are called kernels. It is mostly useful in non-linear separation problem. The new mapping is then linearly separable. For this kernel functions are used. The idea of the kernel

function is to enable operations to be performed in the input space rather than the potentially high dimensional feature space. Hence the inner product does not need to be evaluated in the feature space. We want the function to perform mapping of the attributes of the input space to the feature space. The kernel function plays a critical role in SVM and its performance[5].

### 3.3 ASSOCIATION RULE LEARNING

Association Rules is one of the very important concepts of machine learning being used in market basket analysis. In a store, all vegetables are placed in the same aisle, all dairy items are placed together and cosmetics form another set of such groups. Investing time and resources on deliberate product placements like this not only reduces a customer's shopping time, but also reminds the customer of what relevant items (s)he might be interested in buying, thus helping stores cross-sell in the process[7]. Association rules help uncover all such relationships between items from huge databases. Understanding the buying patterns can help to increase sales in several ways. Association rules analysis is a technique to uncover how items are associated to each other. An association rule has 2 parts:

- an antecedent (if) and
- a consequent (then)

An antecedent is something that's found in data, and a consequent is an item that is found in combination with the antecedent. Have a look at this rule for instance:

"If a customer buys bread, he's 70% likely of buying milk."

In the above association rule, bread is the antecedent and milk is the consequent.

There are three common ways to measure association.

Measure 1: Support - This measure gives an idea of how frequent an itemset is in all the transactions. Consider itemset1 = {bread} and itemset2 = {shampoo}. There will be far more transactions containing bread than those containing shampoo. So as you rightly guessed, itemset1 will generally have a higher support than itemset2. Mathematically, support is the fraction of the total number of transactions in which the itemset occurs.

$$\text{Support}(\{X\} \Rightarrow \{Y\}) = \frac{\text{Transactions containing both X and Y}}{\text{Total number of transactions}}$$

Measure 2: Confidence - This measure defines the likeliness of occurrence of consequent on the cart given that the cart already has the antecedents. Technically, confidence is the conditional probability of occurrence of consequent given the antecedent.

$$\text{Confidence}(\{X\} \Rightarrow \{Y\}) = \frac{\text{Transactions containing both X and Y}}{\text{Transactions containing X}}$$

Measure 3: Lift - Lift controls for the support (frequency) of consequent while calculating the conditional probability of occurrence of {Y} given {X}. Lift is a very literal term given to this measure. Think of it as the \*lift\* that {X} provides to our confidence for having {Y} on the cart. To rephrase, lift is the rise in probability of having {Y} on the cart with the knowledge of {X} being present over the probability of having {Y} on the cart without any knowledge about presence of {X}. Mathematically,

$$\text{Lift}(\{X\} \Rightarrow \{Y\}) = \frac{\text{Transactions containing both X and Y}}{\text{Fraction of transactions containing Y}}$$

#### 3.3.1 PROBLEM IN ASSOCIATION RULE MINING:NON INTERESTING RULES

Now that we understand how to quantify the importance of association of products within an itemset, the next step is to generate rules from the entire list of items and identify the most important ones. This is not as simple as it might sound. Supermarkets will have thousands of different products in store. After some simple calculations, it can be shown that just 10 products will lead to 57000 rules!! And this number increases exponentially with the increase in number of items. Finding lift values for each of these will get computationally very very expensive. How to deal with this problem? How to come up with a set of most important association rules to be considered? Apriori algorithm comes to our rescue for this.

#### 3.3.2 SOLUTION TO THE PROBLEM : APRIORI ALGORITHM

Apriori algorithm is given by R. Agrawal and R. Srikant in 1994 for finding frequent itemsets in a dataset for boolean association rule. Name of the algorithm is Apriori because it uses prior knowledge of frequent itemset properties. We apply an iterative approach or level-wise search where k-frequent itemsets are used to find k+1 itemsets.

To improve the efficiency of level-wise generation of frequent itemsets, an important property is used called Apriori property which helps by reducing the search space[8].

Apriori Property – All non-empty subset of frequent itemset must be frequent. Apriori assumes that ,all subsets of a frequent itemset must be frequent(Apriori property). If an itemset is infrequent, all its supersets will be infrequent.

Rule-generation is a two step process. First is to generate an itemset like {Bread, Egg, Milk} and second is to generate a rule from each itemset like {Bread → Egg, Milk}, {Bread, Egg → Milk} etc. The challenge is the mining of important rules from a massive number of association rules that can be derived from a list of items. Frequent itemsets are the ones which occur at least a minimum number of times in the transactions. Technically, these are the itemsets for which support value (fraction of transactions containing the itemset) is above a minimum threshold — minsup.

Apriori principle allows us to prune all the supersets of an itemset which does not satisfy the minimum threshold condition for support. Once the frequent itemsets are generated, identifying rules out of them is comparatively less taxing. Rules are formed by binary partition of each itemset. From a list of all possible candidate rules, we aim to identify rules that fall above a minimum confidence level (minconf). With these two steps, we have identified a set of association rules which satisfy both the minimum support and minimum confidence condition. The number of such rules obtained will vary with the values of minsup and minconf.

#### IV. CONCLUSION

This paper has introduced you to Machine Learning , their possible approaches and problem. Also the solution is mentioned. Now, you know that Machine Learning is a technique of training machines to perform the activities a human brain can do, albeit bit faster and better than an average human-being. Today we can see that the machines can beat human champions in games such as Chess, AlphaGO, which are considered very complex. You have seen that machines can be trained to perform human activities in several areas and can aid humans in living better lives. Machine Learning can be a Supervised or Unsupervised. If you have lesser amount of data and clearly labelled data for training, opt for Supervised Learning. Unsupervised Learning would generally give better performance and results for large data sets. We have seen three different supervised learning algorithms which are used for classification. Each approach has some problem associated with it which can be solved.

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## Li-Fi Technology

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**Abstract** — This paper introduced the concept of Li-Fi which is used for data transfer. Li-Fi stands for Light Fidelity. Li-Fi is the term some have used to label the fast and inexpensive wireless communication system which is the optical version of Wi-Fi (Wireless Fidelity) technology. The Li-Fi technology can transfer the data through LEDs. It is a high security wireless communication system, compared to Wi-Fi. Li-Fi is designed to use LED light bulbs similar to those currently in use many energy-conscious homes and offices. However, Li-Fi bulbs are equipped with a chip that modulates the light imperceptibly for optical data transmission.

A Li-Fi enabled device converts the beam of light into an electrical signal. The signal is then transformed back into actual data. These days, with the fast development of remote interchanges the issue of utilizing range effectively has turned out to be more commanding. Plentiful arrangements have been proposed to measure this issue; one of these arrangements is the use of noticeable light frequencies to send information. These frequencies are as of now free and unused. Light loyalty is another short range optical remote correspondence innovation which gives the availability inside a nearby system, by utilizing Light-Emitting Diodes (LEDs) to transmit information trusting upon light brightening properties.

**Keywords** — LED Bulbs, LED Diodes, Li-Fi technology, Visible Light communication (VLC), Wi-Fi.

### I. INTRODUCTION

Now a day's Wi-Fi is widely used in all the public areas like home, small restaurants, hotels, airports. Due to this radio frequency is being blocked day by day, at the same time use of wireless data is increasing as time goes on every year. Everyone is interested to use wireless data but the ability (to hold or do something) is going down. Wireless radio frequencies are getting higher, difficulties are increasing and RF interferences continue to grow. In order to overcome this problem in future, light - fidelity (Li-Fi) technology came into reality since 2011. Li-Fi is a wireless communication system in which light is used as a sinusoidal signal instead of traditional radio frequency as in Wi-Fi. Li-Fi is a technology that uses light sending out diodes to transmit data wirelessly. Visible light communication (VLC) uses fast pulses of light to transmit information wirelessly that cannot be noticed by human eye. The aim of paper is to focus on Li-Fi technology over Wi-Fi technology and challenges. <sup>[1]</sup>

At the time of using internet whether it is own or stealing from other, one has probably gotten unfulfilled because slow speed of the internet when more devices are connected to a same router. Due to increasing number of internet users, Radio Spectrum is crowded and blocked but the demand for wireless data double each year. Dr. Harald Haas has come up with a solution for those he calls "Data through lighting up/education", Simply-Fi. Li-Fi is nothing but Wi-Fi using light. Li-Fi is now part of the VLC as is used using white LED light bulbs. Data transmission occurs from this LED bulb by changing the current at very high speeds which undetectable by the human eye. Li-Fi is a data move from one place to another way of doing things that uses light for data move from one place to another This way Li-Fi provides very high data rates. In addition, Li-Fi is very

secure as light cannot penetrate through the walls. Li-Fi uses visible light spectrum, this way it is known as visible light communication (VLC). Visible light is uncontrolled unlike radio frequency spectrum. Because of this, it is cost effective. Here we developed application module of Li-Fi technology, which transmits data through LED bulbs and receive by using photodiode. <sup>[2]</sup>

In the data communication system there is a need of higher data rate and secure mean of (how easy something is to get to, use, or understand). So to deal with this needed thing the technology is exploring day by day to overcome the need of stream less communication. In this development, the (people who work to find information) have come with many technologies like Bluetooth, infrared and many more. This development leads the German physicist--Harald Haas to found new data transmission way of doing things named as Li-Fi i.e Light Fidelity which uses the visible light as a medium for data transmission. <sup>[3]</sup>As the light is part of our day to day life, there is no paucity of light in our homes, streets, working area, etc. so it can be used (in a way that produces a lot with very little waste) both as a light source and as a data transmitting medium. In order to overcome this problem in the future, Professor Harald Haas, an expert in optical wireless communications, proposes in 2011 a brilliant and related solution by using light to transmit data, he (showed/shown or proved) how an Light-Sending out Diodes (LED) bulb prepared with signal processing technology could stream a high-definition video to a computer and he showed that one watt LED light bulb would be enough to provide net connectivity to four computers. This new technology is known as Light-Fidelity (Li-Fi) which is created by Professor Harald Haas. It is a short range wireless communication system based on light lighting up from LED, and use the visible light as a signal carrier instead of traditional RF carrier as in Wi-Fi.

## II. WORKING OF Li-Fi

The working of Li-Fi is very simple. There is a light on one end i.e an LED transmitter, and a photo detector (light sensor) on the other. The data input to the LED transmitter is (translated/put into secret code) in to the light (technically referred to as Visible Light Communication) by changing the flickering rate at which the LEDs flicker 'on' and 'off' to create different strings of 1s and 0s. The on off activity of the LED transmitter which seems to be invisible (The LED strength is controlled/adjusted so quickly that human eye cannot (see aware of), so the light of the LED appears constant to humans), enables data transmission in light form (going along with/obeying) the incoming binary codes: switching ON a LED is a logical '1', switching it OFF is a logical '0'. In a typical setup, the transmitter (LED) is linked to the data network (Internet through the modem) and the receiver (photo detector/light sensor) on the receiving end receives the data as light signal and changes secret code into understandable information, which is then displayed on the device connected to the receiver. The receiver records a binary '1' when the transmitter is ON and a binary '0' when the transmitter is OFF. This way flashing the LED many times or using an organized row of LEDs will eventually provide data rates in the range of hundreds of Mbps. Hence all that is needed/demanded, is some or an organized row of LEDs and a controller that controls/encodes data into those LEDs. All one has to do is to change/differ the rate at which the LEDs flicker depending upon the data input to LEDs. <sup>[5]</sup> Further data rate improvements can be made in this method, by using organized row of the LEDs for parallel data transmission, or using mixtures of red, green and blue LEDs to change the light's frequency, with each frequency (translating/putting into secret code) a different data channel. LiFi is high-speed (going in both directions) networked and mobile communication of data using light. LiFi contains/makes up of multiple light bulbs that form a wireless network.

LED bulbs are devices, which means that the brightness of the light flowing through them can be changed at very high speeds. This allows us to send a signal by controlling/adjusting the light at different rates. The signal can then be received by a detector, which understands/explains the changes in light strength (the signal) as data. The strength controlling/adjusting cannot be seen by the human eye, and so communication is just as very smooth as other radio systems, allowing the users to be connected where there is Li-Fi enabled light. Using this way of doing things, data can be transmitted from a LED light bulb at high speeds. <sup>[6]</sup>

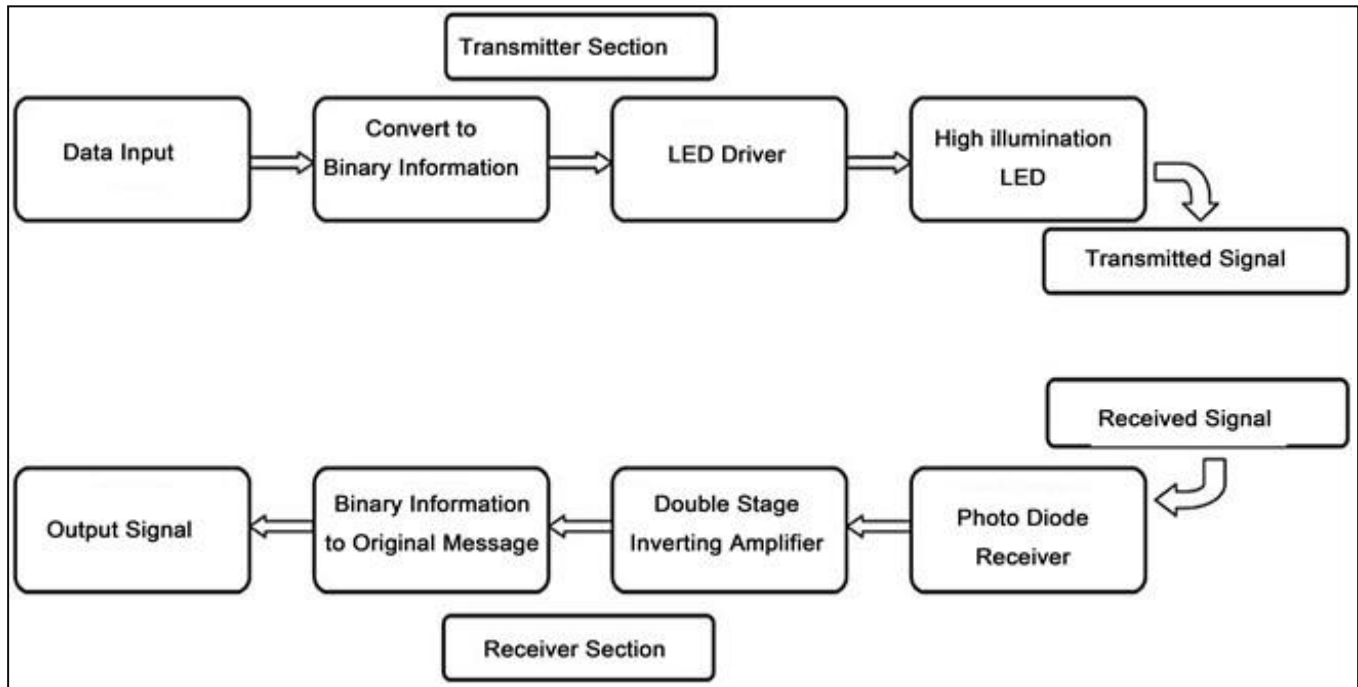


FIGURE 1: Block diagram of working of Li-Fi system

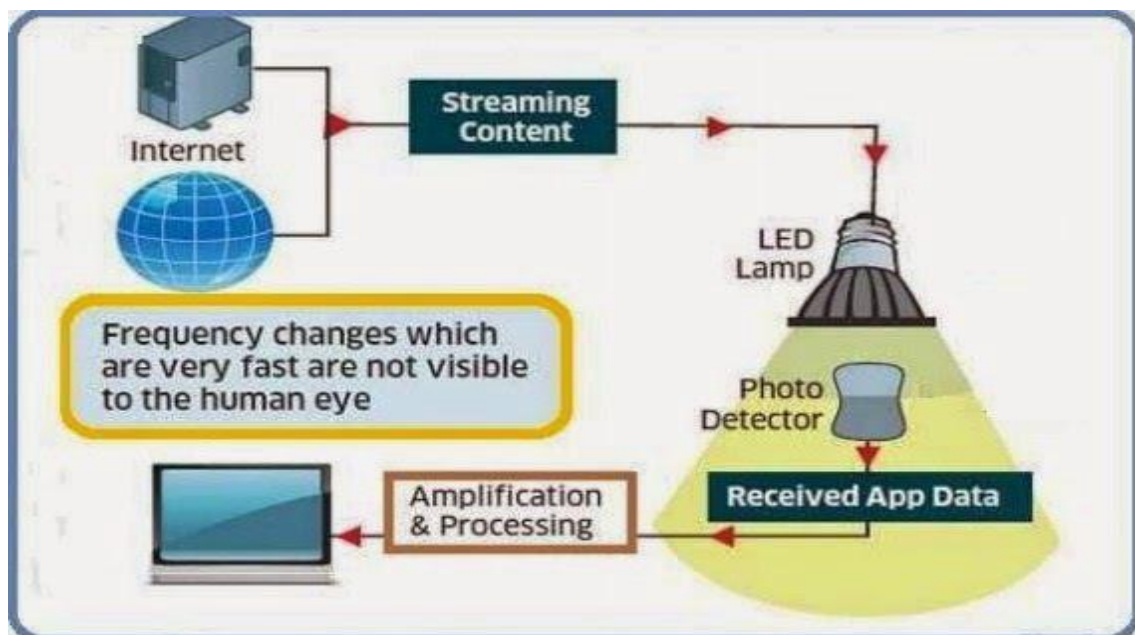
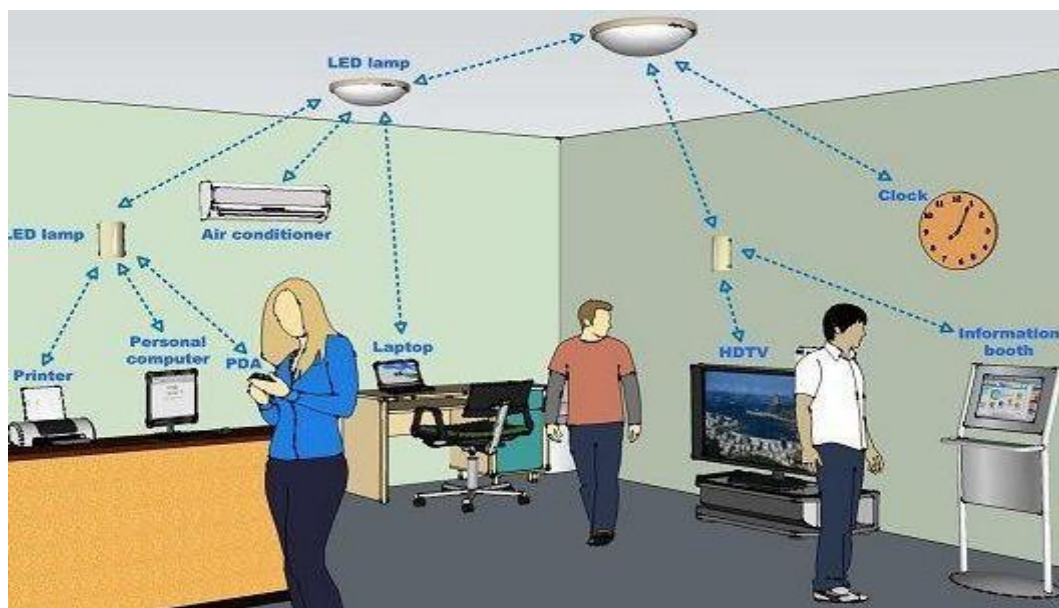


FIGURE 2: Flow diagram for Li-Fi subsystem

Li-Fi consumes light from LEDs, instead of radio waves as in the case of Wi-Fi, to send information in the form of binary data. Let us simplify this a little - Li-Fi works much like the infrared technology in your television. Infrared works on a simple way of thinking/basic truth/rule: a command is given (e.g. "change channel" when you press a button on your remote control) and that input is turned into binary code. The code is then transmitted via infrared light waves by your remote's sensor, and the light waves are received by your TV's infrared sensor, which (changes secret code into understandable language) the light and (does/completes) the meant action. In case of Li-Fi, LED bulbs transmit the data by controlling/adjusting the light waves while a photodetector on your phone or laptop picks up those light waves.

Li-Fi is creating a lot of buzz since Li-Fi technology has (not very long ago) made its way to live trials based on solutions from the Estonian startup, Velmenni. The company has taken advantage of the new technology to design a smart lighting solution for commercial and industrial conditions. Velmenni has also showed/told about that its pilot program is now providing Internet access with speeds up to 1GBps to its clients in different businesses, including office-based structures. In lab conditions even higher radio frequencies/abilities have been received (the fastest recorded speed was 224 Gbps). In short, LED bulbs at any place can provide you with 100 times (more than Wi-Fi speed) faster internet with this technology.<sup>[7]</sup>



**FIGURE 3: Li-Fi system connecting devices in a office**

**TABLE 1**  
**COMPARE BETWEEN LI-FI AND WI-FI**

Sr.No.	LI-FI	WI-FI
01.	Li-Fi is through data transfer in light medium.	Wi-Fi is through data in radio waves.
02.	A range of 10,000 times more than radio waves.	Short frequency range of 2.4GHz to 5GHz
03.	Cannot penetrate through walls.	Can penetrate through walls.
04.	Interference is fewer as it can pass through salty sea water, works in dense region.	Interference is more as it can not pass through salty sea water, works in dense region.
05.	In Li-Fi, light is choked by the walls and hence will provide more secure data transfer.	In Wi-Fi, radio frequency signal can not be blocked by the walls and hence need to employ techniques to achieve secure data transfer.

### III. ADVANTAGES

**4.1 Convenience:** Convenience is not an issue as light sources are present everywhere. As everywhere there is a light source, there can be Internet. Light bulbs are present everywhere in homes, offices, shops, malls and plane planes, which can be used as a medium for the data transmission.

**4.2 Efficiency:** Energy consumption can be minimized with the use of LED illumination, which are once misogynist in the home, offices and Mall etc. for lighting purpose. Hence the transmission of data requiring negligible spare power, which makes it very efficient in terms of financing as well as energy.

**4.3 Security:** One main wholesomeness of Li-Fi is security. Since light cannot pass through opaque structures, Li-Fi internet is misogynist only to the users within a serving zone and cannot be intercepted and misused, outside the zone under operation.

**4.4 Upper speed:** Combination of low interference, upper bandwidths and high-intensity output, help Li-Fi provide upper data rates i.e. 1 Gbps or plane beyond.

**4.5 Cheaper:** Li-Fi not only requires fewer components for its working, but moreover uses only a negligible spare power for the data transmission.<sup>[11]</sup>

### IV. CONCLUSION

Li-Fi is the ideal solution for effective data transmission due to its basic building block: Light. Unlimited, fast, safe and cost effective, Li-Fi could possibly be the (person or thing that comes after something else) of Wi-Fi upon further development. Its working centers around the way of thinking/basic truth/rule of changing the electrical signal based on the needed/demanded output. Its applications range from toys to communication and can find uses in critical fields like military and medicine. Further research on Li-Fi is gaining pace in the recent times, which will possibly resolve the many unsolved mysteries of the world.

Although there is still a long way to go to make this technology a commercial success, it promises a great in the field of wireless internet. Many people who are finding information and companies are now working on this idea, which promises to solve the problem of lack of radio spectrum, space and low internet connection speed. By use/military service of this technology, we can move to greener, cleaner, safer communication networks. The very idea of Li-Fi promises to solve issues such as, shortage of radio-frequency radio frequency/ability and eliminates the disadvantages of Radio



communication technologies. Therefore, there is feeling of being completely sure of development of future computer programs of the Li-Fi, which can be extended to raised, flat supporting surfaces, and different walks of human life.

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# Virtual Smartphone

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**Abstract** — Smartphones have become increasingly ubiquitous in our daily life. The number of smartphones users and mobile application providing area unit growing speedily. A smartphone is usually expected to supply PC-like practicality. The recent advent of novel sensing and show technologies has inspired the event of a spread of multi-touch and gesture based mostly interactive system. The recent advent of novel sensing and show technologies has inspired the event of a spread of multi-touch and gesture based mostly interactive system. In these systems user could move directly with data victimization bit and natural gestures. Now a days there are several method by that we are able to hook up with digital world within the controlled surroundings victimization multi-touch and gesture based mostly interaction. Moreover, information still resides on screens or dedicated projection surfaces. These isn't any link between our interaction with these digital devices and interaction with the physical world around North American nation. During this paper, we have a tendency to gift Virtual smartphone, a multi-touch and gesture based mostly interaction system. Which replace the physical movable device to the virtual multi-touch and natural gesture based mostly interaction on the user's organ like articulation radiocarpea, palm, eyes and etc. By that user communicate with different digital devices over the network. For this, the package technologies used like gesture recognition, increased reality, and pc vision based mostly formula. And hardware technology like projection machine. Virtual smartphone primarily turns the human organs as a transportable by that is in a position to user connect with the digital world likewise as others.

**Keyword** — Augmented Reality, Computer Vision Based Algorithm, Gesture Recognition, Human Organs, Sensing, Virtual, Virtual Reality.

## I. INTRODUCTION

Introduction the recent technologies has inspired the event of a spread of multi-touch and gestural primarily based interaction system. In these paper, delineate that however user could act directly with data mistreatment bit add natural hand gestures. Currently a days there square measure uncountable approach by that we are able to connect with digital world. By mistreatment gesture primarily based interaction. Unfortunately, most good phone and alternative devices square measure did not give gestural and multi-touch primarily based interactive systems and therefore the intuitive expertise of full-sized gestural systems. Moreover, data still show on screens or dedicated projectors and alternative devices and surfaces. There's no link between our interaction with these digital devices and interaction with the physical and virtual world around North American country. In this paper, we tend to gift virtual smartphones, a multi-touch and gestural primarily based interactive system. That replace the physical movable devices to the virtual multi-touch and natural gesture primarily based interaction on the user organs by that user communicate with alternative digital devices over the network.

Virtual smart phone essentially turns the human organs as a movable by that is ready to connect with the digital world additionally as alternative peoples like their friends and relatives Virtual smart phone could be a pc vision primarily based wearable and gestural data interface that augments the physical world around us with digital data and proposes natural gestures because the mechanism to act with the knowledge. Recently, there are a good sort of multi-touch interaction and mobile devices, merchandise and prototypes that have created it attainable to directly manipulate computer programme elements mistreatment bit and natural gestures. Most of those system depends on the physical bit primarily based interaction between the user's fingers and physical screens and therefore don't acknowledge and incorporate bit freelance freehanded gestures.

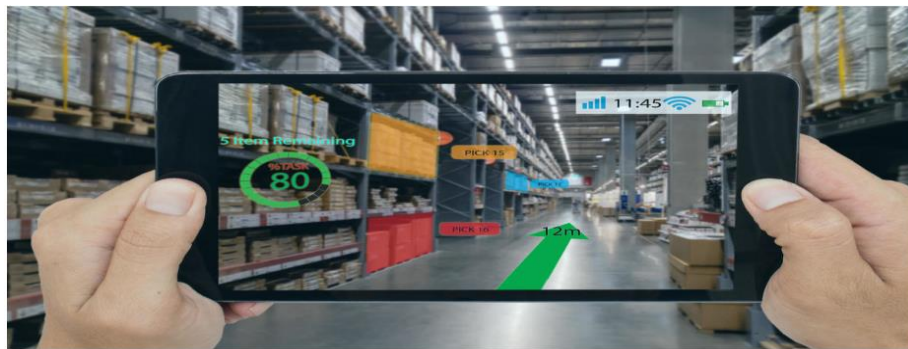
Virtual smartphones technology takes a distinct approach to computing and tries to form the digital side of our lives additional intuitive, interactive and specifically additional natural. It's plenty complicated technologies squeezed into an easy transportable device. Once we usher in property, we are able to get instant, relevant visual data projected on AN object we tend to obtain or act with the technology is especially supported hand increased reality, gesture recognition, pc vision primarily based algorithmic program and etc.

## II. TECHNOLOGY USED

Virtual smartphone is basically a wearable device which is combination of software as well as hardware. In Software it uses Gesture Recognition System, Touch Based Interaction System, Augmented Reality, and Computer Vision Based Algorithm to fulfil all the Objectives. In Hardware, Virtual smartphone consist of Processor unit, RAM and ROM Memory, Battery, Sensors (Proximity Sensor, Accelerometer Sensor), LED indicator for device Mode (ON/OFF), Micro Vibrator, USB Port, HD Camera, WI-FI and Bluetooth Devices and Nano SIM card slot.

### 2.1 Augmented Reality

Augmented reality, usually abbreviated "AR", and could be a pc generated content overlaid on a true world surroundings. Increased Reality hardware comes in several forms, together with devices that you just will carry, like handled displays, and devices you wear, like gliding joint watches, headsets, and glasses. Common applications of increased reality technology embody video games, television, and private navigation, through there square measure several alternative uses in addition. Increased reality (AR) could be a term for a live direct or indirect read of a physical globe surroundings. It's associated with a additional general conception known as mediate reality during which a read of reality is changed by a devices. The augmentation is conventionally in period and in linguistics context with environmental parts. As an example, golf broadcasts generally displays a line on the screen that tracks the flight of the ball. In navigation, increased Reality is employed to show location info in period. This is often usually done through a wide-awake show that comes image ahead of you wish a photo.



**FIGURE 1: Navigation (Augmented Reality)**

Virtual sensible phone uses increased Reality conception to set digital data on the physical world. With the assistance of advanced increased reality technology (e.g. adding pc vision and object recognition) the knowledge regarding the encircling planet of the user become interactive and digitally usable. Artificial data regarding the setting and also the objects in it will hold on associated retrieved as an data layer on prime. the most hardware elements for increased reality are: show, input devices, and sensible phone devices like sensible wrist joint watch, lens, and video game box, combination of powerful processors, RAM, camera, measuring system, world Positioning System (GPS) and solid state compass square measure typically gift in trendy smartphone, that create them prospective platforms.

### 2.2 Virtual Reality

Virtual reality may well be a engineering that immerse a user in Associate in Nursing fanciful or replicated world, or simulates presence inside the earth. game may well be a medium that gives us a simulated experience of the physical reality. because

of this, game permits us to purposefully prune the danger of physical reality and to further safely turn out things that do not appear to be potential inside the earth.

### 2.2.1 Virtual world

A Virtual world is a 3-Dimensional environment generated by a computer in which one can interact with others and create objects as part of that interaction.

### 2.2.2 Sensory Feedback

In Virtual Reality, individuals are provided with direct sensory feedbacks based on their bodily positions and sports within the virtual global. A virtual display, for example, responds to a player moving his or her head by means of updating the displayed image accordingly.



**FIGURE 2: Virtual Reality**

## 2.3 Gesture Recognition

Gesture recognition could be a topic in computing and language technology with goal of decoding human gestures via mathematical algorithms. Gestures will originate from any bodily motion or state however unremarkably originated from the face or hand. Current focuses within the field embody feeling recognition from the face and hand gesture recognition. several approaches are created victimisation cameras and pc vision algorithms to act sign languages. Gesture recognition is seen as how for computers to start to grasp body language, therefore building a richer bridge between machines and humans than primitives text user interfaces or perhaps GUI's(Graphical User Interfaces),which still limit the bulk of input to keyboard and mouse. Gesture recognition permits humans to interface with the machine (HMI) and act naturally with none machine devices. Gestures is accustomed communicate with a pc thus we'll be principally involved with empty handed philosophical doctrine gestures.

## 2.4 Computer Vision Based Algorithm

Computer vision is behind a number of the foremost attention-grabbing recent advances in technology. From formula which will determine carcinoma additionally as dermatology's to cars that drive themselves, it's pc vision formula that area unit behind these advances. Computer vision may be outlined as "the theory and technology for building artificial systems that get data from pictures or multi-dimensional information." As a subject area, pc vision cares with the speculation behind artificial system that extract data from pictures. The image information will take several forms, such a video sequences, and views from multiple cameras, or multi-dimensional information from a medical scanner. The code tracks the user's gestures victimisation pc vision primarily based algorithms. the pc vision system for pursuit and recognizing the hand postures that management the menus is predicated on a mixture of multiple scale color feature detection, read primarily based hierarchical hand models and particle filtering. The hand postures or states area unit drawn in terms of hierarchies of multiple scale color image feature at totally different scales, with qualitative interrelations in terms of scale, position and orientation. In every image, detection of multiple stages color feature is performed.

### III. OBJECTIVE

Virtual sensible phone is helps to transfer of knowledge Associate in Nursing build the communication from one device to different device Virtual Smartphone is largely an makes an attempt to create the communication between users and digital devices additional tangible and interactive. the target of this invention is establishing the communication/connection between humans and additionally digital devices (smartphones) by barely gestures on the human organs. Virtual sensible phones work on 2 varieties of knowledge transfer. First, it build the voice affiliation between the users with the assistance of GSM technology with none physical cellular or smartphones. Second, for transfer of knowledge between the humans and additionally with digital devices. It build use of the web, computer network network or the other sort of knowledge servers through that device and humans square measure connected to and also the distinguish from one user to a different by the authentication methodology like username/password, drawing a pattern on the virtual screens, face recognition, palm recognition victimisation palm lines or fingerprint detection are often used. In Virtual smartphone speech from one human to a different are often done either by victimisation GSM or internet/intranet technology. The transferring of knowledge from one creature to a different creature or device victimisation Virtual Smartphone. the primary and second digital devices could also be gesture recognition Virtual smartphone system connected to a network as well as an information storage cloud and each uses Virtual smartphone technology.

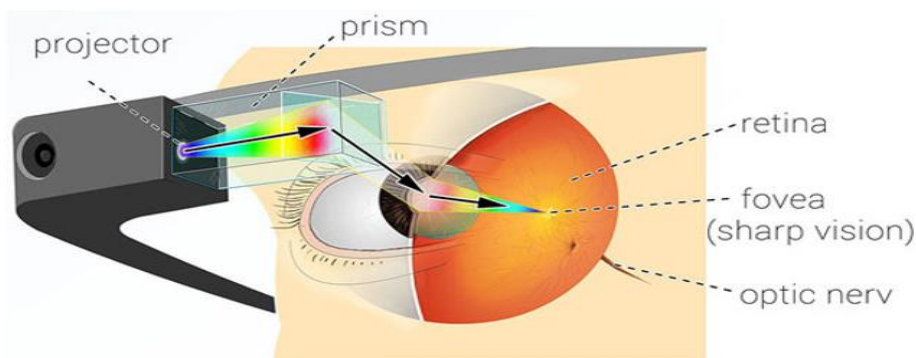
### IV. APPLICATIONS

#### 4.1 Google Glass

Google Glass may be a technical masterpiece. It combines varied functions and options during a very tiny unit. additionally to smartphone and camera. It supply varied options like web association, as well as GPS. The core feature of Google glass may be a visual layer that's placed over the truth (Augmented Reality). This layer opens a door to superb new potentialities.

##### 4.1.1 How Google glass does works?

Within the Google glass incorporates a mini projector, which projected the layer via a clever, semi-transparent prism immediately at the retina in the attention. due to this the image, despite the fact that it is so near the attention, is sharp and clear.



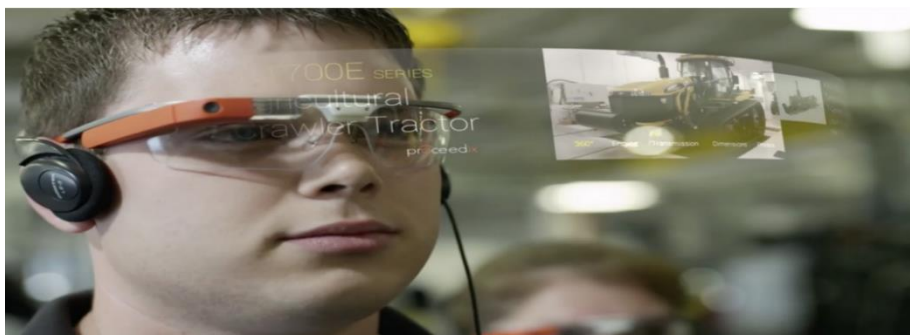
**FIGURE 3: How Google Glass works**

Here the top view on the eye. It shows how the prism focuses the image on the retina (Fovea= point of sharp visual image). Depending upon how the Google glass has wear, the layer appears in the upper right corner or in the middle of visual field. when the Google glass is excessive at the nostril, so that you can nearly see via underneath, you ought to flip the attention up to view the image shape, due to the fact the prism is semi-obvious it at once in front of the pupil.



#### 4.1.2 Challenges

There are lots of challenge to implement this. But, the biggest challenge for Google will now be to make the Google glass also usable people with normal glasses. in this instances the Google glass has to be positioned beforehand of regular glasses which does now not look and experience well or like a pitcher. Or Google has to fabricate character customized prisms, but this will be substantially greater high priced than the usual glass production.



**FIGURE 4: Google Glass**

### 4.2 Smart wristwatch

#### 4.2.1 Working

Working of Virtual smartphone consist of 5 main steps i.e. Enabling and Authentication of Virtual smartphone, make a call, receive a call, Capture a image or video, copying or transferring a data to other Virtual smartphone or digital devices as follows:



**FIGURE 5: Virtual Smartphone**

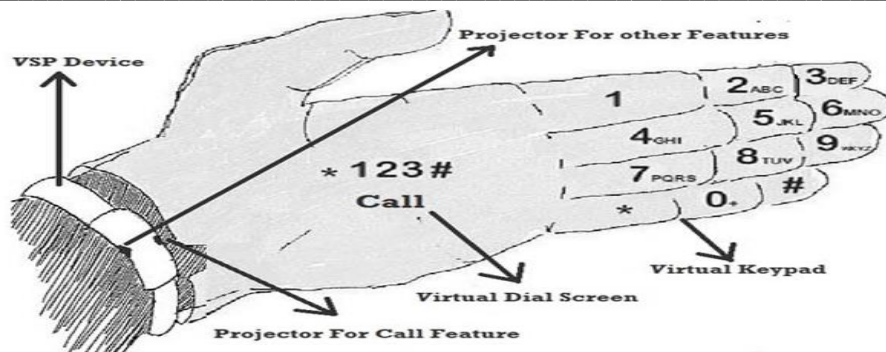
##### 4.2.1.1 Enabling or on/off Virtual smart phone

The Virtual smartphone could be a wearable device and user has the key to on or off the device through the button. once the user alter the Virtual smartphone device, AN icon seems on the user's palm or arm as per user as per selected by the user for showing the standing. very first thing to alter virtual smartphone, perform the authentication like enter the username/password, Drawing a secret pattern, face recognition, image choice and fingerprint detection and palm line detection when the a user has signed in with success, Virtual smartphone is currently prepared for acting operations.

##### 4.2.1.2 Make a Call

After Enabling Virtual smartphone now user is able to make a call and communicate with other users. To make a call, dial mobile number using virtual key or using voice recognition system.

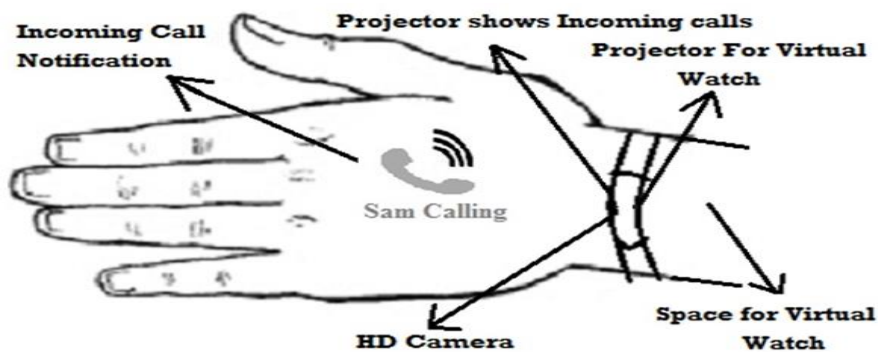




**FIGURE 6: Make a Call**

#### 4.2.1.3 Receive a call

When a Virtual smartphone user by different Virtual smartphone user or different digital devices. The notification of incoming decision are going to be shown as per user selected profile if user choose a vibrate mode, the little vibrator motor indicated incoming decision by vibration and additionally shown the identity of occupation user on back aspect of palm victimisation high density projector of Virtual smartphone. If user choose sound mode, incoming decision notified by selected ring tone with user name on the rear aspect of palm. For attending the incoming decision user simply bit, swipe the incoming decision icon or different bit gesture selected by user. to talk the caller user either use Bluetooth telephone receiver or wired telephone receiver that is connected to Virtual smartphone device victimisation either a pair of 0 or 3.0 instrumentality. User is also ready to receive decision directly victimisation Virtual smartphone device speaker and mice.



**FIGURE 7: Receive a Call**

#### 4.2.1.4 Capture Image or Video

virtual telephone is also capable of capture excessive nice photograph or video using their high exceptional digicam, through clicking, button or the use of gesture for taking photos. After taking the photograph it indicates the picture on user hand using digital phone device projector. For capture the video with the equal gesture user just required to trade the digital camera mode photographs to video. consumer additionally zoom in out whilst they seize photo or video the usage of their hand gesture.

## V. CONCLUSION

Virtual smartphone is basically a Computer Vision based wearable and gestural interface that augments the physical world around us. With the digital information and proposes natural hand gestures as the mechanism to interact with that information. It connect physical world to Virtual world. Virtual Smartphone give intuitive way to communicate and data transfer between different users as well as different digital devices.

Now a days, we can say goodbye to field trips to the museum or art gallery because thanks to Augmented Reality and Virtual Reality, the museum and art gallery will come to you and it will be available any time. This are just some of the future uses of Augmented and Virtual Reality in every field and it is sure to revolutionize the educational process.

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## 5G TECHNOLOGY

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**Abstract** — this paper gives a short idea of 5G Technology. 5G wireless technology is a complete wireless communication with almost no limitations. It can be called real wireless world. It lets you to access internet in a very fast way. 5G network have low latency so the lack of reaches the server is very fast. We are able to connect variety of devices to the mobile network for ex: different sensors, different smart devices like cars, TV, bulbs etc. the download speed can be 10 to 20 times faster than we have now. 5G technology uses high frequency waves which is known as Millimeter Waves so it can carry huge amount of information. It can travel short distance. object like trees, building etc. can block these waves so the 5G network consist of many small Base Stations to help signal to reach everywhere therefore we need to install small stations to increase the range the process is very Expensive and it's likely that 5G will be launch inside densely populated areas. In remote villages and places it may take more time to reach.

**Keywords**— Base Station, Low Latency, Millimeter Waves, Wireless Communication, 5G Technology

### I. INTRODUCTION

5G TECHNOLOGY is the new version of cellular technology that will provide low latency, seamless coverage, high data rate, and highly reliable communications. It will increase energy efficiency, spectrum efficiency, network efficiency as well as efficiency of other systems. Besides providing faster & reliable access, it will act as an information duct built to connect billions of Internet of Things (IOT) devices. [8]

New capabilities of mobile communication networks enabled by 5G technology will allow higher quality video services with mobility at high speed, business automation delivered through billions of connected devices, delivery of critical services such as telephonic-surgery and automatic vehicle assured by low latency and ultra-reliable networks, and improved productivity assisted by real time data analytics. Unlike existing mobile communication networks, 5G networks will allow tailoring of requirements for each of these different use cases within the same network. [8]

#### 1.1 Challenges in 5G OR Technology immersing as foundation of 5G

##### 1.1.1. Millimeter Waves :

Our smart-phone and other electronic devices in our home uses very specific frequency on the radio frequency typically those under 6GHz. but these frequencies are starting to get more crowded. Cares can only squeeze so many bits of data on same amount of radio frequency spectrum as more devices come online the connection gets slower and drop the connection. the solution is to broadcast the data on a shorter millimeter waves which are lies between 30GHz to 300GHz these section of spectrum is never been use before on mobile devices so it can open more bandwidth for everyone.

But there are some cache, millimeter waves can't travel through buildings and other obstacles so the solution of these problem is the next technology which is small cell.

##### 1.1.2. Small Cell :

Wireless network which we are using today depended on high power cell tower to broadcast the signal over long distance. But higher frequency millimeter waves are not able to transfer through obstacles which means if you move behind one you will lose the signal.

Small cell network will solve that problem using thousands of low power mini base stations. These base station could be closer than the traditional towers form in a set of relays team to transfer signal around obstacles. These would be specially use in cities. As user move behind obstacles his smart-phone would automatically switch to new base station in better range of his devices allowing him to keep his connection.

#### **1.1.3. Massive MIMO (multiple input multiple output):**

Massive MIMO substantially increase spectral efficiency to boost capacity and coverage. Massive MIMO is a technology where the number of base station antennas are very large. In Massive MIMO hundreds or thousands of base station antennas simultaneously serves hundreds of user in same frequency resource. Massive MIMO increase throughput and capacity by using many antenna element to create simultaneous data streams to a large number of users.

But cellular antennas that we use today are broadcast data in every direction at a same time. Therefore it cause serious interference which brings us to the next technology which is Beam forming. <sup>[9]</sup>

#### **1.1.4. Beam forming:**

It is a traffic signaling system for cellular signals instead of broadcasting data in every direction it would allow stations to send focus stream of data to specific user so we can prevent interference and its way more efficient .that means stations could handle more incoming and outgoing data streams at once.

Ex: if you are in a cluster of buildings and trying to make a phone call, your signal return from surrounding Of buildings and crisscross with other signal from user in other area and massive MIMO base station receives all of these signals and keep track of the timing and direction of the arrival . it then uses signal processing to triangulate them exactly were each signal coming from and plots the best transmission round back through the air to each phone .sometimes they rebound single packets of data in opposite directions of buildings and other objects to keep signals interfering with each other . The result is relevant data stream is to use which brings us to next technology which is full duplex. <sup>[9]</sup>

#### **1.1.5. Full duplex:**

If you ever use the walkie-talkie then you know that the order of communication .you have to take turns between talking and listening that's kind of a drag. Today's cellular base stations have that exactly the same holdup. Basic antenna can do only one job at a time either transmit or receives. These is because of the radio waves which travel both forward and backward along with same frequency.

Ex: the train is loaded with the data and the frequency of traveling is 1GHz and if there is second train is coming from opposite direction on same track. So we are going to get some interference. The solution is that the train should take the turns or to put other train on different track so you can make it lot more efficient by working around reciprocity. Researchers have use silicon transmitters to create high speed switches that hold the backward role of these wave. It is like a signaling system that can movement internally reroute train that means there is a lot more things done and track is lot faster.

### **1.2. 5G Use Case**

We can categorized 5G use cases into three different use case classes i.e. enhanced Mobile Broadband, massive Machine-Type Communication, and Ultra- Reliable Low-Latency Communications.

#### **1.2.1. Enhanced mobile broadband**

This usage scenario comes with new application areas such as virtual reality, augmented and virtual reality, video monitoring, and mobile cloud computing, enterprise collaboration and also enhanced indoor and outdoor broadband EMMB is the primary use case for 5G. It provide high speed broadband to highly crowded areas. It enables high speed streaming on mobile as well as home screen

**Requirement:** 10 GB data rates for the enhanced Mobile Broadband. <sup>[11] [3]</sup>

### 1.2.2. Massive machine-type communications -

It uses maximum number of connected devices which transmits a relatively small volume of non-delay sensitive data. Devices are to be low cost and have a very long battery life. This use cases covers IOT, remote monitoring, asset tracking, smart cities, smart agriculture, energy monitoring, smart home etc.

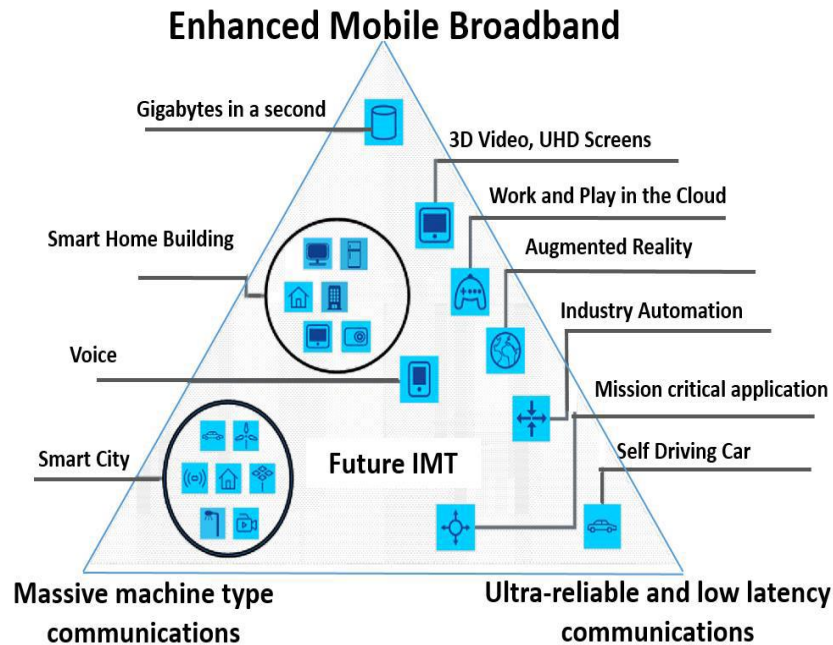
**Requirement:** 1 MN/Km<sup>2</sup> connection (1 million devices per square kilometer). <sup>[11] [3]</sup>

### 1.2.3. Ultra-reliable and low-latency communications -

This use case has solid requirements for capabilities such as availability, throughput and latency to support the delivery of critical communications. Some examples include autonomous self-driving cars, smart grids, remote patient monitoring and industrial automation etc. <sup>[11] [3]</sup>

It enabling smart vehicles to communicate with each other, and creating opportunities for connected, autonomous cars and trucks. For example, an autonomous vehicle (AV) operated via a cloud-based, autonomous driving system must be able to stop, accelerate or turn when told to do so. <sup>[3]</sup>

**Requirement:** 1 MS latency for Ultra-Reliable Low-Latency Communications.



**Figure 1: 5G Use Case Scenario**



## II. 5G DEPLOYMENT AND ARCHITECTURE

### 2.1. 5G deployment can be divided into three phases.

**Deployment Phase 1** –in these phase Fixed Wireless Access services in the millimeter-band with 0.5 to 1 Gbps link in 2019. And mobile services in the < 3 GHz band in 2020. In 2021, lots of countries will have deployed 5G broadband services <sup>[2]</sup>

**Deployment Phase 2** – in these phase 5G based IOT technology is expected to begin deploy in 2021. While small IOT networks built around earlier technologies like NB-IOT have been deployed, the entry of 5G IOT will boost these trends <sup>[2]</sup>

**Deployment Phase 3** –in these phase low latency and highly reliable wireless services will launch in early 2022 and offer new applications like car platooning (coordination between self-driving vehicles), telephonic-surgery and drone navigation <sup>[2]</sup>

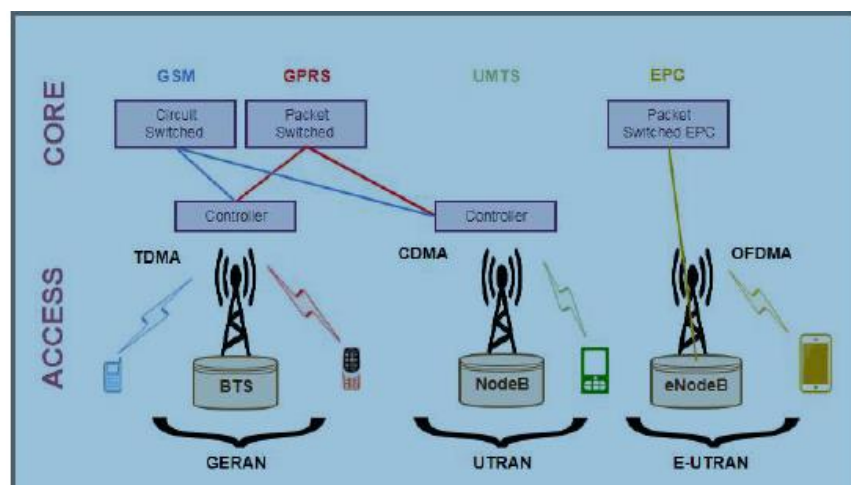
In India, 5G deployment strategy may have different plans and scenarios. If early deployment is adopted, the equipment could be more expensive and being early, it will also be 96latch needing costly maturing. On the other hand, early adoption will fast track the country's embrace of 5G benefits and also increase opportunities to develop innovative and new use cases that support Indian needs.

### 2.2. 5G Network architecture

Global System for Mobile communications was developed to carry voice services in a circuit switched manner. Data services were also possible over a circuit switched modem connection but with very low data rates. Starting with step one which is an Internet Protocol (IP) based packet switched solution and it was taken with the development of global system for mobile to General Packet Radio Service (GPRS) and both using the same access method and air interface. <sup>[9]</sup>

A new access technology i.e. Wideband Code Division Multiple Access was developed to get the higher data range in Universal Mobile Terrestrial System (UMTS). The access network in UMTS follows a connection of circuit switched for voice services and connection of a packet switched for data services. UMTS had to still depend upon the circuit switched core for paging in incoming data service. To overcome this shortcoming, pure IP based Evolved Packet System (EPS) was developed. <sup>[9]</sup>

In EPS system, both voice services and data services are carried by the IP protocol. A new access solution called Long Term Evolution (LTE) which is based on Orthogonal Frequency Division Multiple Access (OFDMA) is used to achieve high data rates. The LTE access network is a network of smart base stations (evolved Node B) without any centralized intelligent controller, generating a flat architecture. Distributing the intelligence amongst the base-stations in LTE, reduced the time required for setting-up the connection and for handover. <sup>[9]</sup>



**Figure 2: 5G Network Architecture**



### III. CONCLUSION

5G technology is expected to play a key role in digital economies, creating new business opportunities and improving economic growth. Larger bandwidth and low latency times will allow the development of new services and the improvement of existing ones.

Deployment of 5G network will require substantial investment in the core, Radio Network and Spectrum. However, the 5G services will open-up many new revenue generating streams also as it will cater to variety of solutions to new verticals besides enhanced mobile broadband solutions. 5G will provide disruptive capabilities, which will be an economy booster by promoting new ways to develop and organize the business sector.

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# Feature Extraction and Feature Selection using Textual Analysis

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**Abstract**— After pre-processing the images in character recognition systems, the images are segmented based on certain characteristics known as “features”. The feature space identified for character recognition is however ranging across a huge dimensionality. To solve this problem of dimensionality, the feature selection and feature extraction methods are used. Hereby in this paper, we are going to discuss, the different techniques for feature extraction and feature selection and how these techniques are used to reduce the dimensionality of feature space to improve the performance of text categorization.

**Keywords**— Character Recognition, Feature Extraction, Feature Selection, Image Segmentation, Pre-processing.

## I. INTRODUCTION

The conversion of textual documents in digital form have increased rapidly worldwide. This is where the text classification becomes a dire need to handle these documents. The character recognition systems are thus used to fulfill these needs. The main objective of character recognition systems is to recognize and classify the text on the basis of predefined categories using some classifiers. Several analysis works have been done to evolve newer techniques and strategies that would scale back the time interval for processing whereas providing higher recognition accuracy.

In the following section, the four major steps used for handwriting recognition systems are described: - Pre-processing, Image segmentation, Feature extraction and Classification. Section II describes the various methods available for pre-processing, feature selection and feature extraction and the classifiers[1]. Section III presents the conclusive idea regarding the reviewed methods.

## II. WORKING PRINCIPLE

Handwritten character recognition is a technique of a computer application recognizing handwritten character or sentence from sources such as photographs, documents, touchscreens and similar devices by a computer. The image of the written sentence / word / character may be gathered either offline or on-line. In off line technique it may be from a scanned image of a paper. In on-line the sleuthing motion of the pen tip, for example by a pen-based display screen surface capturing temporal frequency[2].

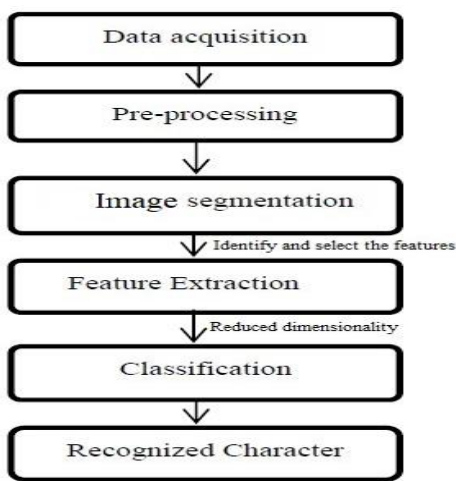


FIGURE 1: Block Diagram of Character Recognition

Fig. 1 describes the process of text classification. Although, text classification has one limitation. This limitation includes high spatial property of feature area thanks to terribly sizable amount of options. The larger the options, the bigger the complexity of methods used for text classification and also the smaller the accuracy due to irrelevant or redundant terms within the feature space. Feature extraction and feature selection methods are used to eradicate this downside.

The initial major step in textual classification is Pre-processing. The moot data existing in the document is eliminated using the pre-processing. The subsequent step, image segmentation decomposes an image of a sequence of characters into sub images of individual symbols. Then, each character image is resized into  $m \times n$  pixels towards the training network. These sub images are used to select the subset from the original feature set on the basis of importance of features, known as Feature Extraction. The fundamental task of feature extraction and selection is to search out a group of the foremost effective features for classification; that is, compressing from high-dimensional feature space to low-dimensional feature space, so that the classifier is designed effectively[16].

## 2.1 PRE-PROCESSING

When a document is scanned it requires some preliminary processing. This pre-processing helps to eliminate the irrelevant data in the scanned image in the form of noise and resize the image. For pre-processing the document, noise reduction, binarization, skew correction, etc. techniques can be used. The main objectives of pre-processing are[1]:

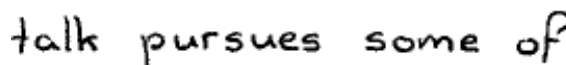
1. Noise reduction
2. Binarization
3. Skew correction
4. Stroke width normalization

### Noise Reduction

The noise removal is achieved by converting RGB image into grayscale. It is then converted into binary image consisting only pixels 0's (white) and 1's (black). Unnecessary background pixels are removed from original image. To remove the redundant or irrelevant data, the threshold value is applied to the image.



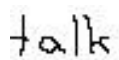
**FIGURE 2: Grayscale image with noise**



**FIGURE 3: Reduced noise image**

### Stroke-width normalization

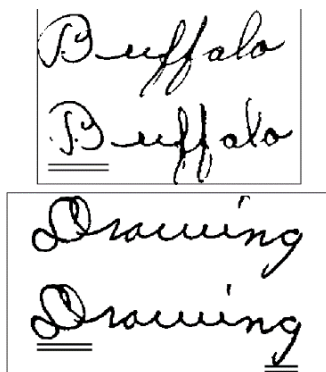
After normalization generally it reduces the amount of data to be processed. For e.g. by thinning the shape information of a character can be gathered without losing the data.



**FIGURE 4: Stroke-width normalization image**

### Skew Correction and Slant Removal

Skew correction methods are used for the alignment of the coordinate system of the scanner with respect to that of the document. Its main approaches include correlation, projection profiles and Hough transform etc[1]. The slant of any handwritten text(s) varies from one user to another. The characters can be normalized by using the slant removal methods[1].



**FIGURE 5: Skew correction and Slant removal image**

### Binarization

In Binarization, a gray scale image is transformed to a binary image using global thresholding technique[3]. Let's assume  $f(x,y)$  is an input image.  $T$  is the threshold value and  $g(x,y)$  is the output image of thresholding process then the mathematical equation of this conversion is  $g(x,y) = 1$  if  $f(x,y) \geq T$  otherwise 0.



**FIGURE 6: Binarized image**

## 2.2 IMAGE SEGMENTATION

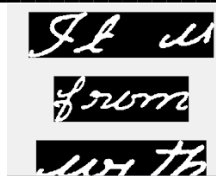
Image Segmentation involves two major steps[4]:

1. Line Detection
2. Word Detection

Line detection: Lines are differentiated using the Hough Transform, horizontal projections, etc. technique.

Hough transform detects straight lines. The straight line  $y = mx + b$  can be represented as a point  $(b, m)$  in the parameter space, where  $b$  represents the intercept parameter and  $m$  represents the slope parameter.

Horizontal Projection profile is the projection profile of an image along horizontal axis. It calculates each row for all column pixels in that row.

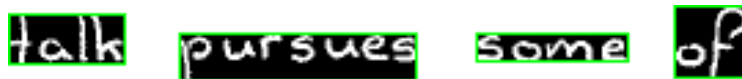


**FIGURE 7: Line Segmentation**

Word detection: Words can be identified using vertical projections, connected component analysis, etc.

Vertical Projection profile is the projection profile of an image along vertical axis. Vertical projection profile is calculated for each column as summation of all row pixel values inside the column.

Connected component labeling works by scanning an image, pixel-by-pixel (from top to bottom and left to right) so as to identify connected pixel regions, i.e. regions of adjacent pixels that share the same set of intensity values  $V$ . For a binary image  $V=\{1\}$ .



**FIGURE 8: Word Segmentation**

### 2.3 FEATURE EXTRACTION

Feature extraction methods include principal component analysis (PCA), latent semantic indexing (LSI), etc[3].

Principal Component Analysis (PCA): Principal Component Analysis is dimension reduction technique. PCA extracts the information from various dataset. The goal of PCA is to produce lower-dimensional feature set from the original dataset. PCA is sensitive to the relative scaling of the original variables[5]. PCA determines the number of principal components using certain criterions. The dimensions representing the principal components at the best are chosen. The number of principal components to be chosen varies depending upon the quality of the dataset.

Latent Semantic Indexing (LSI): Latent Semantic Indexing (LSI) is a technique that projects queries and documents into a space with "latent" semantic dimensions. LSI has fewer dimensions than the original space. It works as a similarity matrix that is an alternative to word overlap measures like  $td.idf$ .

### 2.4 CLASSIFICATION

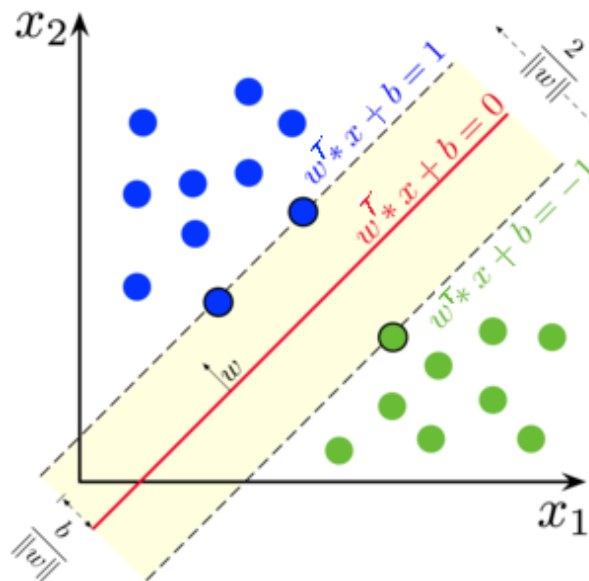
Classification is the process of identifying which of a set of categories a new observation belongs, on the basis of a training set of data containing observations. The classifier utilization depends on several factors, such as available training set, range of free parameters. Some of the vital techniques which can be used for classification are- decision Tree (DT), k-Nearest Neighbor (k-NN), Bayes Classifier, Neural Networks (NN), Support Vector Machines (SVM), etc[1].

Decision Tree (DT) Classifier: In Decision tree classifier, the features are split into completely different regions corresponding to the classes available. It uses Information Gain value to identify the node at each level of the DT. The feature with the highest Information Gain is chosen as the node. The class is assigned along the path of the assigned nodes containing the features.

k-Nearest Neighbor (k-NN) Classifier: The purpose of k-NN classifier is used to assign the class label to a cluster of similar elements. It calculates the nearest neighbors using the Euclidean distance matrix. The similarity score is used as the weight of the classes of the neighbor document.

**Naive Bayes (NB) Classifier:** Naive Bayes Classifier is a probabilistic classifier. It assumes the independence of features. The value of a particular feature is independent of any other feature's value, given the class variable[17]. For example, a fruit can be considered to be an apple if it is round, red, and about 10 cm in diameter. A naive Bayes classifier considers each of these features to contribute independently to the probability that this fruit is an apple, regardless of any attainable correlations between the color, roundness, and diameter features. Despite the over-amplified assumptions, Naive Bayes Classifier has worked well in several complicated real-world issues. Training and testing phase in Naive Bayes is easy for implementation and computation.

**Support Vector Machine (SVM) Classifier:** Support Vector Machine belongs to supervised learning classification technique. SVM algorithm consists of 2 types of versions: non-linear and linear versions[18]. In non-linear version, classes are not separated i.e. no straight lines that separate the classes can be found. In linear version, the classes are separated with the hyperplanes. Linear classifier is defined as  $w^T x + b = 0$ . Where,  $w$  is the direction of the hyperplane and  $b$  is the precise position of hyperplane[18].



**FIGURE 9: Linear SVM Classifier**

SVM find this hyperplane by using margins and support vectors. The region between the two hyperplanes  $w^T x + b = 1$  and  $w^T x + b = -1$  is known as margin.  $2/\|w\|$  is the width of the margin. The tuples that fall on the two hyperplanes are known as support vectors.

### III. CONCLUSION

With the rapid increase in the digital conversion of texts, the need for handwriting recognition systems are soaring higher and higher. Here in this paper, we have discussed the techniques used in converting the text into the digital form. The accuracy rate of the systems determines how well a system is. But the text classification suffers from the higher dimensionality problem. To reduce the feature space and increase the accuracy of the systems, we have reviewed the pre-processing techniques, image segmentation, feature extraction as well as the classifiers available for text recognition.

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## Social Media Platform & Rights for Privacy

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**Abstract**— With the arrival of Social Media the world is varying at an unbelievable speed. These platforms have become a part of human life. The recent trends in social platforms has led to spark in personal information being published on World Wide Web. However, there are two sides to every coin while these socially active websites are creative tools for expressing the personality it also entails serious privacy concerns. The main purpose of this paper is to demonstrate the limits of extending privacy intrusions in the context of social networking. Privacy specific legislation is the most appropriate means of protecting online privacy. So, it is important to maintain a great deal for security and privacy while sharing information on Social Media Platform and rights of privacy where in user will decide which information that are to be kept undisclosed and should be made private.

**Keywords**— *personality, privacy, security, social media, world wide web*

### I. INTRODUCTION

In the course of recent years, the utilization of internet-based life systems has skyrocketed. Social media stages, for example, Facebook, Twitter, WhatsApp, Hike, Instagram and so on has permitted individuals everywhere throughout the world to interface with friends, professionals, and outsiders in a way that was already nonexistent<sup>[1]</sup>. Social Networking Sites are one of the most astounding innovations of the cutting edge age<sup>[1]</sup>. The ascent of online networking has changed the manner in which individuals present data about their own lives and everyday activities about themselves. A few people utilize this stage to advance their businesses, some utilize these web-based life profiles for systems administration and refreshing others about their lives. Social media stages are oftentimes used, it merits addressing the protection rights which some client overlook or are letting go<sup>[2]</sup>.

Users are confiding in these web-based social networking stages and posting individual data without comprehending what befalls the data after it is gathered by systems<sup>[3]</sup>. The absence of information about who can get to which data about the client on these systems proposes that client protection might be in chance. Protection was characterized as privileges of individuals so they can characterize what ought to be conveyed and till what expand data in regards to them ought to be imparted to other people<sup>[3]</sup>.

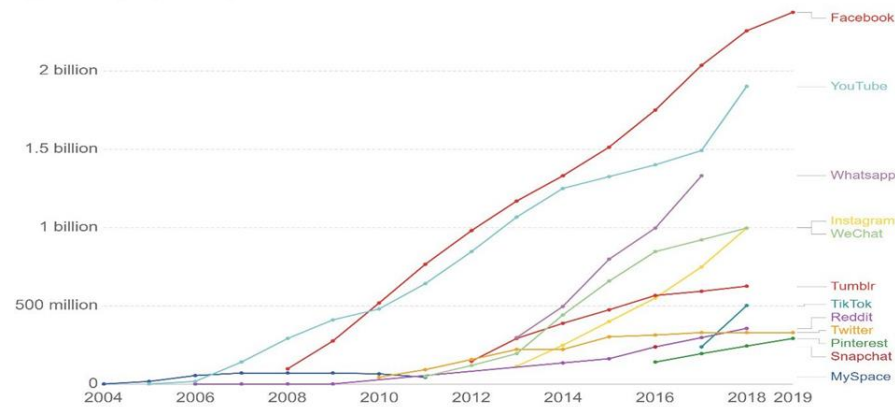


Fig 1. Social Media Trends till 2019

## II. PRIVACY RISKS ON SOCIAL MEDIA

Nowadays programmers slink the interpersonal organization's locales searching for victims. They utilize the abbreviated URLs to fool their victim into visiting harmful sites or to inject viruses into PCs or cell phones<sup>[4]</sup>. Programmers additionally use spyware which can be effectively introduced on cell phones, remotely by means of downloads, messages, abbreviated URLs or texts. The spyware gives programmer data about the passwords which the client uses to connect with web-based networking media and different accounts on web<sup>[4]</sup>.

The greater part of the online networking sites is that they have data that is required, similar to your birthday and email address. Identity Thieves tend to gather their victims personal information from the information available on the social media sites. Many identity thieves tend to hack their victims email account by basically utilizing the individual data accessible via web-based networking media profiles<sup>[4]</sup>. For example, one of the more typical systems utilized by identity thieves is tapping on the "forgot password," and afterward attempting to recover the password through email. When they get to your email account, they basically approach the entirety of your personal information.

Social media sites use mobile apps and the area based administrations to enable users to check-in at their current locations. This ordinarily uncovers the users current location to the entirety of the individuals they are associated with their specific web-based social networking systems<sup>[4]</sup>. The data posted can be effectively utilized by malicious individuals to follow your whereabouts. In addition, telling the online network where you are, or where you are going to, can wind up welcoming criminals and hoodlums to your home or business.

For example, by posting your present area and saying that you are on a long vacation in London, you will let the potential burglars or/and thieves know precisely where you are, and how long you will be gone. To moderate such risk, you should abstain from posting your sightseeing plans, and utilizing the location based services.

## III. TIPS FOR PROTECTING YOUR PRIVACY ON SOCIAL MEDIA

Make solid passwords with the goal that it is harder to figure out. It can incorporate unique character numbers and capital letters in your secret key<sup>[7]</sup>.

We should review our social media accounts security strategy before joining. On the off chance if it isn't clear, at that point don't join or confine your utilization of such networking sites. We should check and arrange security settings.

The default settings for some social media sites may enable anybody to see your data, these setting should be changed to permit just those individuals you trust to approach the data you post<sup>[7]</sup>.

Try not to think all that you read on the web. Individuals may post bogus or deceiving data about their very own characters. The web makes it simple for individuals to distort their characters and objectives. Teach children about web security and know about their online propensities<sup>[7]</sup>.

Kids are increasingly vulnerable towards the dangers that comes with the utilization of social media sites. Although a significant number of these systems have age limitations, kids may distort their ages with the goal that they can join.

Some web-based social networking sites like Facebook gives you the chance of limiting access to specific companions, relatives, and colleagues. Likewise, exploit the upgraded protection alternatives which are offered by these social media platforms like blocking the messages from outsiders<sup>[7]</sup>.

#### IV. DO WE HAVE PRIVACY RIGHTS ON SOCIAL MEDIA?



Your security rights are decreased in social media. Most individuals would probably say this is valid, and there are few court decisions declaring that individuals surrender protection interests once they post generally private matters about themselves on social media. But absolutely blaming social media for reduced security isn't right. Consider a person postings on Facebook.

A Facebook user may see their own Facebook page as their own domain, similar to their home. Yet, a Facebook page is only one connection in a great voluntary overall PC network. Aside from the most stringent privacy settings, postings you make on Facebook can promptly get known to numerous others<sup>[11]</sup>.

While the expression "Friend" appears to be amicable, your Facebook friends may not be your genuine friends. As one court noted, "Where Facebook security settings permit viewership of postings by "friends," the Government may get to them through a participating observer who is a friend without violating the Fourth Amendment."

The court in that case considered that when an individual shares a photo with his friends on Facebook, that individual "has no

reasonable expectation that his 'friends' would keep his profile private," and any "authentic expectation for protection finished when he scattered presents on his 'friends' on the grounds that those friends were allowed to utilize the data any way they needed."<sup>[11]</sup>

What's more, in opposition to the predominant confidence in social media exceptionalism, web-based life action isn't truly treated contrastingly under the law. An essential guideline of security law for quite a long time has been that your protection rights rely on whether you have a "sensible expectation for security." The sensibility of your expectation has consistently been made a decision from a presence of mind totality-of-the conditions approach, paying little heed to the physical or virtual territory of action.

You may have a sensible expectation for security concerning a journal you keep at your bedside, in any case, not to papers you leave obvious in your work environment. Your exercises in a secluded, fenced, and tree-protected home make a more grounded desire for security than your exercises in a skyscraper loft with the blinds open<sup>[11]</sup>.

Web-based life protection cases just apply that long-standing "sensible desire for security" standard to Internet circumstances. Taking a gander at the way Facebook and other web-based social networking destinations work, most courts have inferred that once something is deliberately posted on Facebook, it never again conveys a sensible desire for security. You surrender your protection by posting something on open Facebook pages<sup>[11]</sup>.

Your protection can be damaged on Facebook, in any case, in the event that others make postings trespassing of your security. Your agreement doesn't stretch out to the postings of others that you don't approve of. While the term "friend" seems friendly, your Facebook friends may not be your real friends. As one court noted, "Where Facebook privacy settings allow viewership of postings by "friends," the Government may access them through a cooperating witness who is a 'friend' without violating the Fourth Amendment."

The court everything considered pondered that when an individual offers a photograph with his colleagues on Facebook, that individual "has no sensible want that his 'allies' would keep his profile private," and any "bona fide want for security completed when he scattered introduces on his 'mates' because those 'mates' were permitted to use the information any way they needed. "And in opposition to the common confidence in internet-based life exceptionalism, online networking action isn't truly treated contrastingly under the law. A fundamental guideline of protection law for a considerable length of time has been that your protection rights rely on whether you have a "sensible desire for security." The sensibility of your desires has consistently been made a decision from a sound judgment totality-of-the conditions approach, paying little mind to the physical or virtual zone of movement<sup>[11]</sup>.

You may have a sensible desire for protection regarding a journal you keep at your bedside, be that as it may, not to papers you leave obvious in your work environment. Your exercises in a separated, fenced, and tree-protected home makes a more grounded

desire for security than your exercises in a skyscraper condo with the drapes open.

Web-based social networking protection cases just apply that long-standing "sensible expectation for security" rule to Internet circumstances. Looking at the way Facebook and other internet-based sites work, most courts have presumed that once something is deliberately posted on Facebook, it never again conveys a sensible expectation for protection. You surrender your security by posting something on available Facebook pages.

Your privacy can be violated on Facebook, however, if others make postings trespassing of your privacy. Your consent doesn't extend to the postings of others that you don't authorize.

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## V. CONCLUSION

Internet-based life Platform causes us to associate with individuals everywhere throughout the world. But we should be cautious about what we are posting on these stages despite protection setting we ought to be alert as we can't totally depend on these security settings on the grounds that our information isn't as secure as we might suspect it may be.

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## Cybersecurity in 2019

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**Abstract**— This Research paper offers a review of the challenges and opportunities of Big data with cybersecurity in 2019. Cyber Security is the activity of keep safe from harm information and information systems such as networks, computers, databases, data centers and applications with appropriate procedural and technological security measures. Firewalls, antivirus software, and other technological solving a difficulty for safeguarding personal data and computer networks are essential but not sufficient to ensure security. The cybersecurity plays a great significant role to ensure that the ICT components or infrastructures execute well along with the organization's business success. This paper will present a study of security management models to the principle the security maintenance on existing cyberinfrastructures in 2019. The implemented cybersecurity maintenance within the security management model in a prototype and evaluated it for practical and theoretical scenarios. The focused on cybersecurity maintenance within security models in cyberinfrastructures and presented a way for the theoretical and practical analysis based on the selected security management models in 2019. Cyber-Ethics, Cyber-Safety, and Cyber-Security issues need to be integrated into the educational process beginning at an early age. Security countermeasure helps ensure the confidentiality, availability, and integrity of information systems by preventing or serious asset losses from Cyber Security attacks that occurred during 2019. This paper focuses on cybersecurity emerging trends in 2019 while adopting new technologies such as mobile computing, cloud computing, e-commerce, and social networking.

**Keywords**— Cyber-Ethics, Cyber Infrastructures, Cyber Security, Firewalls, Information Systems.

### 1. INTRODUCTION

Today man can send and get any type of information might be an email or a sound or video just by the snap of a catch however did he ever think how safely his information id being transmitted or sent to the next individual securely with no spillage of data?? The appropriate response lies in digital security. Today the Internet is the quickest developing foundation inconsistent life. In the present specialized condition numerous most recent advances are changing the substance of the humankind. Be that as it may, because of these developing innovations we can't defend our private data in an exceptionally compelling manner and thus nowadays digital violations are expanding step by step. Today in excess of 60 percent of all-out business exchanges are done on the web, so this field required a high caliber of security for straightforward and best exchanges. Thus digital security has become a most recent issue. The extent of digital security isn't simply constrained to verifying the data in the IT industry yet additionally to different fields like the internet and so forth.

Indeed, even the most recent advances like distributed computing, portable figuring, E-business, net banking and so on likewise need a significant level of security. Since these innovations hold some significant data with respect to an individual their security has become an unquestionable requirement thing. Improving digital security and ensuring basic data foundations are fundamental to every country's security and monetary prosperity. Making the Internet more secure (and ensuring Internet clients) has gotten vital to the advancement of new benefits just as a legislative approach. The battle against digital wrongdoing needs an exhaustive and a more secure methodology. Given that specialized estimates alone can't forestall any wrongdoing, it is important that law implementation organizations are permitted to explore and indict digital wrongdoing viably. Today numerous countries and

governments are forcing exacting laws on digital protections so as to forestall the loss of some significant data. Each individual should likewise be prepared on this digital security and spare themselves from these expanding digital violations

### 1.1 CYBER SECURITY

The protection and security of the information will consistently be top safety efforts that any association takes care of. We are directly facing<sup>[4]</sup> a daily reality such that all the data is kept up in a computerized or a digital structure. Long-range interpersonal communication destinations give a space where clients have a sense of security as they collaborate with loved ones. On account of home clients, digital crooks would keep on focusing via web-based networking media locales to take individual information. Social systems administration as well as during bank exchanges an individual must take all the necessary safety efforts.

**Table I**  
**Comparison between different cyber security incidents**

Incidents	Jan- June 2012	Jan- June 2013	% Increase/ (decrease)
Fraud	2439	2490	2
Intrusion	2203	1726	(22)
Spam	291	614	111
Malicious code	353	442	25
Cyber Harassment	173	233	35
Content related	10	42	320
Intrusion Attempts	55	24	(56)
Denial of services	12	10	(17)
Vulnerability reports	45	11	(76)
Total	5581	5592	

The above Comparison of Cyber Security Incidents answered to Cyber999 in Malaysia from January–June 2012 and 2013 plainly displays the digital security dangers. As wrongdoing is expanding even the safety efforts are likewise expanding. As per the study of U.S. innovation and human services officials across the country, Silicon Valley Bank found that organizations accept digital assaults are a genuine risk to both their information and their business coherence.

- ❖ 98% of organizations are keeping up or expanding their digital security assets and of those, half are expanding assets dedicated to online assaults this year
- ❖ The dominant part of organizations are getting ready for when, not if, digital assaults happen
- ❖ Only 33% are totally sure about the security of their data and even less sure about the safety efforts of their colleagues.

There will be new assaults on Android working framework based gadgets, however, it won't be on a monstrous scale. The reality tablets share a similar working framework as advanced cells imply they will be before long focused by the equivalent malware as those stages. The number of malware examples for Macs would keep on developing, however considerably less than on account of PCs. Windows 8 will enable clients to create applications for all intents and purposes any gadget (PCs, tablets and advanced mobile phones) running Windows 8, so it will be conceivable to create pernicious applications like those for Android, thus these are a portion of the anticipated patterns in digital security.

## **2. CYBER SECURITY TECHNIQUES**

### ***2.1 Access control and password security***

The idea of client name and the secret key has been a crucial method for securing our data. This might be one of the primary measures with respect to digital security. Access control is a security system that directs who or what can view or utilize assets in a processing situation. It is a principal idea in security that limits hazard to the business or association.

### ***2.2 Authentication of data***

The records that we get should consistently<sup>[1]</sup> be verified before downloading that is it ought to be checked in the event that it has started from a trusted and a solid source and that they are not modified. Validating of these archives is generally done by the counter infection programming present in the gadgets. In this manner, a decent enemy of infection programming is likewise basic to shield the gadgets from infections. The motivation behind information confirmation is to ensure the information isn't changed in travel. To accomplish this objective, the transmitter goes with the edge with a particular code known as the Message Integrity Code (MIC). The MIC is created by a technique known to both recipient and transmitter.

### ***2.3 Malware scanners***

This is programming that normally examines every one of the records and archives present in the framework for malignant code or destructive infections. Infections, worms, and Trojan ponies are instances of vindictive programming that are frequently gathered and alluded to as malware. Malware (a portmanteau for malevolent programming) is any product deliberately intended to make harm a PC, server, customer, or PC organize (on the other hand, programming that causes unexpected mischief because of some lack is ordinarily portrayed as a product bug). A wide assortment of sorts of malware exists, including PC infections, worms, Trojan steeds, ransomware, spyware, adware, and scareware.

### ***2.4 Firewalls***

A firewall is a product program or bit of equipment that assists screen with excursion programmers, infections, and worms that attempt to arrive at your PC over the Internet. All messages entering or leaving the web go through the firewall present, which inspects each message and hinders those that don't meet the predefined security criteria. Thus firewalls assume a significant job in recognizing the malware. In processing, a firewall is a system security framework that screens and controls approaching and active system traffic dependent on foreordained security rules. A firewall normally builds up a boundary between a confided in the interior system and an untrusted outside system, for example, the Internet.

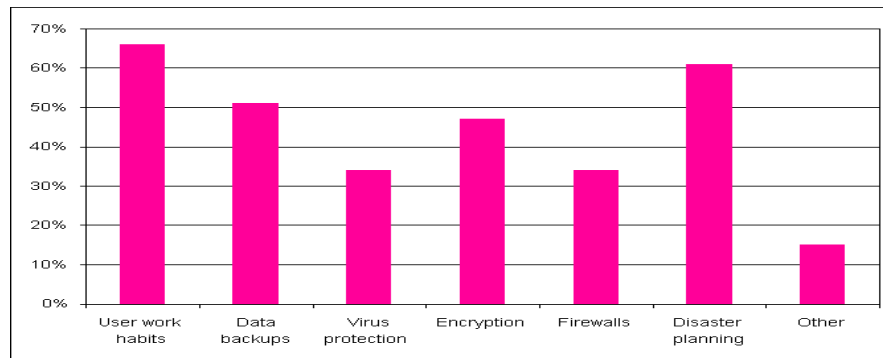
Firewalls are regularly arranged as either organize firewalls or host-based firewalls. System firewalls channel traffic between at least two systems and run on arranging equipment. Host-put together firewalls run with respect to having PCs and control arrange traffic all through those machines.

### ***2.5 Anti-virus software***

Antivirus programming is a PC program that identifies, forestalls, and makes a move to incapacitate or evacuate pernicious programming programs, for example, infections and worms. Most antivirus programs incorporate an auto-update include that empowers the program to download profiles of new infections with the goal that it can check for the new infections when they are found. An enemy of infection programming is an unquestionable requirement and fundamental need for each framework.

Antivirus programming, or against infection programming (shortened to AV programming), otherwise called the enemy of malware, is a PC program used to forestall, identify, and expel malware.

Antivirus programming was initially evolved to distinguish and expel PC infections, henceforth the name. Nonetheless, with the multiplication of different sorts of malware, antivirus programming began to give insurance from other PC dangers. Specifically, present-day antivirus programming can shield clients from malevolent program aide objects (BHOs), program ruffians, ransomware, keyloggers, secondary passages, rootkits, trojan ponies, worms, vindictive LSPs, dialers, fraud tools, adware, and spyware. A few items likewise incorporate security from other PC dangers, for example, tainted and malignant URLs, spam, trick and phishing assaults, online character (protection), web-based financial assaults, social building systems, progressed determined risk (APT) and botnet DDoS assaults.



**Figure 1 : Graphical representation of Techniques of Cyber Security**

### 3. CYBERSECURITY THREATS IN 2019

#### 3.1 CRYPTOJACKING: YOUR MACHINES MAKE THEIR MONEY

Cryptojacking is a type of malware that is intended to mine digital money on your framework without your insight—and without you getting any of the financial advantages. It's definitely more typical than you may suspect; in one prominent case, whiz footballer Cristiano Ronaldo's site was planted with the noxious programming. Also, it's intended to be unobtrusive, so you may go a very long time without really identifying that you've succumbed to it.

Perhaps the simplest approach to see the malware is to investigate your framework assets plate. On the off chance that you're devouring a larger number of assets than you should, at that point, something may be out of order. Other indications incorporate your CPU warming up more frequently than it ought to or on the off chance that you experience slacks notwithstanding opening insignificant procedures.

Make preparations for cryptojacking<sup>[10]</sup> by keeping your gadget refreshed as frequently as could reasonably be expected. Try not to turn off the programmed update alternative, and put resources into a vigorous antivirus programming program in the event that you can.

#### 3.2 PHISHING: A DAILY DELUGE OF FAKE EMAILS

Phishing assaults are a programmer backbone and they aren't leaving style at any point in the near future. For setting, think about this: The U.S. Division of Defense defeats about 36 million messages containing malware, infections, and phishing plans each and every day. That is in excess of a billion every month.

The DoD takes note of that the modernity of cyberthreats just as the recurrence and potential effect are expanding drastically. What's more, the danger levels are probably going to prop up, considering progressively delicate data is presently facilitated on data innovation frameworks.

Regardless of whether you're not as enticing an objective as the U.S. military, the truth of the matter is that phishing is one of the simplest and best strategies to unleash destruction. That is on the grounds that such assaults have all the earmarks of being ordinary messages from people you trust, for example, your relatives or work partners. When opened, in any case, phishing plans can truly destroy your information and uncover all restrictive data.

"90% of malware today starts in the inbox, masked inside phishing messages whose senders imitate confided in partners," states Dave Palmer, chief of innovation at cyberdefense organization Darktrace.

### **3.3 THE USE OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**

The expression "cyberarmy" may invoke pictures of state-supported programmers cooperating to cause dispersed refusal of administration (DDoS) assaults on adversary framework, yet the truth of the matter is that new dangers are progressively directed by computerized reasoning. Programmers are, actually, moving their insight to PCs for the point of scaling the size and modernity of interruption endeavors.

For instance, the Emotet trojan malware, which fooled clients into tapping on contaminated messages and took information thus, utilized man-made brainpower highlights to imitate genuine clients and show up as certified as could be expected under the circumstances.

The methodology, alluded to as "brilliant phishing," is a disturbing new pattern. In the event that machines can effectively gain proficiency with the little-known techniques and copy people as intently as could be allowed, a totally different field of cyberwarfare may be released. IBM has additionally affirmed this plausibility, by building up a "proof of idea" of savvy malware.

### **3.4 POLITICAL MOVES: HACKING BY GOVERNMENTS**

To state that the world is isolated right currently may be a touch of a modest representation of the truth.

With the U.S.- China exchange war, the standard rallying calls from North Korea and Iran, and harmony in the Middle East a remote, all things considered, national governments will go to their cyberarmies for all the more hacking and interruption endeavors.

Government information ruptures are a genuine article, with the Stuxnet worm that influenced Iranian atomic offices viewed as one of the most advanced of its sort. In any case, government-upheld programmers won't simply assault rival government establishments. An ongoing cyberattack against Airbus was credited to Chinese programmers, a case Beijing strenuously denied.

Programmers related with North Korea have attempted to siphon more than US\$1.1 billion from banks and money related foundations, and these endeavors won't die down at any point in the near future. U.S. firms are continually on the less than desirable finish of cyberattacks, yet they're deciding to remain calm to abstain from upsetting their exchanging accomplices Asia. Cybersecurity is a regularly developing space, and the present dangers probably won't be significant tomorrow. By and by, it's a smart thought to keep yourself refreshed on current dangers and ensure yourself and your association.

#### 4. CYBER ETHICS

Digital morals are only the code of the web. At the point when we practice<sup>[11]</sup> these digital morals there are acceptable odds of us utilizing the web in a legitimate and more secure manner. The underneath are a couple of them:

- ❖ DO utilize the Internet to impart and connect with others. Email and texting make it simple to keep in contact with loved ones, speak with work associates, and offer thoughts and data with individuals across town or most of the way around the globe
- ❖ Don't be a domineering jerk on the Internet. Try not to call individuals names, lie about them, send humiliating pictures of them, or do whatever else to attempt to hurt them.
- ❖ Internet is considered as world's biggest library with data on any point in any branch of knowledge, so utilizing this data in a right and lawful manner is constantly fundamental.
- ❖ Do not work others accounts utilizing their passwords.
- ❖ Never attempt to send any sort of malware to other's frameworks and make them degenerate.
- ❖ Never share your own data to anybody as there is a decent possibility of others abusing it lastly you would wind up in a difficult situation.
- ❖ When you're online never profess to the next individual, and never attempt to make counterfeit records on another person as it would land you just as the other individual into inconvenience.
- ❖ Always hold fast to copyrighted data and download games or recordings just on the off chance that they are reasonable.

The above are a couple digital morals one must follow while utilizing the web. We are constantly thought legitimate principles from out beginning times the equivalent here we apply in the internet.

#### 5. CONCLUSION

PC security is a huge subject that is turning out to be increasingly significant in light of the fact that the world is getting profoundly interconnected, with systems being utilized to do basic exchanges. Digital wrongdoing keeps on veering down various ways with each New Year that passes thus does the security of the data. The most recent and troublesome advances, alongside the new digital instruments and dangers that become visible every day, are testing associations with how they secure their foundation, however how they require new stages and insight to do as such. There is no ideal answer for digital wrongdoings however we should attempt our level best to limit them so as to have a sheltered and secure future in the internet.

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## Virtual Reality

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**Abstract**— Device such as joystick gamepad and Virtual reality which can be referred to as immersive multimedia integrated hardware and software replicates an environment that a physical presence in places in the real world or an imagined autonomous virtual actors and the main techniques to create and animate. system for the interactive analysis of large, time-dependent data in virtual environments, touch, hearing, and smell. Human brain project with our collaborative Virtual Reality Research direct human interaction with robots and brains. Virtual reality is an artificial environment that is created with software and presented to the user simulation was developed through benchmarking, texturing, modeling and application. Virtual reality interfaces may be used to display and analyze abstract data that can be explored interactively at a personal computer, usually by manipulating keys or the mouse so that the content of the image moves in some direction or zooms in or out. It could range from creating a video game to having a virtual stroll around the universe, from walking through our own dream house to experiencing a walk on an alien planet. With virtual reality, we can experience the most situations by playing safe and with learning perspective.

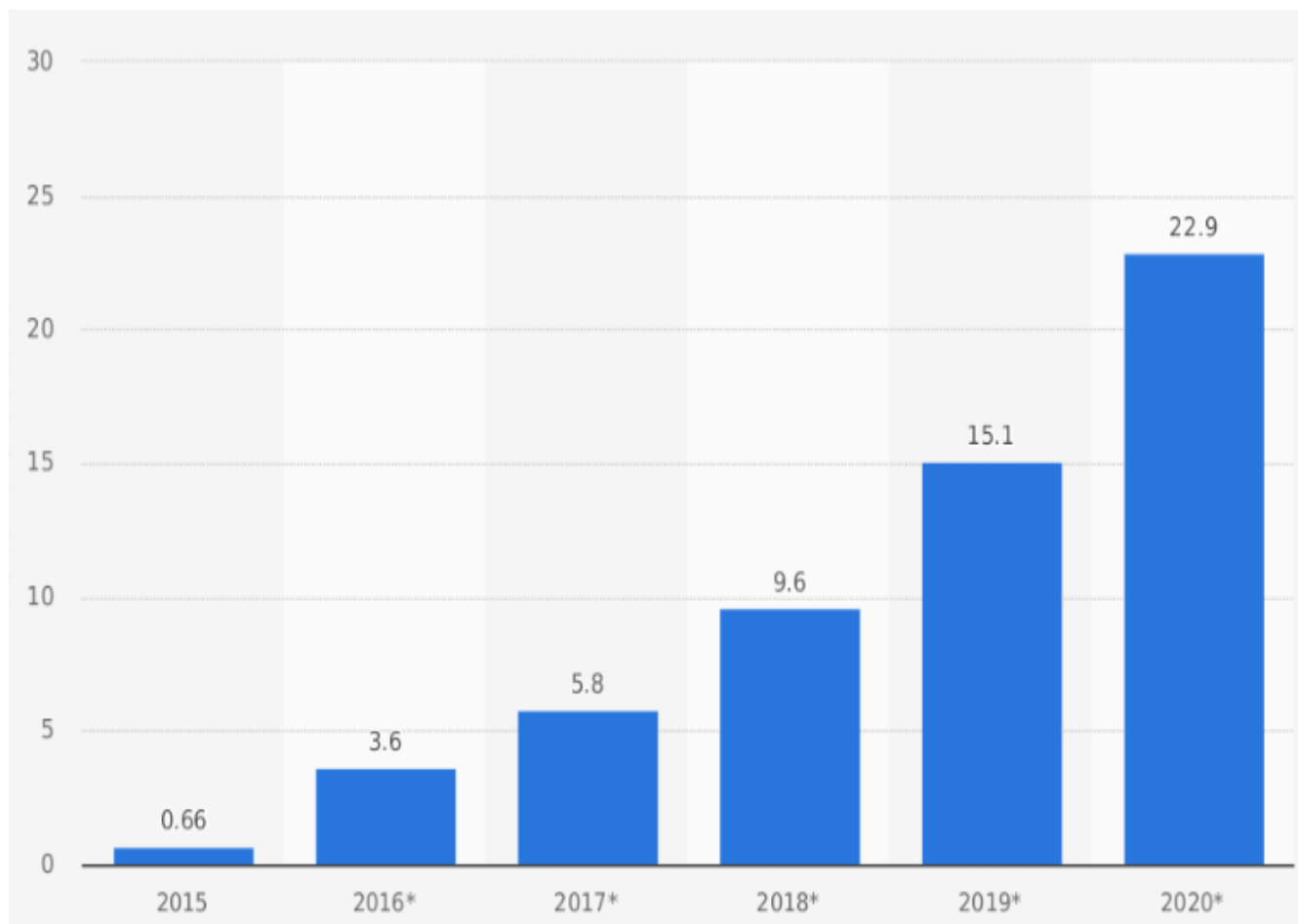
**Keywords**— HMD,4D VR, 360 video, Interactive Virtual Reality

### 1. INTRODUCTION

Virtual reality through our senses and perception systems. virtual reality continued into the 1990's and that combined with the appearance of films such as The Lawnmower Man helped to raise its profile This technology which becomes overwhelmingly popular and fashionable in current decade is called Virtual Reality Most virtual reality environments are primarily visual experiences, displayed either on a computer screen or through special stereoscopic displays. There are two critical problems in VR and AR systems, one is to ensure that virtual objects appear in the correct places in the scene; another one is that the users perceive virtual objects accurately relative to other virtual and physical objects in a scene The ideas presented are rooted in work on scientific visualization, algorithm visualization, hypertext and hypermedia browsers, etc. The comparison of depth perception within virtual environments between the head-mounted display and the stereoscopic widescreen display has been described. In this paper, we develop a virtual shuffleboard experimental scene to compare users' depth perception in VR and AR.<sup>[1]</sup> Much existing discussion around virtual reality systems focuses on technological advances ranging from higher pixel density for head-mounted displays. And while the scale of such technological achievements coupled with the staggering speed of engineering progress is impressive, the fundamental social and experiential concerns as to how virtual reality systems will be incorporated into our societies as a greater whole are often given relatively short shrift. To free the users from cables, wired devices in the VR environment have been replaced with wireless components of equal functionality.<sup>[2]</sup> It allows user to play games in a horror and space theme in a multiplayer platform. Most virtual reality environments are primarily visual experiences, displayed either on a computer screen or through special stereoscopic displays. Also, to cut the cost for building and retiling the escape room and simulate the risky interaction which hardly provided in real world. Commercial VR Escape room has been provided. It allows user to play games in a horror and space theme in a multiplayer platform. It is usually provided in public space, such as, shopping mall

## II. ADVANTAGEA AND DISADVANTAGE

Sr.No	Advantages	Disadvantages
01	the first advantage of VR is the complete control of the stimuli provided to the subject, being the main reason to use VR because it provides a standardized and reproducible environment	The main limitation of VR is different distance perception
02	The second advantage is the ability to have stereoscopic vision that gives the subject salient motion-in-depth information	They can indeed alter patients' actions with for instance different amplitude of center of pressure or reaction times in VR compared to real situations.
03	Virtual reality has also been used extensively to treat phobias and post-traumatic stress disorder	The equipment used in virtual reality are very expensive.
04	It enables user to explore places.	It consists of complex technologies.
05	Virtual reality creates a realistic world	In virtual reality environment we can't move by our own like in the real one.



**figure 1. Data analytics virtual reality size from year 2015- 2020**

### III. TECHNOLOGIES OF VR

#### 3.1 HEAD-MOUNT DISPLAY



**figure 2. head mount display**

Virtual Reality headsets or VR glasses. the simulation of real-world environments in real-time, to the procedural generation of dynamic audio environments. and built-in head-tracker and stereo headphones the HMD used by the system, including a shell and a smart phone. the system input device leap motion and output device HMD, in which leap motion is connected in front of the HMD. the user operating the system input/output devices: users could see the virtual scene through HMD. Meanwhile the hand movement and gestures of the user can be recognized and displayed in a virtual scene, and the user can interact with the virtual scene just by hand movements. The automatic capture function of the input devices of this system mainly includes two parts: the head motion capturing and the hands tracking.<sup>[3]</sup>

#### 3.2 DATA GLOVE



**figure 3. data glove**

The data glove can be easily built by the user, to be used in VR applications. On these exercises, it evaluates and treats the fingers and dysfunction of the through activities that promote the extension of fingers and wrist. Cyber Glove Systems offers a motion- based capture system for a variety of applications such as digital prototype evaluation, virtual reality, animation and rehabilitation. data glove which measures the force applied by fingertips. the data glove system moving the fingers and the image of the 3D model used for the fingers.<sup>[4]</sup>

### IV. APPLICATIONS OF VIRTUAL REALITY

#### 4.1 ENTERTAINMENT

Gaming Virtual Museum, e.g. interactive exhibitions games are available for Xbox 360, PS2 and 3 as well as the Mac and PC so whatever console you use there is a game Virtual reality is evident in video games. Now you can physically interact with a game by using your body. VR cameras are used to create images and videos that can be viewed in Virtual reality. The experience allows users to interact with the characters and worlds most noticeably in games and virtual worlds. But other equally popular areas include: Virtual Museums, e.g. interactive exhibitions Galleries.



**figure 4. entertainment**

## 4.2 MEDICAL

Practice performing surgery. robotic surgery and skills training. Realistic looking virtual patients, but also histological and bone structures. With the simulation of the entire physiology of the human body. Experimenting medical research with virtual patients will be a reality. Computerized 3D human models provide a new approach to research and education in medicine. Tele- surgery: Telepresence applications where the surgeon and the patient are in different locations. Pain treatment: Brain scans show less brain activity with VR in the areas which are responsible for pain. Analysis simulation data Strength and stress calculation Inspection of Location of insertion,Functionality,Strains, tensions on the digital model.<sup>[5]</sup>



**figure 5. medical**

## 4.3 MANUFACTURING

Virtual Reality (VR) in Engineering often associated with mount ability, maintainability, ergonomics, industrial engineering. Design of manufacturing processes: often a spatially complex task. There by VR can basically be applied effectively. Support of local or distributed cooperative work with VR.Augmented reality (AR) for model validation. Manufacturing is the most promising industry. The world has shrunk at an enormous rate. The various processes and aspects related to manufacturing are converged with the suitable simulation technology thus resulting in cost reduction and profitability of the industry. Not surprisingly Virtual Manufacturing plays a vital role in such type of manufacturing. the simulation technology to optimize the various factors that affect the profitability of the products associated with that company. Simulation technology acts like an agent that draws out the factors resulting in cost reduction, less material usage etc



**figure 6. manufacturing**

#### 4.4 EDUCATION & TRAINING

The fully Immersive training environment allows to train through a wide variety and scenarios can be applied in different fields such as design, games, films, simulations, visualization, etc., it also allows integration and creation of different learning contexts which make it successful as a training tool. Flight simulators, driving simulators, tank simulators provide learners with a virtual environment where they can develop their skills without the real world consequences of failing. The Fully Immersive training environment allows to train through a wide variety and scenarios can be applied in different fields such as design, games, films, simulations, visualization, etc., it also allows integration and creation of different learning contexts which make it successful as a training tool. This is followed by a review of several application areas in educational contexts. The usefulness of this for education and training purposes it combines the realism of real world scenarios with the informative detail of computer visualization. Uses include, for example, training for engineers in the functioning of complex mechanisms such jet engines and in medical applications.<sup>[6]</sup>



**figure 7. education & training**

#### V. CONCLUSION

This paper has presented three virtual interactive environments where game mechanics and musical ensemble cooperation are combined to create inherently collaborative virtual spaces. In each of these works, networked three-dimensional virtual reality systems leverage existing gaming technologies and frameworks to create collaborative interactive spaces within which participants must cooperate to achieve a desired result. Building on collaborative models such as those found across arts practices, the future of VR applications can embrace a direction focused on community building and social cooperation rather than one focused on inherent competition. . In summary, we identify the following central benefits of our proposed collaborative Virtual Reality Neurorobotics LabHuman-Robot Interaction Studies: Rich, realistic and natural interactions between virtual robots and humans that can be recorded and played back for reproducible studies and improved evaluations. Real-World Inputs: Robot brains can be trained with and react to complex inputs coming from real human full-body postures, gestures and movements.3D Telepresence: Spatially distributed researchers can meet in ongoing experiments and discuss about them as if they were standing next to each other. The result of evaluation showed that players had positive feedback towards the simulation and inquiries to be available on Steam so they can play it online

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# Securing Web Server Against DDoS Attack

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**Abstract**—A DDoS attack is a malicious attempt to disrupt normal traffic by exhausting web server resources. The DDoS attack is used to block normal traffic flow, crack login credentials, scraping data, bring down websites, reduce domain ranking etc. Securing the web server from DDoS attacks is one of the major problems in network technologies. There are various algorithms to mitigate DDoS attacks but these algorithms have many flaws that are to be overcome. The proposed system can detect and prevent DDoS attack on any live server.

The main goal of this system is to filter incoming traffic based on various parameters and to secure the channel from different types of DDoS attacks. The system is capable of recognizing the behaviour of abnormal traffic by tracking session. This approach can be useful for securing servers from random query injection, botnets, port scanning, directory traversing, brute force, and flooding attacks. The system can help to identify the criticality of the attack. As per criticality, system can stop DDoS attacks with various methods like reducing request per second, captcha, checking browser access, cookie checking. The implementation of this approach can easily be applied to any web server.

**Keyword**—DDoS attacks, Security, Web Security, DDoS Prevention, Proactive Approach.

## I. INTRODUCTION

Preventing network attacks is one of the most difficult tasks in the field of information systems protection. Most modern systems have a distributed structure, their architecture is based on the use of network technologies. And ensuring the operability of such systems depends on the ability to resist malicious acts that are aimed at disrupting the work of both the network itself and the information system functioning within its framework. One of the most dangerous types of criminal activities on the Internet are the so-called DDoS-attacks [8][9]. The International Telegraph and Telephone Consultative Committee (CCITT) describes denial of service as "The prevention of authorized access to resources or the delaying of time-critical operations".

To achieve a bigger attack traffic size, many attack sources can be used. A Denial of Service technique that uses numerous hosts to perform the attack is called Distributed Denial of Service (DDoS). Attacker does not need to own big number of computers and can use an army of corrupted hosts (botnet) [12] to execute DDoS attack. Such attacks attempts to create congestion by consuming all available bandwidth between the target and the larger Internet.

There are currently a lot of efforts being made to come up with mechanisms to detect and mitigate such attacks. Attackers constantly modify their tools to bypass these security systems, and researchers in turn modify their approaches to handle new attacks. There are different types of methods which are used to handle DDoS attacks like the rate limit solution [10][11], defense by offense, active filtering, IP trace back, blocking etc.

DDoS attacks can create significant business risks with lasting effects. Therefore, it is important for any website owner to protect

his/her web server against this attack, it is important to understand the threats, vulnerabilities and risks associated with DDoS attacks. The system introduced can detect and prevent various types of DDoS attacks like flash crowd, botnets, port scanning, directory traversing, brute force, and flooding attacks on any web server [13].

## II. LITERATURE REIVIEW

Ilya V. Chugunkov, et. al. [1] describes Pulse Wave attack which can last very long and can have multiple targets at once. The model is created which simply uses classifier and rule sets with respect to IP table. The results of attack simulation done using python bots the system can reduce DDoS attack significantly. The result of the solution's work was a decrease in the number of time-consuming waits for user model queries from 98% to 5-10% for the duration of the attack. This system is good for all over request flow but not for individual request.

Simona Ramanauskaitė, et. al. [2] proposed different models for detection of DDoS attack by considering resources usages. The system requires to calculate memory and CPU work exhaustion probability the bandwidth exhaustion probability to determine the level of DDoS attack. Model is implemented on network layer for checking real-time data statics. Mitigation of flooding attack can be easily done. However the two-tier architecture does not influence the performance of the model if queuing based models are used for the modeling.

Vaishali Kansal, et. al. [3] proposed an effective system which is able to detect DDoS attack on server and reduce the impact of DDoS attack on main server. Detection is based on IP rule sets and Data exhaustion information. For isolation they are diverting DDoS attack to proxy servers which acts as the original target keeping main server protected. Using the proactive approach proposed in this paper DDoS attack is mitigated at the proxy level efficiently. EDIP deploys two types of proxies one is head proxy which is randomly assigned to clients and another is attack proxy which is instantiated during attack time. This technique helps server running normally without user letting know about attack.

V. Priyadharshini, et. al. [4] developed a New cracking algorithm is implemented on the application layer of web server. It uses pattern checking on incoming traffic and store IP address of the client when they arrived to the website. Mitigation of DDoS is based on blocking if abnormal IP is found. When the new user enters into the site continuously, the new cracking algorithm to determine whether the user is DDoS attacker. Such systems are effective for all scenarios, should have more parameters of detection and various methods for nullifying DDoS attack. But the system is unable to find what kind of DDoS attack occurred and on what part of web page it happened.

S. Renuka Devi, et. al. [5] introduced an metrics algorithm based on information theory for Detecting DDoS attacks on application layer. It consists of two main parts, monitoring and detection system. The system calculates entropy request per session and degree of data usage. The scheme proposed, provides double check point to differentiate the malicious request flow from the normal request flow. It validates legitimacy of user based on the previously recorded history. Based on the information metric of the current session and the user's browsing history, it detects the suspicious session. According to that system has a mechanism for rate limit and scheduling. System also session data to use when client sends request again as per the checking IP is assigned a score.

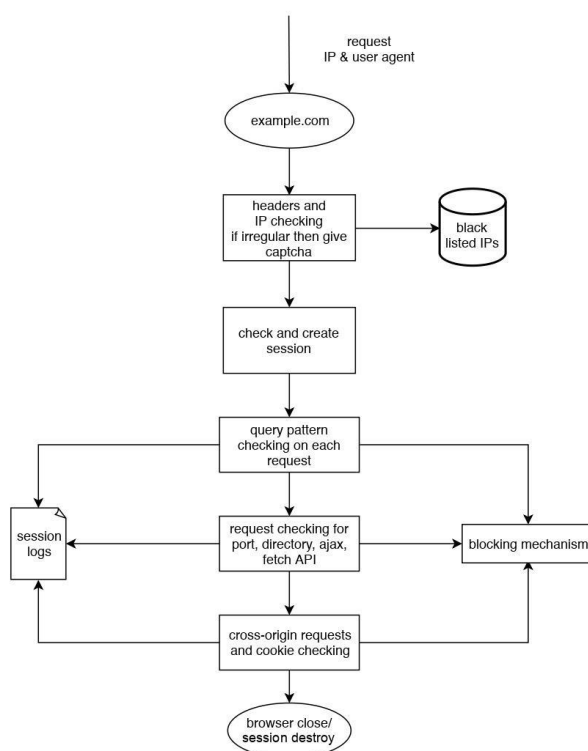
A DDoS attack is a type of DoS attack in which many computers are used to cripple a web page, website or web-based service. This analysis study on flood attacks and flash crowd increases their improvement. Attacks are either classified into high rate flood or low rate flood. For detection system uses  $\alpha$ -Stable Model and the EM Algorithm.[6]

Dr. Punidha R, Pavithra K, Swathika R and Dr. Sivaram M,[7] introduced the algorithm which is node blocking algorithm implemented on network layer. It uses multiple nodes from which the packets are to be sent from the sender to the receiver. It checks from various parameters if it satisfies the condition the user is considered as normal or marked as attacker. If user is genuine then the system provide the right path form multiple nodes. If user is attacker the it is unable to reach original server through routers. System maintain the packet address history and store the pack-address of client when it on network.

### III. PROPOSED SYSTEM

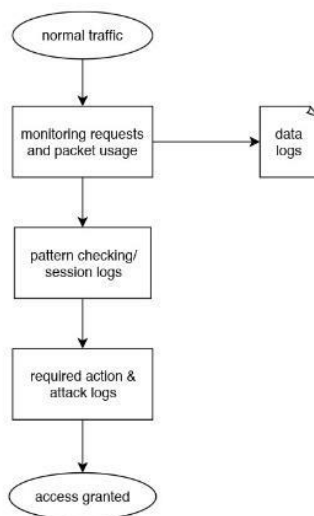
The system acts as a starting point when user sends a request to the website before session is granted. It consists of two main modules, one for checking behavior of individual request and other for monitoring overall request flow of website. Once the request is granted to a user the session log is created which is used to monitor user behavior. The session log includes data like request protocol, header information, access port and directories, time, and request query. Pattern checking is done on each request to determine the purpose of each request, if abnormal behavior is detected then user IP & headers are black-listed. This data is valid for one month since IP are dynamic.

Pattern checking algorithm for single request requires different parameter on bases of which it predicts genuineness of the user. It requires header information, user IP, agent, protocol, request page, upload/download size, url query and domain origin. Algorithm have real-time database of blocked IP's and query injection pattern are always constant. Every request is recorded in the session log. Figure 1 shows the work flow of individual request checking module.



**FIGURE 1: Working of individual request checking module**

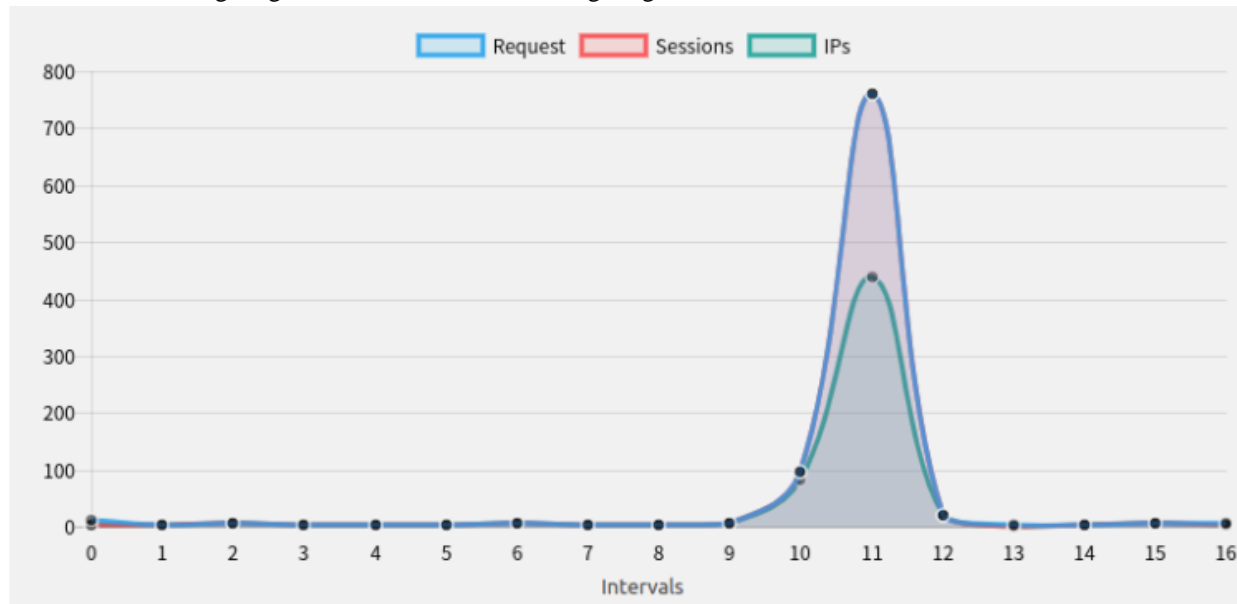
Another module in system is for regulating overall requests to the web-server. This module monitors overall requests to the website which is helpful for detecting flash crowd and flooding attacks on website. After every certain number of requests this module calculates the time elapsed between current request and previous 1000<sup>th</sup> request. This interval between requests is dynamically set in order to meet website normal traffic rate, otherwise if we preset this it will delay every 1000<sup>th</sup> request even if that is normal traffic for that website. After detecting any abnormalities in request flow module will take action such as rate limiting to delay request's access to the website. Figure 2 shows work flow of this module.



**FIGURE 2: Working of overall request monitoring module**

## IV. RESULTS

We have implemented above mentioned system as wordpress plugin. We simulated different attacks like brute force, spamming, flash and flood, etc. These attacks then successfully mitigated by proposed system. We have used captcha, rate limiters as a solution for mitigating these attacks. Following figure shows simulation of flash crowd attack on website.



**FIGURE 3: Simulation of flash crowd attack and mitigation of the same.**

In above figure it is shown that there are multiple requests incoming to the website. And these requests are also coming from multiple IP's. After detecting large number of requests in very small amount of time, algorithm applies rate limiting for each new session.

#### IV. CONCLUSION

The proposed system is able to detect and prevent DDoS attack of type single IP multi-request. System is able to use robots checking verification method for blocked black listed IP's and request which are coming from dark web source. System is also protected malicious user agents and provides extra security headers. System also provides detailed information about DDoS attack with attack type and region of attack. Further implementation can stop various DDoS attacks like multi-IP attack, brute force, random query injection, flash crowd, flood attack and also a combination of the above attacks.

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# Preparation of Papers for International Journal of Engineering Research and Science

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**Abstract**— A brain-computer interface (BCI) may be a communication system that interprets brain activity into commands for a laptop or different devices. In different words, a BCI permits users to act on their atmosphere by mistreatment solely brain activity, while not mistreatment peripheral nerves and muscles. The foremost goal of BCI analysis is to develop systems that permit disabled users to speak with different persons, to manage artificial limbs, or to manage their atmosphere. Another application space for brain-computer interfaces (BCIs) lies within the field of multimedia system communication. To develop systems for usage within the field of helpful technology or multimedia system communication, several aspects of BCI systems are presently being investigated. analysis areas embody analysis of invasive and noninvasive technologies to live brain activity, analysis of management signals (i.e. patterns of brain activity that may be used for communication), development of algorithms for translation of brain signals into laptop commands, and also the development of latest BCI applications .during this paper we tend to offer associate introduction to a number of the aspects of BCI analysis mentioned higher than, gift a concrete example of a BCI system.

**Keywords-**

## I. INTRODUCTION

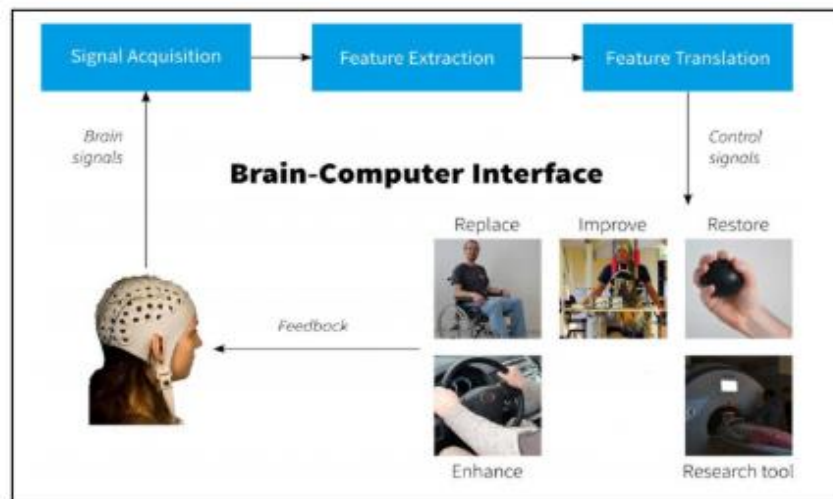
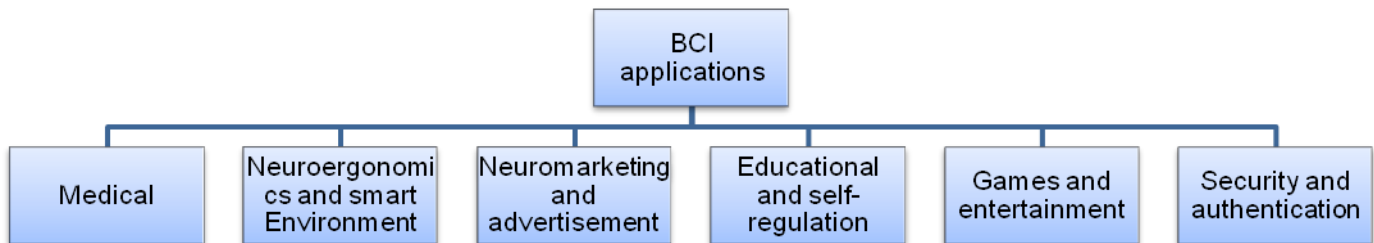
Brain-computer interface (BCI) technology is seen as a new statement tool that is a path between an enhanced or wired understanding and an outer device. In experimental time BCI was scarcely a issue of science fiction, but at the present suitable to technological evolution which leads to a great extent further develop indicator processing, neuroscience, computational neuroscience, sensors, etc. complete it possible. Immediately BCI has befit one of the fastest-growing areas of exact research. In general, the BCI system receives key from the common sense and classifies the leisure interest into a hint as to which a PC tin respond. A gadget preserve be illegal by the consumer by producing a variety of intellect motion patterns, which are captured in the document of an electroencephalogram (EEG) and at that time converted to guidelines by identifying the signatures of EEG by the BCI system. Numerous classifications were undertaken by a range of methods and performed by contraption education algorithms. BCI follow a line of investigation has been focusing on able-user and EEG based BCI systems. The existing BCI system uses customarily EEG signals which are recorded from the scalp in orderliness to choose correspondence or icons, jurisdiction arrow movement, or act upon a neuro-prosthesis. Vital fundamentals in all BCI system is a conversion algorithm, which transforms the user's EEG contribution into an output that joystick exterior devices. BCI system depends on effective interaction between two adaptive controllers; the abuser who sends his or her orders through EEG and the BCI, which recognizes the orders and expresses them in piece of equipment limit.

## II. MATERIAL AND METHOD

Brain computer interface (BCI) systems construct a letter passage between being reason and the exterior earth eliminating the necessitate for representative in sequence freedom methods. They get along the distribution of e-mail from individual brains and decoding their silent thoughts. Thus, they container help out handy-capped public to caution and compose down their opinions and dreams by way of assortment of methods such as in spelling applications, semantic categorization, or silent discourse



communication. BCI can plus facilitate hands-free applications bringing the slacken off and comfort to person beings through mind-controlling of machines. They single need incorporating common sense signals in classification to accomplish a hard of guidelines and no muscles inter-venation is needed. BCI assistive robot's container agreement sup-port for disabled users in each day and proficient life, mounting their cooperation in construction their community. Premature BCI applications allow embattled disabled users who suffer mobility or vocalizations issues. Their ambition was to impart an unorthodox announcement waterway for folk users. But later on BCI enters the globe of good for you colonize as well. It moving parts as a physiological measuring tool that retrieves and uses in sequence about an individual's emotional, cognitive or effectiveness state. The butt of intelligence signals deployment has been unlimited beyond calculating selected target or present a substitution for identifiable functions, in pardon is called passive BCI. According to Garcia-Molina et al., the fastidious awareness of the stream emotional or cognitive position container disturb the acknowledgment of the mental chore linked with the recorded reason waves an extra beneficial employment of such in sequence is to govern the royal itself and advantage that learning for enhancing a choice of BCI systems. BCI abuser public monitoring do is careful an effective hand over in individual processor Interfaces and adapts them according to the estimated client emotional or cognitive state. It participates in a common curb environment and decides the most excellent key of charge that power be old in specific situations. It in addition contributes in the incident of smart environments and emotion calculating applications. Effective conditions' assessment and edifying methods' evaluation are examples of other fields that may perhaps payment from measuring user's reason state.



### 1.1 NEUROPHYSIOLOGIC SIGNALS

To curb a brain computer interface, users come up to make a purchase of conscious inspection over their intelligence activity. Two deeply assorted approaches be to attain this. In the first approach, subjects perceive a inflexible of stimuli displayed by the common sense supercomputer boundary system and be capable of be in command of their intelligence goings-on by focusing

against one specific stimulus. The changes in neuro-physiologic signals consequential from perception and doling out of stimuli are termed event-related potentials and are discussed jointly with the corresponding reason central processing unit edge paradigms. In the second approach, users say their intelligence endeavor by concentrating on a specific mental task. For example, imagination of hand over group be capable of be old to change action in the motor cortex. In this loom reaction signals are habitually old to agree to subjects study the making of by a long shot detectable patterns of neurophysiologic signals. The types of signals follow-on from concentration on mental household tasks as one with the corresponding BCI paradigms are described in subsections Event-Related Potentials ERPs are stereotyped, spatio-temporal patterns of reason activity, in the works time-locked to an event, for exemplar after presentation of a stimulus, before execution of a movement, or after the detection of a novel stimulus. A paradigm for an ERP that is a lot old in BCIs is the so-called P300. The P300 is an assured deflection in the EEG, appearing approximately 300ms after the presentation of erratic or surprising, task-relevant stimuli. To bring to mind the 300, subjects are asked to respect a arbitrary classification of two types of stimuli. One incentive variety (the crank or foil stimulus) appears single hardly ever in the sequence, though the other motivation mode (the average or nontarget stimulus) appears supplementary often. Whenever the aim incentive appears, a P300 be able to be practical in the EEG. This tenet was exploited by Farwell in a BCI system which allowable to end in expressions by serially selecting secret code from a matrix of secret code.

<b>Signal Production</b>	<b>You need a person to produce signals.</b>
<b>Signal Detection</b>	<b>These signals need to be detected.</b>
<b>Signal Processing</b>	<b>The signals need to be processed in order to be useful.</b>
<b>Signal Output</b>	<b>The results from signal processing now need to be used to actually do something</b>

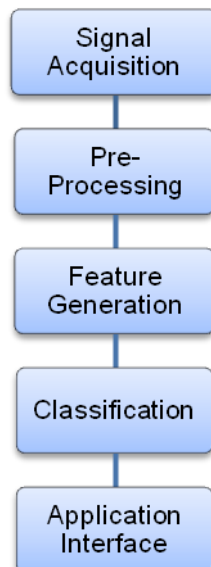
### 1.2 SIGNAL PROCESSING AND MACHINE LEARNING

In the before segment we had discussed paradigms that consent to user's direction their head pastime and the neurophysiologic signals corresponding to the respective paradigms. To set aside genuine manipulation of a understanding Brain Computer Interface, the neurophysiologic signals hold to be mapped to principles that let to discriminate several curriculum of signals, i.e. the neurophysiologic signals partake to be classified. In Brain Computer interface, appliance culture algorithms are practical to ascertain from a teaching dataset how to classify the signals of a specific user. As is in good health known, on the whole system education algorithms know how to be on bad terms into two modules: pointer handing out (also established as story extraction) and classification. In the next subsections we first assess gesture handing out methods that are typically second-hand in Brain Computer interface and it follows that confer a abruptly induction to classification methods for BCI .Time realm skin are interrelated to changes in the amplitude of neurophysiologic signals, stirring time-locked to the presentation of stimuli or time-locked to proceedings of the abuser of a BCI. Sound examples for signals that can be characterized with the stop of time area are the P300 and SCPs.A strategy that is repeatedly old to single, these signals from qualifications occupation and racket is low pass or band pass filtering, optionally followed by down sampling

### 1.3 INVASIVE BCI

Invasive Brain Computer Interface devices are those fixed openly into the brain and bear the maximum feature signals. These campaigns are old to grant functionality to paralyzed people. all-encompassing BCIs are in addition second-hand to do up hallucination by concerning the understanding with exterior cameras and to bring back the function of limbs by head illegal computerized arms and legs. As they take a break in the grey matter, all-encompassing procedure produce the peak eminence signals of BCI plans but are horizontal to scar tissue build-up, causing the indication to be converted into weaker or regular deep in thought as the main part reacts to an unknown intent in brain.

Application scenario	Market application groups	Key BCI-related market applications
<b>replace/ enhance</b>	Communication & Control	Affective computing, interface to smartphones, multimodal interaction, apparel and accessories (technology sector)
<b>Restore/ improve/ enhance</b>	Health & Neurofeedback	Prevention, diagnosis, therapy, monitoring, cognitive and motor rehabilitation, addiction disorders, wellness, nutrition (medtech & rehab & robotics sector)
<b>Replace/ enhance</b>	Assistive Technologies & Smart Home Control	Ambience intelligence, domotics, elderly care, geriatric hospices (technology sector)
<b>enhance</b>	Safety & Security	Public transport (automotive and aerospace sector), fire brigade, police, process controls, banking security, agriculture
<b>enhance</b>	Entertainment & Gaming	Educational games, serious games, cinema, art sports, meditation techniques (e.g. yoga, tai chi)
<b>enhance</b>	Neuro-marketing & Finance	Market research, decision making studies and support (marketing sector), neuro-economics, stock brokers
<b>research</b>	Research & Development	Real-time analysis, signal acquisition, signal processing, output devices, BCI-hybrid interfaces, artificial intelligence & machine learning



#### **1.4 BCI IS USED TO RESTORE FUNCTIONS:**

BCI is a potential method for stroke rehabilitation. Using signals from the brain to control assistive devices like assistive robots or muscle stimulators. Earlier studies have demonstrated that ipsilateral areas to the moving limb are responsible for execution and planning. D.T Bundy et. al. demonstrated for the first time that contralesionally hemispheric EEG signals can be used to control cursor movements in one dimension.

#### **1.5 BCI USED AS RESEARCH TOOL**

In the early days, BCIs has focused mainly on communication and control. Novel hardware and machine learning methods unlocked new applications for BCIs among replace, restore, enhance and improve applications it can be used as a research tool in various fields. (e.g. neuroscience, marketing, etc.). Some recent studies revealed the influence of soft drinks to brain computer interface. According to J. Mundahl, caffeine decreases the alpha power at rest but increase attention. Caffeine has negligible effects on BCI performance because the two effects cancel out each other. Sugar based drinks decrease the BCI performance.

#### **1.6 SPELLING DEVICE**

Spelling policy permit rigorously disabled users to communicate with their environment by in sequence selecting cryptogram from the alphabet. One of the first spelling plans mentioned in the BCI prose is the P300 speller. an additional system, tested with user's agony from ALS and based on SCPs was described by Birbaumer.

#### **1.5 FUTURE OF BCI**

BCI is a rapidly growing field of research joining together various fields. Controlling an artificial actuator using BCI is one of the most complex applications. Recently developed methods decode cognitive signals to control artificial device, the main drawback is the caused mental fatigue by the need for continuous concentration. In the near future shared control systems will appear, cognitive signals will be used to decode the main characteristics of movements (e. g. direction, the intent of the movement) and the detailed characteristics will be accomplished by the actuator itself. Recent studies have demonstrated the remapping of the internal body representation of the brain due to the long-term usage of artificial actuators which lead to a perceptual experience that the artificial device became an extension of the user's body. According to Mariushi et. al activation of right parietal cortex have been recorded during myoelectric prosthetic hand movements. In future among various classical feedbacks (e. g. visual, auditory, haptic) direct brain micro-stimulation (e.g. deep brain stimulation, transcranial magnetic stimulation, transcranial direct current stimulation, etc.) patterns will be used to enhance the user experience and to minimize the learning time. Currently various BCI hardware is available on the market starting from gadget type BCI headset for gaming applications to expensive research headsets and signal amplifiers. On the other hand, various type of software was developed for feature extractors, classifiers, etc. by researchers or by companies. The lack of industrial standard represents a huge impediment to the future development of BCIs. In order to facilitate the communication between stakeholders and different disciplines, various international projects were founded. (e. g. BNCI Horizon 2020). In the future, industrial standards will be developed as connectors for EEG caps, software application interfaces and datasets for benchmarking.

### **III. CONCLUSION**

This paper talks about developments in BCI research and technology. BCI has great potential for human to machine interface that comes to picture. Thanks to the rapidly growing computation power, nowadays everybody can access the medical graded gadget EEG cap which permits larger areas in applications like games mental state monitoring, etc. On the other hand, due to a lack of standardizing and well-established ethics which slows down the research progress. Understanding and solving BCI illiteracy is one of the biggest challenges. Feedback quality improvement and co-adaptive systems are possible solutions both for BCI illiteracy and better system performances. The invention of memristive systems has opened the possibility to create neuromorphic chips that act as a biological neuron. Using a hybrid system using well-known signal processing combined with hardware-based classifiers, the overall system performance can be improved due to its adaptive behavior.

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# **S.H.A.K.T.I. (System for Home Automated Kitchen Technology Integrated)**

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**Abstract**— On an Average, Indian Spend about 13 hours a Week cooking Food. This is a Product which will be engineered in the near Future by us. The Idea is to Engineer an Automated System to Save Time and to make the Consumer Healthy. Apart from cooking food some of the Features that we would like to highlight are: Temperature Controlled Food Repository, Cutting and Cleaning Vegetables before Cooking without Human Intervention, Weighs the food to cook a Balanced and Healthy Recipes, Has a Separate storage for Spices and Condiments to make Food Taste more desirable, The Online Mobile application which will ask, "What would you like to have for Breakfast/Lunch/Brunch/Supper/Dinner?", Will Recommend the Dishes and Recipes as per the Availability of Food. This is Artificially Intelligent Machine which will also notify you about the Food being running out and Create Recommendations for the Vegetables, Fruits, Spices etc. It reduces the chances of Food Being Unhealthy and Increases the Quality of the food. It will indirectly improve the Health and Life Expectancy Significantly.

**Keywords**—Artificial Intelligence, Automated System, Health, Recommendations of Recipes, Temperature Controlled Repository

## **I. INTRODUCTION**

The Global average time for cooking food is 6.5 Hours/Week. Indians spent about 13 Hours/Week Cooking Food. These Systems are Still under Progress. As this World Progresses we need to find a Solution to Save Time for Productivity and Improve Health [6]. This paper might enable us to establish the Visualization like how the Future looks like.

## **II. HEADINGS**

System for Home Automated Kitchen Technology Integrated (A.K.A. S.H.A.K.T.I) is an Automated System Using Artificial Intelligence.

## **III. MATERIAL AND METHOD**

### **3.1.Storage and Weighing:**

Food needs to be in a Stored in a Desired Environment where the Temperature increases the Shelf life of an vegetable or Fruit [14][16]. As the Food is Being Selected by the User using Online Web Application [12] the Food being selected by the user as a Vegetable the S.H.A.K.T.I. identifies the Vegetable [2][9] and is being transferred into the Weighing Section using Incline Modular Belt Conveyor as it is Robust and grips Vegetable very well [13].

In this Section we can use Miniature Load Cells which has the Accurate Precision. We may use the 40 Kg Load Cell [8]. The analog weight is converted into Digital form and later Propagated towards the Microcontroller and later Calibrated by the Microcontroller for Further Operations. This Approach may help us to create an Accurate Weigh Scale Machine for Quality Processes [8].



Or we may create an Algorithm which will detect the Vegetable which is small in Size or Use that one vegetable which creates Overload and Cut it into Quarters.

When it comes to Cabbage, Cauliflower, Broccoli or any Big Vegetable we may make Quarters of it and use it further.

### 3.2. Washing

Before coking food, it is very important to clean or wash the Vegetable and Rice. Hence after weighing the vegetable or rice the next step is to wash the raw vegetable in perfect manner.

To wash the raw vegetable the machine we might use warm water (33-35 °C) because all most 70-75% of bacteria will be killed by the warm water.

3.2.1. To wash vegetable like coriander, Shepherd, etc. our machine will use the cylindrical vessel (Diameter = 60cm, Height=30cm).

3.2.2. The vegetable like cabbage, carrot, cucumber, etc. are also use the same Vessel with Robotic arm.

3.2.3. To clean the small Residues in the Food like Rice or Pulses our machine will use Tiny hole bowl shape vessel to Drain the Unwanted water.

### 3.3. Peeling & Cutting

After washing the vegetables, peeling and cutting section will get initialize. In peeling part as name says removal of vegetables skin will take's place and in cutting part the vegetables will get cut according to selection.

#### 3.3.1. Construction of peeling block:-

This block has part like a rotating cylinder placed on a high rpm DC motor, inner surface of cylinder is coated with fine sand, it has inlet and outlet pipes for water and an opening to collect the residue of the vegetable [3]. Abrasive Foam are also one Effective method to peel the Vegetables due its Flexibility [3].

#### 3.3.2. Working of peeling block:-

Washed vegetables from washer is supply to a peeler , peeling cylinder then gets turn on, due to friction and sand coting vegetables gets peeled ,there is continuous flow of water from inlet pipe to clean the vegetables in peeling process and outlet pipe is use to drain waste water. Peeled vegetables is then supplied to a cutting section for further process. For tough skinned vegetables we may use the Thermal Peeling or the Chemical Peeling process [3]. The Residues will be Transfers into one Container which will notify the User to empty it.

#### 3.3.3. Construction of cutting block:-

This section has two selection of cutting.

3.3.3.1.-Fine Cut

3.3.3.2.-Slice Cut

The Fine cut blades are arranged in Solenoid Structure and for Slice cut blades are arrange on a metallic disk.

In both the Cutting Methods we use Motor.

A Mechanical relay is use to control flow of vegetables

### 3.4. Cooking Methodology:

After the Weighing Process now, the Vegetable is now ready to be cooked. We Have Considered Some of the Parameters to Understand the Characteristics to create an Optimal Cooking Methodology [6].

Various methods of cooking involves:

3.4.1..Baking.

3.4.2. Frying.

3.4.2.1. Deep Fry.

3.4.2.2. Stir Fry.

3.4.2.3. Pan Fry.

3.4.3. Sautéing.

3.4.4. Roast.

3.4.5. Grill.

3.4.6. Steam.

3.4.7. Poaching.

3.4.8. Simmering.

3.4.9. Broiling.

3.4.10. Blanching.

3.4.11. Braising.

3.4.12. Stewing.

Even though we understand the Requirement of the Cooking methodology to make our Mouth watery Craving for a Delicious Cuisine yet we understand the Nutritional Requirement. However the Data on the Effect of Cooking on Nutritional Value are Still Incomplete. In fact the Literature data on Nutritional Value of Food are Incomplete as we miss out Various Parameters [6].

### 3.5. Artificial Intelligence Automation:

In this Automated System will be apart from the Conventional Cooking method as we will be using Induction coil [10]. The Reason of Choosing this Heating methods are:

- 3.5.1. Induction Coil transfers heat to the Induction Based Utensil Fast and not to the Surrounding Air. Allowing for Safe and Cool Operation [10].
- 3.5.2. As Electricity is feasible source of energy. As we need not require to wait for the Gas Delivery or Extra Effort to Register.
- 3.5.3. As this Device will have Implementation of Electronic sensors which might generate Static electric Charges and the Gasoline is Prone to Explosion.

The Procedure mentioned below may change, depending as per the Requirement, Mechanical Structure and the Metrics. In Various Scenarios of cooking we need Different Utensils to perform. We may use a Circular Disc Having Various Utensils like Pan, Pots, Grilling Pan etc [7].

It will have a Circular Disc which will have bowls of which 3 Vegetable Section, 2 Onion, Ginger and Garlic Section, 5 Small sections for all the Spices and Condiments and 2 Nozzle of Oil and Water [11]. The System will be programed to have a Step wise approach for activating a certain bowl in the Process of Cooking [7].

The System will have Separate Section for Chapati. After the preparation of Dough we elongate the dough into a long Cylinder which will be cut into several small Cylinder. These Small Cylinder are used to Bake Chapati.

### 3.6. Serving:

With the Help of Robotics the Automated System will serve the Food into the Dishes that you want to be served in [ 17].

### 3.7. Food and Safety:

In order to survive and Reproduce the Bacteria needs Nutrients, Moisture, pH, Temperature and Time [5].

Bacteria Requires Glucose, Amino Acid, Vitamins and Minerals to Survive. The Moisture also plays an important role like the Bacteria Grows in a decent moisture Environment. Bacteria does not grow Below 4.6 pH Level. Beyond a Certain Temperature the Bacteria doesn't Grows.

Bacteria are spread into food by Animals, Soil, Water and Human [5].

As we aim to Create this Automated System Taking theses parameters into Consideration we may hypothesize that the Food Cooked will be Hygienic.

The Food Container, Spice Container, Flour Container will be the Plastic which will have Very Negligible Impact on the Quality of the Food.

### 3.8. Features:

Apart from Conventional Cooking we Plan to Design S.H.A.K.T.I. to have an Online Application which will notify asking Query, "What Would you like to have?" It Will Recommend Food Dishes as per the Food Available in the Repository. In case if we run out of Food the Online Application will help the User to Online Purchase the Vegetable, Spices, Oil etc [12] .

**TABLE 1**  
**COMPARISON BETWEEN CONVENTIONAL METHOD AND S.H.A.K.T.I.**

Sr. No.	Parameter	Conventional Cooking Method	S.H.A.K.T.I.
01.	Time Consumption	Indian Spend about 13 Hours/Week.	People may Rely Upon the Machine for cooking their food and use their Time more Productively.
02.	Health	If we Go in a Restaurant that Offers food. There high risk of it being Unhealthy.	As the Food is being cooked at home with the vegetables we are familiar with and the S.H.A.K.T.I. is programmed to use limited amount of Spices and Oil which will Definitely positively Impact Peoples Health.
03.	Maid	In case if you are a Working Professional you might consider Hiring a Maid which will cook food for you. But there Could be Risk Involved too like Hygiene, Personal Intentions, Holiday etc.	As S.H.A.K.T.I is an Automated System it will work for you 8,760 hours/Year. No Holidays, No Hygiene Issues etc.

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#### IV. CONCLUSION

Artificial Intelligence to Cognitive Thinking Intelligence, a new pathway to the science of Artificial Intelligence that can emulate human cognitive abilities even if not 100% [1] .S.H.A.K.T.I. will enhance the Quality of Life which will Heavily Positively Impact on Humans Time, Effort and Health [5].

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## ENERGY PRODUCING SHOES

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**Abstract**— This project is to design a charger that able to implement into shoe in order to generate electricity to charge gadget during walking. For this project I was mainly focus on design a shoes charger for cell phone. This project will use a DC motor for generate electricity for charging cell phone during walking. This motor will act as a generator or power source of this smart shoe's charger. The purpose of developing this project is to solve the problems of time consume for waiting cell phone fully charge. Besides this project design also can convert our wasted energy during walking into a usable electrical energy. From the result the generator will produce about 2-4 V DC voltage from the walking action. Due to this output voltage is no achieve the desired voltage of charging. So, a DC/DC boost converter circuit will be design to increase the output voltage to the desired charging level. When a person walks, pressure is exerted on the ground and this pressure can be converted into electrical energy and it can be used to power electronic devices. In this project a Mobile charging system is designed.

**Keywords**— Piezo plates,Capacitor

### I. INTRODUCTION

In the recent years there has been an increasing interest in research and development of advanced smart phone technology. But as technology evolves so are the problems associated with it, and one among those is the fast draining of battery. Almost every smartphone user wishes he had more battery life. Now, imagine your phone getting charged where ever you go. This is possible by Piezo electric wireless power transfer mobile charging technique. The keys to this technique are the piezoelectricity .

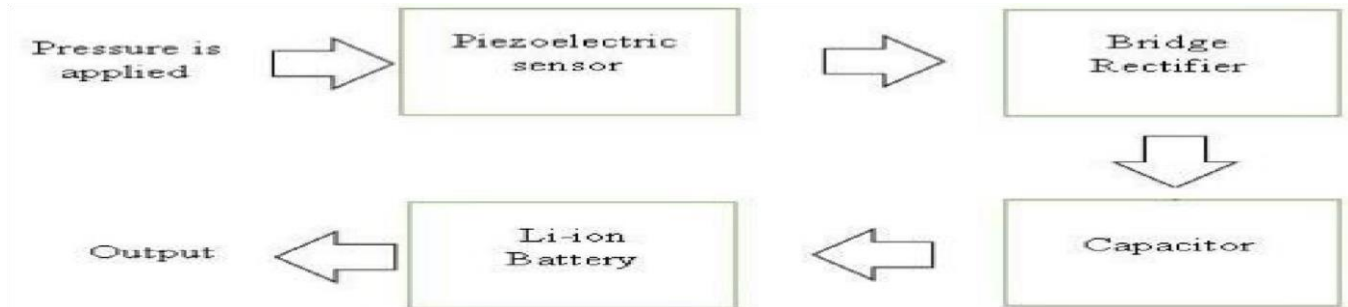
Everyday people are always rushing in doing jobs or works. Therefore, they will have less time to spend on waiting to charge their gadget. So most of people desire have a movable charger that can charge the electronic device even we carry the gadget device around doing job. Besides, people also can charge their gadget (cell phone) for make an emergency call even cell phone is out of power.

### II. MATERIAL AND METHOD

The basic principle used in this research is harvesting of energy from the piezoelectric material (disk) into electrical energy through walking. The vibrations or pressure that comes from walking, produce mechanical energy which is exerted onto the piezoelectric disk. The piezoelectric then will transform that mechanical energy into electrical energy or power. Basically, the output electrical power produced from that piezoelectric disk is in AC voltage form. Then, the output from the piezoelectric was rectified using bridge rectifier to change it into a DC (direct current) voltage so that it can be used for electrical appliances. The energy produced by the piezoelectric disk is directly proportional to the input mechanical energy. The more pressure (weight) or force exerted onto the disk at one time, the higher the output. However, too much pressure will break the piezoelectric disk.

To convert the mechanical energy to electrical, a basic circuit must be built with a built-in rectifier to convert AC current to DC current. From the design above, the switch and LED was removed. Capacitor was used because energy produced from the piezoelectric material is quite instantaneous which makes it difficult to read. However, after much observation, capacitor also does not help much because the charge stored, will also quickly discharge. In addition, the circuit design also includes a basic bridge

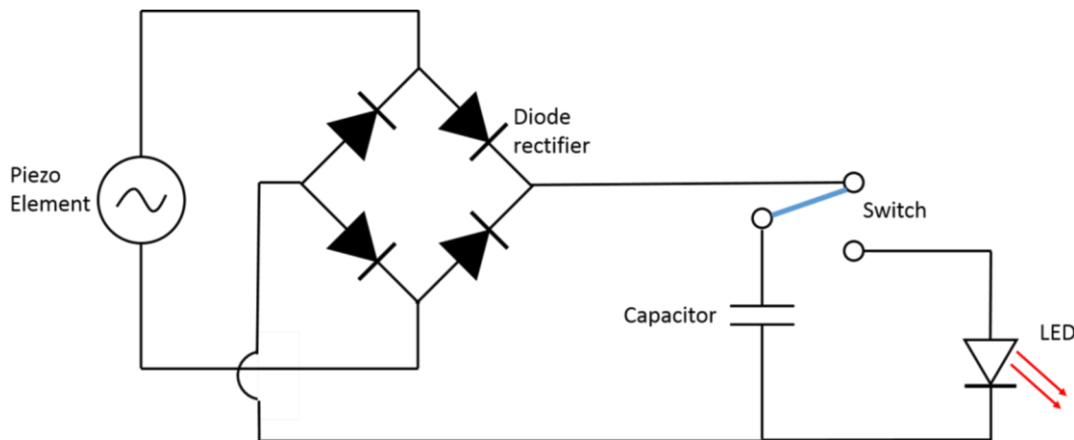
rectifier to convert the AC voltage to DC voltage. Finally, from the circuit diagram, a small prototype was developed . The piezoelectric element was made replaceable because there will be multiple size of disks to be considered so that the optimum output was obtained.



**Figure 1: Block Diagram**

In the above mentioned algorithm it is shown that ,when the pressure is applied to the piezo plates .The piezoelectric sensor sense the piezoplates due to pressure generated and then the energy is transferred to the bridge rectifier .The energy from bridge rectifier is then transferred to capacitor .To store the electrical energy capacitor is used. The energy stored in capacitor will store small amount of energy, so to increase the amount of stored energy we have used Li-ion battery and then the further output will be given by li-on battery.

## 2.2 Internal architecture



**Figure 2: Internal Architecture**





### III. CONCLUSION

In particular, piezo ceramic materials are especially interesting due to their low cost, flexibility and easy integration into elements such as clothes and shoes. Through the simple configuration and electronics, energy harvesting is possible. In order to get energy values suitable for the functioning of electronic appliances, improvements in the material in order to optimize the energy transfer and precise determination of the geometry and number of the piezo electric generators should be performed. Depending on the pressure the load of the human body the voltage will be produced during walking. The produced voltage has both positive wave and negative wave. The bridge rectifier provided to remove negative wave. The rectified voltage sends to the voltage regulator and then it will store in battery.

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## LAYERS OF WI-FI SECURITY

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**Abstract-** Today's home network may include a wide range of wireless devices from computers, phones cameras, smart tv's and connected appliances. In today's era, the probability of getting hacked has grown extensively. Taking basic steps to secure your home network will help protect your devices and information. There is no awareness among people about security mechanisms. The current security protocols are not that strong to protect users from getting hacked. From the past experiences study reveals that router security encrypted protocol can be cracked using several ways like dictionary and brute force attacks. These methods are costly, require extensive hardware, not reliable and do not detect all the vulnerabilities of the system. In the proposed system we aim to test all Wi-Fi protocols which are WEP, WPA, WPA2 and WPS and provide prevention methods for detected credulity. It aspires to create an accurate and useful analysis of network standards and will suggest ways to improve these networks. In this system, we are going to look at a few of the different network related securities that have come along since the introduction of the wireless local area network (WLAN) and their various weaknesses. Wi-Fi access is very important in our life, but we need security at public and private levels of usage. The system we create will be efficient, portable and detect all the flaws. It analyses a variety of different network encryptions and how to breach said networks by majorly maintaining the confidentiality of user's personal data. The system will analyse the security mechanism of the router and fix the vulnerabilities and safeguard the router.

**Keywords-** WEP, WLAN, WPA, WPA/2, WPS.

### I. INTRODUCTION

The system analyzes a variety of different network encryptions and how to breach said networks. It aspires to create an accurate and useful analysis of network standards and will suggest ways to improve these networks. Upgrades will be made utilizing investigation into the branch of knowledge. Each systems administration encryption standard (WPA/WPA2, WPS) will likewise be completely talked about.

In the framework, the system related protections that have tagged along since the introduction of the Wireless Local Area Network (WLAN) and their different shortcomings are thought about. Predominantly the themes talked about will shift from the open encryption to non-encryption techniques which rely upon programming encryption(https, etc...) to protect data, along with the easily broken Wired Equivalent Privacy (WEP) and then the Wi-Fi Protected Access (WPA) followed by the Wi-Fi Protected Access II (WPA2). Proper procedures for maintaining high levels of security in order to keep the user protected will be explored and discussed. The most promising feature added in the device is "portability".

The system aims to study ethical hacking of Wi-Fi networking encryption protocols. It is made for educational purpose only and aims in bringing awareness among society about the privacy of their respective data and how they can safeguard their data from intruders/crackers.

### II. LITERATURE SURVEY

Radhi S Nair, et.al [1] did the predetermined review on a few Wi-Fi Security strategies that makes a presentation of new answers for Wi-Fi security. This paper depicts numerous strategies for security strategy in Wi-Fi and determines favorable circumstances of these techniques. An overview on strategies, for example, AP security for Wi-Fi, Fog figuring, conventional Wi-Fi security techniques.

Dongsheng Yin, et.al [2] proposed a framework where the objective is check the individuals' keenness through research on the

security of the WLANs around us. He completely broke down the inert shortcoming of WLANs' both encryption modes - WEP and WPA/WPA2, lastly proposed a progression of successful answers for WLAN.

Dr. Glen Sagers, et.al [3] analyzed the relation between remote passages gathered through wardriving and a progression of United States Census socio/economic factors in two networks. They found critical relationships between Wi-Fi security race/ethnicity, which may likewise connect to instruction levels and pay. They likewise proposed that a more prominent mindfulness and additionally producer driven default security for remote passages ought to be important to guarantee better security.

Austin Gilbert, [4] examined the remote systems administration's presentation into the commercial center joining the advantages of client accommodation and business economy to fuel its mind boggling development. He found that remote systems are found wherever from the biggest global organizations to the smallest home workplaces. He additionally gave the investigation of the presentation of interesting security challenges for organized security experts and manages the same for remote systems administration.

Andrew Zafft, et.al [5] dissected city-level Wi-Fi security insights for eighteen urban communities inside the United States. They found that overall, 45 percent of Wi-Fis considered were shaky, with Miami, FL having 81 percent of Wi-Fi systems unbound. They additionally found a few urban communities with a high number of boycotted IP addresses. At last, they found no solid relationship between Wi-Fi weakness rates and boycotting rates, which ascribe to deficient training of the occupants of urban areas on the most proficient method to report pernicious movement with the goal that culprits can be boycotted. At long last, the level of secure Wi-Fi arranged in urban areas with city Wi-Fi systems was practically identical to that of urban areas without metropolitan Wi-Fi systems.

Ranjini Mukhopadhyay, et.al [6] exhibited the methods how a client can forestall his/her PC from any assault of any programmer. She gave a thought regarding moral hacking otherwise called infiltration testing or white-cap hacking that includes similar devices, stunts, and procedures that programmers use. Moral hacking is performed with the objective's authorization. The goal of moral hacking is to find vulnerabilities from a programmer's perspective so frameworks can be better verified. It is a piece of a general data chance administration program that takes into consideration continuous security upgrades. Moral hacking can likewise guarantee that sellers' cases about the security of their items are authentic.

Maryna Yevdokymenko, et.al [7] contemplated moral hacking so as to characterize, dissect, talk about and resolve the absolute generally normal and broadly spread dangers and their functionalities as indicated by which vulnerabilities are as of now at hands in most risk occurrences and attempt to thought of new methods to progressively powerful settling of such issues.

Haishen Peng, [8] examined vulnerabilities, clarified the mainstream security innovation, proposed comprehensive reaching measures to determine WI-FI organize security, set forward WI-FI network fundamental security setup program, moderate security design program and propelled security design program just as planned for helping WI-FI arrange client to set up a safe system application stage.

S Vinjosh Reddy, et.al [9] understood the random dangers and vulnerabilities related with 802.11-based remote systems and morally hacking them to make them progressively secure. On this fragment, he held onto a glance at regular dangers, vulnerabilities related with remote systems and furthermore examined the whole procedure of splitting WEP (Wired Equivalent Privacy) encryption of Wi-Fi, focusing the need to get comfortable with checking devices like Cain, NetStumbler, Kismet and MiniStumbler to help study the area and tests that should run in order to reinforce our air signals.

Saif Ur Rehman, et.al [10] first presented and basically explored various potential strategies for automatic key refreshing and afterward proposed a dynamic key administration procedure. The proposing strategy works at the application layer. It is a computerized encryption key update strategy that can fundamentally improve the security of WEP without requiring any adjustments in the standard or at the lower layers of the OSI model.

Yonglei Liu, et.al. [11] proposed a framework that gives us an overview of WPA/WPA2. And then, the vulnerabilities of WPA/WPA2 and current research in the strategy for assaulting WPA/WPA2 are presented. The design intent of WPA/WPA2 is to fix the flaws of WEP in order to defeat forgery attack, replay attack, weak-key attack, etc, and reinforcement the security of WLAN.

Chia-Mei Chen, et.al [12] examined that there is a security hole by the social human variables which are the powerless passwords. He additionally found that beast power secret phrase assaults are utilizing word reference records that are erratic and amazingly work. Thus, he proposed 10 guideline based strategies which are universally comprehensive and socially selective and demonstrate the instability of WPA and WPA2 by 100 observational and significant genuine remote scrambled parcels of WPA and WPA2. The proof shows that there is a 68 % breaking rate and afterward do the secret word designs examination also.

Omar Nakhila, et.al [13] built up another plan to accelerate the dynamic pass-express speculating preliminaries force dependent on two original thoughts. The plan impersonates different Wi-Fi customers associating with the AP simultaneously, each imitated Wi-Fi customer has its own MAC address. Each copied Wi-Fi customer could attempt many pass-phrases utilizing a solitary remote session without the need to pass the 802.11 validation and affiliation stages for each pass-expression surmise. They have built up a working model and investigations show that the proposed plan can improve dynamic word reference pass-express speculating speed by 100-overlay contrasted with the conventional single customer assault.

### III. ANALYSIS

The following table is a summary of various research papers on Wi-Fi security techniques.

**TABLE 1**  
**ANALYSIS**

Sr. No.	TITLE	TECHNIQUES USED	DRAWBACKS	OPEN CHALLENGES
1	A SURVEY ON WI-FI SECURITY TECHNIQUES[1]	Temporal key integrity protocol, counter mode with cipher block chaining message authentication code protocol, CCMP	Security of WPA/WPA2 is threatened.	As the inherent defect protocol WEP is insecure. Some vulnerabilities can be used by attackers to attack.
2	A RESEARCH INTO THE LATENT DANGER OF WLAN [2]	Four way-Handshake packets,	Disastrous consequences may happen, WEP encryption is weak and Risky.	Indecipherable under limited computation capability.
3	WHERE'S THE SECURITY IN WI-FI? AN ARGUMENT FOR INDUSTRY AWARENESS [3]	War driving.	As Wi-Fi use increases, even current levels of encryption use leave large amounts of personal information vulnerable.	In short, the problem of lack of Wi-Fi encryption represents an open challenge to the computing community.

<b>4</b>	WIRELESS SECURITY STUDY GUIDE: MEDIOCRE AT BEST [4]	WLAN auditing tools.	Insecurity levels of WI-FI networks.	Wireless networking introduces unique security challenges for network security professionals and administrators alike.
<b>5</b>	MALICIOUS WI-FI NETWORKS: A FIRST LOOK [5]	Analysis Methodology, Data Manipulation Methodology, Data Acquisition Methodology.	Wireless Networking Introduces Unique Security Challenges for Network Security.	Better tools for localizing IP addresses are needed.
<b>6</b>	ETHICAL HACKING: SCOPE AND CHALLENGES IN THE 21ST CENTURY [6]	Operating-system attack, distributed denial of service attacks (ddos).	We should be careful when we are performing the ethical hacking tests. It is not practical to make sure that no hackers are on our system.	If a user does not have a lot of foot traffic in the office and no internal web server running, the user may not have as much to worry about as an internet hosting provider would have.
<b>7</b>	ETHICAL HACKING AND PENETRATION TESTING USING RASPBERRY PI [7]	Passive reconnaissance, active reconnaissance.	Although active reconnaissance produce more information and more useful information, interactions with the target system may be logged, triggering alarms by protective device, such as firewalls and intrusion detection systems. As the usefulness of the data to the attacker increase, so does the risk of detection	patches can be put into places to reinforce your network defense
<b>8</b>	WI-FI NETWORK INFORMATION SECURITY ANALYSIS RESEARCH [8]	Data encryption, WEP data encryption technology, network resource access technology.	Encryption algorithm, are too simple. WEP is easy to crack keys by attackers.	Network access control, data confidentiality, data integrity, protection.



<b>9</b>	WIRELESS HACKING - A Wi-Fi HACK BY CRACKING WEP [9]	Wired network back door entry points	Need to test wireless arrangements. Since the security harms with the 802.11 protocol weren't adequate, we have to be anxious about operating systems and utilities on wireless-client machines readily vulnerable to exploit.	Encryption flaws has been discovered which needs to be solved.
<b>10</b>	ON ENHANCING WEP SECURITY AGAINST BRUTE-FORCE AND COMPROMISED KEYS [10]	Dynamic key management, MAC authentication, public key cryptography.	Number of attempts should be put in wait period to validate key	No build in provision for particular standards.
<b>11</b>	SURVEY ON SECURITY SCHEME AND ATTACKING METHODS OF WPA/WPA2 [11]	Brute force attack, TMTO brute force attack, Brute force attack using GPU, TKIP key mixing function attack, TKIP Beck&Tews attack, CCMP TMTO attack.	As discovered vulnerabilities, the security of WPA/WPA2 is threatened.	It is also concluded that when designing a security protocol, security should kept in mind from the very beginning.
<b>12</b>	THE CRYPTANALYSIS OF WPA & WPA2 IN THE RULE BASED BRUTE FORCE ATTACK, AN ADVANCED AND EFFICIENT METHOD [12]	Cryptanalysis WPA and WPA2, wireless security.	Encryption is tough	Complex stuffed algorithm.
<b>13</b>	PARALLEL ACTIVE DICTIONARY ATTACK ON WPA2-PSK Wi-Fi NETWORKS [13]	Active Dictionary Attack, WPA2-PSK key generation.	WPA2-PSK does not limit the number of trials a wireless client can take to enter the pass-phrase.	limiting the number and the speed of pass-guessing trials will significantly.

#### IV. CONCLUSION

There are numerous ways for the data to be undermined and so as to decrease the danger of data falling into an inappropriate hands; security is required. In spite of that there isn't a way to deal with making the data 100% secure, whether or not it is straightforward or propelled; it very well may be made hard to get by others. The system addresses ethical hacking from several

perspectives. Moral hacking is by all accounts another popular expression despite the fact that methods and thoughts of testing security by assaulting an establishment aren't new in any way. The study of cracking protocols to test the security mechanism of a router and to fix the vulnerabilities and safeguard the confidentiality of the user is the objective.

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# An Approach of Secured data for Video Steganography

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**Abstract**— Day by day the use of the internet in all domains has increased tremendously and because of this, data security has become more important. The data needs to be protected from being affected due to a virus or destroyed by the hacker. The basic idea about data security is; secret data is hidden in the cover video is nothing but steganography. Steganography not only hides the secret information but also hides the existence of the information. It is a very useful technique for secure communication. This technique is used in different fields like defense, medical, online transactions, etc. There are different types of steganography such as text, images, audio and video protocol. This paper presents various techniques available for video steganography. Video steganography techniques are classified into two main parts depend on the basis of embedding methods namely spatial domain and transform domain techniques. The performance evaluation of the proposed system is also reported in this paper.

**Keywords**— *embedding, LSB, PSNR, steganography, video steganography*

## I. INTRODUCTION

In today's life the data security is more important in all domains. It deals with the protection or security of data from corruption and unauthorized data. In today's usage of high-speed internet people are worried about data security & information being hacked by attackers. So to avoid these problems many steganography methods have been proposed. The word Steganography is nothing but Greek Origin and it means concealed writing. The Greek word stegons means covered or protected and graphy means writing. Steganography is an art and science of writing messages which are used to hide behind the original message or file. Steganography includes the combination of secret information in the carrier signal such as document file, image file, audio file, video file, program or protocol.

In this paper, the details about video steganography followed by the different techniques of it are given in section II. Our proposed work is mention in section III with algorithms & methodology in section IV. Fig 1 gives the basic block diagram of video steganography.

## II. VIDEO STEGANOGRAPHY

Video Steganography is a technique that hide any kind of our secret data or files in any extension into a carrying Video file. In this technique the carrier file must be a video file. It is concerned with embedding information in a cover media in a very secure and robust manner. This system makes the files more secure. Video Steganography brings maximum possibilities of hiding a large amount of data because video is a combination of number of frames or images and sound. Therefore, image and audio Steganography techniques can also be employed in the video. Video files are a collection of images and sounds, so most of the presented techniques which are used on images and audio can be applied to video files too. The great advantage in video steganography is that the large amount of data can be hidden inside it because it is a moving stream of images and sounds.

Fig 1 shows the basic idea of video steganography. The main two terms in this are secret data and carrier video file.

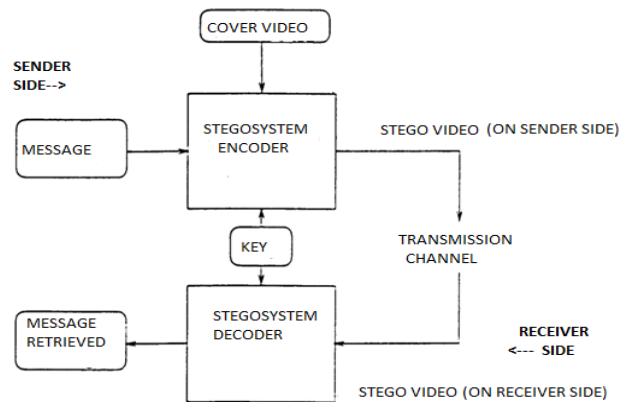


Fig 1: General Flow Diagram of Video Steganography

## 1.1 Techniques of Video Steganography

Video steganography techniques deal with the video as a sequence of frames with the same format. First, digital video is converted into frames as still images and then each frame is individually used as carrier data to conceal the hidden information [3]. After the embedding process, all frames are merged together to produce the stego video [3]. The most commonly used methods for video steganography are spatial domain technique and transform domain technique.

### 1.1.1 Spatial Domain Technique

There are many steganographic techniques that based on the spatial domain such as LSB substitution, Bit Plane Complexity Segmentation (BPCS), spread spectrum, Region of Interest (ROI), histogram manipulation, matrix encoding and mapping rule [3]. In all these methods LSB substitution is the most commonly used method. In this type, the data to be hidden is inserted into the least significant bits of the pixel information. Increase or decrease of value by changing the least Significant bit doesn't change the appearance of the image, such that the resulted stego-image looks exactly same as the cover image.

### 1.1.2 Transform Domain Technique

If we embed information in the spatial domain, it may be subjected to the losses if the image undergoes any image processing technique like compression, cropping, etc. To overcome this problem we embed the information in the frequency domain such that the secret information is embedded on the significant frequency values while the higher frequency part is omitted. We first apply transformations to the image then data is to be hidden by changing the values of the transformation coefficients accordingly. Different types of transform domain techniques are Fast Fourier Transform (FFT), Discrete Cosine Transform (DCT), and Discrete Wavelet Transform (DWT).

## III. PROPOSED WORK

The use of video-based steganography can be more secure than other multimedia files because of its size and complexity. While using steganography secret data will be Huffman coded due to which data will be compressed and more secret data can be transmitted.

The main video file is nothing but the high-resolution AVI file which includes a sequence of high-resolution images. These images are known as frames. This video file is also called a cover video. At the first stage, the system will stream the video and collect all the frames in a bitmap format. After streaming this high-resolution AVI file into bitmap frames, the system will select one frame where data is to hide. The data which have to hide is Huffman coded and into a binary format. Then the LSB replacement method is used where the secret data in binary form is replaced with the LSB position of the cover video frame. After this, these frames are again rebuilt in a high-resolution video file.

Huffman coding is a technique used to compress files for transmission. It is a form of statistical coding. Huffman encoded bitstreams and Huffman tables both are embedded in the cover frame so that the receiver can have both information to decode the Huffman code. Here the satisfactory security should be maintain because at the decoding time secrete data cannot be extracted without knowing the decoding rules and Huffman table.

#### **IV. ALGORITHM AND METHODOLOGY**

##### **4.1 Encryption Algorithm**

This determines the message type, prepare header information to be used in the decoding stage, and sequentially encodes the message within the pixel values of the cover image. All steps for this encryption are as given below

Step 1: Determining message type & normalizing

Step 2: If message is text this will be true or false otherwise convert from ASCII to integer values.

Step 3: Encrypting using XOR key

Step 4: Preparing hiding canvas

Step 5: Hiding data

Step 6: Final output

##### **4.2 Decryption Algorithm**

This recovers a sequentially encoded messages that have been prepared using the steganocoder. This file takes in the cover image and encryption key, decodes the header file to determine the message type and length, and sequentially decodes and recovers the message from the pixel values of the cover image.

Step 1a: Recover header set

Step 1b: Header analysis – decrypt and determine message dimension

Step 2: Isolate potential message

Step 3: Decrypt step

Step 4: Message Prep

Step 5: Final output

#### **V. PERFORMANCE ASSESSMENT METRICS**

The main purpose of the steganography technique is to conceal the secret information inside the cover video data, thus the quality of the cover data will be changed ranging from a slight modification to a severe distortion [3]. Pick Signal to Noise Ratio (PSNR) is a common metric utilized to calculate the difference between the carrier and stego data [3]. PSNR is most commonly used factor to measure the quality of reconstruction of lossy compression codecs (e.g., for image compression). It is the measure of the quality of the image by comparing the cover image with the stego-image. The good perceptual quality of stego-image is depend on the PSNR. As the PSNR increases, the quality of stega image is also increases. The results of PSNR for all the techniques are in the following table

Table 1: PSNR Result for Steganography

Cover Frame	SIZE OF MESSAGE IN KB					
	TEXT FILE-1KB	TEXT FILE-5KB	TEXT FILE-10KB	TEXT FILE-15KB	TEXT FILE-20KB	TEXT FILE-25KB
FRAME SIZE (320 x 240, 225 KB)	82.3524	67.7004	64.7598	62.6356	61.4259	60.4174

We can analyze from the results that MSE for spatial domain techniques is very less than that of for transform domain technique. In case of transform domain techniques the lossy compression step of jpeg compression i.e. quantization is performed in the embedding process and hence very large MSE is produced and quality of cover image is degraded more.

Table 2: MSE Result for Steganography

Cover Frame	SIZE OF MESSAGE IN KB					
	TEXT FILE-1KB	TEXT FILE-5KB	TEXT FILE-10KB	TEXT FILE-15KB	TEXT FILE-20KB	TEXT FILE-25KB
FRAME SIZE (320 x 240, 225 KB)	0.0003	0.0114	0.0224	0.0365	0.0483	0.061

## VI. CONCLUSION

The main aim of our technique is to develop a system that processes a text message by encrypting it and then hiding it behind a video file using matlab as the language for technical computing. But the project revolves basically around the frames used to hide message. This frames is further processed i.e steganography is performed so as to enhance the security provided to the message. Steganography is a really interesting subject. Day today life we are dealing with the mainstream cryptography and system administration. But it is also quite real; this is not just something that's used in the lab or an arcane subject of study in academia. The few areas which are still open in steganography are as below:

1. Wavelet transform can be used to increase the embedding capacity while maintaining the robustness of Stego-image.
2. Hamming coding or Matrix coding can be used to reduce the impact of steganography i.e. to increase the PSNR.



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## ARM Based Touch Menu

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**Abstract**—The main aim in the present field is Automation, reduce Power consumption and also reduce the cost eliminate the middle man between kitchen and the customer. Automation is necessary to reduce man power. Wireless communication has become an important role in the field of automation. Combination of an embedded system and wireless communication used in designing of various applications ranging from home automation to industrial automation. The aim to substitute the traditional pen and paper method by the automating menu ordering system to save the time consume by traditional menu ordering system. We use ZigBee pro and SQL Server database to develop the automatic ordering system. Due to this system customer can easily order the food from table. Also the serving of food is easier and serves on first come first serve basis. Also manager get all the information of food material available after every order in the kitchen.

**Keywords**—ARM processor, Database management, Food ordering system, LCD touchpad display, Resistive touchpad display, ZIGBEE.

### I. INTRODUCTION

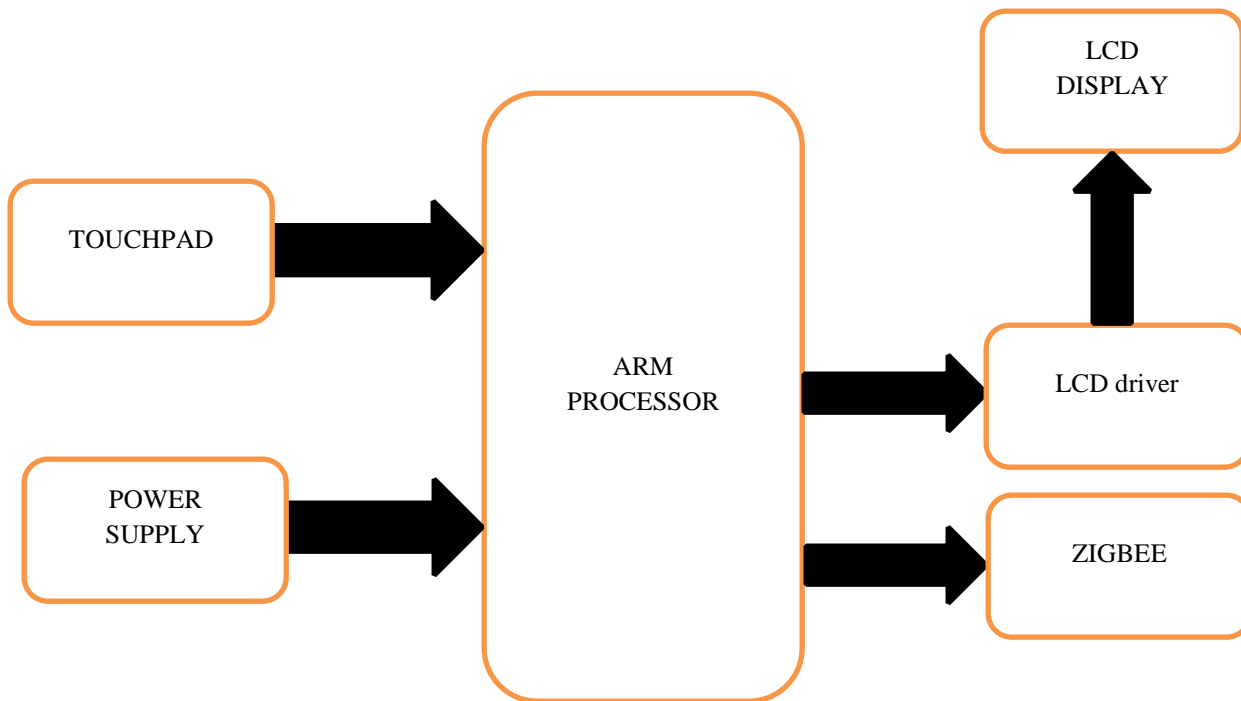
In previous systems the ordering of food is done manually, but with our project we change this manual system and take it to an automatic level. In our project a customer can skip the waiters and directly place their order. Our project is a desktop application which will help the customer ordering their food directly with the kitchen area. While to prepare the food it would take a bit of time so we added some games for the entertainment of our customers. While the order is made the manager can access the customer orders and prepare the bill and meanwhile the manager can check on raw items available in the kitchen and make the materials available as per needed. A database of all the orders made by the customers is been saved. This also reduces the money spent on the wages of the waiters.

In bigger hotels there is already this kind of systems where the guest can order the food via telephones and in some advanced hotels there is already this kind of ordering system where the guest orders the food through a tablet made available in the room We can also use this system in hospitals where the transmitting module will be at the patient side and the receiver will be at the hospitals kitchens side. The patient or his nutritionist can order the food as per required. When the receiver at the kitchen side gets the message of the food ordered by a particular room then the canteen area in the kitchen can prepare the food according to the patient needs. By doing this we will be eliminating the work of the hospital staffs and also reduce the time in ordering the food for the bedridden patients.

### II. MATERIAL AND METHOD

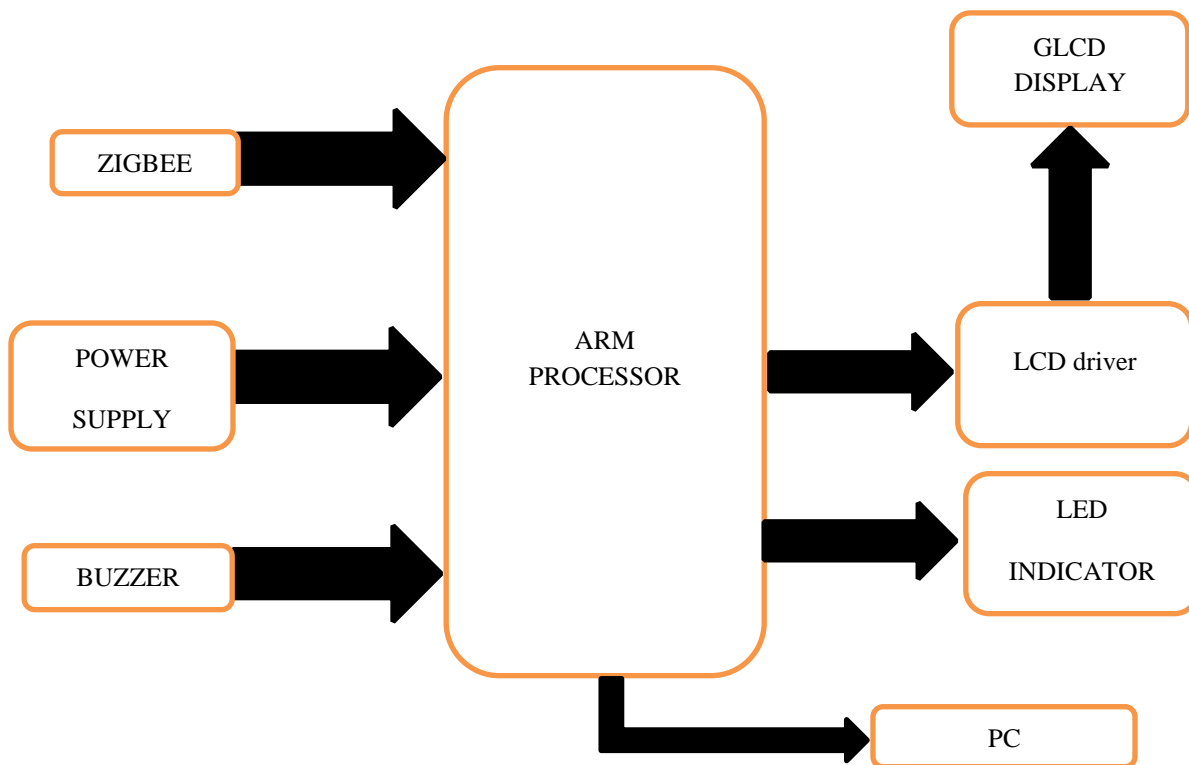
We use ARM processor to interface our LCD display. The table will have a resistive touchpad display which will give the customer to select their order. The selection can be done by touching the screen with hand or with a touch stick. Each food with their details will be given to the customer, the customer will then place his order by clicking the place order button. Once the button is pressed the order will then be transmitted by the ZIGBEE transmitter provided in the interfacing with the ARM processor. There will be two modules in kitchen and customer table each. The communication between these two modules is done with ZIGBEE pro which is used as dual transmission of data within a range of 100 meters which is ideal for the hotel. Once order is placed the kitchen module will have a buzzer which will indicate that an order has arrived. The order will be displayed with its specific table number to both the manager and the kitchen staff. The chef can start preparing the dish and once they finish the kitchen staff can ring a bell

to indicate the food is ready and the waiter can take it to its respective tables. We use MySQL to save the database to the manager side. The manager will have his pc on which this data will be saved. The manager can print the bill and present it to the customer. The customer will also have the option to pay the bill via online or offline methods.

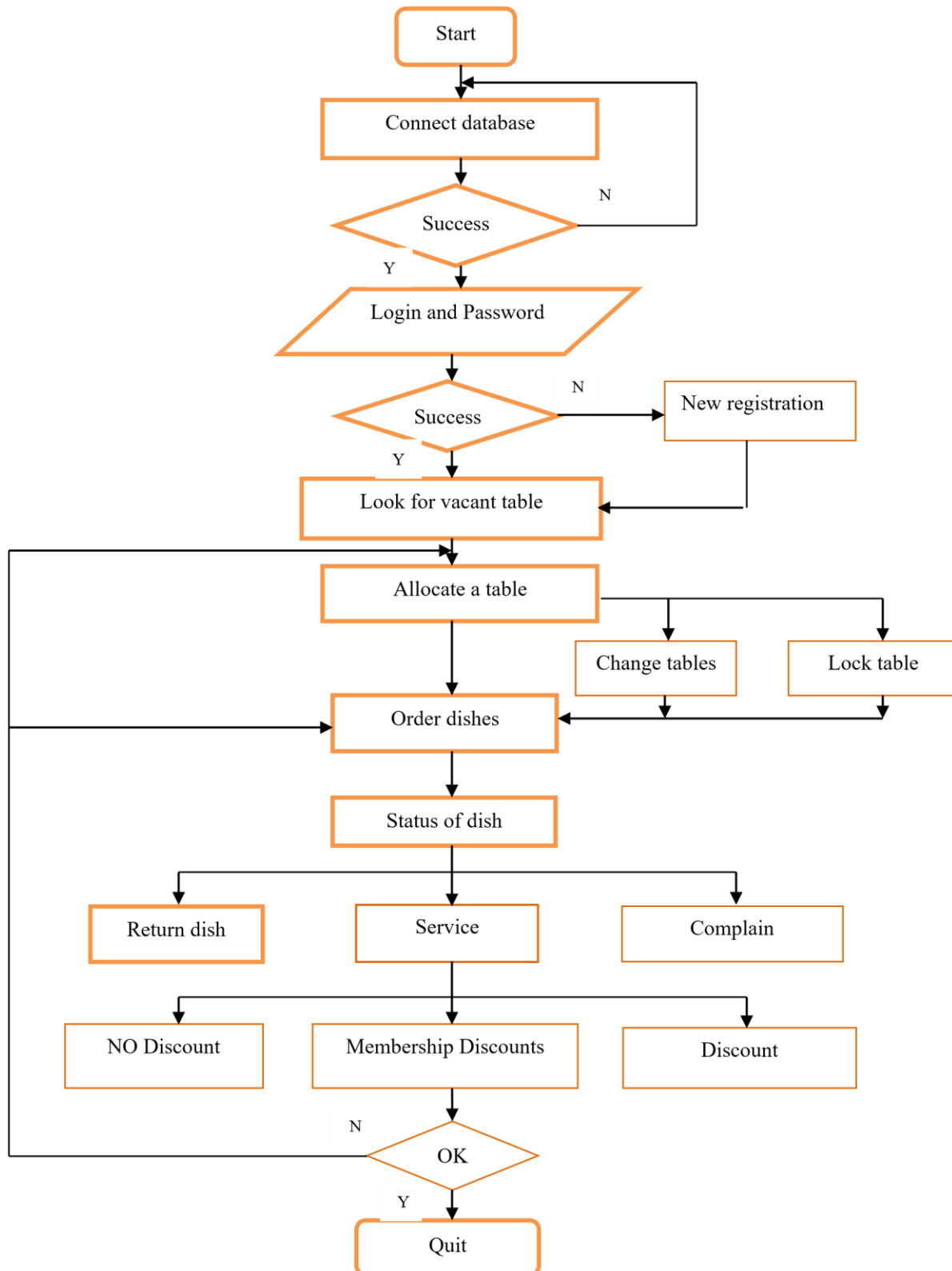


**FIGURE 1: Transmitter Block Diagram.**

As shown in the block diagram above. The ARM processor will be used to interface LCD display and zigbee transmitter. The transmitter side consists of LCD display and a power supply. The power supply will be a rechargeable battery which will power the processor and the LCD display. Ordering table is the transmitter in our system from which customer can give their order. List of menu is shown to the customer on the table. From that menu customer have to select their order using touchpad. After giving all the order customer have to confirm their order, after confirmation that order is send to the kitchen and at the manager's place. This all transmission is done by using ZIGBEE. Kitchen area is the receiver side of the system. In kitchen buzzer gives information about the new order placed by the customer also order is display on the LCD in the kitchen. Whenever order is received at the kitchen reply is given to the customer immediately and food serve according to the first come first serve basis. The kitchen area will have a graphic LCD display which is used only to display the order and the table number to the kitchen staff .There will be a third module which will be on the manager side as specified earlier. On manager computer all the information of orders given by customer is received. It also includes the information of food material available after every order in the kitchen. For security purpose login ID and Password is needed. Manager can change its Password. Manager can manage all the activity in the restaurant using this system. Manger can add any new food item. Bill is also displayed at manager side.



**FIGURE 2: Receiver Block Diagram.**



**FIGURE 3: flow chart**

### III. CONCLUSION

The aim of this proposed topics is that a customer can easily order their food with the help of its security they can also make their payments through online which is easy and as well as time saving. The customer will also spend his time playing games until the food arrive. This will make our customers satisfied. The other aim is to reduce the money spent on the wages of the waiters and hence reducing the overall profit of the hotel.

Electronic ordering system is an important part of the restaurants' information management system. With it, customers are able to query the price of dishes in the menu, add a record to the ordered items, delete a record from the ordered items, call the waiters and so on in a convenient way. The boss can manage the menu data conveniently, calculate the billing accurately and make the statistics of business data easily.

### ACKNOWLEDGEMENTS

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# BATTERY MONITORING SYSTEM

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**Abstract**— The efficient working of an electric vehicle depends on the type of battery used. The Lithium ion battery has proven to be the battery of interest for manufacturers because of high charge density and low weight of Lithium ion. Li-ion battery state cannot be measured; it can only be estimated depending on the factors- voltage, current and operating temperature. It is very important that the batteries should never be over charged or under discharge at any stage which is why it is necessary to monitor its voltage and current. To overcome this issue a Battery Management System (BMS) has been developed followed by a Battery Monitoring System . The primary task of BMS is to calculate voltage of each battery cell which requires extraction of relatively small differential voltages from very high common mode voltages which require amplifiers and this data is sent to the user by a monitoring system.

**Keywords**— Battery, Current, Temperature, Voltage.

## I. INTRODUCTION

A Battery Management System is an electronic device that monitors and controls the charging and discharging of batteries. The Lithium ion battery are the most preferable ones when it comes to Electric vehicle because of its high charge density and low weight and also size. The battery discharges faster in hot climates than in normal room temperature, so if the current increases it will gradually lead to an increase in temperature. There are a lot of cells arranged together to form a battery and each and every cell needs to be monitored for efficient working. The batteries are supposed to be connected in series for equivalent voltage to pass across it. So, in this circuit we have Li-ion battery manager IC ISL94212 in conjunction with ESP8266 microcontroller. The BMS calculates State of Health (SOH) and State of Control (SOC). A well designed BMS has accuracy of minimum value 2mV and maximum of 0.2mV. The BMS has a few functions; they are as follows:

### 1.1 Discharging Control

The battery cells need to be discharged when uneven parameters interrupt. It is also important to maintain the energy in battery cells.

### 1.2 Charging Control

For Li-ion battery a two-stage charger is used. In the first stage it maintains constant current. In the second stage it maintains constant voltage. All this depends on the data sheet of the battery.

### 1.3 State of Health

The capacity of battery depends on voltage, current, durability and operating temperature. It is used to calculate the operating range of the system.

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#### 1.4 State of Charge

It is a measuring quantity which determines the fuel gauge of an EV.

$$\text{SOC} = \text{TOTAL CHARGE INPUT} / \text{MAXIMUM CAPACITY}$$

#### 1.5 Cell Balancing

It is a very crucial factor the working of the battery depends on equivalent battery cells. In this voltage across battery remains constant. Cell balancing is of two types – Active and Passive type. Active type cell balancing is when stronger cells charge the weaker ones whereas Passive type cell balancing where cells are forced discharge.

#### 1.6 Thermal Control

In thermal system oil can be used in a battery pack, it helps adjust temperature on itself and hence maintain the overall temperature.

#### 1.7 Power from Battery itself

The battery charges and discharges itself as per the requirement of the battery pack.

#### 1.8 Less Ideal Power

A BMS needs to be powered continuously but consuming less energy so as to not drain the battery. So, when an EV is left uncharged for a long time it tends to drain the battery.

#### 1.9 Galvanic Isolation

BMS provide galvanic isolation between Battery pack and Electronic Control Unit (ECU). The ECU and BMS must communicate through Local Interconnect Network (LIN) bus.

#### 1.10 Data Logging

The BMS needs to contain data from its installation period and should be updated automatically. It should also track charge cycles and charge time of battery pack.

#### 1.11 Accuracy

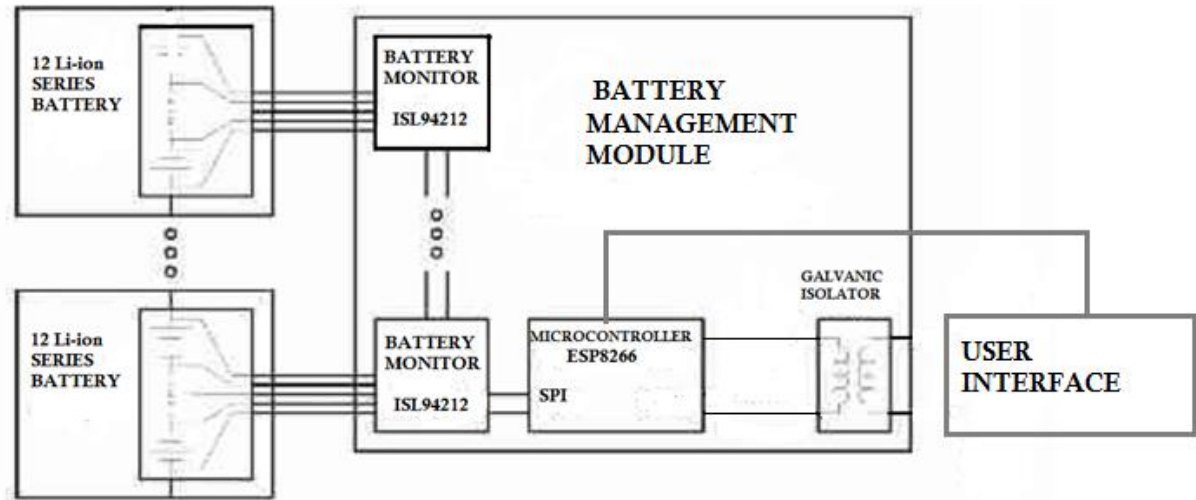
The cells when charged or discharged affect the voltage across it. It is necessary that the cells maintain constant voltage across it.

#### 1.12 Processing Speed

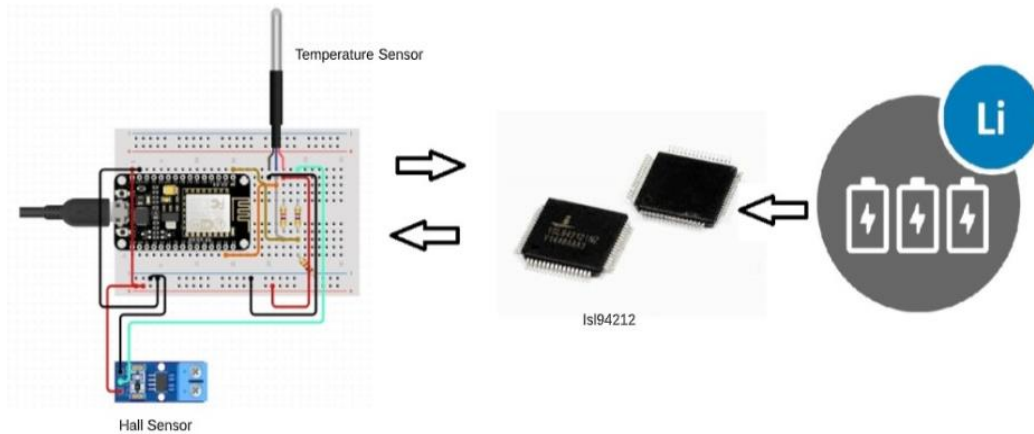
The BMS should calculate cell voltage, SOH, SOC and other corresponding factors.

The Battery Monitoring System consists of two modules beginning with the Management module where in the efficiency of the battery are tried to be maintained and the details of the battery are provided to the user.

## II. MATERIAL AND METHOD



**FIGURE 1: BLOCK DIAGRAM OF BATTERY MONITORING SYSTEM**



**FIGURE 2: SIMPLIFIED VERSION OF THE CIRCUIT**

## III. DESIGN METHODOLOGY

The Li-ion battery pack is connected to the battery management module. It consists of an ESP8266 microcontroller which acts as a remote host that helps to receive information from the other components in the management system.

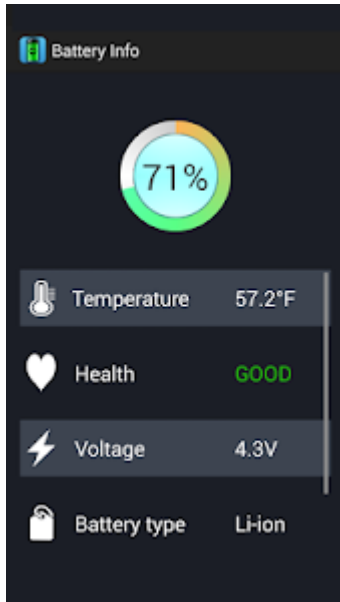
The ISL94212 module provides the ESP with the information of the battery such as its individual cell voltage and also manages the individual battery level maintaining constant voltage and current.

The sensor such as the hall sensor and the temperature provide with the real time and accurate current, voltage and temperature values of the battery pack.

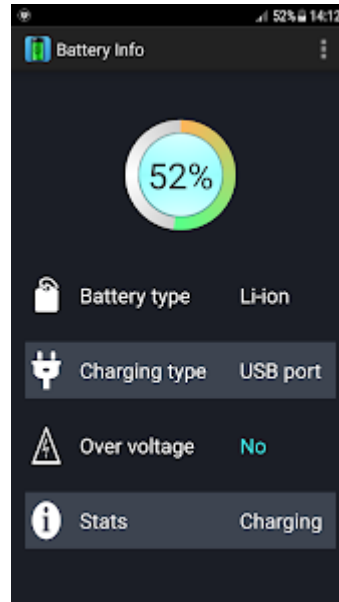
With the pre embedded mathematical equations in the microcontroller it calculates the State of Health (SOH), State of Charge (SOC), Operating temperature range and other crucial statistics of the battery.

The output of the monitoring system will be provided to the user by a software application. The monitoring module consists of ESP8266 which has inbuilt Wi-Fi which can be connected to any display device

#### IV. EXPECTED RESULT



**FIGURE 3**



**FIGURE 4**

The estimated output will be in the above form. It will be a complete software application based for U.I.

#### V. CONCLUSION

Electric vehicle is the future of transportation system. A BMS is a helping hand to control the internal working of an EV. In this project we have considered CAN bus instead of LIN bus only to overcome the problem of processing speed. Depending on the situation we can modify the circuit for different types of electric vehicles such as BEV, HEV and PHEV. We have tried to overcome maximum of the drawbacks of the models available in the market currently and in a cost-effective manner.

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# ELECTRONIC HEALTH RECORD

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**Abstract**— *The Electronic Health Record (EHR) is an essential aspect of all the citizens in any country. EHR makes the workflow of patients & hospitals very efficient. As EHR contains information about the patients' health history. This information should be kept very confidential and safe. On the dark-web, the price of a single patient's health record is nearly \$1000. By this we can see how important this is for the bad actors. This is where blockchain technology comes into the picture. By leveraging all the features of data sharing & security of a blockchain, we will implement EHR on it. This paper further discusses more about the fusion of EHR and Blockchain.*

**Keywords**— *blockchain, health, hospitals, patients, record.*

## I. INTRODUCTION

We will consider a basic scenario which happens frequently with most of the patients and hospitals.

Patient A needs medical data while having a medical appointment at X hospital, but the data was created at Y hospital. In this case, A is a regular patient and X & Y are the hospitals who keep the medical data with them.

By analysing the scenario, many questions arise. The main question that comes up is, How to find and access patient's A health data? Other questions such as how will the data exchanges between hospitals take place? Who will access which part of the data?

### **Absence of EHR in India:**

The adoption of EHR in India is too low. Because of the poor infrastructure in the hospitals and clinics makes it infeasible to maintain EHR. Divergence of hospitals which are maintained by different bodies like in the public sector, there are state and central government run hospitals and in private sectors there are big names in the field. 2% of the whole budget is allocated to the healthcare from which only 30% is used to improve the infrastructure. The large portion of this goes to the prominent institutions like All India Institute of Medical Sciences (AIIMS) and Post Graduate Institute of Medical Education and Research (PGIMER) which consist of world class ICT infrastructure. Due to capital investments in private hospitals, there is a good infrastructure of computers and internet connectivity. Even if we gap the problem of infrastructure, there is the other problem of interoperability. Private hospitals maintain EHR only for its internal functioning. They don't share it with patients and other organizations. So there is a need for all the players in the field to come together to make a difference.

### **Importance Of Blockchain In EHR:**

Blockchain brings the decentralized nature of the EHR. No one entity will hold the patient's data. It will create a mechanism of access control which will be useful in sharing the permission of the data between the stakeholders. Blockchain will maintain privacy and security of data while bringing interoperability to the system.

### **EHR 101**

An electronic health record (EHR) is a digital version of a patient's paper chart. These are real time patient centered records that make information available instantly and securely to an authorized user. They contain a patient's medical history. They allow access to evidence based tools that providers can use to make decisions about a patient's care. They automate and streamline provider workflow.



It contains Administrative and billing data, Patient demographics, Progress notes, Vital signs, Medical history, Diagnoses, Medications, Immunization Dates, Allergies, Radiology images, Lab and test results and all the other health data.

## WHY NORMAL INTERNET CAN'T BE USED TO DEPLOY EHR:

ERROR 404 NOT FOUND



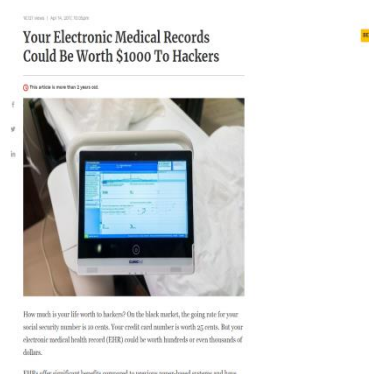
**FIGURE.1 : ERROR NOT FOUND**

This is the error we have encountered many times while using the internet. This error is a HTTP response code that means the browser communicated with the server, but it did not find what was requested. This occurs when links or files are broken. This would be a very huge problem when it comes to EHR. We can't risk the missing of patient's health data in any case.

## HACKING



**FIGURE.2 : ARTICLE ON EHR**



**FIGURE.3 : ARTICLE ON EHR**

THIS IS ONE OF THE MOST SEVERE PROBLEMS. IN THE YEAR 2019, MORE THAN 25 MILLION PATIENT RECORDS WERE BREACHED. ON THE DARK-WEB, THE COST OF DATA ABOUT THE CREDIT CARD OF ONE PERSON IS ABOUT \$100 AND INFORMATION OF HEALTH DATA OF ONE PERSON GOES ABOUT \$1000 AND THE WHOLE EHR DATABASE WOULD BE WORTH \$5,00,000 .

Centralized



**FIGURE.4 : ARTICLE ON INTERNET TRAFFIC**

In 2013, Google servers were down because 40% of internet traffic dropped. Google holds a huge amount of the internet traffic. Making EHR on a centralized structure will cause many problems. Server shutdowns will cause problems in accessing health data which will be a big problem during medical emergencies.

#### WHY ARE BIG COMPANIES NOT ADOPTING THIS TECHNOLOGY?

In Q4 of 2017, Google earned \$31.91 billion from which 27.7 were from its ads business. That is almost 85.5% of the total revenue. This is the main reason why tech giants are not adopting this technology as they will lose a big amount of their revenue because blockchain does not allow for centralization. This feature of blockchain blocks tech giants from having the data and using them to show ads to the users.

#### BLOCKCHAIN 101

It is the underlying data that stores a permanent history of all the transactions to ever occur. The first time blockchain came into its core existence was when white paper of bitcoin was published in October 2008 by Satoshi Nakamoto. Bitcoin was the first successful implementation of blockchain.

#### Data Structure:

It is a virtual format for organizing, retrieving and storing information.

There are four basic operations that can be performed on any data structure. That goes by the acronym CRUD.

C - Create | R - Read | U - Update | D - Delete

Difference between the normal data structure and blockchain data structure is that the deletion operation is not allowed. It is an append only ledger, meaning that any information added to the ledger cannot be deleted.

#### RECORD KEEPING

Every update to the distributed database, is a batch of transactions grouped into what are called blocks. Every block is built off, or chained to, a previous block. Altogether, this form a magical data structure known as a blockchain.

In this way, blockchain efficiently keeps track of not only the transactions in any given update but also gives the database discrete states. Every block is an update, and a chain of blocks represents a history.

Every block contains information about the previous block, as every block is built off the previous one. If any block is mutated, intentionally or not, information within this block and all the future blocks will change. This makes the blockchain tamper-evident, as tampering with a transaction from the past would invalidate any future blocks linking back to it.

#### UNIQUE PROPERTIES OF BLOCKCHAIN:

**Pseudonymous:** users use pseudonyms, not real world identities to make transactions.

**Decentralized:** every user possesses the same copy of transaction history.

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**Immutable:** it is close to impossible for any user to change the network transaction history in their favour.

**Trust less:** users don't need to trust anyone they are transacting with to be sure that their transactions will be accurately recorded by the rest of the network.

## II. MATERIAL AND METHOD

There will be two main stakeholders in the system:

**Data Owner:** All the individuals who are in the network using EHR for medical purposes.

**Data User:** All the hospitals, clinicians, labs and research teams who need data for their operation.

Technology stack used for the implementation is

### 1.1 Ethereum Private Network

It is a decentralized platform designed to run smart contracts. It's like a distributed computer to execute a code. It is turing complete protocol that uses its coin ether as fuel

### 1.2 Smart Contracts

These are a code that facilitate, verify or enforces the negotiation or execution of a digital contract. Smart contracts in ethereum are like autonomous agents that live inside of the ethereum network. They react to the external world when poked by transactions (which call specific functions ). They contain address, associated contract code and persistent storage. They have direct control over internal ether balance, internal contract state and permanent storage. Smart contracts generally serve four purposes:

1.2.1 Store and maintain data.

1.2.2 Manage contract or relationship between untrusting users.

1.2.3 Provide functions to other contracts.

1.2.4 Complex Authentication.

### 1.3 IPFS

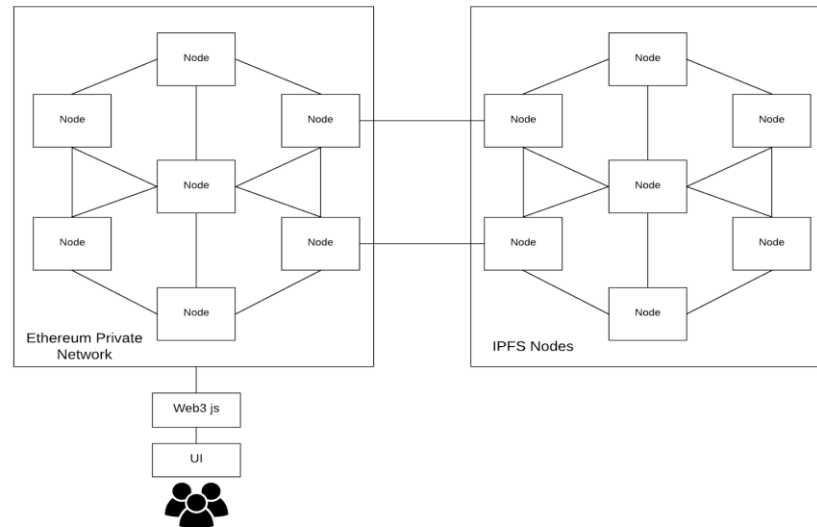
Its full form is Interplanetary File System. It is a protocol and peer-to-peer network for storing and sharing data in a distributed file system. It is here to replace HTTP. It uses content-addressing to uniquely identify each file in a global namespace connecting all computing devices.

### 1.4 Web3.js

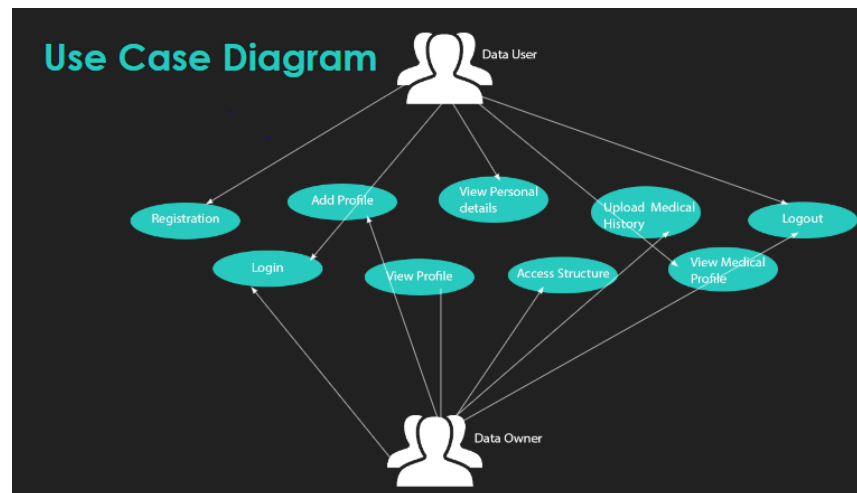
It is a collection of libraries which allows you to interact with a local or remote ethereum node, using a HTTP or IPC connection. The web3 java script library interacts with the ethereum blockchain. It can retrieve user accounts, send transactions and interact with smart contracts.

### 1.5 HTML and CSS.

### III. DESIGNED METHODOLOGY



**FIGURE 5: SYSTEM ARCHITECTURE**



**FIGURE 6: Use Case Diagram**

We will be setting up an ethereum private network.

The nodes will be run by the hospitals, clinicians, labs, pharmacies and others related to the medical cycle.

All the medical data will be stored on the IPFS network in an encrypted state and the pointer to the location will be saved in the block of the patient.

Whenever there is a need for data, it can be accessed from the pointer and decrypted using the encryption key.

The process of logging data for small clinicians and big hospitals will be made using optical character recognition (OCR).

Using this it will be able to extract data from the formatted papers and log it, so the institutions can do more of what they are best at.

This is especially useful in India, because the doctors are more busy in treating patients and can't allocate time anywhere because of the tight schedule.

There will be a mobile app for the civilians to see data and give or revoke access of their data to the institutions. This is the brief overview of the proposed mode .

#### IV. Conclusion

This proposed model successfully deploys EHR on Ethereum blockchain. This way we can keep the data secure and safe. No one will misuse the data or no one entity will own the data. There is a decentralization concept in the solution. We can add many more features to the solution. This will work perfectly in any condition. In India, there is a very much need for efficient working of the medical chain.

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# VOICE ENABLED MEDICINE VENDING MACHINE

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**Abstract** *The Medicine Vending Machine is the machine that will dispense the required medicine as per the user's choice. The biggest advantage is that people have access to this AMVM in 24x7 accessible public areas. The project provides basic medical services available to those who have not yet benefited because of their surroundings and affects people with physical disabilities and the elderly. He is very focused on treating minor health problems and giving fever a priority. It could also reduce the current cost of open drug boxes or pills. By having a counter-in-the-job sales rep at work sites, work sites other than clinics or pharmacies can benefit from increased efficiency and avoid working under sick workers. In addition, Medicines play an important role in human health in all cases. Introduced an automated medical system to reduce one's time and energy. The same is true with the ATM where we get the required cash at any time and at any location. The project presents a machine designed to provide such health care in areas where medical marijuana is likely to occur Allows the user to select a drug and to pay the required amount taken and distribute the drug. Provides practical relief for minor health problems. By minimizing the minor symptoms at work, it can completely and permanently remove the workplace. It can also reduce the current cost of open drug tablets.*

**Keywords—** *Medicine, automatic vending machine.*

## I. INTRODUCTION

Many people in India die as a result of early detection and without timely treatment. Problems arise when the need for a particular drug is urgent and pharmacies are not open or the drug is not available in stock, especially at night. In rural areas and areas where public benefit is low, access to medicines within a patient's reach is a critical issue. These are some of the important public .problems that are facing the public in this current situation. The voice-enabled sales machine will help solve these problems by providing the 24x7 medication. The aim of the company is to add consumers to increase the speed of customer service. Access to primary health care is an important pillar of development in building a healthy future. This paper has a mechanism designed to provide such health care in areas where it is unlikely to have a medical store .Allows the user to select a drug, pay the required amount after which confirms the value received and submits the drug. With the availability of the item after the price of the item is compared with the coins included, the system will evaluate the availability of the Product. If no fee is received the refund will be returned. In Currency Return mode when no wizard is selected and PB2 is pressed, the system goes to Currency Return mode.

## II. MATERIAL AND METHOD

### 2.1 Raspberry Pi

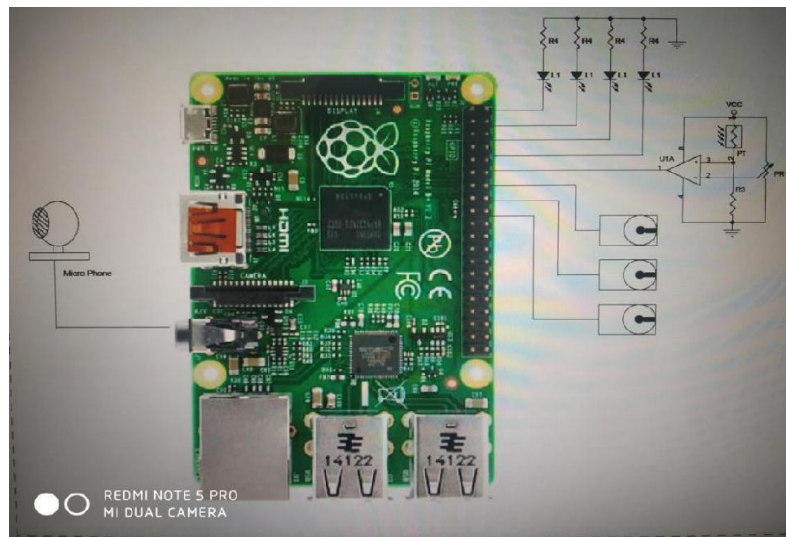
Raspberry Pi is a pioneering product. The number of users and fan base support that the device has good in future. The device can definitely help to everyone who really interested to learn electronics and computer technology. Increasing the processing power can help the product in the future. Also supplying a kit and a proper instruction manual will improve the product and the



current operating systems are not compatible due to the ARM processor. If the processor is upgraded to run Windows directly on the Raspberry Pi, then it would be a good step for the Pi controller. The Raspberry Pi is a very small machine due to the combination of high quality images of the average personal computer and software installed. Supporting PC operating systems like Linux and providing basic information lines. the GPIO influences it to be ready to control anything. Configuring GPIO is much simpler and more natural compared to a standard FPGA board. It can work as a personal computer but it can't replace the original computer because the raspberry pi size and the port limit are the input result. These organizations sell the Raspberry Pi on various websites. The sense of belonging creates an opportunity for transfers to China and Taiwan, which can be recognized from other Pi's due to their red shading and absence of FCC identity marks. The equipment is one of a kind of all-in-one output of 256 megabytes of RAM, later Model B and Model B+) to 512 MB. Gadgets are available in Python as a programming language, with the help of BBC BASIC C, Java layer Raspberry Pi has a Broadcom BCM2835 assembly on the chip, which also includes an ARM1176JZF-S 700 MHz processor. The figure below shows the hardware implementation of the PIBOT program and the exchange of modules with raspberry pi is shown in the schematic way. In this paper, we build Multi-Environmental robots use a raspberry pi which, in turn, is used to enable real-time monitoring of the local network. Live streaming is accomplished using the MJPEG streamer. The method used in this paper is to get a full overview of the many environment here Raspberry pi using the camera is used for surveillance and captured data is transmitted to users with the help of Wi-Fi and many other wireless systems that can be viewed by a personal computer or laptop.

## 2.2 Microphone

A microphone is a sound device that converts sound waves into electrical signals. This signal can be amplified as an analog signal or can be converted into a digital signal, which can be processed by computers or other digital audio devices.



**FIGURE 1: circuit diagram**

Starting with Initialize system after initialize, detect the coin through coin detection circuit. Give the input as voice through microphone then voice recognition is done by raspberry pi, if voice will not recognize it will blink error (red) LED. When the voice recognition is take place perfectly then blinking of green LED is take place after that medicine came out through dispenser container.

### 2.3 Give voice as input

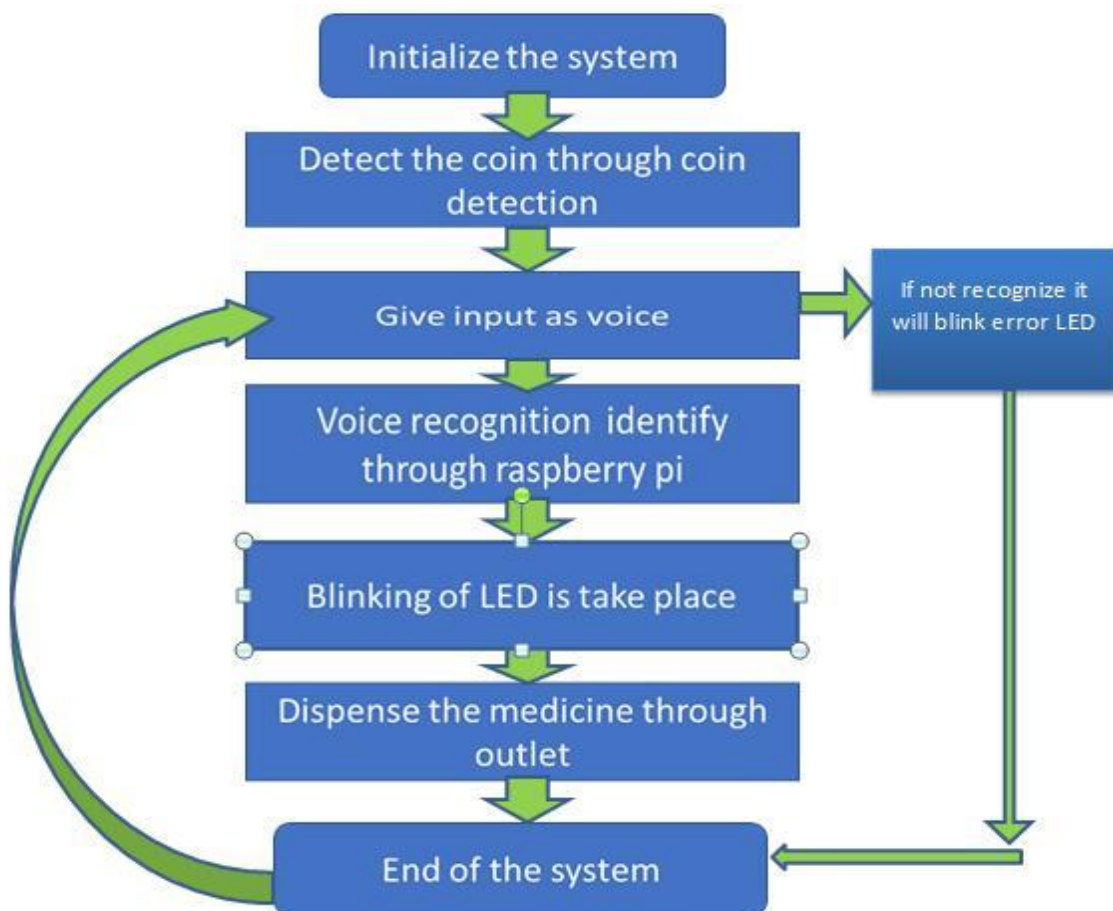
In this we give input of voice through microphone, user will easily speak on the microphone about the particular medicine. system will take as input and it will Recognize the voice and dispense the medicine through dispenser container.

### 2.4 Recognition of voice

After taken voice from user it will recognize the voice .If it is recognize above 75% then system will glow green LED and further process is take place If it is not recognize above 75% then system will glow red LED and user will know the voice recognition is not done perfectly.

### 2.5 Dispenser container

If voice Recognition is done perfectly then it will ask for money as coin. (coin detection is added to detect the coin) After coin detection system will ready to dispense the medicine through dispenser container.



**FIGURE 2: Flow chart**

**TABLE 1**  
**COMPARISON BETWEEN MAIN METHOD**

Sr. No.	Paper Name	Advantages	Disadvantages
01.	Design and Implementation of Speech to Text Conversion on Raspberry Pi	The Voice Command System works on the idea and the logic it was designed Our system. Using the raspberry pi to take a command. Each of the commands given to it is matched with pre-existing sample.	Takes a lot of time to voice recognition for speech text conversion using the raspberry pi.
02.	Voice Based Home Automation System Using Raspberry Pi	The main technology is used Raspberry Pi it is a credit sized computer in which main Programming is done by using python overall.	It does the home automation by voice recognition, input is given by microphone.
03.	The Autonomous Pill Dispenser: Mechanizing the Delivery of Tablet Medication	In voice enabled medicine vending machine we use raspberry pi so it will give alert system to user before dispenser container is empty.	Autonomous Pill Dispenser shows promise and consistent ability to trap and release medication ,but there must be possibility if dispenser container is empty.

### III. CONCLUSION

Medicine vending machine give specified medicine and amount of medicine as per instruction by the user with voice controlled. The medicine dispensing machine offers a flexible, simple and rugged solution for basic healthcare to all places, at a very moderate cost. The machine can be customized to suit any type of terrain or climate with minimal changes to the hardware and software. This machine will be extended to add an intelligent medicine unit, which send s a refill notification message to the administrator when the number of medicine strips decrease below a certain level.

### IV. EXPECTED RESULT



**FIGURE 3: Dispenser container**

We represents the complete hardware and software entity of the application with the motors and raspberry pi setup packed inside. The medicine dispensing got accomplishment based on the requirement of the user. The results with respect to the health care improvement were fascinating after installing this device in a village, city malls, railway stations etc.

### ACKNOWLEDGEMENTS

We would like to express our deep appreciation to all those who offered me the possibility to complete this report. A special gratitude that we owe to our final year project manager, Ms. Ameya Purandare, whose suggestions and encouragement I have contributed in helping me write this project particularly helped to coordinate my project. In addition, We would also like to commend the important role of the staff of the EXTC department who allowed the use of all necessary equipment and necessary materials to complete the work. Last but not least, many thanks, we must appreciate the guidelines given in our project presentation along with other supervisors who have improved our presentation skills for our comments and advice

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# **SECTION E**

## **H & S**

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# Prominence of Employability Skills in Multinational Companies

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**Abstract**— A job in the multinational companies specifically in the IT industries is now a days consider as a dream for many aspiring graduates in India. Though working with such companies may look most profitable or rewarding at first glance, but the reality is far away from the truth. Once the freshly graduates get into the process of job search, there they realizes that just the technical or hard skills are not sufficient to get a good salary job. In short, there the graduates understand the need and importance of employability skills to get the good job as well as to perform proficiently in their jobs. And these other skills are popularly known as soft skills. Through the present research article the author is trying to focus on major soft skills that are essential for graduating pupils and at the same time identifying the expectations of the corporates' from newly graduated students. Through the research paper author is also trying to focus on existing practices in higher education colleges, understanding the reason for gap and highlighting on how to bridge the gap to enhance the market value of graduated students.

**Keywords**— *Employability, Soft Skills, Hard Skills, Employment, Proficiency*

## I. INTRODUCTION

After the occurrence of globalization, as a fast developing nation India spectators incredible evolution and prospect in the areas like commerce, management, business, retail industry, insurance etc. The resultant struggle has raised in a new standard of business. The growth and rapid development changes the economy and with the emergence of new technology, employment designs or patterns and prospects are exceptionally transformed. Due to the Globalization and Privatization, many multinational businesses have set up their services in India and many other are planning for expansion of their global operations. Thus, creates a great challenge to set up a favorable milieu for progressing economy of the country.

Employability supposes the requirement for both hard skills and soft skills thinking about the consistently expanding challenge for work in the present employment scenario commanded by the IT (Information Technology) enterprises. As per Smith and Comyn (2003) employability skills are "abilities required not exclusively to pick up work yet additionally to progress inside a venture in order to accomplish one's latent capacity and contribute effectively to venture vital bearings". As it were, employability skills allude to those abilities required both to find a new line of work and furthermore to do well in that activity and suggest positive results for people just as for the associations they are utilized in. Other than their technical abilities, the job searchers are required to have a scope of different skills together known as Soft skills so as to pro their meetings and furthermore to advance in their expert life once they are utilized. Soft skills, then again known as fundamental abilities, basic instincts or relationship building abilities, despite the fact that basic for all, are critical for the new graduates who wish to find a new line of work of their decision and who expect to ascend the stepping stool of accomplishment in their expert life.

Employability skills can likewise be characterized as a set of accomplishments, understandings and individual traits that make people more employable and be effective in their picked occupations (Latisha et.al, 2010). These aptitudes are sorted by the accompanying competency zones: individual qualities, critical thinking and basic leadership abilities, relations with others, relational abilities, task-related abilities, development, wellbeing and security propensities, and duty to work. For the most part,



employability abilities are required by pupils to set themselves up to address the issues of a wide range of occupations upon graduation.

It is mainly recognized that there still exists a lacuna where the degree of employability skills of graduates and entry level work necessities don't meet. Researchers Morley, 2001; Kivinen and Silvennoinen, 2002; Shivpuri and Kim, 2004 perceive the predominant skill deficiency among the college graduates (Maripaz et. al, 2013). Employers today are more concern about recruiting those graduates who not just have fundamental scholastic skills like perusing, composing, science, math, oral conversation skills, yet additionally they looked for candidates with higher thinking abilities, leadership qualities, time management, creativity, problem solving and decision making skill. What's more, they additionally search for representatives who having individual characteristics that among all incorporate obligation, fearlessness, discretion, social expertise, genuineness, respectability, versatility, adaptability, solidarity, dependability, productivity, self-directedness, great work frame of mind, great prepping, collaboration, self-inspiration and self-administration. In any case, the greater part of our alumni don't know about this present marvel and thus on occasion don't see the association between what they do in their classes and what is really required in the corporate world that they will wander into later. In this manner, it is mandatory for higher education institutions to guarantee that their pupils are well-furnished with employability skills so as to additionally prevail in their forthcoming job fields.

## II. LITERATURE REVIEW

Fresh graduates need to adjust to the new business milieu and requirements of workplace environment in order to compete with the global competition. The primary component to empower graduates to keep up with those requirements is to be proficient in employability skills and qualities that are conferred during tertiary education.

It has similarly become a common traits in industry that higher education institutions should outfit graduates with the essential employability skills to gain entry in the workplace (Robinson and Garton, 2007). It has likewise become a typical trait in industry that advanced education institutions ought to furnish graduates with the best possible skills important to make progress in the workplace (Robinson and Garton, 2007).

Rahim and Ivan in 2007 discovered that the employability skills ought not to be instructed since students automatically gained them on their own during their education and training. Be that as it may, Robinson (2000) has an alternate opinion. The researcher accepts that employability skills are teachable and might be taught in the schools and work place. Hence, the institution authority should set objectives and targets for infusing employability skills among undergraduates. Moreover, she recommends that proper guidance ought to be intended to guarantee objectives and targets are achievable.

As indicated by Poole and Zahn, 1993, most managers require in any event a secondary school recognition, and they are similarly worried about whether youngsters can coexist with others at work, are solid, and can introduce themselves well to people in general. They further include that the improvement of good employability abilities should start at home and frequently is the consequence of viable child rearing. Nonetheless, the advancement of such aptitudes can't depend entirely on guardians and home. In this way, the instructing of employability abilities has a place with the school educational plan. Zinser in 2003 shares a comparative view. He accepts that profession and employability abilities ought to be instructed in schools, since numerous understudies leave training without the essential aptitudes to prevail in the grown-up work world. What's more, Washer (2007) underscores that graduates should leave advanced education preferable from numerous points of view over when they enter it. This improvement ought to be owing to the undergrad educational plan which is essential to furnish them with aptitudes they can use to 'offer themselves' to their potential bosses (Latisha et. al, 2010).

In 2014, The National Association of College and Employers have gathered a list of the top employability skills required by the corporate recruiters. These skills are listed as follows: Leadership, communication skills mainly in English; critical thinking, creativity, teamwork, time management, computer skills, technical skills, adaptability, good entrepreneurial skill, flexibility, strategic planning and tactfulness.

These abilities are viewed as significant for potential representatives to have and apply to their activity. These days, most of the recruiters want to recruit candidates from Tier I colleges like IITs (Indian Institute of Technology), BITS (Birla Institute of Technology and Science, Pilani) and NITs (National Institute of Technology), since they seem to have the fundamental scholastic capabilities and employability skills which are requested by the present place of employment condition.

In the present world, it's hard to deny the way that we need to take the necessary steps to endure. Hence, so as to confront the difficulties of this competitive world, students are required to have great proficiency, especially in English with the goal that they would have the option to convey well in this worldwide English. As we know, English is utilized broadly in news and data, business, strategy, callings, travel and furthermore excitement (Kenji Kitao, 2006). One of the criteria required by organizations from their workers is the ability to converse well particularly in English. It is a requirement for graduates to ace the language as it is utilized around the world. With the end goal for graduates to find a decent line of work and make due in the focused corporate world they need to satisfy the work environment ability necessity.

### III. RESEARCH METHODOLOGY

The present research work is descriptive in nature using a survey method. The survey utilized as a part of this review was intended to empower respondents to share their recognitions on the significance, handiness and need of the soft skills and communication abilities in English for enhancing understudies' performance in the corporate areas. The main objective of the corporate questionnaire was to understand and evaluate their needs and requirements from the graduates and in turn to get their suggestions on improving the employability of today's young graduates. The questionnaire was circulated among twenty corporate professionals to understand the target requirements of the global graduates of India. A total of 50 HR professionals from various MNCs including TCS, WIPRO, CAPAGEMINI, TechMahindra etc., to list a few were participated and returned the questionnaires. Besides, interviews were also conducted.

### IV. RESEARCH FINDINGS AND DISCUSSION

A survey was carried out in the various industries and IT companies by a researcher to collect the primary data. In total 50 senior managers, recruiters and HR managers were the participants of the survey.

*Table 1.1 Corporate Participant's view on engineering pupil's possessing employability skills*

	Yes	No	Can't Say	Total
<b>Corporate's Response</b>	6	42	2	50
<b>Percentage</b>	11%	84.2%	4.8%	100%

As shown in the above table where an attempt has been made to know the opinions of corporate professionals about whether they find engineering pupils possess essential skills to meet the industries demands or not and as shown in the table only 11% of the recruiters were agreed and say 'yes' and maximum numbers of the respondents mainly 84.2% voted for 'no' and of the opinion that today's young graduates are lacking in the required employability skills. The remaining 4.8% opted for 'can't say' option.

Following are the most highly rated soft skills which are in demand by employers.



**Figure 1.1** Soft skills rated by Employers

Hence the analysis of the above data clearly indicates that company recruiters now days give a lot of importance to soft skills as compared to technical skills. No respondents responded for ‘strongly disagree’ or ‘disagree’.

The Corporate Professional’s perception about changes or additional efforts to be taken by the Institutions/Academics should take to fill the apparent competency gap

The corporate’s questionnaire, respondents were questioned about their opinions on the extra efforts to be taken up by colleges/teachers to fill the gap between the industry needs and Institution’s supply of the employable engineering graduates. Table 1.2 demonstrates professionals’ vision about the efforts requests to be occupied by Institutions/Academics.

**Table 1.2** Corporate Professionals’ Perception about changes or additional efforts to be taken by the Institutions/Academics (N= 50)

Efforts to be taken by Institutions/Academicians	Professional’s Response (Out of 100%)
Curriculum Change	87.8%
Corporate-Institutions Communication	90.5%
Practical Experience	90.0%
Guest Sessions	83.2%
Workshops, Conferences	77.5%
Skill Training program	74.2%

Live Projects	75.6%
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### Summary of Remarks acquired through personal interviews

The researcher in order to analyze the needs of the corporate professionals an open ended interview was carried out with professionals. As different companies' visits higher education institutes under the campus recruitment drive to select candidates for their firms. Hence the researcher decided to interview these personalities to collect data regarding the requirements. It is the role of corporate professional of placement drive to conduct aptitude test, group discussions and personal interview in the campus who shortlist students on the basis of their scores. So it was decided by the researcher to interview these members of recruitment team and HR professionals. The researcher manages to interview 20 professional of various core companies.

The interview with corporate recruiters helps to achieve deep insight into the profile of various posts. The following questions get asked during the process of structured interview-

- 1) What do you think about language and communication skills' importance in 21<sup>st</sup> century?
- 2) How much importance you give to English conversation skill?
- 3) What are the expectations of employers from today's young aspirants?

### Remarks

In order to understand the opinion of recruiters on the essential skills required to converse efficiently in English language, the researcher asked recruiters to elaborate on their views on importance of language and communication skills in English. Majority of the corporate recruiters considered English communication as vital and essential must have skills. For clear understanding and presentation of the data, those HR professionals were mentioned as HR1, HR2, and HR3....HR20.

As HR 1 Suggested "Language is an essential vehicle of conversation. It is only with the communication skills one can understand other better. It helps to improve relation and even individual's competency." HR 2 considered English conversation as vital since its lingua franca of the global world.

The recruiters during the interview with researcher agreed that after the emergence of several MNCs in India, each of the population come to know and accepted the importance of communication mainly in English language. AS HR 6 reflect that "today corporate market is giving a mass importance to English conversation specifically if they are dealing with international customers and big famous brands. They make it mandatory for their selection criteria that their employees must be good in English conversation skills."

To attain a great success at the job employers seeks for the certain employability skills among the engineering candidates for work Excellency. Fifteen out of twenty recruiters mentioned certain soft skills that they expect their employees need to possess. To summarize them they are mentioned below as the order of their importance or priority-

- Hard skills
- English conversation skills
- Soft skills
- Interpersonal skills
- Creative thinking

- 
- Professionalism
  - Time management
  - Team building
  - Leadership
  - Positive approach
  - Assertiveness
  - Good presentation skills
  - Analytical skill
  - Team spirit

Above mentioned skills are commonly expected by all the employers which they seek in candidates at the time of an interview.

### CONCLUSION

In spite of the fact that today corporate recruiters do anticipate that young graduates should be in any event excited, proficient, numerate and ready to turn up on schedule. They don't anticipate that these applicants should have completely developed skills that could be depicted as explicit to the work environment, yet rather incompletely created degrees of these abilities. Proficiency, relational abilities, math, and eagerness are the most significant employability skills in the perspective on respondents, and an absence of them in an up-and-comer is a 'major issue' for some employers. For a vocation that requires five years' understanding, most employers accept that the most employability abilities ought to be completely created. Considering the way that the worldwide interest for soft skills has expanded fundamentally, it is presently essential for building understudies to outfit them with gain sufficient Soft-skills other than getting scholastic and specialized technical information.

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# STUDY OF MPS UNDER STRESSED CONDITIONS.

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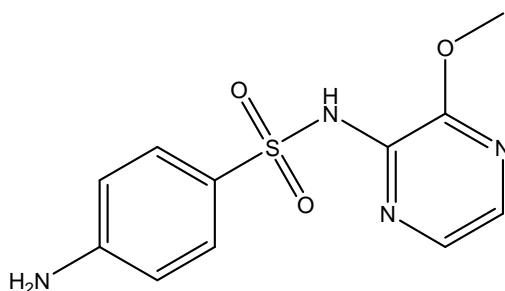
Email id – skchuri@gmail.com

**ABSTRACT** – THIS STUDY IS DONE TO ACCESS THE CHEMICAL STABILITY OF THE CANDIDATE COMPOUND IN THE PHARMACEUTICALS. USUALLY, IT IS PERFORMED AT THE PRELIMINARY STAGE IN THE PROCESS OF DRUG DEVELOPMENT. FORCED DEGRADATION/ STRESS TESTING IS PERFORMED UNDER ACCELERATED ENVIRONMENT. THE EXPERIMENTAL CONDITIONS CAUSE THE CANDIDATE COMPOUND TO DEGRADE UNDER EXTREME CONDITIONS LIKE ACID AND BASE HYDROLYSIS, PEROXIDE OXIDATION, PHOTO-OXIDATION AND THERMAL STABILITY TO IDENTIFY THE RESULTANT DEGRADATION PRODUCTS. THIS HELPS TO ESTABLISH DEGRADATION PATHWAYS AND THUS INTRINSIC STABILITY OF A DRUG SUBSTANCE. THE STABILITY OF PRODUCT DESCRIBES SHELF LIFE AND STORAGE CONDITIONS AND HELPS IN THE SELECTION OF APPROPRIATE FORMULATIONS AND THEIR SUITABLE PACKAGING. THIS IS COMPULSORY FOR REGULATORY DOCUMENTATION. THE COMMONLY USED ANALYTICAL APPROACH FOR FDS IS HPLC WITH UV AND/ OR MS BUT THESE TECHNIQUES CONSUME A LOT OF TIME AND NOT PROVIDE HIGH RESOLUTION TO CONFIRM THE PRECISE DETECTION OF DEGRADATION PRODUCTS. USE OF UPLC WITH PHOTODIODE ARRAY AND MS ANALYSIS SUPPORTS THE IDENTIFICATION OF DEGRADATION PRODUCTS AND ALSO REDUCES THE TIME NEEDED TO EVOLVE STABILITY INDICATING METHODS.

**Keywords** –Pharmaceuticals, Degradation, Stability Hydrolysis, Oxidation.

## 1. INTRODUCTION

N1 - ( 3 - Methoxypyrazin - 2 - yl) sulphanilamide is a long acting sulfonamide that has been used in the treatment of urinary tract infections and respiratory due to sensitive organisms by oral route of administration. MPS is given with pyrimethamine in the treatment of malaria. It has also been given in the ratio 4 parts of N1 - ( 3 - Methoxypyrazin - 2 - yl) sulphanilamide to 5 parts of trimethoprim as a combination with uses similar to those of co - trimoxazole 1.



*N*<sup>1</sup>-(3-Methoxypyrazin-2-yl)sulphanilamide

Molecular formula: C<sub>11</sub>H<sub>12</sub>N<sub>4</sub>O<sub>3</sub>S

Molecular Weight.: 280.3

Fig: 1 Chemical structures of solifenacin.

Literature search reports few bio analytical methods for the quantitation of N1 - ( 3 - Methoxypyrazine - 2-yl) sulphanilamide (MPS) concentration in biological fluid samples using liquid chromatography and mass spectroscopic method. So far, the active pharmaceutical ingredient (API) to MPS as a published report describing the complete characterization of



impurities, are there. MPS active pharmaceutical ingredient (API) in the respective objects isolation / synthesis of LC / MS / MS are no reports on the use.

Profiling of drug substance for its impurities is a critical parameter which determines the safety of the drug substance as well as the controls required during manufacturing to ensure appropriate level of impurities. Identification and characterization of Impurities in pharmaceutical production, the acceptable limit of 0.1 % of the present [10] is mandated. The present study details the identification and determination of structure of few process related impurities found in the product (MPS). Though, different methods of synthesis of MPS are reported, the selected route was safe, feasible & economical. However, these did not give information regarding possible impurities. Impurity profiling of drugs in pharmaceutical analysis is an important topic - the high purity of the drug substance manufacturing process technology to develop and deliver safe drugs.

## 2. EXPERIMENTAL

**Preparation of solutions for under stressed conditions was used as given below:**

**a)Parent sample:** Take accurate quantity of about 25.00 mg of MPS in a volumetric flask of 50 cm<sup>3</sup> capacity add 5.0 cm<sup>3</sup> of diluent and sonicate to dissolve the sample and with the diluent make up the volume.(Concentration : 500 ppm)

**b)Acid Hydrolysis:** Take accurate quantity of about 25.00 mg of MPS in a volumetric flask of 50 cm<sup>3</sup> capacity. Add 5.0 cm<sup>3</sup> of 1N Hydrochloric acid, heat at 60 degree Celsius in water bath for 3 hours for Acid hydrolysis and cool and then add 5.0 cm<sup>3</sup> of 1 N NaOH for neutralization and with the diluent make up the volume. (Diluent blank solution was also prepared in same manner without MPS and disregard peaks due to blank in the test sample if any)

**c)Base Hydrolysis:** Take accurate quantity of about 25.00 mg of MPS in a volumetric flask of 50 cm<sup>3</sup> capacity. Add 5.0 cm<sup>3</sup> of 1 N NaOH, heat at 60 degree Celsius in water bath for 3 hours for base hydrolysis and cool and then add 5.0 cm<sup>3</sup> of 1N Hydrochloric acid for neutralization and with the diluent make up the volume. (Diluent blank solution was also prepared in same manner without MPS and disregard peaks due to blank in the test sample, if any)

**d)Aqueous (Humidity):** Take accurate quantity of about 25.00 mg of MPS in a volumetric flask of 50 cm<sup>3</sup> capacity. Add 5.0 cm<sup>3</sup> of water, heat at 60 degree Celsius in water bath for 3 hours for aqueous hydrolysis and cool and with the diluent make up the volume. (Diluent blank solution was also prepared in same manner without MPS and disregard peaks due to blank in the test sample, if any)

**e)Oxidation:** Take accurate quantity of about 25.00 mg of MPS in a volumetric flask of 50 cm<sup>3</sup> capacity. Add 5.0 cm<sup>3</sup> of 5 % v/v hydrogen peroxide solution, heat at 60 degree Celsius in water bath for 3 hours for Oxidation and cool and with the diluent make up the volume. (Diluent blank solution was also prepared in same manner without MPS and disregard peaks due to blank in the test sample if any)

**f)Photolytic Exposure:** 1.00 g MPS was exposed in photolytic stability chamber. Solution was prepared as same as parent sample.

**g)Thermal Exposure:** 1.00 g of MPS Batch No9025-P kept in oven at 105°C for 3.0 hrs and analyzed by HPLC. Solution was prepared as same as parent compound.

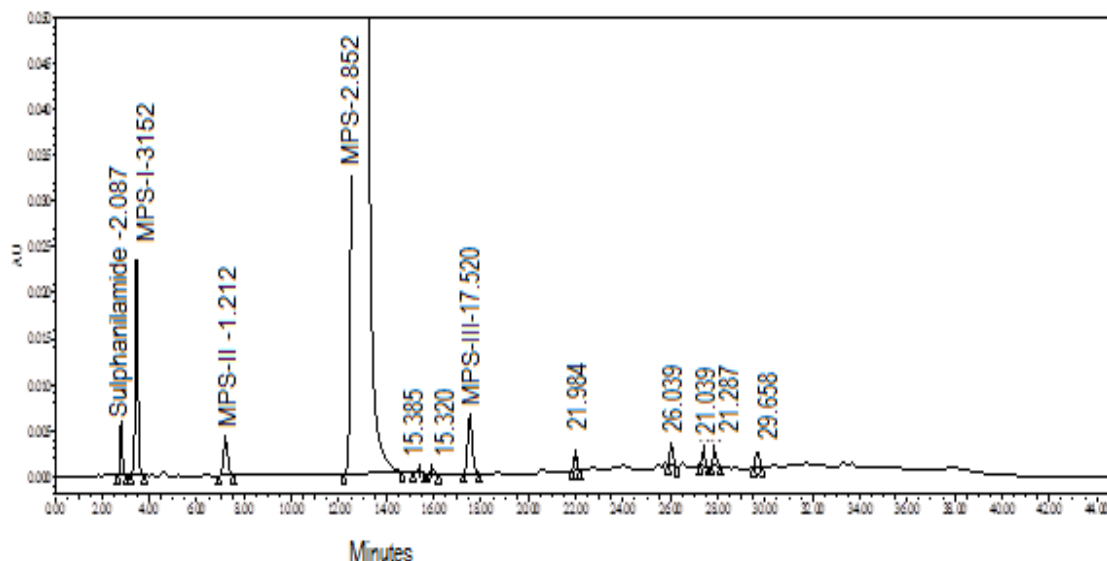


Fig.a MPS crude sample chromatogram

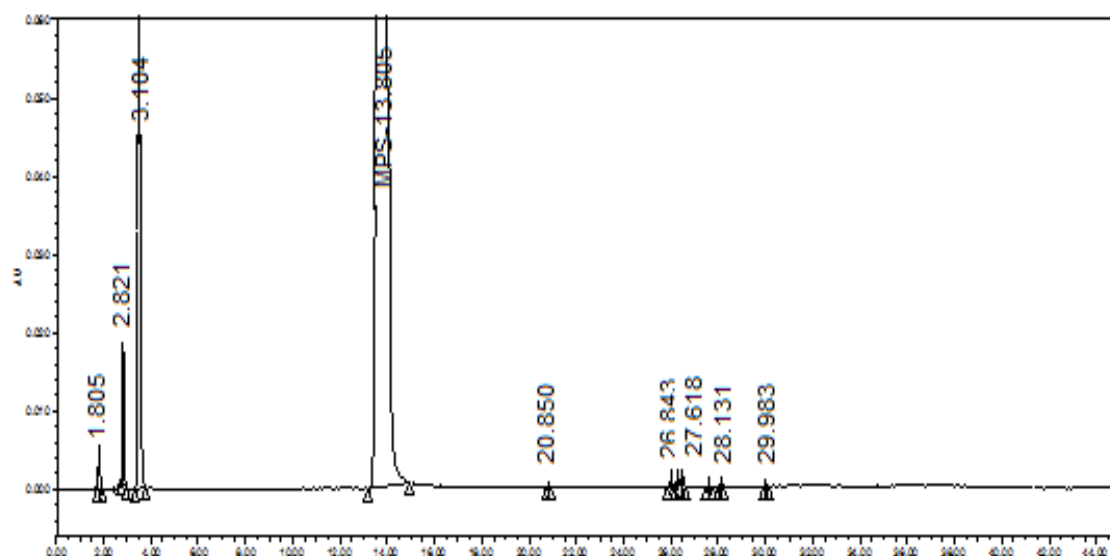


Fig.b Chromatogram of Acid hydrolysis of MPS under stressed condition.

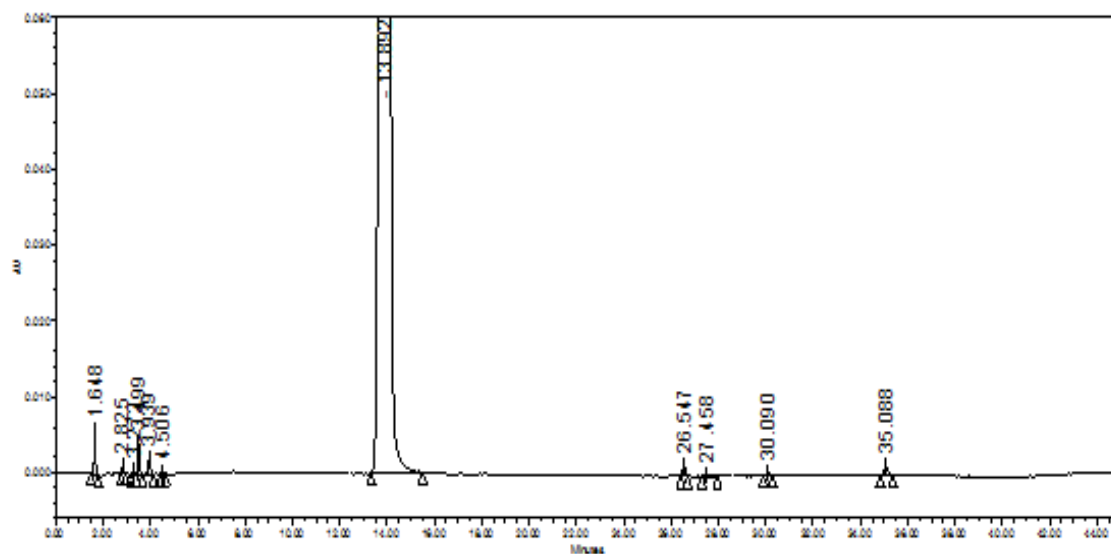


Fig.c. Chromatogram of Base hydrolysis of MPS under stressed condition.

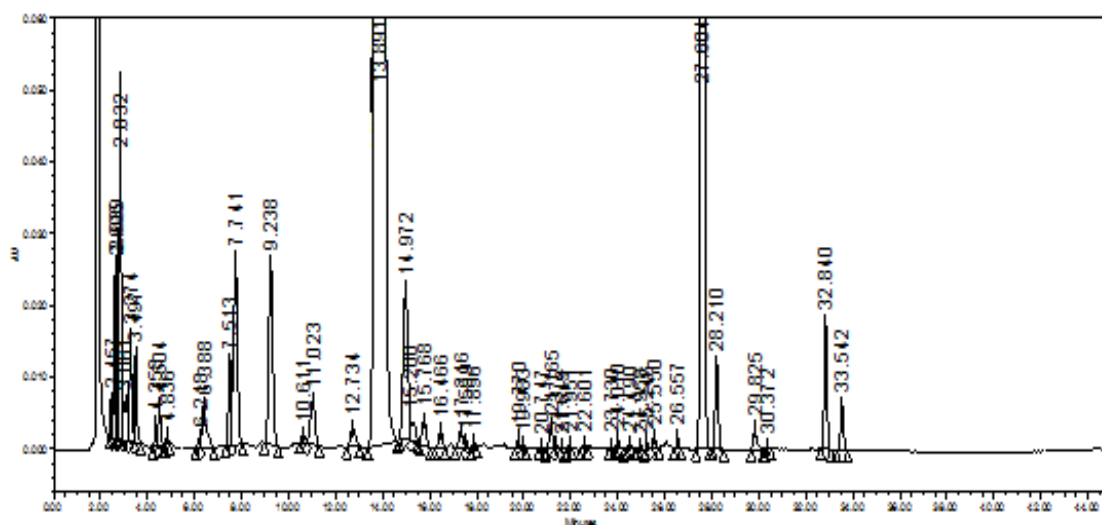


Fig.d Chromatogram of Oxidation of MPS under stressed condition

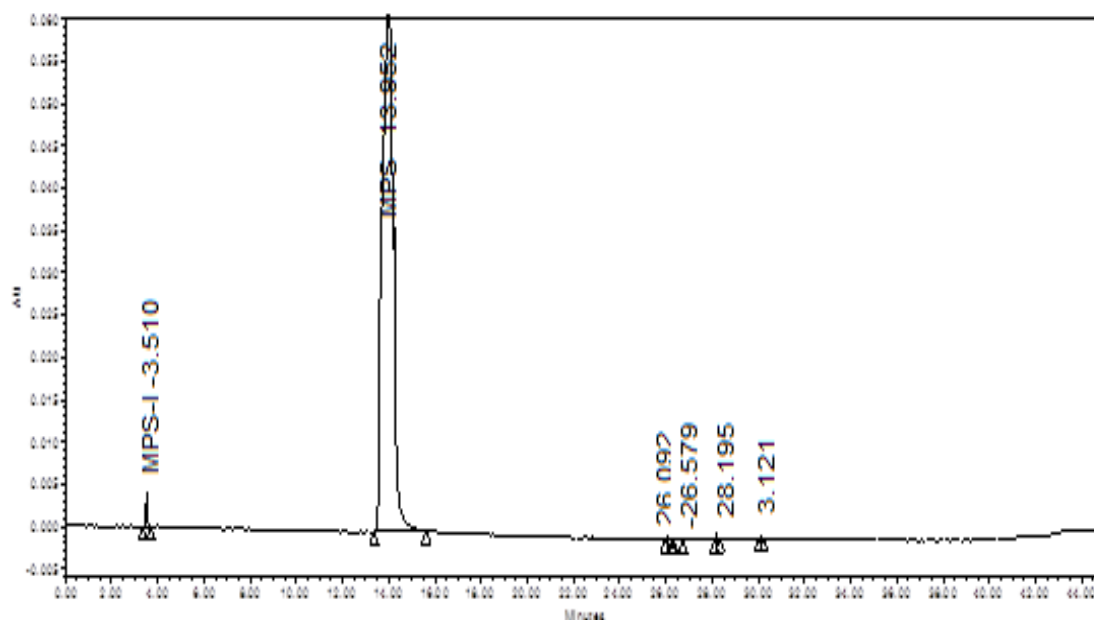


Fig.e Chromatogram of Aqueous (humidity) of MPS under stressed condition

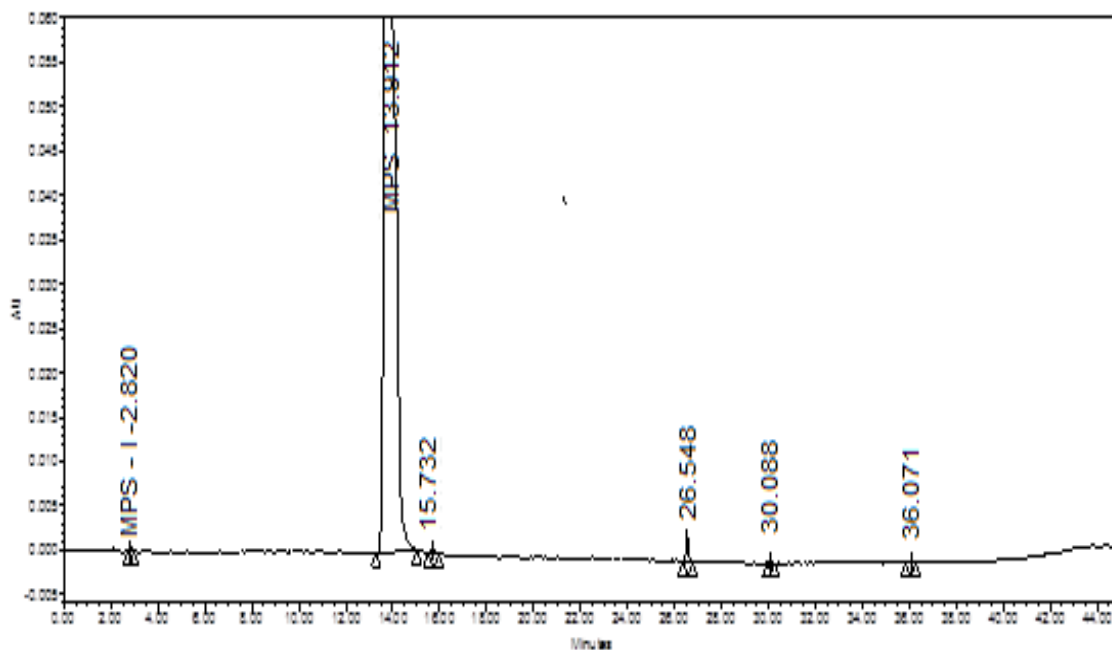


Fig.f Chromatogram of Photolytic Exposure of MPS under stressed condition

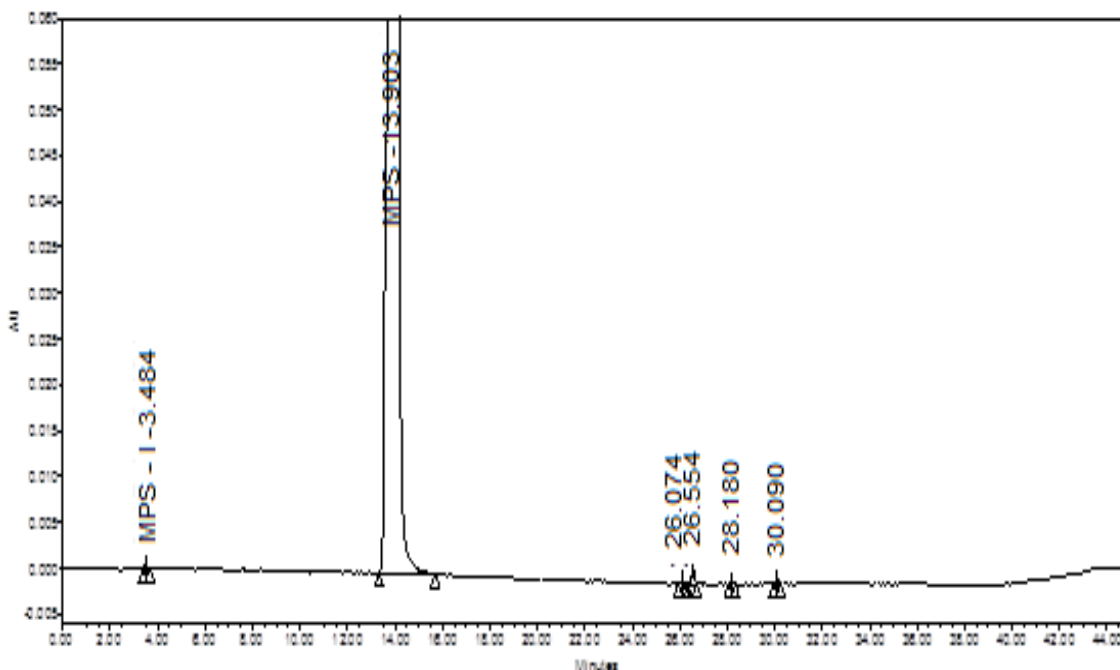


Fig.g Chromatogram of Thermal Exposure of MPS under stressed condition.

### 3. RESULTS AND DISCUSSION

Peak Purity of the principle Peak chromatographic peaks under stressed condition gave the following results:

- 1) Under the degradation condition, the parent sample showed five degradation impurities, 0.09% of total impurities degradation, 99.91% of MPS and PDA analysis showed the homogeneity of peak (Purity angle < Purity threshold).

- 2) Under the degradation condition, the aqueous hydrolysis showed five degradation impurities, 0.14% of total impurities degradation, 99.89% of MPS and PDA analysis showed the homogeneity of peak (Purity angle < Purity threshold).
- 3) Under the degradation condition, the acid hydrolysis showed ten degradation impurities, 5.61% of total impurities degradation, 94.40% of MPS and PDA analysis showed the homogeneity of peak (Purity angle < Purity threshold).
- 4) Under the degradation condition, the base hydrolysis showed ten degradation impurities, 0.40% of total impurities degradation, 99.60% of MPS and PDA analysis showed the homogeneity of peak (Purity angle < Purity threshold).
- 5) Under the degradation condition, the oxidation showed forty six degradation impurities, 23.09% of total impurities degradation, 76.91% of MPS and PDA analysis showed the homogeneity of peak (Purity angle < Purity threshold).
- 6) Under the degradation condition, the thermal exposure showed five degradation impurities, 0.09% of total impurities degradation, 99.9% of MPS and PDA analysis showed the homogeneity of peak (Purity angle < Purity threshold).
- 7) Under the degradation condition, the photolytic exposure showed five degradation impurities, 0.13% of total impurities degradation, 99.82% of MPS and PDA analysis showed the homogeneity of peak (Purity angle < Purity threshold).

#### 4. CONCLUSION.

Peak purity of main peak in all conditions of force degradation passes. PDA Scan for degraded drug substance and drug product is comparable to that of untreated drug substance and drug product. All peaks due to degradation are well separated from each other and from main peak. So there is no interference of blank, placebo and degradant at retention time of main peak observed in MPS drug.

This study relates that MPS-I, MPS-II, MPS, & MPS-III are well separated & comply with peak purity parameter i.e. purity angle < purity threshold.

#### 5. ACKNOWLEDGEMENT

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# Conductivity studies of nano gel polymer Electrolytes for its application in EDLCs.

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**Abstract** Electrochemical capacitors fabricated by sandwiching nano gel polymer electrolyte between two blocking electrodes are showing better ionic conductivity along with mechanical as well as dimensional stability. Therefore preparation of such nano gel polymer electrolyte is the main area of concern. In this paper synthesis of nano gel polymer electrolyte comprising of poly (vinylidene fluoride-co-hexafluoropropylene)-propylene carbonate-magnesium perchlorate-nano alumina has been done by using conventional solution cast technique. The resultant nano gel polymer electrolyte shows the good ionic conductivity, mechanical stability, dimensional stability and wide range of power window, which are compatible for its application in electrochemical capacitors. Finally the fabricated supercapacitor was characterized by a.c impedance technique, cyclic voltammetry and charge-discharge techniques.

**Keywords** nano gel polymer electrolytes, potential window, ionic conductivity, dimensional stability, electrochemical capacitor.

## I. INTRODUCTION

In the recent years the 'scarcity of electricity' is the main area of concern, amongst the researchers and scientists of all the interdisciplinary fields. The electrochemical energy sources which are more commonly used now a day's are rechargeable batteries which have high energy density but low power density and conventional capacitors having liquid electrolytes, have their own drawbacks like bulky model, self- discharge, leakage, corrosion etc. Therefore the nano gel polymer electrolytes are the better alternative electrolyte which can be used as conducting medium. They have amorphous nature causing high ionic conductivity of  $\sim 10^{-4}$  to  $10^{-3}$  Scm<sup>-1</sup>, low glass transition temperature, easy fabrication, flexibility, mouldability etc. all these characteristic properties make them compatible conducting medium for their use in various electrochemical devices such as rechargeable batteries, fuel cells, sensors, electrochromic devices etc.[1]. To improve the ionic conductivity, mechanical stability, thermal stability etc numbers of electrolytes are prepared with different compositions. All the polymer electrolytes which are in use nowadays are polymer blend electrolyte, polymer composite electrolyte, polymer gel electrolyte, and ionic liquid-base polymer electrolyte. They all have some problems, like low mechanical stability, low range of power window, and high reaction rate at electrode- electrolyte interface etc. Polymer gel electrolyte is having very good ionic conductivity of  $\sim 10^{-3}$  Scm<sup>-1</sup>, flexibility, good electrode-electrolyte contact in fabrication of the device but due to its gelly or semisolid nature they have poor dimensional stability, reduction in ionic conductivity with time, less stability towards electrode interface etc. One of the methods to solve these problems of polymer gel electrolyte is to add some organic/ inorganic filler (in micro or nano sizes) to convert polymer gel electrolyte in composite type of electrolyte. When such fillers are added or dispersed to the polymer gel electrolyte, amorphous or porous nature of electrolyte increases, which enhances the liquid adsorbing quality of polymer and hence problems of leakage, poor mechanical and thermal stability can be sorted out [2-5]. It was observed that ionic conductivity increases, when nano particle of alumina was added as filler because, when (Al<sub>2</sub>O<sub>3</sub>) was added to the system they interact with paired ions and undissociated salts which enhances the concentration of free ions and further increases the ionic mobility and ionic conductivity.

In this paper nano gel polymer electrolyte having alumina filler [PVdF (HFP)-PC-Mg(ClO<sub>4</sub>)<sub>2</sub> - Al<sub>2</sub>O<sub>3</sub>] was successfully synthesized and characterized for its compatibility by a.c impedance spectroscopy technique, linear sweep cyclic voltammetry and Galvanostatic charge-discharge techniques.

For fabrication activated charcoal was taken as electrode material due to its easy availability, cheap cost, amorphous nature, large active surface area and environmental friendly nature. (PVdF-HFP) Polyvinylidene fluoride-co-hexa fluoro propylene is taken as host polymer because it has high dielectric constant of 8.4 as well as PVdF contributes to the crystalline property which imparts mechanical stability and HFP contributes to the amorphous character which is responsible for ionic conductivity [6-8], magnesium perchlorate Mg(ClO<sub>4</sub>)<sub>2</sub> is taken as a salt because previously used Li salt is explosive in nature so it is dangerous to use.

## II. Experimental methods

### 2.1 Synthesis of nano gel polymer electrolyte

The nano gel polymer electrolyte [PVdF (HFP)-PC-Mg(ClO<sub>4</sub>)<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub>] has been prepared by using 'standard solution cast-technique'. To prepare nano gel polymer electrolyte, nano particles of Al<sub>2</sub>O<sub>3</sub> in different weight ratios (from 0 to 20 wt % w.r.t the weight of polymer) were dispersed. Finally, the mixtures were poured in glass petri dish and allowed to evaporate volatile solvent THF to obtain solid-like free-standing nano composite gel films of thickness ~250 μm.

Prepared polymeric electrolyte was then characterised for its conductivity and compatibility in EDLC by following techniques.

### 2.2 Conductivity studies

Figure 1 shows the ionic conduction spectra of nano gel polymer electrolyte [PVdF(HFP)(15%)-PC-Mg(ClO<sub>4</sub>)<sub>2</sub>(0.3M)-Al<sub>2</sub>O<sub>3</sub> (8wt%)] system, as the function of frequency at different temperature. As we can see from the plot that almost all the plot are having two different regions. The lower region enhancement in ionic conductivity is due to electrode- electrolyte interfacial chemical reactions and the higher zone ionic conductivity is explained as dc conductivity. At low frequency zone the accumulation of ionic charge carrier ions at electrode- electrolyte interface is more dominant so the concentration of mobile ions decreases due to which the ionic conductivity decreases. While in high frequency zone the movement of charge carrier is very high so the ionic conductivity increases.[9]. At high temperature the viscosity of the system decreases hence the free volume around the polymeric chain increases which cause the easy mobility of ions through polymeric chain or segment. This phenomenon of dispersion in conductivity is expressed by Jonscher's law [10], expressed as  $\sigma(\omega) = \sigma_{dc} + A\omega^n$ . Where, ' $\sigma_{dc}$ ' is the direct current (dc) conductivity of the sample, ' $A$ ' is a constant for a particular temperature,  $\omega = 2\pi f$  is the angular frequency and ' $n$ ' is the frequency exponent lying in between the range of 0 to 1. Extent of interaction between the mobile ions and the surrounding environment is represented by factor ' $n$ '. (for ionic conductor material the value of ' $n$ ' is in between 0.5 to 1), which shows the long diffusion range of ions and this process can be explained by 'hopping models'[10]. According to this model when the value of ' $n$ ' is =0 then ionic motion is completely random and independent. In general the transportation mechanism in ionic conductor can be explained by the thermally activated hopping process between two different sites separated by energy barriers. Frequency dispersion behaviour of ionic conductors can be explained by the physical model known as 'jump relaxation model'.[11]. Which states that at very low frequency ions available at one site can jump to its neighbouring vacant sites very easily, enhancing the dc conductivity.

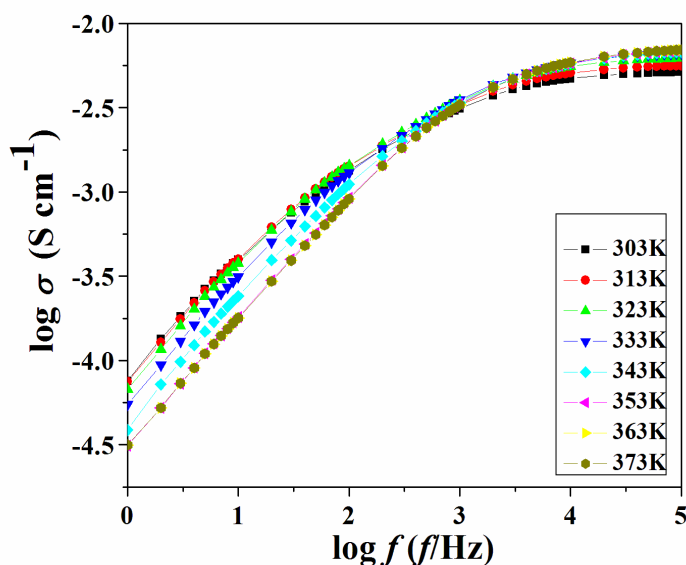


Figure 1: Variation of ionic conductivity as a function of frequency with temperature for nano gel polymer electrolytes system[PVdF (HFP)](15 wt%)-{PC-Mg ( $ClO_4$ )<sub>2</sub>}(0.3M)]-nano  $Al_2O_3$ (8 wt%)].

At higher frequency, the excited ion can return back to its actual site due to very less periodic reversal time period of the electric field. This is the reason of high probability of forward- backward hopping in this region; along with this relaxation of the dynamic cage potential is the reason of high frequency dispersion in its conductivity.

### 2.3 Analysis of electrochemical potential window of polymer gel electrolytes

In the present work the Potential window of the nano polymer gel electrolyte is detected by sandwiching the polymer gel electrolyte [PVdF(HFP)(15%)-PC-Mg( $ClO_4$ )<sub>2</sub>(0.3M)- $Al_2O_3$  (8wt%)] in between two stainless steel, as blocking electrodes. Figure 8 shows the linear sweep cyclic voltammograms of nano polymer gel electrolyte at the scan rate of  $5\ mVs^{-1}$ . This analysis gives the idea about the working voltage range of the electrolyte to know its compatibility for the device fabrication. In the present work the nano polymer gel electrolyte [PVdF(HFP)(15%)-PC-Mg( $ClO_4$ )<sub>2</sub>- $Al_2O_3$  (8wt%)] shows the working potential window of  $\sim 2.5\ V$ , which is the indication of its safe use in any electrochemical device.

### 2.4 Ionic transport number measurement

Ionic transport number was determined by using d.c.polarization method [12].

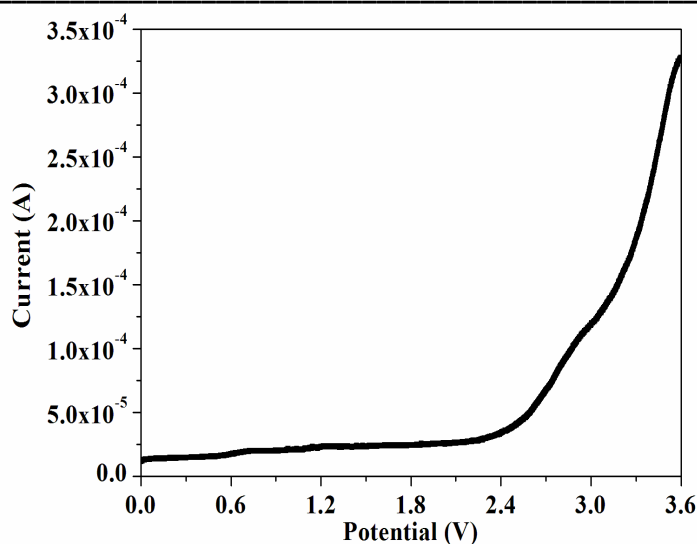


Figure 2: Linear sweep curves of nano gel polymer electrolytes Cell SS| NGPE|SS recorded at room temperature at a scan rate 5 mVs<sup>-1</sup>.].

When d.c. voltage was applied to the electrolyte material below its decomposition potential then the resultant current was observed with respect to time. Figure 2 shows the plot of polarization current as the function of time for nano gel polymer electrolyte [PVdF(HFP)(15%)-PC-Mg(ClO<sub>4</sub>)<sub>2</sub>(0.3M)-Al<sub>2</sub>O<sub>3</sub> (8wt%)] . the voltage applied to the system was 1.0 V( within the potential window range).

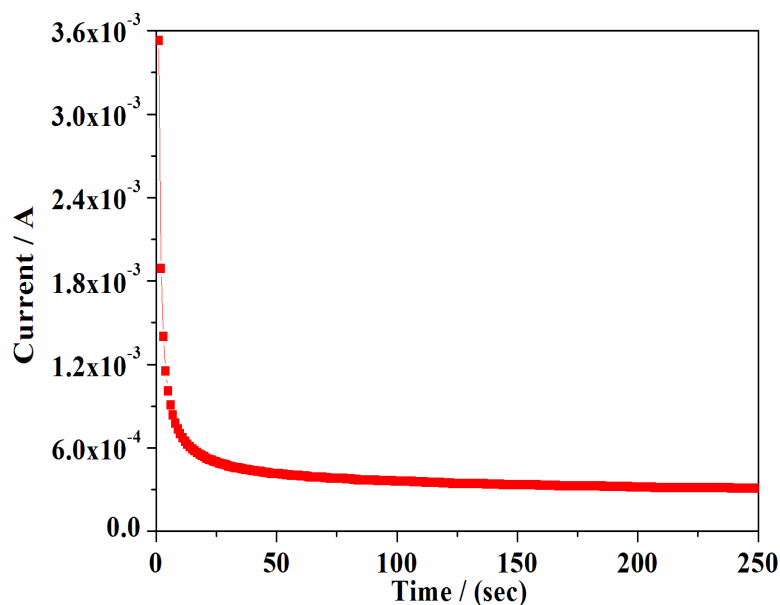


Figure 3: dc polarization curve as a function of time for nano gel polymer electrolyte[PVdF (HFP)](15 wt%)-{PC-Mg (ClO<sub>4</sub>)<sub>2</sub>}(0.3M)]-nano Al<sub>2</sub>O<sub>3</sub>(8 wt%)].

The ionic transport number was calculated by using the given equation:  $t_{ion} = I_t - I_e/I_t$ , where  $I_e$  and  $I_t$  are electronic and total current respectively. The ionic transport number was found to be 9.6 which shows that nano gel polymer electrolyte [PVdF(HFP)(15%)-PC-Mg(ClO<sub>4</sub>)<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> (8wt%)] using magnesium ion salt is dominantly ionic in nature.

### Characterization of fabricated supercapacitor device

To check the compatibility of optimized nano gel polymer electrolyte for its use in energy storage devices, symmetrical supercapacitor having following configuration was fabricated: AC | [PVdF(HFP)(15%)-PC-Mg(ClO<sub>4</sub>)<sub>2</sub>(0.3M)-Al<sub>2</sub>O<sub>3</sub> (8wt%)] |AC. Where AC is electrode made up of activated charcoal.

### Impedance spectroscopy analysis

Electrical properties such as bulk properties of electrolytes, charge transfer, ion accumulation in electrode-electrolyte interfacial region and low frequency capacitance values etc. can be evaluated by this method [13]. In the present paper a.c impedance measurement was done in the frequency range of 1mHz to 100 mHz. Figure 10 shows the complex impedance plot for above mentioned cell. In the plot two regions were seen, first high frequency semicircle region which is related to bulk resistance ( $R_b$ ) and charge transfer resistance ( $R_{ct}$ ) and second low frequency straight line due to Warburg impedance which is associated with the charge accumulation in electrode- electrolyte interfacial region that results into the formation of electrical double layer [14]. The semicircle region indicates the parallel combination of resistance and capacitance while straight rising line indicates the capacitive behaviour of the fabricated cell. The values of ( $R_b$ ) and ( $R_{ct}$ ) have been calculated by expanded plot in higher frequency region, and overall capacitance was calculated by the equation:  $C = -1/\omega Z''$  where,  $\omega$  is angular frequency ( $2\pi f$ ) and  $Z''$  is imaginary part of impedance. Various electrical parameters ( $R_b$ ), ( $R_{ct}$ ), total resistance ( $R$ ) and capacitance ( $C$ ) at frequency range of 1mHz to 10 mHz. are given in table number 1

Table 1: Electrical parameters of fabricated EDLC cell from impedance analysis

$R_{ct}$ ( $\Omega \text{ cm}^2$ )	$R_b$ ( $\Omega \text{ cm}^2$ )	10 mHz			1 mHz		
		$R$ ( $\Omega \text{ cm}^2$ )	$C$		$R$ ( $\Omega \text{ cm}^2$ )	$C$	
			(mF $\text{cm}^{-2}$ ) <sup>a</sup>	(F $\text{g}^{-1}$ ) <sup>b</sup>		(mF $\text{cm}^{-2}$ ) <sup>a</sup>	(F $\text{g}^{-1}$ ) <sup>b</sup>
14.4	5.0	68	95	27	556	153	44

<sup>a</sup> Overall capacitance of the cells.

<sup>b</sup> Single electrodes specific capacitance of the cells.

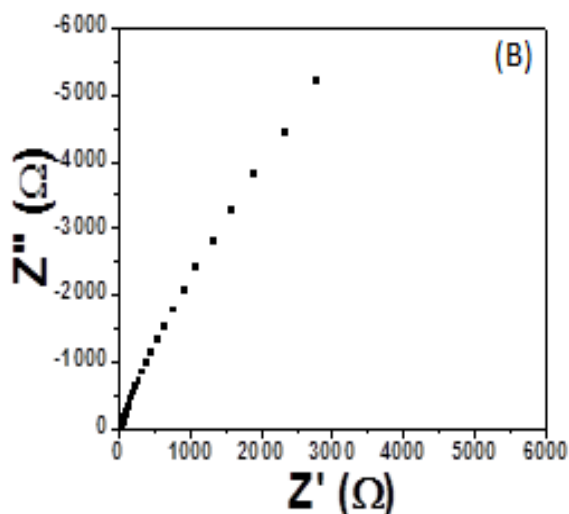


Figure 4: impedance plot of cell: AC| PVdF(HFP)(15%)-PC-Mg(ClO<sub>4</sub>)<sub>2</sub>(0.3M)-Al<sub>2</sub>O<sub>3</sub> (8wt%) |AC.

#### Cyclic voltammetry analysis

Figure 5 shows the specific capacitance of the fabricated cell at different scan rates. From the figure it was seen that the cell retains its ideal rectangular geometry even at higher scan rate. This behaviour ensures its application at higher scan rate also. Some initial deviation from the ideal behaviour can be seen which may be due to fast ion behaviour change at electrode-electrolyte interfacial region. There were no redox peaks present which confirms the non-faradic process and hence confirms the EDLCs behaviour [15]. The capacitance value can be calculated by the equation:  $C = i/s$ , where,  $i$  is constant current and  $s$  scan rate. The calculated capacitance value was found to be almost in the range of capacitance calculated by a.c impedance and charge- discharge method.

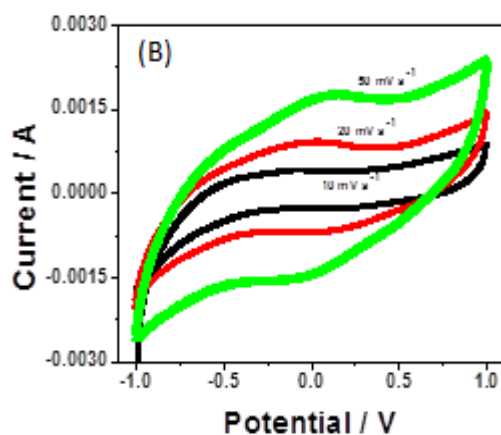




Figure 5: Cyclic voltammograms of cell: AC| [PVdF(HFP)(15%)-PC-Mg(ClO<sub>4</sub>)<sub>2</sub>(0.3M)-Al<sub>2</sub>O<sub>3</sub> (8wt%)] |AC. at different scan rates.

### Charge- discharge analysis

Figure 6 shows the charge- discharge plot for the fabricated cell at a constant current of 2mAcm<sup>-1</sup> between the potential range of 0-1 V. from the figure it was clear that the plot follows the ideal linear triangular profile, this linear profile confirms the capacitive behaviour of fabricated cell and it also confirms that the energy storage process is based on the charge accumulation in electrode- electrolyte interfacial region. Initial voltage drop was also observed due to internal resistance of the capacitor cell. The internal resistance has been calculated by this drop and was found to be 60Ω cm<sup>-1</sup>. The specific capacitance was calculated by linear part of discharge curve by the equation:  $C_d = i\Delta t/\Delta V$ . Where, 'i' is constant current, 'Δt' is time interval for the voltage change ΔV. From this specific capacitance the corresponding energy density and power density can be calculated by the following equations: Energy density =  $\frac{1}{2} CV^2$  and power density =  $(\frac{1}{2} CV^2)/\Delta t$ . Different electrical parameters such as specific conductance, energy density, power density has been calculated and reported in table number 2.

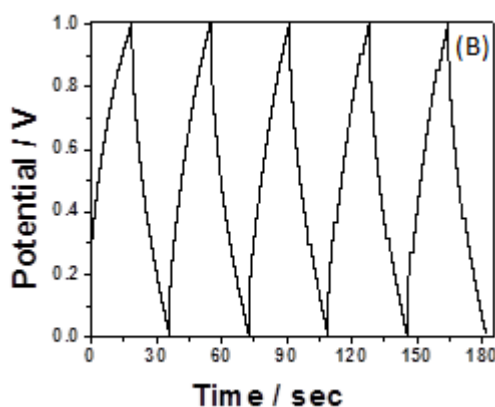


Figure 6 Charge- discharge curve of cell: AC| [PVdF(HFP)(15%)-PC-Mg(ClO<sub>4</sub>)<sub>2</sub>(0.3M)-Al<sub>2</sub>O<sub>3</sub> (8wt%)] |AC.at current density of 2.0mA cm<sup>-2</sup>

Table 2: Typical charge-discharge characteristics of fabricated EDLC cell at current density of 2.0m Acm<sup>-2</sup>

<b>R<sub>i</sub></b> (Ω cm <sup>2</sup> )	<b>Discharge capacitance, C<sub>d</sub></b>		<b>Working voltage</b> (V)	<b>Energy density (Wh kg<sup>-1</sup>)</b>	<b>Power density</b> (kW kg <sup>-1</sup> )
	<b>(mF cm<sup>-2</sup>)<sup>a</sup></b>	<b>(F g<sup>-1</sup>)<sup>b</sup></b>			
64	94	27	1.0 V	3.8	0.9

<sup>a</sup> Overall capacitance of the cells.

<sup>b</sup> Single electrodes specific capacitance of the cells.

### Conclusion

From all the above experimental analysis, we can conclude the following important conclusions:

- ✓ The nano gel polymer electrolyte [PVdF(HFP)(15%)-PC-Mg(ClO<sub>4</sub>)<sub>2</sub>(0.3M)-Al<sub>2</sub>O<sub>3</sub> (8wt%)] has been prepared by conventional "solution cast" method and then optimized. The maximum ionic conductivity was found to be  $7.0 \times 10^{-3} \text{ Scm}^{-1}$  at room temperature.
- ✓ The compatibility of synthesized nano gel polymer electrolyte has been checked by using it for the successful fabrication of supercapacitor having activated charcoal as electrode materials.
- ✓ The fabricated capacitor shows non-faradic behaviour which confirms its EDLCs nature.
- ✓ The maximum capacitance value for above cell was found to be  $94 \text{ mF cm}^{-2}$ , which is equivalent to a single electrode specific capacitance of  $27 \text{ Fg}^{-1}$ . The energy density was  $3.8 \text{ Wh kg}^{-1}$  and power density was  $0.9 \text{ kWkg}^{-1}$ .

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## Benefits of Outsourcing

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**Abstract**— *India is a successful outsourcing destination in the world of IT & IT enabled services. This paper discusses the benefits in outsourcing. Outsourcing is a business practice in which a company hires another company or an individual to perform tasks, handle operations or provide services that are either usually executed or had previously been done by the company's own employees. Companies today can outsource a number of tasks or services. They often outsource information technology services, including programming and application development as well as technical support. Outsourcing can involve using a large third-party provider, such as a company like IBM to manage IT services or FedEx Supply Chain for third-party logistics services, but can also involve hiring individual independent contractors and temporary office workers.*

*This practice started in the late 1980s and gained popularity at the turn of the 21<sup>st</sup> century with special emphasis on offshore outsourcing (also known as offshoring), which involves relocating parts of a business function to another country. There are several reasons why a company might outsource. Reasons for outsourcing include: Cost Advantage, Focus on Core Competency, Quality and Capability, Labor Flexibility. Many companies depend on outsourcing to help their business to become more productive and successful. Without outsourcing, many companies will not be doing business because they are depending on outsourcing to help their business grow. Outsourcing have been around for many years and has increased in large amount. The aim of re-appropriating is to make the cost less. Most organizations redistribute to discover less expensive wellspring of work and get the outcomes they need as they would have on the off chance that they are to utilize correctly. They can offer little advantages, pay bundle, or less expensive arrangements, yet at the same time get the equivalent or once in a while better outcomes. Redistributing is likewise utilized if a specific organization or individual has the failure to play out a particular assignment and get the outcome they need.*

**Keywords**— *I.T, Logistics, Operations, Outsourcing, services.*

### I. INTRODUCTION

Outsourcing is an understanding where one organization procures another organization to be answerable for an arranged or existing action that should be possible inside, and in some cases includes moving representatives and resources starting with one firm then onto the next. The term outsourcing, which originated from the expression outside resourcing, started in 1981. The idea, which The Economist says "made its quality felt since the time of World War," frequently includes the contracting of a business procedure (e.g., finance handling, claims preparing, operational, and additionally non-center capacities, for example, fabricating, office the board, call focus/call focus support). Redistributing is additionally the act of giving over control of open administrations to private undertakings, regardless of whether on a momentary restricted premise. Redistributing incorporates both outside and household contracting, and in some cases incorporates offshoring (migrating a business capacity to a far off nation) or nearshoring (moving a business procedure to a close by nation). Offshoring and redistributing are not commonly comprehensive: there can be one without the other. They can be connected (Offshore Outsourcing), and can be separated or together, in part or totally turned around, including terms, for example, reshoring, inshoring, and insourcing. Outsourcing issues occur. This happens specifically when an association initially takes part in outsourcing rehearses. There can be an alteration stage when entering a concurrence with any new

outsourcing specialist co-op. It's another method for working together, another methodology; and adjusting to your new colleague is significant. While redistributing issues will undoubtedly occur, there are approaches to beat them. Here are the absolute most regular redistributing issues organizations face today: Expectations, Organizational culture Outsourcing issues, Process alterations, Decisions rights and authority. The commitment of outsourcing is characterized into following terms, for example, Increased readiness, Brand portrayal, Reduced expenses and so on. The main objective of re-appropriating is to lessen cost, yet that isn't generally the situation. Most organizations redistribute to discover less expensive wellspring of work and get the outcomes they need as they would have on the off chance that they are to utilize appropriately. They can offer littler advantages, pay bundle, or less expensive arrangements, yet at the same time get the equivalent or once in a while better outcomes. Redistributing is likewise utilized if a specific organization or individual has the failure to play out a particular assignment and get the outcome they need. These organization utilizes re-appropriating to search for an individual or an organization who could give preferred outcomes over if they somehow managed to do a similar undertaking. The expense might be somewhat higher however the outcomes are better. Re-appropriating in this manner has two essential goals: 1) To get work at diminished cost yet get the equivalent or somewhat better outcomes. 2) To show signs of improvement results for the equivalent or marginally greater expense. The historical backdrop of redistributing is profoundly implanted throughout the entire existence of the development of the Modern Business Enterprise, which jumped up in the last 50% of the 19th Century. History specialists in the previous fifty years have helped us to comprehend this sudden development. As the colloquialism goes, what is old is new once more. The changes in present day strategic policies unequivocally take after patterns that occurred over a century prior. It is critical to follow the authentic model that the leading business history specialist Alfred Chandler put forward: esteem decisions are to be left out and just what really happened ought to be discussed.

## II. TERMINOLOGY

Offshoring is moving the work to a far off nation. On the off chance that the far off working environment is an outside auxiliary/claimed by the organization, at that point the seaward activity is a hostage, some of the time alluded to as in-house seaward. Insourcing involves bringing forms dealt with by outsider firms in-house, and is here and there achieved by means of vertical joining. Seaward redistributing is the act of contracting an outer association to play out some business capacities ("Outsourcing") in a nation other than the one where the items or administrations are really performed, created or produced ("Offshore"). A portion of the abbreviations identified with BPO (Business Process Outsourcing) are:

EPO - Engineering Process Outsourcing

ITO - Information Technology Outsourcing

KPO - Knowledge process redistributing

LPO - Legal procedure outsourcing

RPO - Recruitment process redistributing

## III. OUTSOURCING MODELS

There are many redistributing models, and they've changed by nation, year and industry. Another methodology is to separate among strategic and key redistributing models. Strategic models incorporate staff increase, venture based and to pick up mastery. Key consultancy incorporates for Business process improvement. Saying that every one of this IT re-appropriating models

variety has its own advantages and disadvantages would an incredible style. Those agreements are basically intended for various sorts of commitment. Every a couple of them fit some particular determination criteria. There are no exchange offs when you have to think of its correct decision re-appropriating models. Just an inappropriate and the correct decision. When all is said in done, programming improvement redistributing models are not the bundles of a similar help. You can get a few advantages by paying extra yet at the same time get a similar base contribution. Settle on an inappropriate decision, and the entire joint effort with the administrations supplier will be demolished and you'll have to begin without any preparation. There are 4 types of IT outsourcing models: 1) Time and Material model 2) Fixed-price contracts 3) Dedicated development teams or resources 4) Offshore development center

### **3.1 INNOVATION OUTSOURCING**

At the point when seaward re-appropriating information work, firms vigorously depend on the accessibility of specialized faculty at seaward areas. One of the difficulties in offshoring building development is a decrease in quality. Re-appropriating advancement is a system of utilizing outside gatherings to participate in thought age for new items and administrations and improvement of techniques for putting up these thoughts for sale to the public. It is a type of business process redistributing that centers less around cost-sparing and more on accomplishing advancement and worth.

### **3.2 CO-SOURCING**

Co-sourcing is a half and half of interior staff enhanced by an outside specialist organization. Co-sourcing can limit sourcing dangers, increment straightforwardness, lucidity and loan toward preferable power over completely re-appropriated. Co-sourcing administrations can enhance interior review staff with specific aptitudes, for example, data hazard the executives or respectability administrations, or help during top periods, or likewise for different territories, for example, programming improvement or HR. Co-sourcing is a kind of re-appropriating where the re-appropriating understanding is an aggregate course of action between one seller and various customers. From the point of view of the re-appropriating association, co-sourcing is the way toward re-appropriating certain business exercises to just a single outer merchant

#### **3.2.1 IDENTITY MANAGEMENT CO-SOURCING**

Character the board co-sourcing is when on location equipment associates with outside personality administrations. This stands out from an "all in-the-cloud" administration situation, where the personality administration is constructed, facilitated and worked by the specialist organization in a remotely facilitated, distributed computing framework.

#### **3.2.2 OFFSHORE SOFTWARE R&D CO-SOURCING**

Seaward Software R&D is the arrangement of programming improvement benefits by a provider (regardless of whether outside or inner) situated in an alternate nation from the one where the product will be utilized. The worldwide programming R&D administrations advertise, as differentiated to Information Technology Outsourcing (ITO) and Business Process Outsourcing (BPO), is somewhat youthful and presently is at a generally beginning time of advancement.

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#### **3.2.1.1 COUNTRIES INVOLVED IN OUTSOURCED SOFTWARE R&D**

Canada, India, Ireland, and Israel were the four driving nations starting at 2003. Albeit numerous nations have taken an interest in the offshore re-appropriating of programming improvement, their contribution in co-sourced and re-appropriated Research and Development (R&D) was to some degree restricted. Canada, the second biggest by 2009, had 21% as of 2018, the main three were esteemed by one "explore based arrangement examination and discourse from driving financial experts" as China, India and Israel." Gartner Group includes Russia, however doesn't clarify whether this is unadulterated R&D or average IT re-appropriating.

#### **IV. ADVANTAGES**

- Overall Cost Advantage: It dodges the need to enlisting people inside an organization, henceforth enrollment and operational expenses can be diminished all things considered. It decreases the expense and furthermore spares time on preparing cost.
- Stimulates Entrepreneurship, Employment, and Exports: Outsourcing invigorates Entrepreneurship, Employment, and Exports in the nation from where redistributing is finished. Take a gander at the case of India. After the underlying accomplishment of call focuses, there was an unexpected rise of numerous little scales and medium scale BPO and KPO organizations.
- Low Manpower Cost: The labor cost is a lot of lower than that of the host nation. This is actually the situation with India. We have a huge instructed workforce. Furthermore, this causes the work cost in our nation to be a lot of lower.
- Access to Professional, Expert and High-quality Services: Mostly, the assignments are given to individuals who are talented in that specific field. This gives us a superior degree of administration and less odds of causing the mistakes.
- Emphasis on Core Process Rather than the Supporting Ones: With its assistance, organizations can concentrate on their center regions which lead to better benefits and increment the nature of their item. They essentially re-appropriate giving vital help to essential exercises or administrations.
- Investment Requirements Are Reduced: The association can save money on putting resources into the most recent innovation, programming, and framework and let the redistributing accomplice handle the whole foundation.
- Increased Efficiency and Productivity: There is an expanded proficiency and profitability in the non – center regions of an association.
- Knowledge Sharing: Outsourcing empowers the associations to impart information and best practices to each other. It creates both the organizations and furthermore supports participation in the business.

#### **V. DISADVANTAGES**

- Lack of Customer Focus: A redistributed merchant might be serving to the necessities of different associations one after another. In such circumstances, merchants may need total spotlight on an individual association's undertakings. And the reputation of the organization may suffer as a result.



- **A Threat to Security and Confidentiality:** within updates on the association might be spilled to the outsider, so there are security issues. The break of delicate data may bring about misfortunes to the organization and furthermore be a favorable position to contenders.
- **Dis-satisfactory Services:** Some of the regular issue regions with re-appropriating incorporate extended conveyance time and sub-standard quality.
- **Ethical Issues:** The major moral issue is accepting endlessly business open doors from one's own nation. Rather than making work and riches in the birthplace nation it gets re-appropriated to another nation. Lately this has been seen by numerous individuals as dishonest and even unpatriotic.
- **Other Disadvantages:** Include misconception of the agreement, absence of correspondence, low quality and postponed administrations among others.

Sr.No	Attribute	Details
1	Base year for estimation	2017
2	Actual estimates/Historic data	2014 - 2016
3	Forecast period	2018 - 2025
4	Market representation	Revenue in USD Million & CAGR from 2018 to 2025
5	Regional scope	North America, Europe, Asia Pacific, Latin America, and MEA
6	Country scope	U.S., Canada, UK, Germany, India, Japan, China, and Brazil
7	Report coverage	Revenue forecast, company ranking, competitive landscape, growth factors, and trends
8	15% free customization scope (equivalent to 5 analyst working days)	If you need specific market information that is not currently within the scope of the report, we will provide it to you as a part of the customization

Table: Revenue Growth at the Global, Regional, and Country levels and provides an analysis of the industry trends

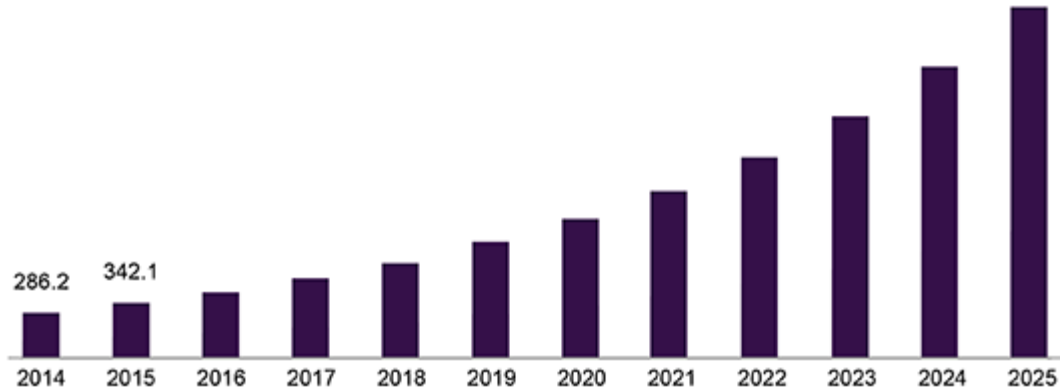


Figure: Data Analytics Outsourcing market size from year 2014-2025

The figure shows the worldwide information investigation redistributing market size was esteemed at 2,006 million US dollars in 2017 and is relied upon to develop at a pace of 22.8% from 2018 to 2025. The market saw development in the course of recent years unpaid to the rising of social investigation and reliable increment in the volume of client information. Also, the expansion utilization of web based life, which prompts age of colossal measures of information, and chopping down the information stockpiling costs are additionally expected to help the market development.

## VI. CONCLUSION

Redistributing is a fundamental piece of a business' choice. There are different elements that has a significant impact in this choice, for example, quality, cost and different variables. Clients also will be additionally a piece of this choice. The world is become increasingly more general that the nations which are ease may fire going up on their costs. As indicated by Dolgui and Proth (2013), "Outsourcing is characterized as the demonstration of getting semi-completed items, completed items or administrations from an outside organization if these exercises were customarily performed inside". Numerous organizations rely upon re-appropriating to assist their business with becoming increasingly profitable and effective. A large number of the re-appropriating organizations can be found in different pieces of the world. Be that as it may, call-focuses are situated in different pieces of the world. These call-focuses are not getting paid a ton of cash, however they are doing what they should do. Without redistributing, numerous organizations won't work together in light of the fact that they are relying upon re-appropriating to enable their business to develop. Redistributing have been around for a long time and has expanded by an enormous sum. Work expenses can be a main consideration in redistributing for organizations. Redistributing is currently a worldwide wonder, and it is digging in for the long haul. Governments should perceive this reality and, rather than enacting straightforwardly against it, take measures to forestall unnecessary redistributing of occupations and build up a compelling know-ledge framework. This would help hold an edge in advancement and help foster the brooding of new ventures and would counterbalance any positions lost throughout sourcing. An entrenched information foundation would likewise be useful in retraining laid-off specialists and

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decrease open kickback. This would involve significantly redesigning the instructive framework to prepare and prepare individuals to take specialized employments in industry. Over the long haul, we expect that the mass of outsourcing will happen gradually, along these lines permitting ventures to modify and respond to the new plans of action. The Government, as far as it matters for its, ought to guarantee that this transformation happens easily.

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# APPLICATION OF MATHEMATICS TO CERTAIN PHARMACOKINETIC EQUATIONS

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**Abstract**— Mathematics has been given a significant place in pharmacy course to resolve a variety of equations in pharmacokinetics. Pharmacokinetic models consider drugs in the body to be in a dynamic state. Calculus is a significant mathematic tool for investigating drug movement quantitatively. Differential equations are used to relate the absorptions of drugs in various body organs over time. Integrated equations are regularly used to model the cumulative therapeutic or toxic reactions of drugs in the body. Differential calculus that involves finding the rate at which a variable measure is changing. In This paper we will discussed 2- compartmental model equation, 3- compartmental model equation , application of derivative and differential equations to certain pharmacokinetics equations.

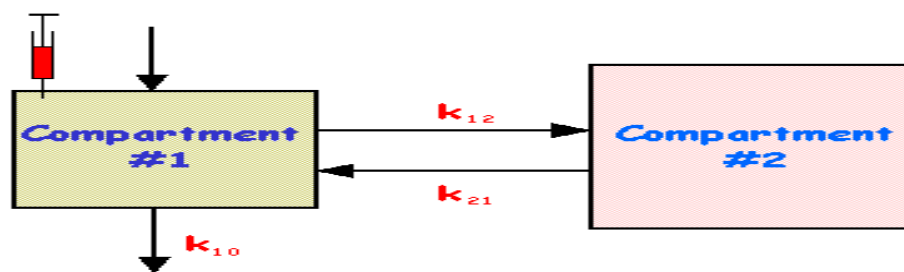
**Keywords**—Ratio & Proportion, Derivative, Integration, Differential Equation, Laplace Transform, Inverse Laplace Transform, Determinant.

## I. INTRODUCTION

Pharmacokinetics refers to the rate and extent of distribution of a drug to different tissues, and the rate of elimination of the drug. Pharmacokinetics can be summarized to mathematical equations, whichever define the transfer of the drug all through the body, a net steadiness sheet from absorption and distribution to metabolism and excretion.

## II. 2- COMPARTMENTAL MODEL EQUATION

Pharmacokinetic 2-compartment model separated the body into central and peripheral compartment. The central compartment (compartment 1) consists of the plasma and tissues where the distribution of the drug is nearly instant. The peripheral compartment (compartment 2) contains a tissues wherever the supply of the drug is slower.



Figure(1)

### Two compartment model

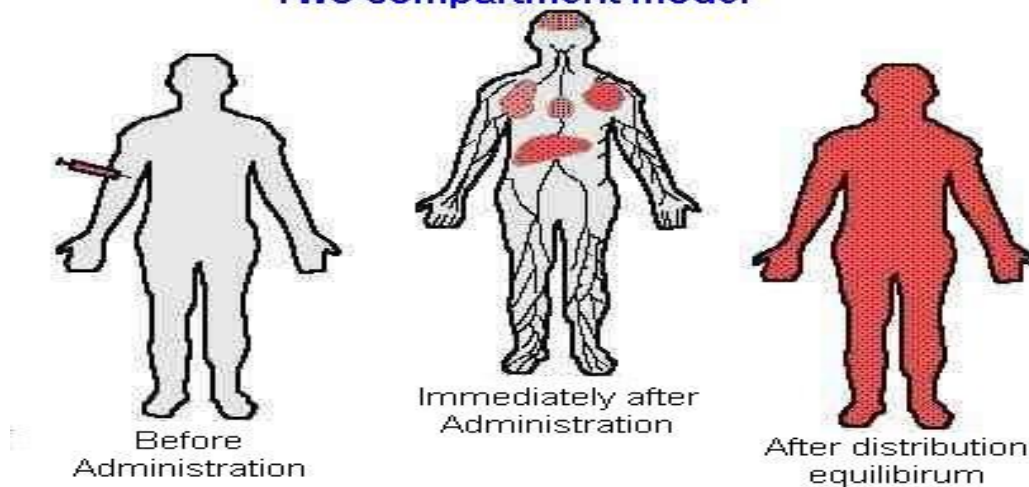


Figure (2)

In a 2- compartment model equation, distribution and elimination of a drug in a body are given by the differential equations as shown below

$$\frac{dy_1}{dt} = K_{21}y_2 - K_{12}y_1 - K_{10}y_1$$

$$\frac{dy_2}{dt} = K_{12}y_1 - K_{21}y_2$$

Applying the Laplace transform both side of the differential equation, can be transformed into Linear equations

$$L\{y_1^1\} = K_{21}L\{y_2\} - K_{12}L\{y_1\} - K_{10}L\{y_1\}$$

$$L\{y_2^1\} = K_{12}L\{y_1\} - K_{21}L\{y_2\}$$

$$S\overline{y_1} - y_1(0) = K_{12}\overline{y_2} - K_{10}\overline{y_1}$$

$$S\overline{y_2} - y_2(0) = K_{12}\overline{y_1} - K_{21}\overline{y_2}$$

$$(S + K_{12} + K_{10})\overline{y_1} - K_{21}\overline{y_2} = \overline{y_1}(0) \text{ -----(1)}$$

$$-K_{12}\overline{y_1} + (S + K_{21})\overline{y_2} = 0 \text{ -----(2)}$$

Applying Crammer's Rule to solve equation (1) and (2)

$$\Delta = \begin{vmatrix} (S + K_{12} + K_{10}) & -K_{21} \\ -K_{12} & (S + K_{21}) \end{vmatrix} = (S + K_{12} + K_{10})(S + K_{21}) - (K_{21}K_{12})$$

$$\Delta_1 = \begin{vmatrix} Dose & -K_{21} \\ 0 & (S + K_{21}) \end{vmatrix} = (Dose)(S + K_{21}) - 0$$

$$\Delta_2 = \begin{vmatrix} (S + K_{12} + K_{10}) & Dose \\ -K_{12} & 0 \end{vmatrix} = (Dose)(-K_{12})$$

$$\bar{y}_1 = \frac{\Delta_1}{\Delta} = \frac{(Dose)(S+K_{21})}{(S+K_{12}+K_{01})(S+K_{21})-(K_{21}K_{12})}$$

$$\bar{y}_1 = \frac{(Dose)(S+K_{21})}{(S^2+S(K_{21}+K_{12}+K_{10})+K_{10}K_{21})}$$

$$\bar{y}_1 = \frac{\Delta_1}{\Delta} = \frac{(Dose)(S+K_{21})}{(S^2+S(a+b)+ab)}$$

$$\text{Put } (K_{21}+K_{12}+K_{10}) = a+b \text{ and } K_{10}K_{21} = ab$$

$$\bar{y}_1 = \frac{\Delta_1}{\Delta} = \frac{(Dose)(S+K_{21})}{(S+a)(S+b)}$$

### III 3- COMPARTMENT MODEL EQUATION

Pharmacokinetic 3-compartment model separated the body into central compartment and two peripheral compartments. The central compartment (compartment 1) consists of the plasma and tissues where the distribution of the drug is essentially instant. The peripheral compartments (no. 2 and 3) contain a tissues wherever the supply of the drug is slower compared to compartment 1.

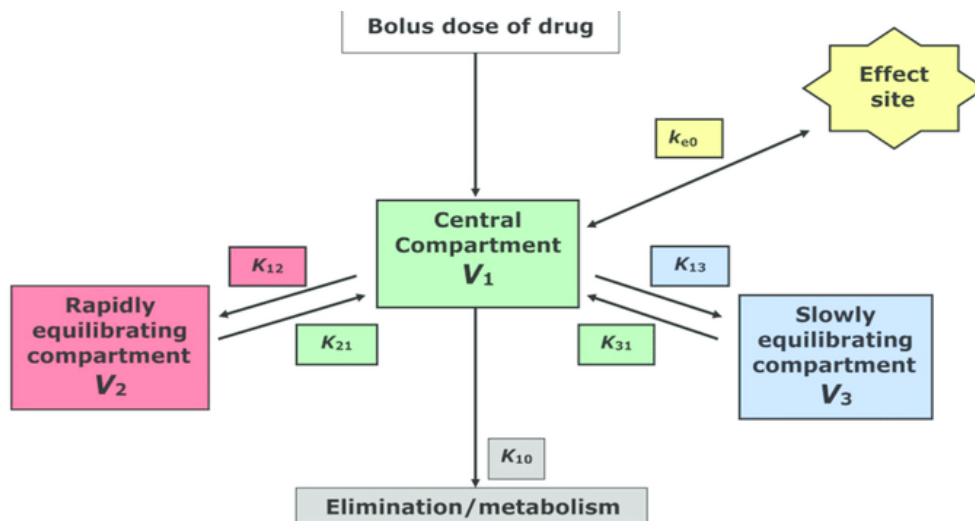


Figure (3)

In a 3- compartment model equations distribution and elimination of drug in the body is given by the differential equations as shown below

$$\frac{dy_1}{dt} = K_{21}y_2 + K_{31}y_3 - K_{12}y_1 - K_{13}y_1 - K_{10}y_1$$

$$\frac{dy_2}{dt} = K_{12}y_1 - K_{21}y_2$$

$$\frac{dy_3}{dt} = K_{13}y_1 - K_{31}y_3$$



Applying the Laplace transform both side of the differential equation, can be transformed into Linear equations

$$L\{y_1'\} = K_{21}L\{y_2\} + K_{31}L\{y_3\} - K_{12}L\{y_1\} - K_{13}L\{y_3\} - K_{10}L\{y_1\}$$

$$L\{y_2'\} = K_{12}L\{y_1\} - K_{21}L\{y_2\}$$

$$L\{y_3'\} = K_{13}L\{y_1\} - K_{31}L\{y_3\}$$

$$Sy_1 - y_1(0) = K_{21}y_2 + K_{31}y_3 - K_{12}y_1 - K_{13}y_1 - K_{10}y_1$$

$$Sy_2 - y_2(0) = K_{12}y_1 - K_{21}y_2$$

$$Sy_3 - y_3(0) = K_{13}y_1 - K_{31}y_3$$

$$Sy_1 - y_1(0) = K_{21}y_2 + K_{31}y_3 - (K_{12} + K_{13} + K_{10})y_1 \text{-----(3)}$$

$$Sy_2 - y_2(0) = K_{12}y_1 - K_{21}y_2 \text{-----(4)}$$

$$Sy_3 - y_3(0) = K_{13}y_1 - K_{31}y_3 \text{-----(5)}$$

Apply Crammer's rule to solve systems of linear equations (3),(4) and (5) to find the value of  $y_1$

$$\Delta = \begin{vmatrix} (S + K_{12} + K_{13} + K_{10}) & -K_{21} & -K_{31} \\ -K_{12} & s + K_{21} & 0 \\ -K_{13} & 0 & s + K_{31} \end{vmatrix}$$

$$= S^3 + S^2(K_{10} + K_{12} + K_{13} + K_{21} + K_{31}) + S(K_{10}K_{21} + K_{13}K_{21} + K_{10}K_{31} + K_{21}K_{31} + K_{31}K_{12}) + K_{21}K_{31}K_{10}$$

$$= S^3 + S^2(a + b + c) + S(ab + bc + ca) + abc$$

$$\Delta_1 = \begin{vmatrix} 1 & -K_{12} & -K_{13} \\ 0 & s + K_{21} & 0 \\ 0 & 0 & s + K_{31} \end{vmatrix} = (s + K_{21})(s + K_{31})$$

$$y_1 = \frac{\Delta_1}{\Delta} = \frac{(s + K_{21})(s + K_{31})}{S^3 + S^2(a + b + c) + S(ab + bc + ca) + abc}$$

$$y_1 = \frac{\Delta_1}{\Delta} = \frac{(s + K_{21})(s + K_{31})}{(S + a)(S + b)(S + c)}$$

#### IV. APPLICATION TO DERIVE PHARMACOKINETICS EQUATIONS

(i) After the intravenous injection of a drug to a patient, it distributing in the body and also eliminates in the body as first order kinetics is set into the differential

$$\frac{dY}{dt} = -KY, \text{ where } Y \text{ is the total amount of drug in the body of a patient in time } t.$$

$$\text{Let } \frac{dY}{dt} = Y'$$

$$\text{Then } Y' = -KY$$

Applying Laplace transform on both side

$$L\{Y'\} = -L\{KY\}$$

$$\bar{Y} - Y_0 = -K\bar{Y}$$

$$(S\bar{Y} + K\bar{Y}) = Y$$

$$\bar{Y} = \frac{Y_0}{s+K} \quad \text{S-Laplace operator}$$

Then take inverse Laplace transform both side

$$L^{-1}\{\bar{Y}\} = Y_0 e^{-Kt}$$

$$Y = Y_0 e^{-Kt}$$

Thus  $Y_0$  – amount of drug given to the patient when time is zero.

## V. APPLICATION OF DIFFERENTIAL EQUATION

(I) In a certain culture of bacteria, the rate at which bacteria increase is proportional to the instantaneous number present. If the original number doubles in one hour, in how many hour will it triple?

N represent the number at time t

$$\frac{dN}{dt} \propto N$$

$$\frac{dN}{dt} = KN \quad \text{where K is positive constant}$$

By method of one variable

$$\frac{dN}{N} = K dt$$

$$\therefore \int_0^N \frac{dN}{N} = \int_0^N K dt$$

$$\log N = kt + \log C$$

$$\log N - \log C = Kt$$

$$\therefore \frac{N}{C} = e^{Kt}$$

$$N = Ce^{Kt}$$

For  $t=0$  then  $N = N_0$

Put  $C = N_0$

$$N = N_0 e^{Kt}$$

This gives the number of bacteria at time  $t \geq 0$ , if  $K$  is known

It is given that  $N = 2N_0$  WHEN  $t=1$

Then  $2N_0 = N_0 e^K$

$$e^K = 2$$

Then  $N = N_0 e^{Kt}$  can be written as  $N = N_0 2^t$

Suppose the original triple in T (hr.). Then  $N = 3N_0$  when  $t = T$

Then  $3N_0 = N_0 2^T$

$$3 = 2^T$$

$$\log(3) = T \log(2)$$

$$T = \frac{\log(3)}{\log(2)} = \frac{0.4771}{0.3010} = 1.6 \text{ hrs.}$$

The time of course for which the drug is administered intravenously (Infusion at a constant rate is set into the system of linear differential equation

$\frac{dP(t)}{dt} = -k P(t) + Q_0$  where  $P(t)$  – Amount of drug present at time  $t$  and  $Q_0$  - is a drug flow rate into the compartment in units of amount/time.

By linear differential equation

The above equation should be used for solving

$$\frac{dP(t)}{dt} + k P(t) = Q_0 \quad (K \text{ and } Q_0 \text{ are functions of } t)$$

$$P(t) e^{\int K dt} = \int Q_0 e^{\int K dt} dt + c$$

$$P(t) e^{Kt} = \int Q_0 e^{Kt} dt + c$$

$$P(t) e^{Kt} = Q_0 \left[ \frac{e^{Kt}}{K} \right]_0^t$$

$$P(t) e^{Kt} = Q_0 \left[ \frac{e^{Kt}}{K} - \frac{e^0}{K} \right]$$

$$P(t) e^{Kt} = \frac{Q_0}{K} \left[ \frac{e^{Kt}}{K} - 1 \right]$$

$$\text{Then } P(t) = \frac{Q_0}{K} (1 - e^{-Kt})$$

## (II) Diffusion Problem:

Let the Cell contains constant volume of solute of concentration  $C_0$

Let  $C = c(t)$  be the concentration when time is  $t$

By diffusion the molecules of the solute will enter the cell from the surrounding liquid

Let  $m = m(t)$  be the mass of solute in the cell

A- Artea of the cell Membrane

V- Volume of the cell

But  $m(t) = V.C(t)$

According to the Fick's Law

$$\frac{dm}{dt} = KA(C_0 - c)$$

If  $C < C_0$  then  $\frac{dm}{dt}$  is directly proportional to the area of the membrane and to the difference in concentration on both side of the membrane

But  $\frac{dm}{dt} = V \frac{dc}{dt}$

$$\frac{dc}{dt} = \frac{1}{V} \frac{dm}{dt}$$

$$\frac{dc}{dt} = \frac{KA(C_0 - c)}{V}$$

$$\frac{dc}{(C_0 - c)} = \frac{KA}{V} dt$$

$$\int \frac{dc}{(C_0 - c)} = \int \frac{KA}{V} dt$$

$$\text{Log}(C - C_0) = \frac{KA}{V} t$$

Apply if  $t=0$  and  $t=t$

$$\text{Log}(C - C_0) = \frac{KA}{V} t + K$$

Take exp both side

$$C - C_0 = e^{\frac{KA}{V} t + K}$$

$$C - C_0 = e^{\frac{KA}{V} t} + e^K$$

$$C - C_0 = K e^{\frac{KA}{V} t}$$

$$C = K e^{\frac{KA}{V} t} + C_0$$

## VI.CONCLUSION

Using operators like derivative, differential equation, integration, Laplace transform, Determinants, Ratio & Proportion we can find Pharmacokinetic equations. In this paper we have proved 2-compartment model equation, 3-compartment model equation, diffusion problem by application of above mentioned mathematical operators.

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# STUDY OF FOURIER TRANSFORM AND ITS APPLICATION IN FIELD OF SCIENCE AND TECHNOLOGY

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**Abstract**—Present study is an effort to understand the application and modification of utility of Fourier transform. During last few decades there is a drastic improvement in study and application of Fourier transform. It is one method of mathematics which helps to study of converting image domain signal into signal domain or vice versa. Now its study is important for any type of signal transmission of video, audio, picture electronics telecommunication, clarity of cameras, etc. It has very large application such as in filtering, radar, communication, etc. its study may help us to understand the topic clearly which can lead to innovate something new signal transmission only

**Keywords**—Audio, Filtering, Fourier transform, Radar, Signal transmission, Video

## I. INTRODUCTION

Fourier transform helps us to look at the complicated image domain in a simple way through signal domain. In this way it occupies less memory to perform a pile of work. FT is used in almost all types of signal transformation of any form such as phone, internet, radar, connection, walky-talky, filtering technology, etc. Fourier transform is modification of Fourier series. Indeed there are three type of transform viz series, Fourier, and Laplace. Fourier transform is a mathematical tool which converts the time domain in frequency domain. there the Fourier transform is itself divided into number of parts. there is requirement of bandwidth to transmit the signal and bandwidth can be calculated in domain of frequency only.

Condition for existence of Fourier series is as follows:

- 1.1. It should be of finite range in absolute integral
- 1.2. Function should have finite maxima and minima
- 1.3. Function should have finite discontinuity

## II. Basic theory in Fourier transforms

Fourier transform is derived from the Fourier series. where the functions are basically required to be periodic but in Fourier transform function can be aperiodic. There are many formula for Fourier transform and here one of them :

$$f(\delta) = \int_{-\infty}^{\infty} f(x) e^{-2\pi i x \delta} dx$$

Over here -ve sign have a special meaning because +ve of exponent and -ve makes it 1 which is required

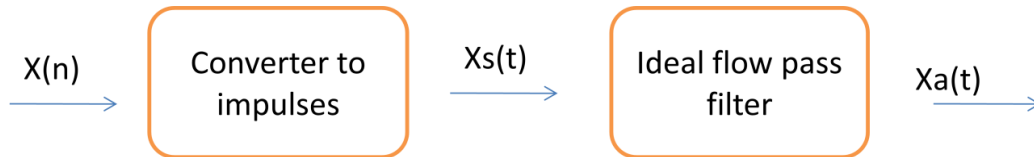
## III. DATA SAMPLING

It is the statistical study of sample collected and read by a Fourier transform and making its output. In Fourier transform during data sampling there is use of digital to analog converter and analog to digital converter. In Fourier transform there is use of digital to analog converter and analog to digital converter. We need it because there is somewhere we require digital and sometimes we require analog. Like for our computer, mobile working we need the signals in form of digital, because they work

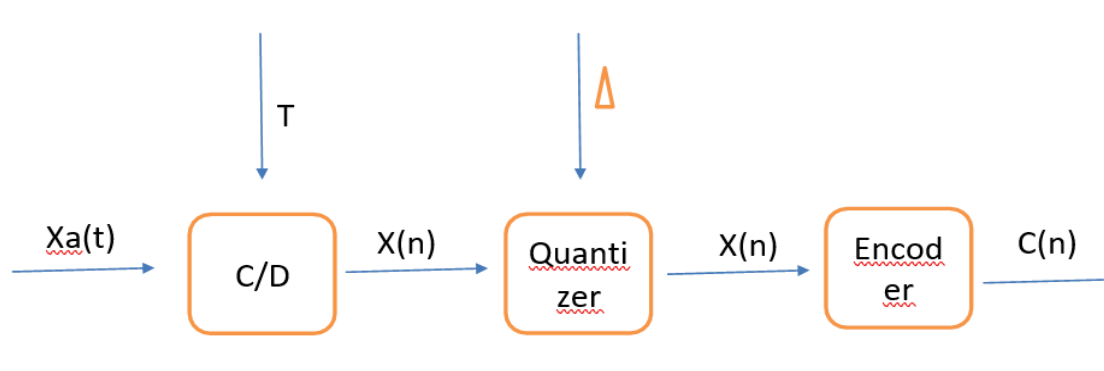


and understands digital signals but on the same hand we require the analog signals because digital signals cannot be transmit in the air and analog can be transmit through air medium

D/A component converter:



A/D component converter :







#### IV. Application

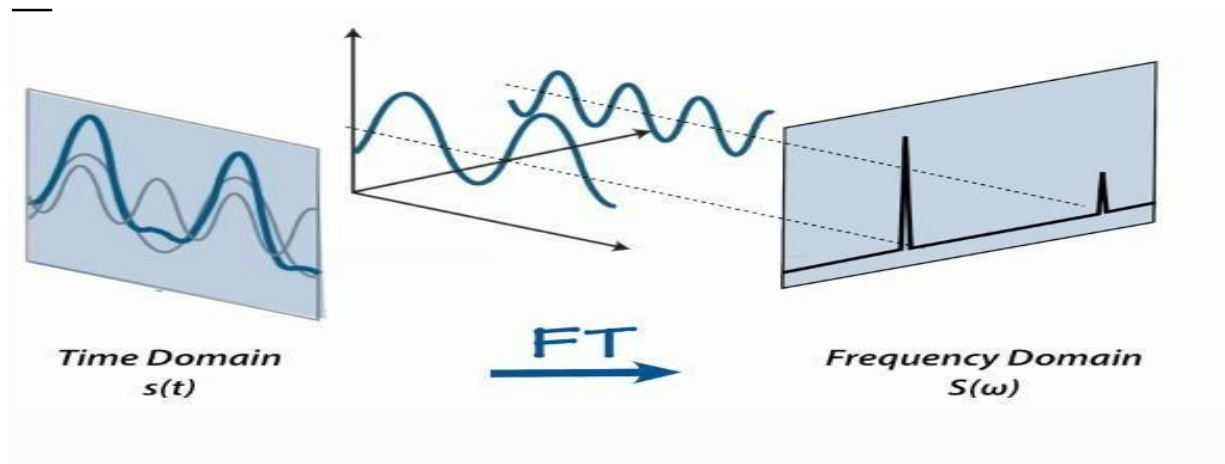
**4.1 Filter--** The application of Fourier transform are in signal processing audio and visual transmission telecommunications, speech processing, hearing aids, electrocardiographs ,etc. The MATLAB is software which helps to implement the signal processing system on computer, so that we can verify the function of signal processing and rectify the problem. The radar echo contains several of information in the signal form. This information is convicted by Fourier transformation into data transformation which can be used by the computing aided signal processing.

**4.2 Sound Editing---**The Fourier transform study has an ability to convert the noise in sound. Fourier transform is a mathematical funnel where we feed the raw wave or basic equation with so many disturbances and it converts it into a required wave or equation. The audacity is a software application which is constructed with mathematical equation of Fourier transform. Its help to separate the desired notes of sound with undesired notes of noise.

**4.3 Cell Phones--** Each and every cell phone has a unique number and which contains its unique IP address. IP stands for internet protocol. Where protocol means set of rules. The device has to use the co-ordinators which is developed in receiver, transmitter and satellite to receive and transmit to other end .The converter at the end to convert voice message into electrical impulse and vice-versa. The messages transmits in binary i.e. in '0' and '1'.The message transmission done through machine learning language i.e. it works on either true or false condition.

#### IV. RESULT

Type of Transform	Example Signal
Fourier Transform <i>signals that are continuous and aperiodic</i>	
Fourier Series <i>signals that are continuous and periodic</i>	
Discrete Time Fourier Transform <i>signals that are discrete and aperiodic</i>	
Discrete Fourier Transform <i>signals that are discrete and periodic</i>	



This effort makes a realization that Fourier transform is the basic for all types of signal transformation. To study and develop it we need a good understanding of mathematics. Only because of its study we were able to make signal possible to transmit with help of wire and later on with help of that only we replaced that wire with wireless connections. It may possible that with help of this we can make more dynamic things possible in future

#### V. Conclusion

The proposed Fourier transform has a wide range of help in various domains like power distribution system, wireless, signal processing, cell phone manufacturing, mechanical and industrial application. In power system, proposed method easily analyzes the faults, harmonics and disturbance.

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# THE STUDY OF LAPLACE TRANSFORM AND FOURIER TRANSFORM

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**Abstract**—In this paper we study the basics of Laplace transform and Fourier transform it deals with what a Laplace transform and Fourier Transform means and its application. The history of both the transformation and properties with examples on differential equation have been discussed.

**Keywords**— Fourier transform, Laplace transform, Ordinary differential equation, Partial differential equation.

## Introduction

Mathematics is everywhere in the world, it is used in every field. It is in every phenomenon, every technology, every observation, every experiment and more. The knowledge of Laplace transform and Fourier transform is required for engineers and scientist in recent year because it is essential part of mathematical background. And the Laplace transform is used to find out the solutions of ordinary differtial equation whereas Fourier transform is used to find solution of ordinary differential equations.

The method of Laplace Transform give the directly Advantage for the solution of differential equations with given boundary values without the necessity of first finding the general solution and then evaluating from it the arbitrary constants.

Moreover the ready tables of Laplace transforms reduce the problem of solving differential equations to mere algebraic manipulation. Fourier transform when applied the partial differential equation reduces the number of its independent variables by one.it is highly useful in the study of conduction of Heat, Wave propagation, communication etc.

## I. HISTORY

### 1.1) Laplace transform

Laplace transform was formulated by Pierre-Simon Laplace [1749-1827] who was well known French mathematician astronomer whose work contributed greatly to the development mathematical astronomy and statistic. He formulated Laplace's equation, pioneered and developed the Laplace transforms, it is used in many branches of science. The laplacian differtial operator is named after him. He is remembered as one of the greatest science of all time and is called Newton of France.

### 1.2) Fourier transform

Fourier transform was formulated by Jean Baptiste Joseph Fourier [1768-1830] a great French mathematician and physicist he is best remember for pioneering Fourier series, Fourier transform He went to Egypt with napoleon bonapararte in 1798 and was made governor of lower Egypt he contributed several mathematical papers to Cairo institute founded by napoleon He was permanent secretary of French academy of sciences in 1830 he was elected to royal Swedish academy of science Key idea is that the Fourier transforms changes a function on one space into another function on a different space.

Fourier transforms are properly a subdomain of harmonic analysis, which is a very general and powerful set of mathematical ideas. The Laplace transform is similar to the transform. The Fourier transform of a function is a complex function of a real variable were as Laplace transform of a function is a complex function of a complex variable.

## II. DEFINITION

### 2.1) LAPLACE TRANSFORM:-

Let  $f(t)$  be a function of  $t$  defined for all positive values of  $t$ . then the LAPLACE TRANSFORM of  $f(t)$ , denoted by  $L\{f(t)\}$  is defined by

$$L\{f(t)\} = \int_0^{\infty} e^{-st} f(t) dt$$

Provided that the integration exists  $s$  is the parameter which may be real or complex no.  $L\{f(t)\}$  being a function of  $s$  is briefly written as  $\bar{f}(s)$  i.e.  $L\{f(t)\} = \bar{f}(s)$

$$\therefore f(t) = L^{-1}\{\bar{f}(s)\}$$

Then  $f(t)$  is called inverse Laplace transform of  $\bar{f}(s)$

### 2.2) FOURIER TRANSFORM:-

If a function  $f(t)$  is defined on  $(-\infty, \infty)$ , is piecewise continuous in each finite interval and is absolutely integrable in  $(-\infty, \infty)$  then the integral  $\frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(t) e^{-ist} dt$  is called the Fourier Transform  $f(t)$  and is denoted by  $F\{f(t)\}$  or  $F(s)$  thus

$$F(s) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(t) e^{-ist} dt$$

## III. PROPERTIES

### 3.1) LAPLACE TRANSFORM:-

#### 1. Linearity Property:

If  $f(t)$  and  $g(t)$  are any two functions of  $t$  and  $\alpha, \beta$  are any two constants then,

$$L[\alpha f(t) + \beta g(t)] = \alpha L[f(t)] + \beta L[g(t)]$$

#### 2. Shifting Property:

If  $L[f(t)] = F(s)$ , then  $L[e^{at} f(t)] = F(s - a)$ .

#### 3. Multiplication by $t^n$ Property:

$L[f(t)] = F(s)$ , Then

$$L[t^n f(t)] = (-1)^n \frac{d^n}{ds^n} [F(s)]$$

#### 4. Laplace Transform of Derivative:

If  $L[f(t)] = F(s)$ , then

$$L[f'(t)] = sF(s) - f(0)$$

$$L[f''(t)] = s^2 F(s) - s f(0) - f'(0)$$

$$L[f'''(t)] = s^3 F(s) - s^2 f(0) - s f'(0) - f''(0)$$

$$\vdots$$

$$L[f^{(n)}(t)] = s^n F(s) - s^{n-1} f(0) - s^{n-2} f'(0) - s^{n-3} f''(0) - \dots - f^{(n-1)}(0).$$



### 5. Laplace Transform of Bessel's function:

$$L[J_0(t)] = \frac{1}{\sqrt{s^2+1}}, \text{ where}$$

$$J_0(t) = \sum_{k=0}^{\infty} (-1)^k \frac{\left(\frac{1}{4}t^2\right)^k}{(k!)^2} \text{ Is called Bessel's function.}$$

### 6. Inverse Laplace Transform:

$$L[f(t)] = F(s), \text{ Then}$$

$$L^{-1}[F(s)] = f(t) \text{ Is called inverse Laplace Transform of } F(s)$$

### 7. Inverse Laplace Transform by Convolution Theorem:

if

$$\begin{aligned} \text{Then, } L^{-1}[\phi_1(s)] &= f_1(t); \quad L^{-1}[\phi_2(s)] = f_2(t) \\ L^{-1}[\phi_1(s) \cdot \phi_2(s)] &= \int_0^t f_1(u) \cdot f_2(t-u) du \end{aligned}$$

## 3.2) FOURIER TRANSFORM:-

### 1. Linear Property:

If  $F(s)$  and  $G(s)$  are Fourier Transforms of  $f(t)$  and  $g(t)$  respectively

$$\text{Then } F[af(t) + bg(t)] = aF(s) + bG(s)$$

### 2. Change of scale property:

If  $F(s)$  is complex Fourier Transforms of  $f(t)$  Then  $\{f(at)\} = \frac{1}{a}F\left(\frac{s}{a}\right), a \neq 0$

### 3. Shifting Property:

If  $F(s)$  is complex Fourier Transforms of  $f(t)$

$$\text{Then } F\{f(t-a)\} = e^{isa}F(s)$$

### 4. Modulation Theorem:

If  $F(s)$  is complex Fourier Transforms of  $f(t)$

$$\text{Then } F\{f(t)\cos at\} = \frac{1}{2}(F(s+a) + F(s-a))$$

## IV. EXAMPLES

- 1) solve  $(D^3 - 3D^2 + 3D - 1)y = t^2e^t$  given that  $y(0)=1, y'(0)=0, y''(0)=-2$ .

Sol:-

Taking the Laplace transform on both side, we get

$$[s^3\bar{y} - s^2y(0) - sy'(0)] - 3[s^2\bar{y} - sy(0) - y'(0)] + 3[s\bar{y} - y(0)] - \bar{y} = \frac{2}{(s-1)^3}$$

Using the given conditions, it reduces to

$$\begin{aligned}\bar{y} &= \frac{s^2 - 3s + 1}{(s-1)^3} + \frac{2}{(s-1)^6} = \frac{(s-1)^2 - (s-1) - 1}{(s-1)^3} + \frac{2}{(s-1)^6} \\ &= \frac{1}{(s-1)} - \frac{1}{(s-1)^2} - \frac{1}{(s-1)^3} + \frac{2}{(s-1)^6}\end{aligned}$$

On inversion, we obtain

$$\begin{aligned}Y(t) &= L^{-1}\left\{\frac{1}{(s-1)}\right\} - L^{-1}\left\{\frac{1}{(s-1)^2}\right\} - L^{-1}\left\{\frac{1}{(s-1)^3}\right\} + L^{-1}\left\{\frac{2}{(s-1)^6}\right\} \\ &= e^t \left(1 - t - \frac{1}{2}t^2 + \frac{1}{60}t^5\right)\end{aligned}$$

- 2) An impulsive voltage  $E\delta(t)$  is applied to a circuit consisting of L, R, C in series with zero initial conditions . If I be the current at any subsequent time t find the limit of I as  $t \rightarrow 0$

**Sol:-**

The equation of the circuit governing the current I is

$$L \frac{di}{dt} + Ri + \frac{1}{C} \int_0^t i dt = E E\delta(t) \quad \text{where } i=0, \text{ when } t=0$$

Taking Laplace transform of both sides we get

$$L[s\bar{i} - i(0)] + R\bar{i} + \frac{1}{C} \frac{1}{s} \bar{i} = E$$

Where  $R/L = 2a$  and  $1/CL = a^2 + b^2$

$$\begin{aligned}\bar{i} &= \frac{E}{L} \frac{(s+a) - a}{(s+a)^2 + b^2} \\ &= \frac{E}{L} \left\{ \frac{(s+a)}{(s+a)^2 + b^2} - a \frac{1}{(s+a)^2 + b^2} \right\}\end{aligned}$$

On inversion we get

$$= \frac{E}{L} \left\{ e^{-at} \cos bt - \frac{a}{b} e^{-at} \sin bt \right\}$$

Taking limits as  $t \rightarrow 0, i \rightarrow \frac{E}{L}$

Although the current  $i=0$  initially yet a large current will develop instantaneously due to impulsive voltage applied at  $t=0$  .In fact we have determinant the limits of this current which is  $\frac{E}{L}$

**3) Find the Fourier transform of :**

$$f(x) = \begin{cases} 1 - x^2, & |x| \leq 1 \\ 0 & , |x| > 1 \end{cases}$$

**Sol:-**

$$F\{f(x)\} = \int_{-\infty}^{\infty} f(x)e^{isx} dx = F(s), \text{ say}$$

$$= \int_{-\infty}^{-1} (0) e^{isx} dx + \int_{-1}^1 (1 - x^2) e^{isx} dx + \int_1^{\infty} (0) e^{isx} dx$$

$$= \left| (1 - x^2) \frac{e^{isx}}{is} - (2x) \frac{e^{isx}}{is^2} + (-2) \frac{e^{isx}}{is^3} \right|_{-1}^1$$

$$= 2 \left( \frac{e^{is} + e^{-is}}{-s^2} \right) - 2 \left( \frac{e^{is} - e^{-is}}{-is^3} \right)$$

$$= -\frac{4}{s^3} (s \cos s - \sin s)$$

Now by inversion formulae we have,  $f(x) = \frac{1}{2\pi} \int_{-\infty}^{\infty} F(s) e^{-isx} ds$

$$= -\frac{1}{2\pi} \int_{-\infty}^{\infty} \frac{4}{s^3} (s \cos s - \sin s) e^{-isx} ds = \begin{cases} 1 - x^2, & |x| \leq 1 \\ 0 & , |x| > 1 \end{cases}$$

**4) Find the Fourier transform of**

$$f(x) = \begin{cases} k & , |x| < a \\ 0 & , |x| > a \end{cases}$$

**Sol:-**

$$F(s) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(x) e^{-isx} dt$$

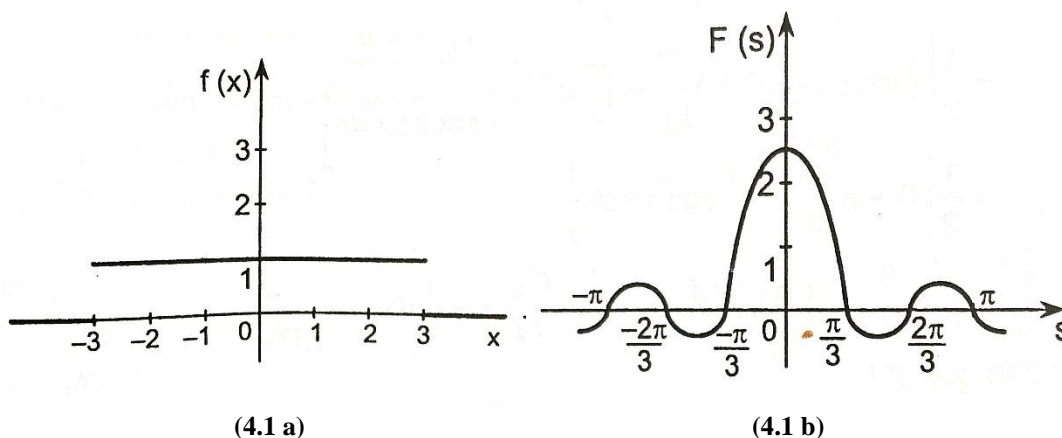
$$F(s) = \frac{1}{\sqrt{2\pi}} \int_{-a}^a k e^{-isx} dt$$

$$= \frac{k}{\sqrt{2\pi}} \left[ \frac{e^{-isx}}{is} \right]_{-a}^a$$

$$= \frac{k.2}{\sqrt{2\pi}.s} \left[ \frac{e^{isa} - e^{-isa}}{2i} \right]$$

$$= \frac{k}{s} \sqrt{\frac{2}{\pi}} \sin sa$$

We show below the graph of f(x) and F(s) at k=1 and a=3



### V. CONCLUSION

The Laplace transform and Fourier transform has wide use in many fields especially in engineering it used to solve the differential equation and the properties of Laplace transform and Fourier transform is very helpful for finding different way of solving differential equations to mere the algebraic manipulation. In general, the Laplace transform is used when the functions are defined on the half space i.e  $t \geq 0$ , whereas the Fourier transform is used when the functions defined on  $(-\infty, \infty)$ . Laplace Transform does a real transformation on complex data but Fourier Transform does a complex transformation on real data.

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# THE STUDY OF RELATION BETWEEN FOURIER TRANSFORM AND LAPLACE TRANSFORM

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**Abstract**— in this paper the author present the Laplace and Fourier transformations with their applications in solving boundary value problems of Heat conduction, Vibration of string, Transmission lines and also explain the relation between Laplace and Fourier transformation. The part of the course introduces two extremely powerful methods to solving differential equations that is the Fourier and the Laplace transforms. The choice of particular transform to be employed for the solution of an equation depends on the boundary conditions of the problem and the ease with which the transform can be inverted.

**Keywords**— Fourier transform, Heat equation, Laplace transform, differential equation, boundary value problems

## I. INTRODUCTION

Mathematics is everywhere in the world, it is used in every field. It is in every phenomenon, every technology, every observation, every experiment and more. All we need to do is to understand the logic hidden behind it and apply the Mathematics in it. The knowledge of Laplace transform and Fourier transform has in recent year becomes an essential part of mathematical background required of engineers and scientist. And the Laplace transform is used to find out the solutions of ordinary differential equation whereas Fourier transform is used to find solution of ordinary differential equations, by using a particular type of definite integral as an operator a new function can be defined. One such operator is called Laplace transform. Laplace transform is used to solve the differential equation and boundary value problems. Fourier transforms transform a non-periodic function  $f(t)$  in time domain into function  $f$  in frequency domain. Fourier transforms are highly useful in study of conduction of heat, wave propagation, communication.

## II. DEFINITIONS

The integral transform of a function  $f(t)$  denoted by  $I[f(t)]$ , is defined by  $\bar{f}(s) = \int_{t_1}^{t_2} f(t) k(s, t) dt$

Where  $k(s, t)$  is called the kernel of the transform and is a known function of  $s$  and  $t$ . The function  $f(t)$  is called the inverse transform of  $\bar{f}(s)$ .

Simple examples of a kernel are as follows:

(1) When  $k(s, t) = e^{-st}$ , it leads to the Laplace transform of  $f(t)$ , i.e.

$$\bar{f}(s) = \int_0^{\infty} e^{-st} f(t) dt$$

(2) When  $k(s, t) = e^{ist}$ , we have the Fourier transform of  $f(x)$ , i.e.

$$F(s) = \int_{-\infty}^{\infty} e^{ist} f(t) dt$$

## III. RELATION BETWEEN FOURIER AND LAPLACE TRANSFORM

$$\text{If } f(t) = \begin{cases} e^{-xt} g(t), & t > 0 \\ 0, & t < 0 \end{cases} \dots\dots\dots (1)$$

Then  $F\{f(t)\} = L\{g(t)\}$

$$\begin{aligned} \text{We have } F\{f(t)\} &= \int_{-\infty}^{\infty} e^{ist} f(t) dt = \int_{-\infty}^0 e^{ist} \cdot 0 dt + \int_0^{\infty} e^{ist} \cdot e^{-xt} g(t) dt \\ &= \int_0^{\infty} e^{(is-x)t} g(t) dt \end{aligned}$$

$$= \int_0^{\infty} e^{-pt} \cdot g(t) dt \quad \text{where } p=x-is$$

$$=L \{g(t)\}$$

Hence the Fourier transform of  $f(t)$  [defined by (1)] is the Laplace Transform of  $g(t)$ .

#### IV.FOURIER TRANSFORM OF THE DERIVATIVE OF FUNCTION

The Fourier transform of the function  $u(x, t)$  is given by

$$F[u(x, t)] = \int_{-\infty}^{\infty} u e^{isx} \cdot dx$$

Then the Fourier Transform of  $\frac{\partial^2 u}{\partial x^2}$  i.e.

$$F\left[\frac{\partial^2 u}{\partial x^2}\right] = \int_{-\infty}^{\infty} \frac{\partial^2 u}{\partial x^2} e^{isx} dx = \left[ e^{isx} \frac{\partial u}{\partial x} - is e^{isx} \cdot u \right]_{-\infty}^{\infty} + (is)^2 \int_{-\infty}^{\infty} u e^{isx} dx$$

On applying the general rule of integration by parts. If  $u$  and  $\frac{\partial u}{\partial x}$  tend to zero as  $x$  tends to  $\pm\infty$ ,

$$\text{Then } F\left[\frac{\partial^2 u}{\partial x^2}\right] = -s^2 F[u] \quad \dots\dots\dots (1)$$

Similarly in the case of Fourier sine and cosine transforms, we have

$$F_s\left[\frac{\partial^2 u}{\partial x^2}\right] = s(u)_x = 0 - s^2 F_s[u] \text{ And } \dots\dots\dots (2)$$

$$F_c\left[\frac{\partial^2 u}{\partial x^2}\right] = -\left(\frac{\partial u}{\partial x}\right)_{x=0} - s^2 F_c[u] \quad \dots\dots\dots (3)$$

In general, the Fourier Transform of the  $n$ th derivative of  $f(x)$  is given by

$$F\left[\frac{\partial^n u}{\partial x^n}\right] = (-is)^n F[f(x)] \quad \dots\dots\dots (4)$$

Provided the first  $n-1$  derivatives vanish as  $x \rightarrow \pm\infty$

$$\text{For } F[f^n(x)] = \int_{-\infty}^{\infty} f^n(x) e^{isx} \cdot dx$$

By the general rule of integration by parts, when follows (4)

#### V.INVERSE LAPLACE TRANSFORM BY METHOD OF RESIDUES

Let the Laplace transform of  $f(x)$  be  $\bar{f}(s)$  so that

$$\bar{f}(s) = \int_0^{\infty} f(t) e^{-st} dt$$

Under certain conditions therefore



$$f(x) = \lim_{r \rightarrow \infty} \frac{1}{2\pi i} \int_c e^{xs} \bar{f}(s) dx$$

=Sum of the Residues of  $e^{xs} \bar{f}(s)$  at the poles of  $f(s)$

(1) Evaluate  $L^{-1} \left\{ \frac{1}{(s-1)(s^2+1)} \right\}$  by the method of residue

Sol:-

$$\text{Since } \left| \frac{1}{(s-1)(s^2+1)} \right| = O\left(\frac{1}{s^3}\right) \text{ for } |s| \rightarrow \infty$$

Therefore,  $L^{-1} \left[ \frac{1}{(s-1)(s^2+1)} \right] = \text{sum of Res} \left[ \frac{e^{xs}}{(s-1)(s^2+1)} \right] \text{ at the poles } s = 1, \pm i$

$$\text{Now } (Res)_s = 1 = \lim_{s \rightarrow 1} \left[ \frac{(s-1)e^{xs}}{(s-1)(s^2+1)} \right] = \frac{e^x}{2}$$

$$(Res)_{s=i} = 1 = \lim_{s \rightarrow i} \left[ \frac{(s-i)e^{xs}}{(s-1)(s^2+1)} \right] = \frac{e^{ix}}{-2(i+1)}$$

Changing I to -I we get

$$(Res)_{s=-i} = 1 = \lim_{s \rightarrow -i} \left[ \frac{(s+i)e^{xs}}{(s-1)(s^2+1)} \right] = \frac{e^{-ix}}{-2(1-i)}$$

$$\begin{aligned} L^{-1} \left[ \frac{1}{(s-1)(s^2+1)} \right] &= \frac{e^x}{2} - \frac{1}{2} \left( \frac{e^{ix}}{(i+1)} + \frac{e^{-ix}}{(1-i)} \right) \\ &= \frac{1}{2} (e^x - \sin x - \cos x) \end{aligned}$$

## VI.APPLICATION OF TRANSFORM TO BOUNDARY VALUE PROBLEMS

In one dimensional boundary value problems, the partial differential equation can easily be transformed into an ordinary differential equation by applying a suitable transform. The required solution is then obtained by solving this equation and inverting by means of complex inversion formula or by any other method. In two dimensional problems, it is sometimes required to apply the transforms twice and the desired solution is obtained by double inversion.

- 1) If in a problem  $u(x, t)_{x=0}$  is given then we use infinite sine transform to remove  $\frac{\partial u^2}{\partial x^2}$  from the differential equation  
 In case  $[\partial u(x, t) / \partial x]_{x=0}$  is given then we employ infinite cosine transform to remove  $\frac{\partial u^2}{\partial x^2}$
- 2) If in a problem  $u(0, t)$  and  $u(1, t)$  are given, then we use finite sine transform to remove  $\frac{\partial u^2}{\partial x^2}$  from the differential equation  
 In case  $[\partial u / \partial x]_{x=0}$  and  $[\partial u / \partial x]_{x=1}$  is given then we employ infinite cosine transform to remove  $\frac{\partial u^2}{\partial x^2}$   
 The method of solution is best explained through the following Examples

## VII.HEAT CONDUCTION, VIBRATION OF STRING, TRANSMISSION LINES

- 1) Determine the distribution of temperature in the semi-infinite medium  $x \geq 0$ , when the end  $x=0$

**Is maintained at zero temp. And the initial distribution of temperature is  $f(x)$**

**Sol:-**

Let  $u(x,t)$  be the temp. At any point  $x$  and at any time  $t$ . We have to solve the Heat flow equation

$$\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2} \quad (x > 0, t > 0) \quad \dots\dots\dots (1)$$

$$\text{subject to the initial condition} \quad u(x, 0) = f(x) \quad \dots\dots\dots (2)$$

$$\text{And the boundary condition} \quad u(0, t) = 0 \quad \dots\dots\dots (3)$$

Taking Fourier sine transform and denoting  $F_s[u(x, t)]$  by  $\bar{u}_s$  we have

$$\frac{d\bar{u}_s}{dt} = c^2 [s u(0, t) - s^2 \bar{u}_s] \quad (x > 0, t > 0) \quad \dots\dots\dots (4)$$

Also Fourier sine transform of (2) is  $\bar{u}_s = \bar{f}_s(s)$  at  $t=0$

Solving (4) and (5) we get  $\bar{u}_s = \bar{f}_s(s) e^{-c^2 s^2 t}$

Hence taking its inverse Fourier sine transform we obtain

$$u(x, t) = \frac{2}{\pi} \int_0^\infty \bar{f}_s(s) e^{-c^2 s^2 t} \sin xs \, ds$$

- 2) An infinite string is initially at rest and that initial displacement is  $y(x,0)$  ( $-\infty < x < \infty$ ) determine the displacement  $y(x, t)$  of string**

**Sol:-**

The equation for vibration of string is

$$\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2} \quad \dots\dots\dots (1)$$

$$\text{And the initial conditions are } \left( \frac{\partial y}{\partial t} \right)_{t=0} = 0 ; y(x, 0) = f(x) \quad \dots\dots\dots (2)$$

Multiplying (1) by  $e^{isx}$  and integrating w.r.t  $x$  from  $-\infty$  to  $\infty$

$$\frac{\partial^2 Y}{\partial t^2} = c^2 (-s^2 Y) \quad \text{provided that } \frac{\partial y}{\partial x} \rightarrow 0, x \rightarrow \infty$$

$$\text{The solution is } \frac{\partial^2 Y}{\partial t^2} + c^2 (s^2 Y) = 0 \text{ is } Y = A_1 \cos cst + A_2 \sin cst \quad \dots\dots\dots (3)$$

Also Fourier transform of (2) are  $\frac{\partial y}{\partial t} = 0$  and  $Y = F(s)$  when  $t = 0$

Applying these to (3) we get  $A_2 = 0$  and  $A_1 = F(s)$

$$Y = F(s) \cos cst$$

Now taking the Fourier transform we get

$$y(x, t) = \frac{1}{2\pi} \int_{-\infty}^\infty F(s) \cos cst e^{isx} \, dx$$

$$y(x, t) = \frac{1}{2\pi} \int_{-\infty}^\infty F(s) \frac{e^{icst} + e^{-icst}}{2} e^{isx} \, dx$$

$$y(x, t) = \frac{1}{4\pi} \int_{-\infty}^{\infty} F(s) (e^{icst} + e^{-icst}) e^{isx} dx$$

$$y(x, t) = \frac{1}{4\pi} \int_{-\infty}^{\infty} F(s) e^{-is(x-ct)} + F(s) e^{-is(x+ct)} dx$$

$$y(x, t) = \frac{1}{2} [f(x-ct) + f(x+ct)] \quad \text{Where } f(x) = \frac{1}{2\pi} \int_{-\infty}^{\infty} F(s) e^{-isx} dx$$

3) A semi- infinite transmission line of negligible inductance and leakance per unit length has it's voltage and current equal to zero a constant voltage  $V_0$  is applied at sending end ( $x=0$ ) at  $t=0$ . find the voltage and current at any point  $x$  and at any instant

**Sol:-**

Let  $v(x, t)$  and  $i(x, t)$  be the voltage and current at any point  $x$  and at any time  $t$

If  $L=0$  and  $G=0$  then

The transmission line equation becomes  $\frac{\partial v}{\partial x} = -Ri, \frac{\partial i}{\partial x} = -C \frac{\partial v}{\partial t}$

$$\text{i.e. } \frac{\partial^2 v}{\partial x^2} = RC \frac{\partial v}{\partial t} \quad \dots \dots \dots (1)$$

The boundary condition are  $v(0, t) = V_0$  and  $i(x, t)$  is finite for all  $x$  and  $t$ .

The initial condition are  $v(x, 0) = 0, i(x, 0) = 0 \quad \dots \dots \dots (2)$

Laplace transform of (1) are

$$\frac{d^2 \bar{v}}{dx^2} = RC(s\bar{v} - 0)$$

$$\frac{d^2 \bar{v}}{dx^2} - RC(s\bar{v}) = 0 \quad \dots \dots \dots (3)$$

The Laplace transform of condition in (2) are

$$\bar{v}(0, s) = \frac{V_0}{s} \quad \text{at } x = 0 \quad \dots \dots \dots (4)$$

And  $\bar{v}(x, s)$  remains finite as  $x \rightarrow \infty$

The solution of (3) is

$$\bar{v}(x, s) = C_1 e^{\sqrt{RCs}x} + C_2 e^{-\sqrt{RCs}x} \quad \dots \dots \dots (5)$$

To satisfy condition (5) we must have  $C_1 = 0$

Using the condition (4) we get  $C_2 = \frac{V_0}{s}$  thus

$$\bar{v}(x, s) = \frac{V_0}{s} e^{-\sqrt{RCs}x}$$

Using the inversion formula we obtain

$$v(x, t) = v_0 L^{-1} \left\{ \frac{e^{-\sqrt{RC}x\sqrt{s}}}{s} \right\} = v_0 \operatorname{erfc} \left( x \frac{\sqrt{RC}}{2\sqrt{t}} \right)$$

$$= v_0 \left( x \frac{\sqrt{RC}}{2\sqrt{t}} \right) \int_0^t u^{-3/2} e^{-(RCx^2/4u)} du$$

Since  $i = -\frac{1}{R} \frac{\partial v}{\partial x}$  we obtained by differentiation

$$i(x, t) = v_0 \left( x \frac{\sqrt{R}}{2\sqrt{t}} \right) t^{-3/2} e^{-(RCx^2/4t)}$$

## VII.CONCLUSION

Through this paper we give the relation between Laplace transform and Fourier Transform and explain it by using examples of both the transforms. Laplace transform have wide use in many field so in this paper we use Laplace Transform to solve residues and Fourier Transform for the derivative of function. And explain the boundary value problem of Transforms for Heat conduction, Vibration of string, Transmission lines.

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## APPLICATION OF TIME SERIES

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**Abstract**— this is an important study of statistical methodology for the analysis of Time series which is more appropriate for a special class of longitudinal designs of research. These designs of the study typically involve subjects (seasonal variation, Cyclical Variations) and other research units that are measured repeatedly at regular intervals over a large number of observations. Time series analysis can be measured as an exemplar of a longitudinal design. A time series analysis can help us to understand the underlying process of nature, the pattern of change over the domain of the function or evaluate the effects (range) of either a planned or unplanned intervention. The data's particularly in the field of social sciences are dynamic in nature (Agricultural and Industrial production increases every year or due to improved medical facilities) there is decline in the death rate over a period of time. It gives the information about increment or decrement in sales or exports of various products over a period of years. This distinct change (either increasing or decreasing) can be observed in the values of time-series.

**Keywords**— Average, Trend Value, Time Series, Seasonal Variations, Cyclical Variations.

### I. INTRODUCTION

A time series is a sequence of values of a phenomenon arranged in order of their occurrence. Mathematically it can expressed as a function, namely  $y_n = f(t_n)$ , where domain  $t$  represents time and range  $y$  represents the corresponding values. That is, the values  $y_1, y_2, y_3, \dots$  of a phenomenon with respect to time periods  $t_1, t_2, t_3, \dots$  Form a Time Series. Various methods can be applied to study the time-series which leads to analysis of time series. By studying the past behavior of the characteristics, the nature of variations in the values can be determined. The values in the past can be compared with the present values of comparisons at different places during same time period can also be made. The study of time series helps in formulation of future plans and policies. It also enables us to forecast the future changes. A businessman, for example, is interested in knowing likely sales, say, on month to month basis, so as to adjust the production schedule. The study of population, over a given time span, is the most important tool for a country's planning authorities in many ways, so as to allocate financial resources according to various portfolios such as agriculture, industry, education, etc. or amongst different geographical regions and states. Using the past data, financial institutions like banks can plan the future growth of deposits and advances; so that new and more attractive schemes can be introduced.

### II.EXAMPLE-1

Calculate 3 yearly moving averages from the following time series. Also plot the given data and the moving averages on a graph paper.

Year	2001	2002	2003	2004	2005	2006	2007
Sales	46	53	72	58	62	78	61

Table No.:1

Year	Sales	3 yearly moving total	3 yearly moving averages
2001	46	-----	-----
2002	53	$46 + 53 + 72 = 171$	$171 / 3 = 57$
2003	72	$53 + 72 + 58 = 183$	$183 / 3 = 61$
2004	58	$72 + 58 + 62 = 192$	$192 / 3 = 64$
2005	62	$28 + 62 + 78 = 198$	$198 / 3 = 66$
2006	78	$62 + 78 + 61 = 201$	$201 / 3 = 67$
2007	61	-----	-----

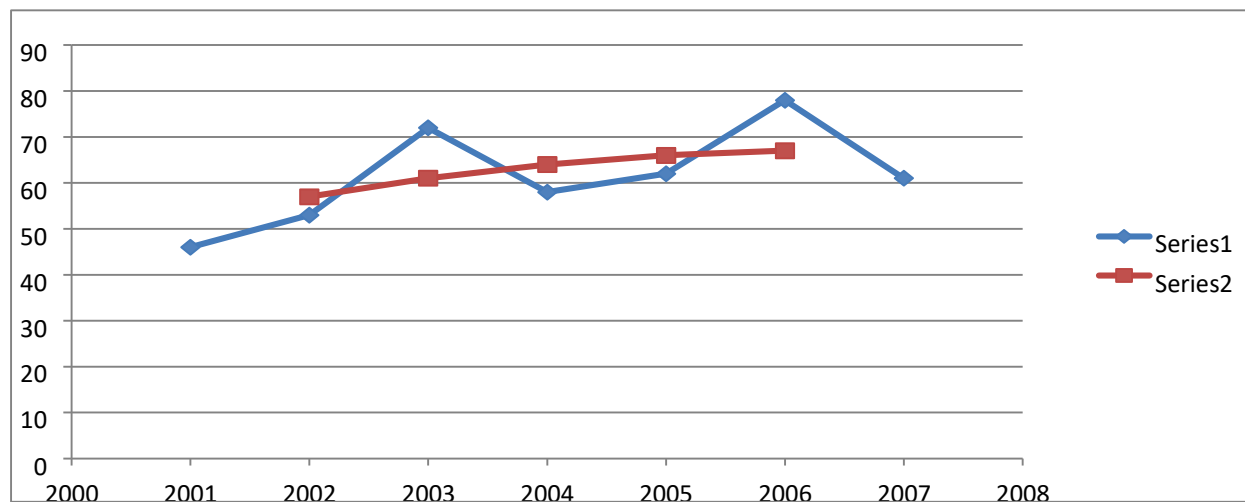


Figure:1

### III. EXAMPLE 2.

Calculate 4 yearly moving averages from the following time series. Also plot the given data and the moving averages on a graph paper.

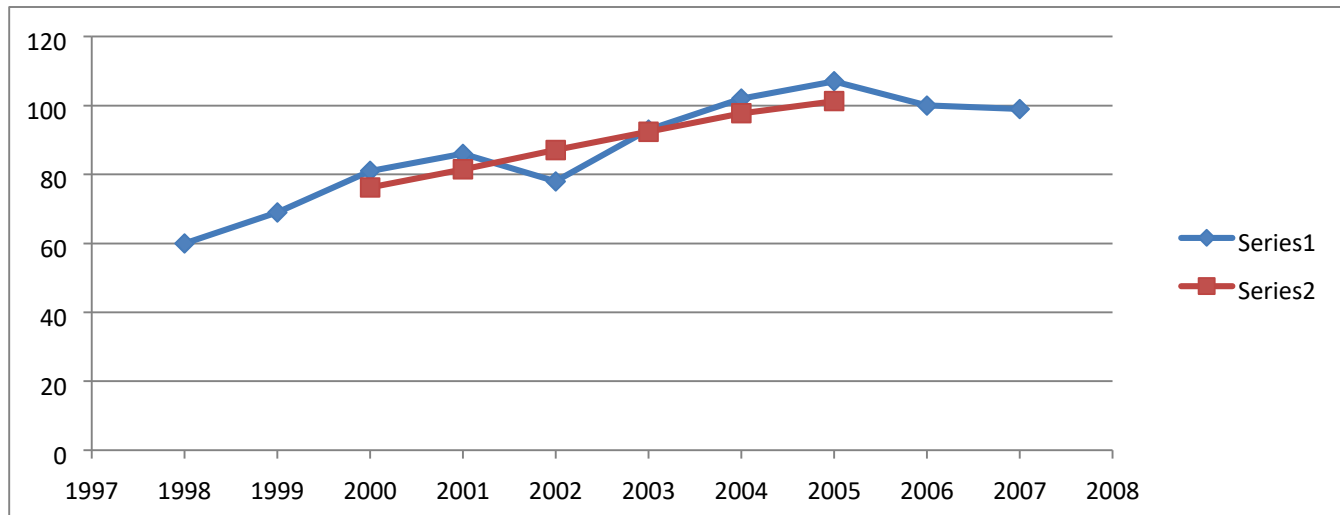
Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
------	------	------	------	------	------	------	------	------	------	------



<b>Trend value</b>	<b>60</b>	<b>69</b>	<b>81</b>	<b>86</b>	<b>78</b>	<b>93</b>	<b>102</b>	<b>107</b>	<b>100</b>	<b>99</b>
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Table No.:2

Year	Trend value	4 yearly moving total	Centered Total	4 yearly moving averages
<b>1998</b>	<b>60</b>	-----	-----	-----
<b>1999</b>	<b>69</b>	-----	-----	-----
		$60 + 69 + 81 + 86 = 296$		
<b>2000</b>	<b>81</b>		$296 + 314 = 610$	$610 / 8 = 76.25$
		$69 + 81 + 86 + 78 = 314$		
<b>2001</b>	<b>86</b>		$314 + 338 = 652$	$652 / 8 = 81.5$
		$81 + 86 + 78 + 93 = 338$		
<b>2002</b>	<b>78</b>		$338 + 359 = 697$	$697 / 8 = 87.125$
		$86 + 78 + 93 + 102 = 359$		
<b>2003</b>	<b>93</b>		$359 + 380 = 739$	$739 / 8 = 92.375$
		$78 + 93 + 102 + 107 = 380$		
<b>2004</b>	<b>102</b>		$380 + 402 = 782$	$782 / 8 = 97.75$
		$93 + 102 + 107 + 100 = 402$		
<b>2005</b>	<b>107</b>		$402 + 408 = 810$	$810 / 8 = 101.25$
		$102 + 107 + 100 + 99 = 408$		
<b>2006</b>	<b>100</b>	-----	-----	-----
<b>2007</b>	<b>99</b>	-----	-----	-----



**Figure No.:2**

### III.COMPONENTS OF TIME SERIES

The fluctuations in a time series are due to one or more of the following factors which are called “components” of time series.

- (i) **Secular Trend:** The general tendency of the data, either to increase or to remain constant is called Secular Trend. It is smooth, long term movement of the data. The changes in the values are gradual and continuous. An increasing demand for luxury items like refrigerators or color T.V. sets reflects increasing trend. The production of steel, cement, vehicles shows a rising trend. On the other hand, decrease in the imports may be linear or curvilinear, in practice, curvilinear trend is more common. Trend is due to long term tendency. Hence it can be evaluated if the time series is available over a long duration.
  
- (ii) **Seasonal Variations:** The regular seasonal changes in the time series are called “Seasonal Variations”. It is observed that the demand for umbrellas, raincoats, reaches a peak during monsoon or the advertisements of cold drinks, ice creams get a boom in summer. The demand for greeting cards, sweets, increases during festivals like Diwali, Christmas. In March, there is maximum withdrawal of bank deposits for adjustments of income-tax payment, so also various tax-saving schemes shoot up during this period. The causes, for these seasonal fluctuations, are thus, the changes in weather conditions, the traditions and customs of people etc. The seasonal component is measured to isolate these changes from the trend component and to study their effect, so that, in business, future production can be planned accordingly and necessary adjustments for seasonal changes can be made.
  
- (iii) **Cyclical Variations:** These are changes in a time series, occurring over a period which is more than a year. They are recurring and periodic in nature. The period may not be uniform. These fluctuations are due to changes in a business cycle. There are four important phases of any business activity viz. prosperity, recession, depression, and recovery. During prosperity, the business flourishes and the profit reaches a maximum level. Thereafter, in recession, the profit decreases, reaching a minimum level during depression. After some time period, the business

again recovers (recovery) and it is followed by period of prosperity. The variations in the time series due to these phases in a business cycle are called "Cyclical Variations".

- (iv) **Irregular Variations:** The changes in the time series which cannot be predicted and are erratic in nature are called "Irregular Variations". Usually, these are short term changes having significant effect on the time series during that time interval. These are caused by unforeseen events like wars, floods, strikes, political changes, etc. During IranIraq War or recent Russian revolution, prices of petrol and petroleum products soared very high. In recent budget, control on capital issues was suddenly removed. As an effect, the all India-Index of share market shot up very high, creating all time record. If the effect of other components of the time series is eliminated, the remaining variations are called "Irregular or Random Variations". No forecast of these changes can be made as they do not reflect any fixed pattern.

The purpose of studying time series is to estimate or forecast the values of the variables. As there are four components of the time series, these are to be studied separately. There are two types of models which are used to express the relationship of the components of the time series. They are additive model and multiplicative model.

Let O = Original Time Series

T = Secular Trend

S = Seasonal Variations

C = Cyclical Variations and I  
 = Irregular Variations

In Additive model, it is assumed that the effects of the individual components can be added to get the resultant value of the time series, that is, the components are independent of one another. The model can be expressed

$$O = T + S + C + I$$

In Multiplicative model, it is assumed that the multiplication of the individual effects of the components results in the time series, that is, the components are due to different causes but they are not necessarily independent, so that, changes in any one of them can affect the other components. This model is more commonly used. It is expressed as

$$O = T \times S \times C \times I$$

If we want to estimate the values in the time series, we have to first estimate the four components and then combine them to estimate the value of the time series. The irregular variations cannot be predicted and hence estimates of the first three components only can be found. However, we will restrict ourselves, to discuss methods of estimating the first component, namely Secular Trend.

#### IV. LEAST SQUARE METHOD

When the values in the time series are plotted, a rough idea about the type of trend whether linear or curvilinear can be obtained. Then, accordingly a linear or second degree equation can be fitted to the values. In this chapter, we will discuss linear trend only. Let  $y = a + bx$  be the equation of the straight line trend where a, b are constants to be determined by solving the following normal equations,

$$\begin{aligned}\sum y &= na + b\sum x \\ \sum xy &= a\sum x + b\sum x^2\end{aligned}$$

Where  $y$  represents the given time series.

We define  $x$  from years such that  $\sum x = 0$ . So substituting  $\sum x = 0$  in the normal equations and simplifying, we get

$$b = \frac{\sum xy}{\sum x^2} \text{ and } a = \bar{y} = \frac{\sum y}{n}$$

Using the given set of values of the time series,  $a$ ,  $b$  can be calculated and the straight line trend can be determined as  $y = a + bx$ . This gives the minimum sum of squares of deviations between the original data and the estimated trend values. The method provides estimates of trend values for all the years. The method has mathematical basis and so element of personal bias is not introduced in the calculations.

The trend line equation is given by  $y = ax + b$  where  $a = \frac{\sum y}{n}$  &  $b = \frac{\sum xy}{\sum x^2}$

Here  $x$  value is selected depending upon the data  $n$ . **Case**

**– I** If  $n$  is odd ( $n = 5, 7, 9$ ) then  $x$  values are taken as

.....,  $-4, -3, -2, -1, 0, 1, 2, 3, 4$ .....

**Case – II** If  $n$  is even ( $n = 4, 6, 8$ ) then  $x$  values are taken as

.....,  $-7, -5, -3, -1, 1, 3, 5, 7$ .....

### V.EXAMPLE 3

**Case – I** ( $n$  is odd)

Fit a straight line trend for the following data and hence find the trend value for the year 1999.

Year	1994	1995	1996	1997	1998
Profit	33	31	35	37	34

Table No.:3

Year	Profit Y	x	x <sup>2</sup>	xy	Trend value $y = 34 + 0.8x$
1994	33	$-2$	4	$-66$	$y = 34 + 0.8(-2) = 32.4$
1995	31	$-1$	1	$-31$	$y = 34 + 0.8(-1) = 33.2$
1996	35	0	0	0	$y = 34 + 0.8(0) = 34$
	37	1	1	37	$y = 34 + 0.8(1) = 34.8$

1997					
1998	34	2	4	68	$y = 34 + 0.8(2) = 35.6$
Total	$\Sigma y = 170$	$\Sigma x = 0$	$\Sigma x^2 = 10$	$\Sigma xy = 8$	-----

$$a = \frac{\Sigma y}{n} = \frac{170}{5} = 34 \text{ \& } b = \frac{\Sigma xy}{\Sigma x^2} = \frac{8}{10} = 0.8$$

$y = 34 + 0.8x$

Trend line equation is  $y = a + bx \rightarrow$  For the year 1999  
 $\rightarrow x = 3 \ y_{1999} = 34 + 0.8(3) = 36.4$

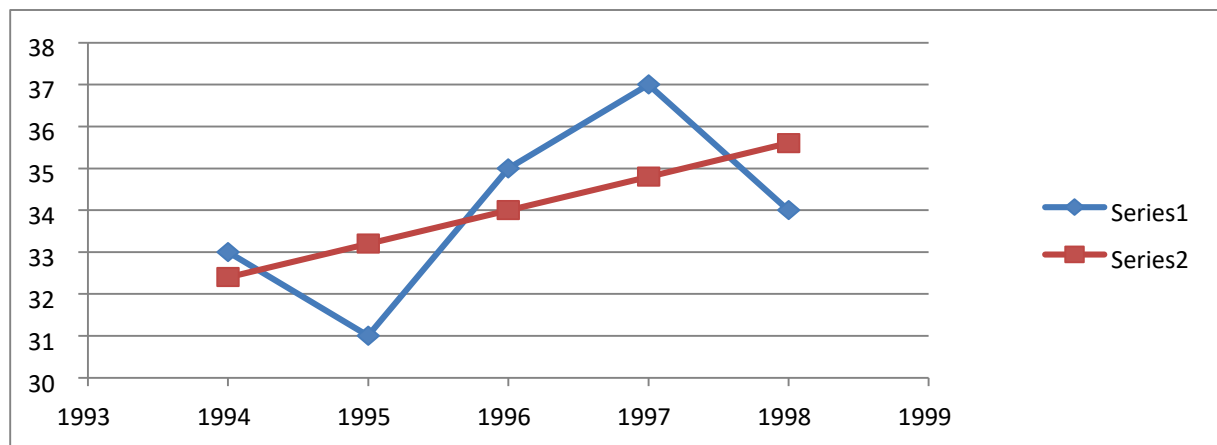


Figure No.:3

#### V.IEXAMPLE 4.

**Case – II** (n is even)

Year	2006	2007	2008	2009
Profit in k's	41	43	46	48

Fit a straight line trend for the following data & hence find profit for the year 2010.

Table No.4

Year	Profit y	X	x <sup>2</sup>	xy	Trend value $y = 34 + 0.8x$
2006	41	-3	9	-126	$y = 44.5 + 1.2 (-3) = 40.9$
2007	43	-1	1	-43	$y = 44.5 + 1.2 (-1) = 43.3$
2008	46	1	1	46	$y = 44.5 + 1.2 (1) = 45.7$
2009	48	3	9	144	$y = 44.5 + 1.2 (3) = 48.1$
Total	$\Sigma y = 178$	$\Sigma x = 0$	$\Sigma x^2 = 20$	$\Sigma xy = 24$	-----

$$a = \frac{\Sigma y}{n} = \frac{178}{4} = 44.5 \text{ \& } b = \frac{\Sigma xy}{\Sigma x^2} = \frac{24}{20} = 1.2$$

$$y = 44.5 + 1.2x$$

Trend line equation is  $y = a + bx \rightarrow$

For the year 2010  $\rightarrow x = 5$

$$y_{2010} = 44.5 + 1.2 (5) = 50.5$$

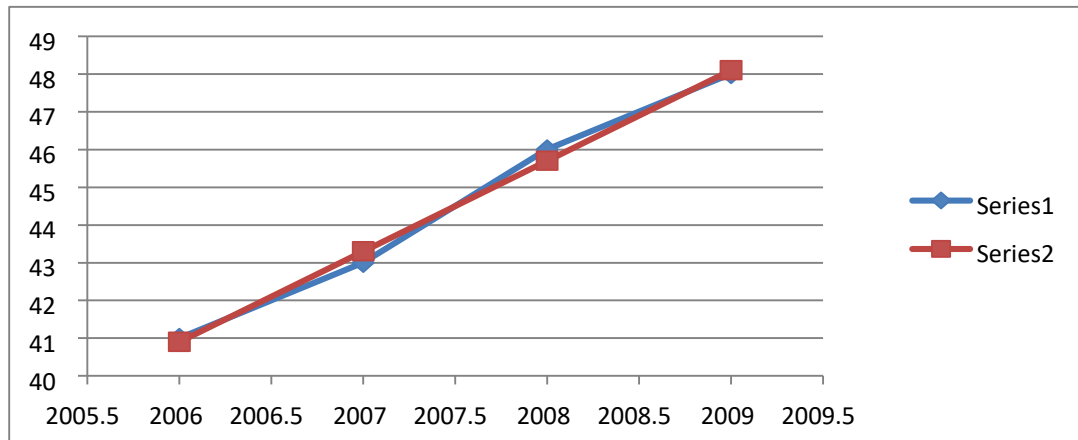


Figure No.4

## V.CONCLUSION

Thus we have studied that Time series analysis is a tremendous potential method for the study of behavioral sciences and longitudinal data, analysis have the potential to address research questions that could not be addressed, or only addressed indirectly, by cross-sectional methods. Time series analysis is one of the large numbers of computational procedures that have been developed specifically for the analysis of longitudinal data during the last thirty years.



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# Effect of increasing pollution and use of fertilizers and pesticides on the environment and human health

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**Abstract**—Today pollution is rising at an alarming rate; various human activities are responsible for it. The rise in pollution worldwide has affected the lives of millions of people, biological diversity, natural cycle is disturbed all around. Agricultural practices that play a crucial role throughout the life of every individual and for the economy of the country are devastated due to the extensive use of chemical fertilizers and pesticides in farming. Deadly diseases are rising due to pollution which has badly affected the health status of the population of a country. The use of chemical fertilizers and pesticides in farming increases rapidly after the Green revolution. This article provides a sketch of chemical fertilizers and pesticide effects on the environment and human health. It also provides the current health issues occurring in India and the upcoming scenario which could be the biggest obstacle for the development of the country.

**Keywords**— Agriculture, Diseases, Fertilizers, Health, Pollution.

## I. INTRODUCTION

The population is increasing rapidly to meet the present food demand of the society, agriculture must be practiced on a large scale. Due to the urbanization of villages and increasing factories and industries, an ample amount of land is not available for cultivation. The green revolution helped to meet this ever-increasing demand for food with the use of technologies in the field of agriculture. The use of chemical fertilizers and pesticides in farming has improved the growth of fruits and vegetables. At the same time, it badly affects the environment by polluting air, water, and soil. Studies have shown that more than 98% of the pesticides reach a destination other than their target and 50% of applied fertilizers are used by crops. Thus, remaining fertilizers and pesticides in the environment result in pollution. An increase in pollution gives rise to health issues which in the long term give rise to deadly diseases such as lung cancer, cardio disorder, kidney failure, etc. Studies of different institutes worldwide show that in the last 3 to 4 decades nutrient content of fruits and vegetable decreases; composition elements present in the soil decreases; fertility of soil decreases; groundwater, rivers, lakes are contaminated. Pollution is responsible for the death of millions of people worldwide; this even affects the GDP of a country. According to the World Bank, 8.5% of decrease in the GDP of India is due to expenditure on medical facilities and medicines provided by the Government. In the year 2017-2018, the Government of India allocates the subsidy of 70,000 crore rupees for chemical fertilizers and pesticides.

## II. AGRICULTURE WITH FERTILIZERS AND PESTICIDES

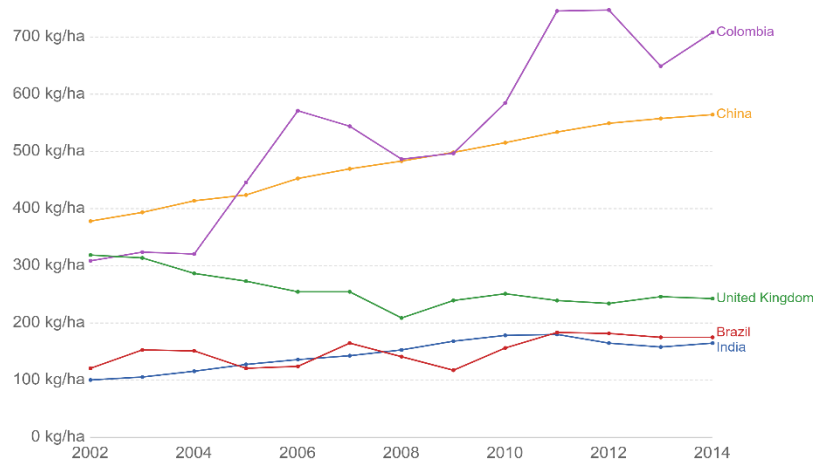
Fertilizers such as Urea (46% N), Urea (coated) (45% N), Ammonium Sulphate, Ammonium Chloride, Calcium Ammonium Nitrate (26% N), Calcium Ammonium Nitrate (25% N), Anhydrous Ammonia are used in farming. Fertilizers increase the nutrients content of the soil but at the same time, it also pollutes the soil. Synthetic fertilizers are by-products of naphtha such as urea-based fertilizers. These fertilizers require more water for their proper functioning which results in more water consumption. These fertilizers are absorbed by the plants through soil. Some amount of these chemical fertilizers even gets into fruits and vegetables which is finally consumed by humans and other herbivorous animals. Long-term consumption of such fruits and vegetables results in diseases. According to All India Institute of Medical Science, every year 2mg of urea is consumed by peoples indirectly.

The substances which are meant to control pests and weeds are known as pesticides. Pesticides such as herbicides, insecticides, fungicides, molluscicides, bactericide, etc. are used to protect crops from unwanted agents such as insects, fungi and weeds. The use of pesticides kills even the good insects such as bees which play a vital role in agriculture by pollination. In China, the

population of bees is too low that the farmers need to do hand pollination. Earthworms are even called the friends of farmers as they maintain the physiochemical properties of soil by converting organic waste and biodegradable materials into nutrient rich products which are also killed by the use of pesticides. Excessive use of pesticides results in the contamination of water, air pollution and soil pollution. Figures below describe the number of fertilizers and pesticides used by top agricultural producing countries.

**Fertilizer application rates over the long-run**

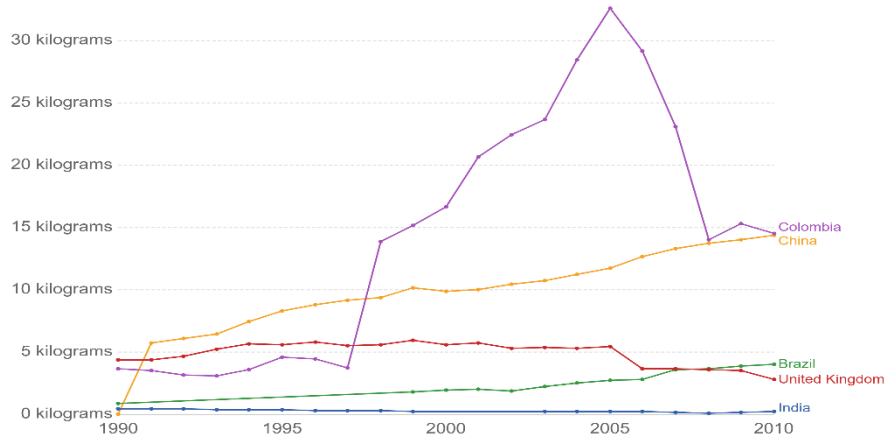
Average fertilizer application rates for select countries over the long-run, measured in kilograms of nutrient per hectare of arable land.



**FIGURE 1: Fertilizers use per hectare of cropland in year 2002 – 2014**

**Pesticide use per hectare of cropland**

Average pesticide application per unit of cropland, measured in kilograms per hectare.



**FIGURE 2: Pesticides use per hectare of cropland in year 1990 – 2010**

### III. EFFECTS OF USE OF FERTILIZERS AND PESTICIDES

In India, consumption of chemical fertilizers containing nitrogen, potassium and phosphorus are increased from 1 million tonnes in 1960 to 25.6 million tonnes in 2014-2015, while the consumption of pesticides increased from 55,540 tonnes in 2010-2011 to 57,353 tonne in 2014-2015. Extensive application of fertilizers and pesticides pollutes the environment by polluting air, contaminating groundwater and lakes, ponds, rivers, and polluting the soil. Plants use 50% of the nitrogenous fertilizers applied

to the soil, out of the remaining 2 to 20% lost in evaporation, 15 to 25% react with organic compounds and the remaining 2 to 10% interfere with the surface and groundwater. Urea fertilizers result in the evaporation of ammonia (NH<sub>3</sub>). Ammonia further oxidizes and turns into nitric acid, sulfuric acid from industrial sources and results in acid rain after this chemical transformation. Acid rain damages vegetation, organisms that live in both lakes and reservoirs. The soil has strong buffering power due to its components thus effects of chemical fertilizers are not seen immediately but over a long run element present in the soil decreases. Thus, degradation of the fertility of soil increases the demand for chemical fertilizers. Fertilizers containing more amount of Nitrogen, Potassium, and Sodium causes a decrease in the pH value of soil.

Indian Dietetic Association analyzed the report presented by the National Institute of Nutrition with the previous report published in the year 1989 and found that in the last 28 years micronutrients of soil essential for plants decreased in the last 30 years as shown in the table below.

**TABLE 1**  
**DECREASE IN CONSTITUENTS OF SOIL**

Sr. No.	Essential elements of soil	Decrease of constituents in percentage
01.	Boron	18.3%
02.	Copper	5.4%
03.	Iron	12.1%
04.	Magnesium	5.6%
05.	Zinc	4.3%

Nowadays in many urban regions of India vegetables and fruits are grown by using contaminated water, drainage water, etc. This results in the deposition of heavy metals in vegetables and fruits above the specified limit set by the Food Safety Standard Authority of India (FSSAI). Table 2 shows the comparison between the specified limit of heavy metals set by FSSAI and obtained results from vegetables grown near the Yamuna river at Akshardham point. The results obtained are tested in a laboratory registered by the government of India.

**TABLE 2**  
**COMPARISON BETWEEN MAIN METHOD**

Sr. No.	Heavy metals	Amount set by FSSAI (in ppm)	Amount of heavy metals present in tested samples of vegetables (in ppm)
01.	Lead	0.1	19.34 to 28.06
02.	Mercury	1.0	105 to 139
03.	Cadmium	0.1 to 0.2	2.30 to 3.42
04.	Arsenic	—	209 to 318

#### IV. CURRENT HEALTH ISSUES

Pollution has badly affected the lives of all living beings. Deadly diseases do not occur overnight, it takes time, shows many symptoms and can be cured if treatment is done on time. Proper diet and exercise could be very helpful to stay healthy, but the impact of increasing pollution causes many health problems directly or indirectly. Due to an increase in pollution, every person's

2 years of average life span decreases. Every year more than 7 million people die due to air pollution and more than 1.2 million people die due to unsafe water. In India, more than 840,000 children die before completing the first year of their lives. In the health statistics of the BRICS countries, India lies in the lowest position. According to world health statistics, India ranks 187th out of 194 countries. Globally cardiovascular diseases are the biggest reason for the death of 17.79 million people every year, followed by cancers (9.56 million) and respiratory diseases (3.91 million). According to the World Health Organization, more than 4.25 billion people suffer from diabetes. After China, India is the second country whose majority of the population is suffering from diabetes. In India, in the year 1991-1992 average sugar consumed per person was 12kg which has increased to 20kg per person in the year 2011-2012. In India 1 out of 10 people suffers from kidney diseases. According to the All India Institute of Medical Science report, in the last 20 years, 3 out of 5 people in Delhi suffer from high blood pressure. In the last 20 years, people suffering from high blood pressure increased from 23% to 43% in urban areas and from 11% to 29% in rural areas. According to World Health Organization in 2030, India will have more than 10 crore people suffering from diabetes and 23 lakhs 30 thousand crore rupees will be spent for their treatment which is more than 5 times of total health budget of India. Only 5% of the total population of the world is completely healthy.

National Institute of Nutrition researched on 528 food products collected from 6 different geographical regions and measured values of 151 nutrients present in it and published a report in 2017. In this report, it has been found that many essential micronutrients present in the food have decreased in the last 3 decades, while some of the micronutrients even increased. Table 3 shows the percentage change in the micronutrients of some of the selected food analyzed by the National Institute of Nutrients.

**TABLE 3**  
**PERCENTAGE CHANGE IN THE MICRONUTRIENTS OF SOME FOODS**

Sr. No.	Foods (/100g)	Carbohydrates (%)	Fats (%)	Protein (%)	Iron (%)	Magnesium (%)	Zinc (%)
		Present in g			Present in µg		
01.	Apple	-2.16	28	45	-60	15.57	50
02.	Banana	-13.12	10	2.5	-22	-14.68	-6.66
03.	Egg	—	-31.2	-0.15	-13.33	-7.61	—
04.	Mung bean	-18.64	-12.3	-6.12	11.13	55.9	-11
05.	Mustard seed	-29.41	1.23	-2.45	70.76	—	-16.04
06.	Potato	-34.11	130	-3.75	18.75	-19.76	-47.17
07.	Rice	0.05	4	16.76	-7.14	-78.55	-13.57
08.	Tomato	-11.11	25	-15.55	-65.62	—	-73.17
09.	Wheat	-9.1	-2	-17.26	-25	-9.42	5.55

## V. CONCLUSION

Today increasing pollution is the biggest problem globally, it is directly proportional to the increasing population. With an increase in population, demand for resources also goes on increasing but due to the limited resources available, new technologies and innovations are needed to fulfill this never-ending demand. The Green Revolution, the Industrial Revolution, Globalization are some of the significant steps taken to overcome these challenges but now its adverse effects are seen globally. Today we need a sustainable technology that maintains a balance between natural resources and urbanization. The use of eco-friendly things,

natural fertilizers, pesticides, and compost, instead of harmful chemicals will help us to maintain the quality of crops, air, water, and soil. If the environment in which we live, the water we drink and the food that we eat is healthy and pure, then most of the health problems can be avoided, as we all know, "Prevention is better than cure".

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# **SECTION F**

# **MECHANICAL**

## Design of Disc Brake System for an E-ATV

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**Abstract**— In an automobile system, the braking system is arrangement of various linkage and components such as brake lines and or mechanical linkages, brake drum or brake disc, master cylinder etc. that are arranged in such a way that it converts the vehicle's kinetic energy into the heat energy which in turn de-accelerate the vehicle and thereby stopping it. In a typical braking system, brake pads produce friction with the brake rotors to slow or stop the vehicle. Additional friction is produced between the slowed wheels and the surface of the road. This friction is what turns the car's kinetic energy into heat and causes wear. Disc brakes do a better job of managing heat than drum brakes. This causes them to experience less brake wear, which results in more consistent performance. A disc brake is a type of brake that uses calipers to squeeze pairs of pads against a disc or rotor to create friction and stopping the vehicle. The brake system of any vehicle is the most important safety system which helps to slow down or stop at a moment where it will help to avoid an incident or accident. The aim of this project is to design a disc brake system for an ATV by using basic engineering knowledge and constraints of braking. The paper includes designing of vital parameters which are required for braking such as forces, pedal design, brake disc, master cylinder etc. And thereby modelling it into CAD software.

**Keywords**—ATV, Brake System, Disc Brake, Design, Pedal Design.

### I. INTRODUCTION

The braking system is designed to decrease the velocity of the vehicle by converting kinetic energy to heat energy to ensure maximum safety. The vehicle's braking system is designed to be robust and provide better stability by locking four wheels simultaneously. The braking system is purely mechanical type. The disc is designed considering weight and also different dynamic factors which is imposed on the vehicle. Disc brake system has many advantages compared to drum brake system as it provides better cooling and is easy to service. Disc brake system is also compact and can be adjusted as per the space available in wheel assembly.

#### 1.1 Project objective: -

In order to achieve maximum performance from the braking system, the brakes have been designed to lock up all four wheels, while minimizing the cost and weight.

The main objective of the braking system is to stop the ATV within a patch of 5 meters.

The brake pedal must multiply the drivers input sufficiently to increase the braking performance.

#### 1.2 Braking system

By mounting the master cylinders on the top of the nose, we ensured easy maintenance. The master cylinder we have used is of Bosch Tandem master cylinder which has an advantage that it is pre-biased. Caliper selected is KBX Fixed type and has an advantage that it can be mirrored so as to keep the bleeding valve facing upward to ensure easy and effective bleeding. The material

we have selected for the brake disc is SS420 as it is easily available and has appropriate yield strength and can sustain high temperature. The pedal ratio of 6:1 for maximum leverage and power multiplication. Brake circuit is well balanced by varying the

size of disc and using different types of fluid lines. The mounting for pedals were designed considering the space availability inside nose of ATV.

## II. PROBLEM DEFINITION

The main objective is to stop the ATV within a patch of 5 meters with all the four wheels locked at once. The design of disc is done by considering various factors involved while the vehicle is in running condition. The ATV is supposed to stop at maximum velocity of 60kpmh. Also the weight is important factor affecting the braking performance and also affects the life of brake component

## III. METHODOLOGY

The braking system for our ATV can be improved by reducing the weight and the cost but keeping the reliability and performance of the system. The main objective for the brake team is to design and fabricate a system which is effective as brakes are important. Since there is no differential the rear braking system is inboard type and is attached at the output shaft of the gearbox, this will eliminate a lot of weight by using less part. The main goals were to reduce weight, cost, ease of maintenance. This was kept in mind while designing the brake disc. Weight is the main factor which affects the performance of the vehicle even if the braking system does not weigh much but we can lose some weight without affecting the performance of the ATV.

## IV. DESIGN CALCULATIONS

**TABLE 1**  
**DESIGN PARAMETERS USED IN CALCULATIONS**

Sr. No	Design parameters	Data
01.	Weight of the ATV (w)	250kg
02.	Velocity of the ATV	40kmph
03.	C.G Height (h)	450mm
04.	Stopping time (t)	1.5sec
05.	Wheel base (l)	1422mm
06.	Weight distribution	40:60

Tyre radius,

Front = 10" = 0.26m

Rear = 11.5" = 0.29m

Co-efficient of friction = 0.7

Weight of ATV at front

$$W_f = W * 0.4$$

Weight of ATV at rear

$$W_r = W * 0.6$$

Dynamic Weight

$$W_d = (h/l) * (w/g) * d$$

Dynamic Weight at Front

$$W_{fd} = W_d + W_f$$

Dynamic Weight of Rear

$$W_{rd} = W_d + W_r$$

Brake Torque,

Front

$$T_f = F_f * R_f$$

$$= 208.95 \text{ Nm}$$

Rear

$$T_r = F_r * R_r$$

$$= 280.65 \text{ Nm}$$

Where,

$F_f$  - Frictional force on front and rear

$R_f$  - Front rolling radius

$R_r$  - Rear Rolling radius

For effective radius,

$$F_c = T_b / \mu * n * R_e$$

Where,

$F_c$  = Clamping Force

$T_b$  = Brake Torque

$\mu$  = coefficient of friction of brake pads

$n$  = no. of frictional faces

$R_e$  = effective radius

Front effective radius = 70mm

Rear effective radius = 85mm

Front brake disc = 170mm

Rear brake disc = 190mm

Pedal design:-

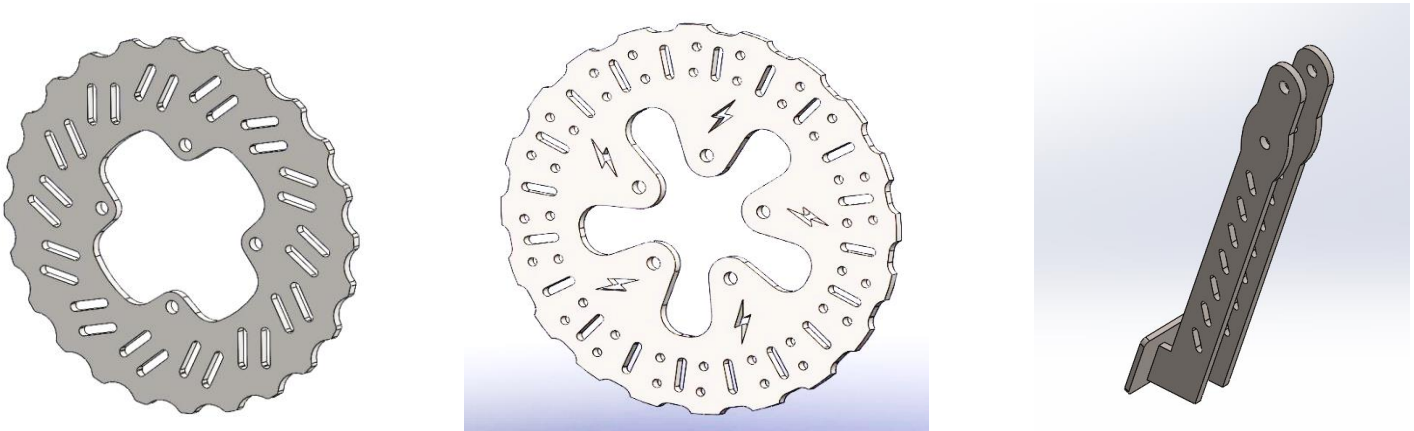
Pedal ratio = 6:1

Pressure from master cylinder = 6.20 N/mm<sup>2</sup>

Clamping force = 4375.45N

### V. MATERIAL

Material is selected by considering the machinability, weight, cost, and availability. We have selected Stainless Steel 420 for our brake disc and EN8 for brake pedal. SS420 has less coefficient of thermal expansion and also is resistant from corrosion. Carbon ceramics, Grey cast iron, Titanium alloys, Aluminium matrix composite are some materials used for brake rotor. Stainless steel was selected on the basis of cost, machinability, availability and properties mention in the table below.



**FIGURE: CAD MODEL OF BRAKE DISC AND BRAKE PEDAL**

**TABLE 2**  
**PROPERTIES OF MATERIAL USED**

Sr. No	Properties	Data
01.	Yield strength	345 MPa
02.	Brinell hardness	241 HB
03.	Mean coefficient of Thermal Expansion	10.3 $\mu\text{m/m.K}$ (at 0-100°C ) and 10.8 $\mu\text{m/m.k}$ (at 0-315°C)
04.	Thermal conductivity	24.9 W/m. K
05.	Melting range	1495°C
06.	Magnetic Permeability	High
07.	Corrosion resistance	High

## VI. COMPONENTS USED

**TABLE 3**  
**COMPONENTS**

Sr. No	OEM	Specification
01.	Master Cylinder	Bosch tandem master cylinder
02.	Brake Caliper	KBX single piston fixed
03.	Fluid Lines	Steel Braided flexible and rigid lines
04.	Brake Oil	MOTUL DOT 4

## CONCLUSION

With concern of efficient braking capability and increased driver and passenger safety, the braking system designed is such that it satisfies all the parameters of safety and ensures effective locking of all four wheels without skidding within shortest distance covered.

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# Analysis of Custom Parts of Hydraulic Braking System used in Electric All-Terrain Vehicle

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**Abstract**—Brakes is defined as the force applied on the rotating wheel axially on the brake disc to stop the vehicle. The braking system is the most important part in accordance of confirming the driver's safety. So, the components designed are safe or not is to be confirmed and if not then re-design by changing the parameters considered. To confirm the design of custom parts of braking system like brake disc and brake pedal is safe or not, analysis of this parts is performed before confirming the design. This paper briefly explains about "how analysis of brake pedal and brake disc are performed". The type of brake disc used is slotted brake disc and the pedal is a cantilever brake pedal. The software used to analyze these two components is Ansys and process used are steady state thermal (for brake disc) and static structural (for brake disc as well as for brake pedal). This paper deals with all the information, processes used and the calculation needed for designing and analyzing the brake disc and the brake pedal. It validates the design proposed and obtained after proper calculation of the designs.

**Keywords**—Analysis, Brake disc, Braking system, Brake pedal, Custom parts.

## I. INTRODUCTION

The braking system in the vehicle plays the important role in accordance with the driver's safety. The braking system used here is hydraulic braking system and type used is disc brake. As the type of brake used is decided considering that the disc used should dissipate heat as it leads to generation of heat after applying so type of brake used is disc type, it is important to understand that the brake disc used is safe and effective and provides effective heat dissipation while braking. This paper also gives us brief idea about analysis of the other parts of braking system i.e. brake pedal that are customized.

## II. OBJECTIVES

The main objective to do analysis of the custom parts of the brake system is to understand that the product designed is safe virtually as well as the theoretical calculation performed are correct. The analysis also helps us to understand the failure and stresses that may occur in the design. Accordingly, changes are to be made in the design and part is made safe to manufactures. Design of the disc for a disc brake system using load analysis, stress analysis and thermal analysis system approach [4]. This will not only ensure that the brake system designed is safe but it will also ensure the driver and passenger system

## III. MATERIAL AND METHOD

The following details are the parts that are to be analyzed and their specification are specified accordingly. The method used for analysis is based on the engineering subject named Computer Aided Design and Finite Element Analysis. This subject gives brief information about the analysis and designing of the component is safe and is ready for machining.

### 3.1 MATERIAL AND REASONING

The parts that are customized in braking system are

1. Brake Disc
2. Brake Pedal

#### 3.1.1 BRAKE DISC:

The brake disc is also known as brake rotor. This helps for effective heat dissipation of heat that is generated due to friction between the brake disc and the brake pad of the caliper. The brake disc type is further classified into three different types:

1. Slotted disc, 2. Vented disc, 3. Drilled disc

The difference between the above-mentioned disc types is mentioned below:

**I. TABLE 1**  
**COMPARISON BETWEEN DIFFERENT TYPES**

Sr. No.	Slotted	Vented	Drilled
01.	Have different slots of different dimensions	Have openings or vents to pass the air	Have drill hole of different size
02.	More heat dissipation than drilled disc	Heat dissipation is more than both other types	Heat dissipation is less than both
03.	Cost for manufacturing of this type of disc is not more than vented	Cost for manufacturing of this type of disc is very high	Cost for manufacturing of this type of disc is less than vented as well as slotted
04.	Less effective than vented for dissipation of heat and is light in weight	This type of disc is the most effective but weight is more than other two	This disc is less effective and is more in weight than slotted

Material used:

The material used for brake disc is SS-420. This material is selected because it is ductile, hard, strong, have magnetic property, malleable etc. the yield strength of this material is 360 MPa. The suitable hybrid composite material which is lighter than cast iron and has good Young's modulus, Yield strength and density properties.

Properties of Stainless Steel-420

Density: 7800 kg/m<sup>3</sup>

Elastic modulus: 200GPa

Thermal conductivity: 24.9 W/m.K

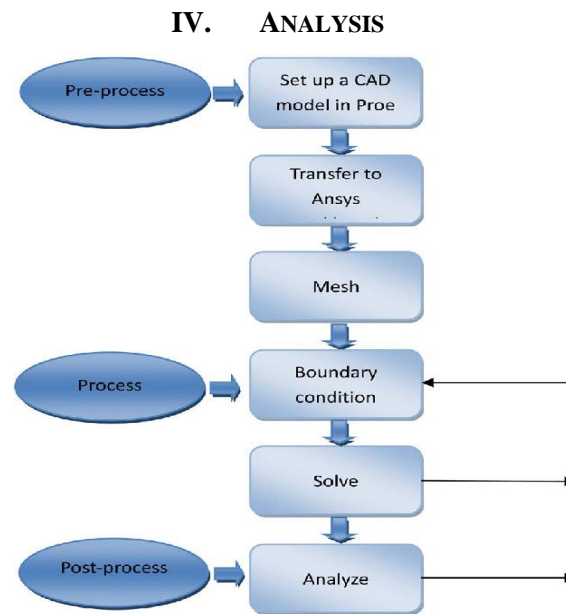
#### 3.1.2 BRAKE PEDAL:

The brake pedal system is the cantilever linkage which is assembled on the master cylinder and designed according to the master cylinder as well as the driver's comfort. The analysis of brake pedal tells us about the fatigue failure as well as the stress applied is safe or not. The force applied on the brake pedal is 350N and the pressure that oppose the piston attached to pedal. The brake pedal helps to actuation of the brake pedal. The material used is en-8 and the reason to use this material is it is strong, hard and have high fatigue strength.

### 3.2 METHODOLOGY

The software used for analysis of braking system is Ansys workbench. The analysis performed on brake disc is structural and thermal analysis and on brake pedal is structural and fatigue testing is done to understand the factor of safety. The analyses of this components will help to understand the design and calculation used are safe to perform the machining of the part with the selected material.

The material used is decided after testing the part design in Ansys under different conditions for different material. The material tested were grade of stainless steel-304, 316, 420. The brake pedal material decided is the strongest material therefore no other material was used for it while analysis.



**FIGURE 1: Flow chart for analysis**

The above figure [fig.1] is the flow chart of the basic process that is followed for performing the analysis of the customized part of the electric all-terrain vehicle. The first step of the analysis is called as preprocess which includes three sub parts. The first step of the pre process is to set up a cad model in pore and then transfer the cad model to the Ansys. After completion pf transfer of the cad model generate the mesh. The meshing helps to divide the model into small number of elements. The importance of this elements is, more the number of elements more accurate are the results. After completing the pre process the second step is to start with the process which includes boundary condition and solve the analysis to get the results accordingly. The third step is to observe the process done on the part is safe and the problems that can be caused and the changes are made for safe design so that the virtual cad model can be manufactured.

#### 4.1 Analysis of brake disc

##### Brake Disc:

##### 4.1.1 Design parameters of disc brake:

Brake rotor material = SS-420

Brake rotor dimension = 240mm

Yield stress of grey cast iron = 360 MPa

Pad brake area =  $2000 * 10^{-6} \text{ m}^2$   
 Maximum pressure = 8 bar  
 Maximum temperature =  $100^{\circ}\text{C}$

The brake disc analysis is carried in two ways:

**4.1.2 Steady State Thermal analysis:** The steady state thermal analysis is done because clamping force applied by brake caliper on the brake disc gives rise to temperature of brake disc. The brake fluid is passed through brake lines which actuate the piston of the caliper and apply pressure on the pad. The reason to use this method for analysis of brake disc is to understand that the brake disc is effectively dissipating the convection heat generated while braking and the problem that may be faced while braking or after braking due to heat. The boundary conditions applied for analysis of brake disc are convection, heat flux, radiation. This gave result for temperature.

The formula to calculate the pressure:

Force = Pressure \* Area

The SI unit is N ( $\text{kg} * \text{m} / \text{Sec}^2$ )

Formula for heat flux:  $Q = k * A (T_{\text{hot}} - T_{\text{cold}}) / d$

Q-Heat flux

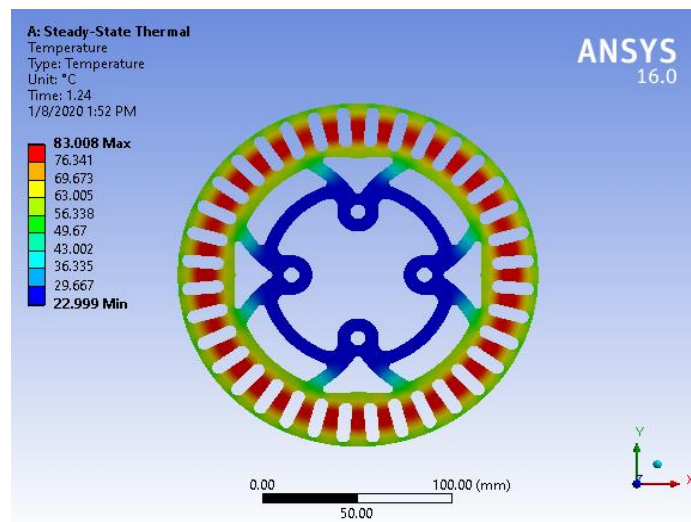
k-coefficient of conductivity

A-Area of Cross-section

$T_{\text{hot}}$  -Temperature after clamping

$T_{\text{cold}}$  - Initial Temperature

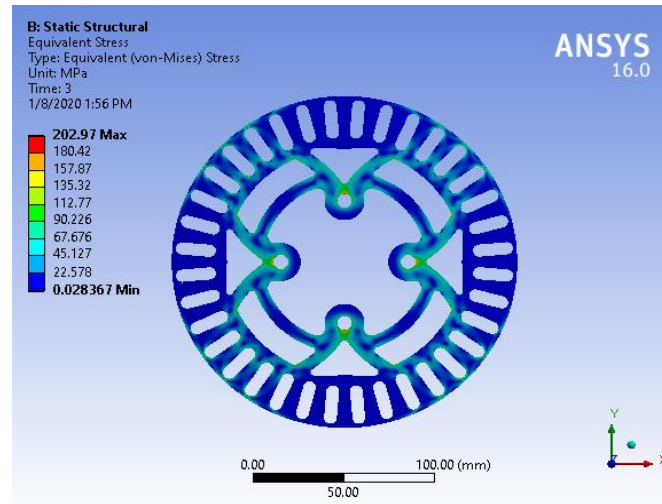
d-Diameter of Disc



**FIGURE 2: Steady State-Thermal Analysis of Brake Disc**

**4.1.3 Static Structural:** The static structural is one of the effective ways to determine the effects of the model that is designed and it also helps to determine the forces, damping forces etc. on the surfaces that induced significant loads and effects acting on it. The reason to use this method for analysis of brake disc is to understand that the brake disc is strong enough that it does not break on extreme stress condition also which is generated while braking and the problem that may be faced while braking or after braking

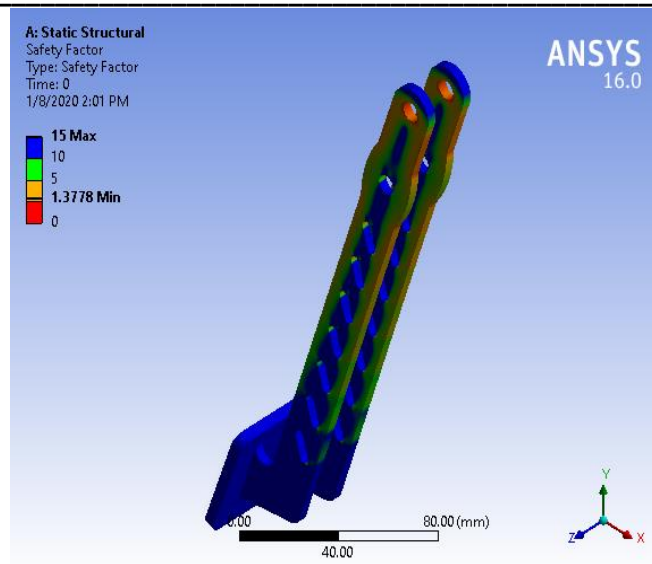
due to stress. The boundary conditions applied for analysis of brake disc are force and momentum. This gave result for Equivalent (von-mises) Stress. The equivalent stresses



**FIGURE 2: Static Structural Analysis of Brake Disc**

**4.1.4 Brake Pedal:** The brake pedal is used to actuate the braking system and it also multiplies the force applied by the driver on the brake pedal which make the vehicle to stop efficiently with less effort for that the pedal ratio is considered. The assembly of brakes is a cantilever assembly. The brake pedal ratio considered is 6:1. The boundary condition applied for fatigue testing of brake pedal are fixed support, remote force and normal force. The force applied by the pedal on the master cylinder piston is 6 times the force applied by the driver on the foot rest of the pedal.

The length of brake pedal is decided according to space available in the vehicle. The length is also considered according to pedal ratio of the pedal. The pedal ratio also helps to find the pivot point and mounting point on the brake pedal.



**Figure 3: Factor of Safety**

#### IV CONCLUSION

Analysis of the braking system plays an important stage as it validates the design and manufactured system to be suitable for the application in the vehicle. The approved system shows apt consideration of the parameters in which the vehicle is meant to endure. The design of this braking system is safe and is capable to stop the vehicle with locking all four wheels in shortest distance. The system designed is as safe as it can also be installed into the all terrain vehicle to lock the four wheel.

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# Design and Development of Low Cost Ploughing, Rice Transplanting and Harvesting Machine- A Concept

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**Abstract**— Rice Farming being one of the major occupation in India and it's plays a important role in the Indian economy. It is very essential to discover and implement new idea in this field, through lot of work has been done in this area. It is unfortunate that, these ideas are not being implemented properly in actual field. This is due to high cost, small farming area and lack of mechanization. The Conventional method of ploughing, rice transplanting and cutting of crop is a laborious process and hence for that reason there is a scarcity of labor's and basically, many farmers use bullocks and buffalo for farming operation. This will not satisfy need of energy requirement of the farming as compared to other countries in the world. This result in delayed farming crop, loss of man power and reduces productivity. Production practices to overcome these difficulties, we are thinking that human and animal efforts can be replaced by some advance mechanization which will be suitable for small scale farmer from economical and effort point of view. So, we are developing this machine which will satisfy all this need and to solve labor problem. A design and development of ploughing, rice-transplanting and harvesting machine. This farming machine is doing three operations i.e. ploughing, rice-transplanting and crop cutting.

**Keywords**— Low Cost Farming Machine, Mechanical Engineering, Multipurpose Agriculture Equipment's, Rice Farming Machine, Small Farming Machine

## I. INTRODUCTION

India is the largest farming country in the world after china. In total land of India the 60.43% land is used for farming and in which the 63% small and fragmented land holding. In spite of the large scale mechanization of agriculture in some parts of the country, most of the agricultural operations in larger parts are carried on by human hand using simple and convectional tools because of the high cost of machinery. Little or no use of machines is made in ploughing, transplanting and harvesting crops. This is specially the case with small and marginal farmers. Its results in low yields per capita labor force. The primary objective of this project is to design and development rice farming mechanical system which perform the ploughing, rice-transplanting and rice crop cutting operation by using only one power source the power source is used as a petrol engine and the attachment is the ploughing, rice-transplanting and harvesting equipment is attached or detached when its required for particular operation. The system is full flexible for small farming area and the making cost of system is low compare to the products are available in market.

### 1.1 Objective of Project

**1.2** The primary objective of this project is to design and development rice farming mechanical system which perform the ploughing, rice-transplanting and rice crop cutting operation by using only one power source the power source is used as a petrol engine and the attachment is the ploughing, rice-transplanting and harvesting equipment is attached or detached when

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its required for particular operation. The system is full flexible for small farming area and the making cost of system is low compare to the products are available in market.

### 1.3 Machine Description

This machine is doing three operations i.e. ploughing, rice-transplanting and crop cutting. This farming machine is driven by 198.88cc petrol engine that means only one power source are used. The machine is divided into four parts, Part-1 is the main machine, in this the power is transmitted by wheel and another three equipment, the equipment is attached or detached when it's required. Part-2 is the Ploughing attachment in this attachment the ploughing (Land preparation and Mudding) operation we can perform. Part-3 is the rice transplanting attachment it reduces human error and increases productivity. Rice seeds are placed in a seeding tray for 1-2 days and transplanted into the rice field by a transplanter. Transplanting is a method for the rice transplantation which increases rice growing rate. The equipment is used the concept of a quick return mechanism in order to transfer rice crop from seeding tray in the field with minimum damage. Part-4 is the harvesting equipment in this compact and can cut up to two rows of rice crops. It has cutting blades which cut the crop in a sliding motion.

### 1.3 Flied of Use and Benefits

Farming mechanization is an essential input to modern farming to decreases the human and animal effort and increases productivity. The need to mechanize the marginal and small farmer, and for inclusive growth of farm mechanization sector.

## II. PROBLEM DEFINITION

### 2.1 Problem Statement

To Design and Development a Rice-Farming mechanical system for the Ploughing, Rice-Transplater and Harvester using only one power source (Petrol Engine) and it's working on Belt-Pulley, Sliding and Quick-Return mechanism, the system is flexible for small farming area.

### 2.2 Objectives:

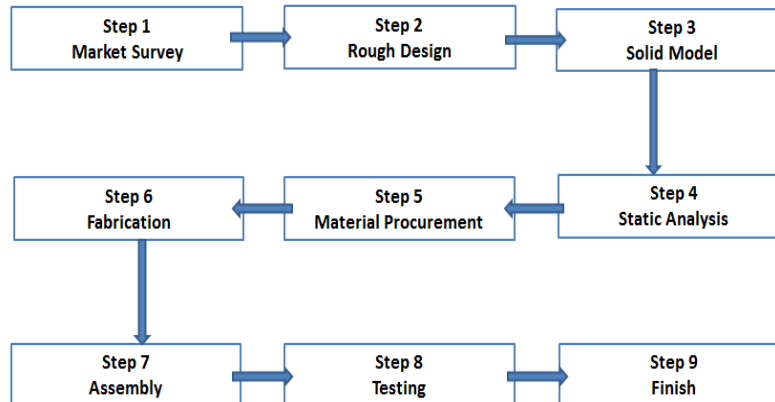
1. To increases the productivity
2. Specially design for small farming areas to the flexible working.
3. Low cost
4. Multipurpose machine with difference attachment
5. Compact in size

## III. METHODOLOGY

In order to overcome problems when manufacturing the system we making some step for manufacturing the system by using the standard procedure for manufacturing product, and by using this we improve productivity.

### 3.1 Methodology

Here we used following methodology to develop the system by increasing the productivity, decreases the manufacturing time and cost. The steps are following



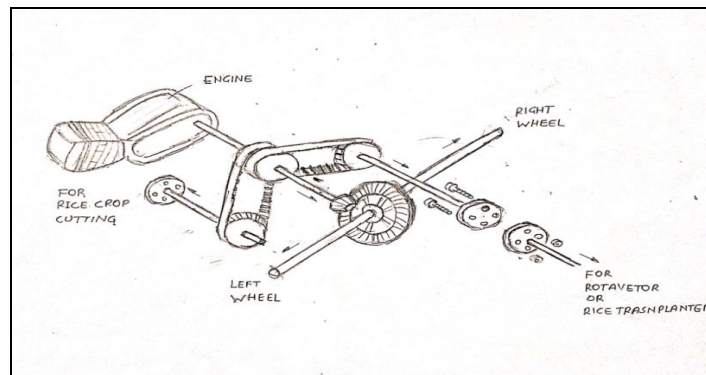
**FIGURE 1: Steps of Manufacturing**

#### 3.1.1 Step 1 Market Survey

In market survey we search all the equipment available in market related to our project topic, their cost and availability. Also we visited Agriculture Science Centre, Kosbad Hill, Dahanu and Agriculture Research Centre, Palghar for getting more information related to our project and its very useful to us for finalize the project.

#### 3.1.2 Step 2 Rough Design

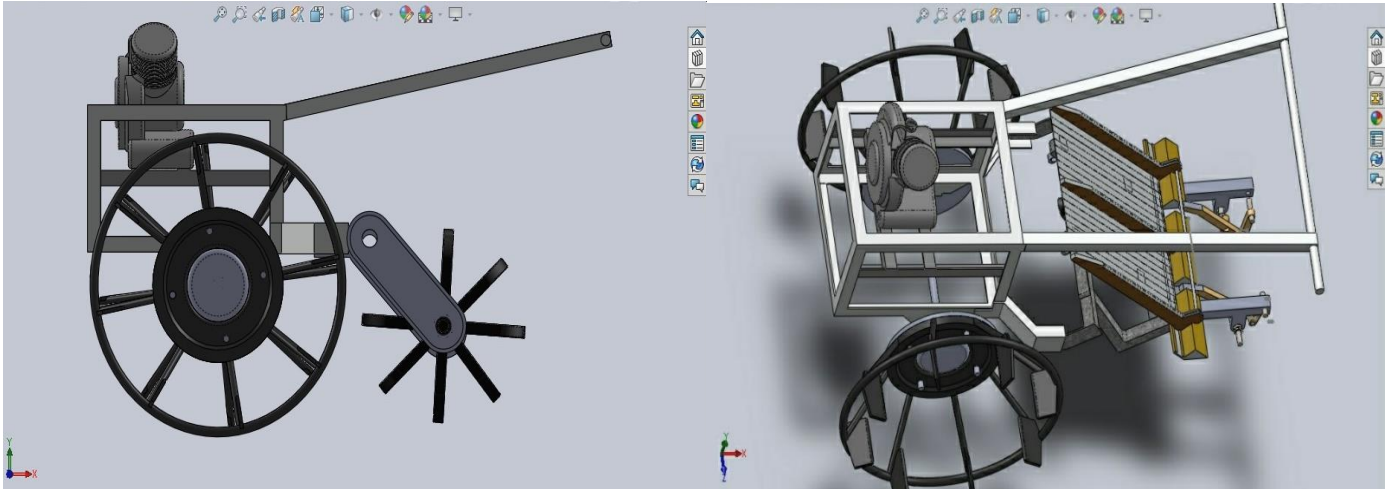
After market survey we making rough design of the project for the better understanding of its construction and working.



**FIGURE 2: Rough Design**

### 3.1.3 Step 3 Solid Model

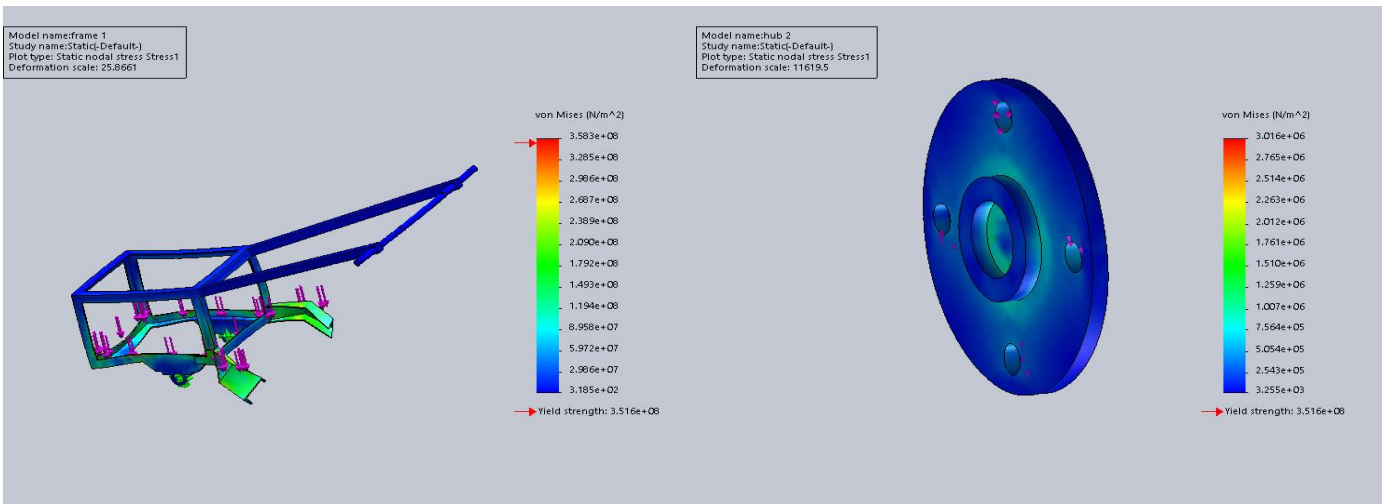
The solid model is finalized model of project by using this model we confirm the dimension and the motion of equipment's. By solid modelling of project we visualise how project is look after manufacturing. Here we used Solidworks software version 2018 to create solid model.



**FIGURE 3: Solid Model**

### 3.1.4 Step 4 Static Analysis

The main purpose of analysis is to check the machine is withstand with the given load or not without making actual model. For analysis of project we used Solidworks Simulation software version 2018.



**FIGURE 4: Static Analysis of Chassis and Hub**

### 3.1.5 Step 5 Material Procurement

Following material and part are required for the manufacturing the system

**TABLE 1**  
**REQUIRED MATERIAL AND PARTS**

Sr. No.	Part Name	Sr. No.	Part Name	Sr. No.	Part Name
1	Engine	8	Spur/ Helical Gears	15	L-Section
2	Cage Wheel	9	Pulley	16	C-Channel Section
3	Bearing	10	V-Belts	17	Square Shape Section
4	Rotavetor Shaft	11	Sprocket	18	Metal Sheet
5	Transmission Shaft	12	Chain	19	Flange Coupling
6	Constant Velocity Joint	13	Clutch	20	Metal Pipe
7	Bevel Gear Set	14	Brakes	21	Nuts and Bolts

### 3.1.6 Step 6 Fabrication

The fabrication is the actual manufacturing process of the project according to the specification. In fabrication we making chassis, hub, transmission part, rotavetor part, transplanting equipment part, harvesting equipment part etc.



**FIGURE 5: Fabrication**



### 3.1.7 Step 7 Assembling

After fabrication next step is assembling in this the all parts and equipment are assemble

### 3.1.8 Step 8 Testing

When all parts are assemble we tested them for the checking the equipment's its proper working or not.

### 3.1.9 Step 9 Finish

In the finishing of the project we do final touches of the project by polishing and painting.

## IV. CONCLUSION

This farming machine has considerable potential to greatly increase productivity of rice crops. So, We are design and developed ploughing , rice transplanting and harvesting rice farming machine which will do multiple-operation i.e. ploughing, land preparation , mudding, rice transplanting and rice crop cutting . The machine solid model is successfully tested on motion analysis and stress, strain and displacement simulation. After the solid model testing we started the actual manufacturing process of build the machine.

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# Design and Fabrication of Temperature Controlling Mug by Using Peltier Effect

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**Abstract**— Now-a-days, every individual prefers to have beverages at their desired temperature. Due to the atmospheric conditions, any beverages tend to naturally approach to the room temperature. This causes a hindrance in maintaining the desired temperature of the beverage. There are various devices which help to maintain the desired temperature of the beverage. The devices available for maintaining the desired temperature are non-portable and support either active cooling or active heating. The proposed model is based on active cooling and active heating of the beverage according to the user's requirement. The model uses a principle of Peltier effect for maintaining the desired temperature. The model not only assists temperature variation but is also feasible due to its compact structure. It is a user friendly model which acts as a closed loop control system, that is, the temperature of the beverage is controlled by the peltier according to the user's requirement.

**Keywords**— Active Cooling, Active Heating, Peltier effect, Peltier module, Temperature Variation.

## I. INTRODUCTION

The Peltier effect is the reverse phenomenon of the Seebeck effect; the electrical current flowing through the junction connecting two materials will emit or absorb heat per unit time at the junction to balance the difference in the chemical potential of the two materials. Thanks to this effect, an electronic refrigerator can be made, which is known as the Peltier cooler. The Peltier cooler has been applied to niche areas such as infrared detectors, CPU coolers, wine cellars, etc., because the cooling power is lower than that of compressor-based refrigerators.

### 1.1 PROBLEM STATEMENT

For cooling any beverage, refrigeration is one of the most common techniques, similarly heating a beverage also requires various equipment's but being non- portable in nature it becomes infeasible to carry it everywhere. Many devices provide either of the features that is, cooling or heating of the beverage. The proposed model helps to maintain the temperature of the beverage according to the user's requirement. It is a rechargeable portable device which can be easily handled. The model is user friendly equipment which allows the user to adjust the temperature of the beverage.

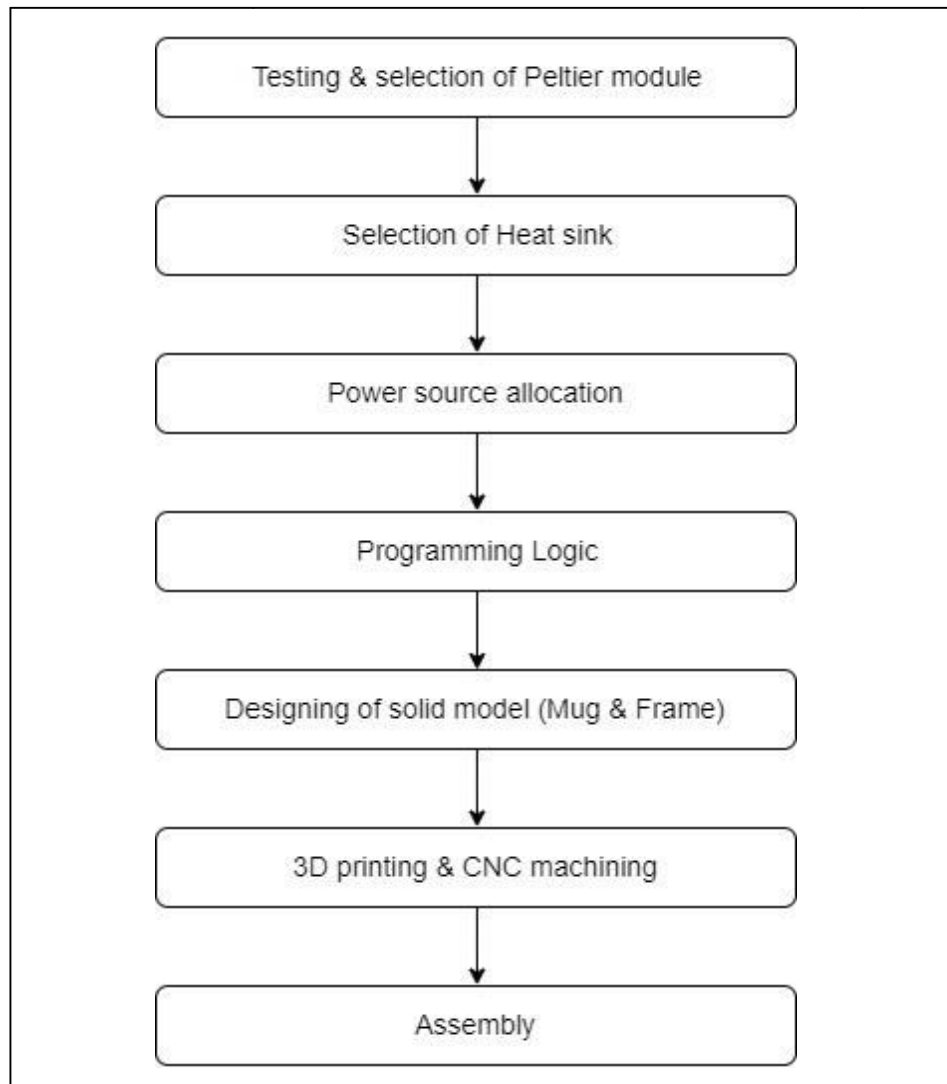
### 1.2 OBJECTIVES

The main objectives of the proposed model are:

- To provide Active heating and Active cooling of the beverage as per the users requirement.
- To develop a user friendly Portable unit that can be carried out by the user with ease.
- To maintain the temperature of the beverage as per the user requirement.

## II. METHODOLOGY

To provide feasible and economical solution for the problem, a brief study and research work has been carried out in the following manner:



**FIGURE 2.1 System Methodology**

- Testing & selection of Peltier module:

The selection of the Peltier module is based on higher rate of heat transferring between the two sides. It is also essential to have a lower rate of power consumption as the model has an independent power source which needs periodic charging. The last selection factor involves lower internal conduction in the Peltier plate.

- Selection of heat sink:

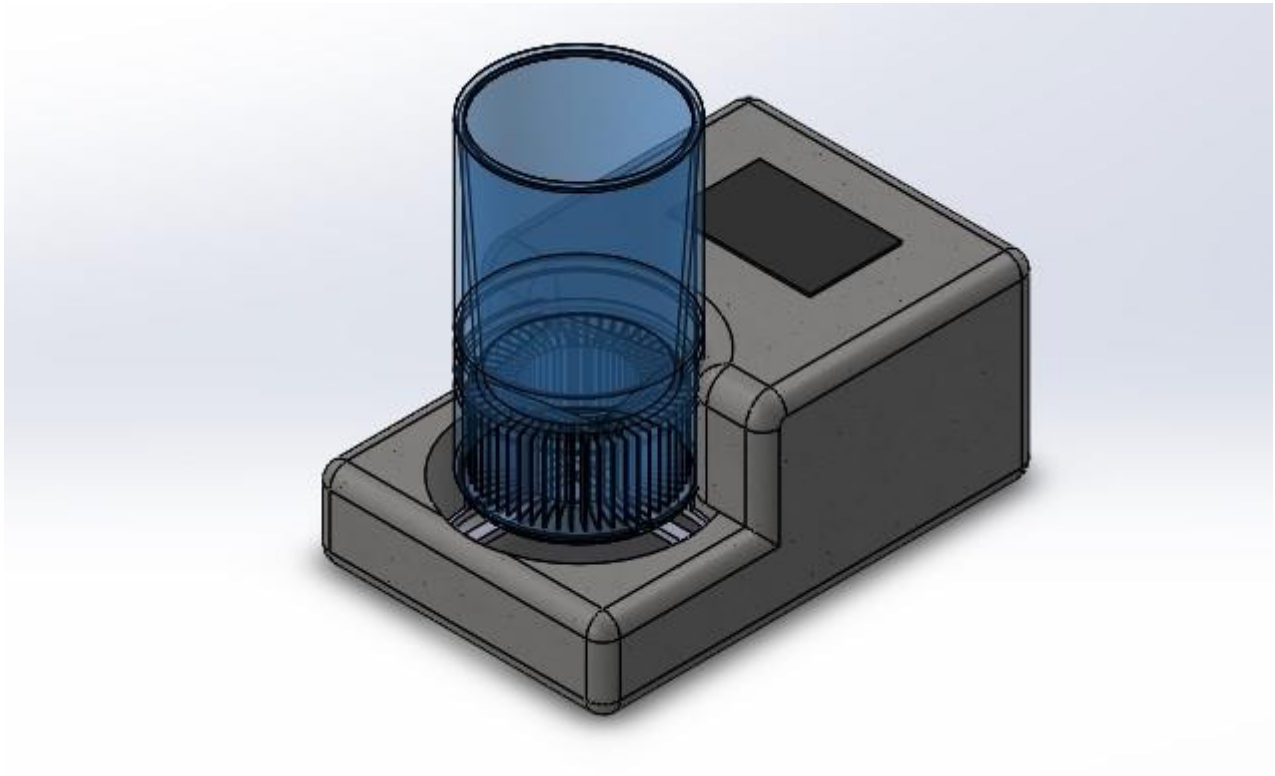
A high amount of heat produced by the Peltier module while the active cooling, to avoid the internal conduction of this heat a highly effective heat sink is to be provided. As weight and size are a key constrain into the project modelling forced air convection cooling heat sink is selected.

- Power source allocation:

The Peltier module and the forced air convection heat sink both required a power supply to operate, a battery is provided to fulfil this power demands. Li ion battery is selected as it light in weight and easily rechargeable by an external power source. A direct current Li ion battery is customized. The embedded closed loop system is also powered by the same unit.

- Programming logic:

The programming logic of the embedded system are operated on microcontroller as it an open source and can be easily integrated with various peripheral devices. The microcontroller is used to sense the temperature and variations into the beverage and accordingly adjust temperature. The microcontroller also handles the GUI of the model.



**Figure: 2.2 Design of the Prototype**

### **2.1 ADVANTAGES**

- Instant Active Heating and Active Cooling of the Beverage
- Low power consumption
- Mobility

### **2.2 LIMITATIONS**

- High initial cost.
- Size Constraint.

## **III. CONCLUSION**

Different Peltier modules were tested during the process. Power supply is the main factor acting here so the battery was tested and verified by several experiments conducted. By combining all this equipment's a product can be made which will maintain the temperature range between 15°C to 50°C. This project aims to work in between this given range and produce efficient results on it.

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# Inventory Management & Analysis in Small Scale Fastener Industry

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**Abstract**— *The Inventory Management System is a real-time inventory database capable of connecting multiple stores. This can be used to track the inventory of a single store, or to manage the distribution of stock between several branches of a larger franchise. However, the system merely records sales and restocking data and provides notification of low stock at any location through email at a specified interval. The goal is to reduce the strain of tracking rather than to handle all store maintenance. Further features may include the ability to generate reports of sales, but again the interpretation is left to the management. In addition, since theft does occasionally occur, the system provides solutions for confirming the store inventory and for correcting stock quantities. Project also helps to understand the system to control the inventory. At different level with different problems. It helps to give the information On Kanban, Just in Time, Enterprises Resource Planning.*

**Keywords** (Inventory Management, Just in Time, Kanban, Restocking, Stock)

## I. INTRODUCTION

Industrial Engineering Corporation is on a 1, 55,000sq.ft.site in the vasai suburbs of thane, Maharashtra. Plant converts 8000 metric tons of steel per year into millions of fasteners. Fasteners manufacture as per required standard has long been the product that IEC has been proudest to put its head mark on. IEC represent the benchmark in fasteners quality and is considered the prime source of innovation and technology in India. As world markets continue to change and issue new challenges to India's manufacturing, so IEC evolves to meet those challenges and ensure that the brand maintains the highest levels of quality and satisfaction to its customers. IEC has over 4 decades of experience in fastener manufacture. The lessons learnt over this time now go into ensuring even the most complex fasteners are forged strictly in accordance with the specifications. One advantage is that the entire fastener – including the tool design, forging heat treatment and plating is done under one roof. It is this level of security that results in high quality product. IEC is manufacturing and exporting wide range of fasteners such as Bolts, Nuts, Washers, Studs, Foundation bolts, Threaded bars, Sag rods, Tie rods, Clamps and other items conforming to rigid international standards such as DIN, ASTM, BS, ANSI, JIS, IS, AS and ISO. The company's products are used in building automobiles, Railway wagons, Ships, Agricultural Pump sets, Electronic equipment's, Setting up Steel, Cement, Paper, Petroleum, Fertilizer plants and construction of Hydroelectric, Thermal, Atomic power stations.

**PROBLEM DEFINITION** - In store department, store keeper has to maintain the whole inventory record properly. But in IEC store keeper has to keep the record of inventory as well as he has to maintain the record of all material which enters in to company. He has to unload the vehicle, with the help of worker, and maintain the register for material in which he keeps the record of challan no, challan date, material description, party name, sign of person who gave order for it. He has to also maintain the register for inventory in the same way, in which he has to keep the record like, date on which the material was issued to worker and in which department the worker works and the quantity that he has given to him. In store, every entry related to the material and inventory is maintained in register manually. It takes lot of time, it looks very tedious and more complicated, and the environment was not like user friendly. All the information is not placed separately, it is more time consuming, lot of paper work, slow processing, and the whole process became headache to the store keeper.



## II. OBJECTIVE

The main objective of this project is to implement the proper system in store for proper inventory control.

- To keep computerized record in store.
- To Control the proper record of inventory with help of different software's or technique.
- To do proper planning for inventory.
- Try to reduce the dead investment
- Implement the proper technique which will give us all the information In one click, like overall investment beyond the process inventory per annum, month or week. What are the inventory we have in stock , in which quantity we have, what type of product we require commonly, what are the price of that products, and so on which overall help us to reduced cost of inventory.
- Try to save the time or reduced time which is required for the marinating the record of inventory.
- To keep the track record of inventory.
- To reduce the cost of inventory.
- To reduce the waste of inventory.
- To save the time.
- Save paper work

## III. MATERIAL AND METHOD

IEC have many years' experience in the manufacture of fasteners in a wide range of materials. Our range of strategic bar stock gives us the ability to offer a rapid delivery response time in order to meet customer requirements. Our scope of supply includes, but is not limited to, the grades are

**TABLE 1**

Sr. No.	Item	Grade
1	Bolt	IS : 4.6, 4.8, 5.6, 10.9
2	Stud	ASTM : B6, B7, B7M, B16, B8, B8M
3	Nut	IS : 4, 5, 6,



**FIGURE 1: Bolt**



**FIGURE 2: Stud**



**FIGURE 3: Nut**



**FIGURE 4: Foundation Bolt**

After observing the problems in store which is already mentioned above, we try to find out the solution on it. After researching on web, books, articles we find out some solution to eliminate the problems the store department is currently facing. That is Instead of maintaining the record manually on register, keep the record in computer. Implement the software which is made for inventory control or in which there is module for control of inventory. To implement this software there is high initial investment and it also requires a proper training of six months to twelve months to operate properly. IEC has its own software which has modules as per the company requirement. We can tackle the problem of inventory control, if we add one module in which we can maintain all record of process inventory. Like Overall investment beyond the process inventory per annum, month or week. What are the inventories we have in stock, in which quantity we have, what type of product we required commonly, what are the price of that products, Period of replenishment, etc. What are the products mostly used in current month in how much quantity. It also help to create a record to who process inventory has given, in which quantity, on which date and time, in which department he work etc. It also helps to maintain the record of semi-finished product which is ordered by an engineer.

#### IV. CONCLUSION

Inventory management must be related to an accurate record of the finished product that is ready for shipment. This usually means posting the production of the newly completed product to the total inventory and subtracting the finished product that was last issued to the buyer. When a company has a return policy, the finished goods inventory usually contains a subcategory that describes any classified or secondary quality returns. Accurately keeping records of finished goods inventory, you can quickly communicate to sales personnel about available goods and ready to ship at any given time. Inventory management helps reduce costs while meeting regulatory requirements. Supply and demand is a delicate balance, and inventory management wants to ensure that the balance is undisturbed. Well-trained inventory management and high-quality software will help make inventory management a success. The results of inventory management investments will be reflected in the form of increased revenue and profit, a positive employee climate and overall customer satisfaction.

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## Development and Control Design of Fire Fighting Uav

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**Abstract**— This project is to design and control a UAV to use it as a fire extinguisher. As we have seen in various accidental fires taking place at heights the fire fighters are failing to do their work or mission of extinguishing the fire efficiently. This drone which is going to be built can be used by the fire fighters as a tool to reach heights where their cranes or ladders cannot reach. This drone. The loss of human life and property will be cut down due to this drone. To make this possible we have made use of a PIXHAWK controller to control it. This UAV is going to be helpful in dangerous fire situation as there wouldn't be any human contact in it. To overcome the problem of high payload we make use of Octa-copter as it will be giving higher payload. The designing of UAV will be done using SOLIDWORKS and it will be analysed for various stresses and forces on ANSYS software. Here we are building a prototype which will fly up to a height of 15 to 20 feet with water supply from the ground.

**Keywords**— Controller, Drone, Fire, Payload, UAV.

### I. INTRODUCTION

An Unmanned Aerial Vehicle (UAV) is an expression that identifies an aircraft that can fly without pilot; that is, an airframe and a computer system which combines sensors, GPS, servos, and CPUs. All these elements combined have to pilot the plane with no human intervention. Another usual definition is that of an aircraft which is capable to fly in an autonomous way and operates in a wide range of missions and emergencies that can be controlled from a ground base station. The UAV's size, type, and configuration could be different and depend on the actual application. There is no doubt today that a huge market is currently emerging from the potential applications and services that will be offered by unmanned aircrafts. More precisely, UAVs can be applied in so-called "D-cube" missions. Mission identified as Dangerous, Dirty, or Dull. If we pay attention to civil applications, a wide range of scenarios appear. For instance; remote environmental research, pollution assessment and monitoring, fire-fighting management, security; e.g., border monitoring, agricultural and fishery applications, oceanography, communication relays for wide-band applications. In general, all of these applications can be divided into four large groups: environmental applications, emergency-security applications, communication applications, and monitoring applications. Nowadays, and after many years of development, UAVs are reaching the critical point in which they could be applied in a civil/commercial scenario. However, we believe that there is a lack of hardware and software support to effectively develop such potentialities. Basically a UAV is automatically piloted by an embedded computer called the Flight Control System (FCS). This system reads information from a wide variety of sensors (accelerometers, gyros, GPS, pressure sensors) and drives the UAV mission along a predetermined flight plan.

## 1.1 Fire Fighting Drone

In today's world with high skyscrapers there is a problem for fire fighters to reach such heights due to lack of equipment. We have seen various incidents that due to lack of equipment. There were many casualties and failure of firefighter to extinguish fire. To overcome the problem drone can be used as a helping hand or a part of firefighting tool to overcome fire by taking water pipe with it at height where the ladder or cranes of fire fighters can't reach thus we are designing a prototype on the experimental bases to reach up to the height of 15 feet.

## 1.2 Features

- This drone will be can be used as a tool by the firefighters.
- This drone as it is an octa-copter it will have high payload.
- This will save loss of human life as there is no human intervention.
- It will be easy to handle and operate it.

# II. PROBLEM DEFINITION

## 2.1 STATEMENT

We have seen that due to various fire accidents occurring in industrial, commercial and residential buildings which are too high for the fire brigade or the fire fighters to reach there has been a considerable amount of loss of life and property. Due to technological advancements the heights of the skyscrapers or buildings is only increasing, on the other hand the fire fighters are lagging behind to carry on their motto or aim of extinguishing the fire when it comes to a height where they fall short of equipment's to reach such height.

## 2.2 OBJECTIVE

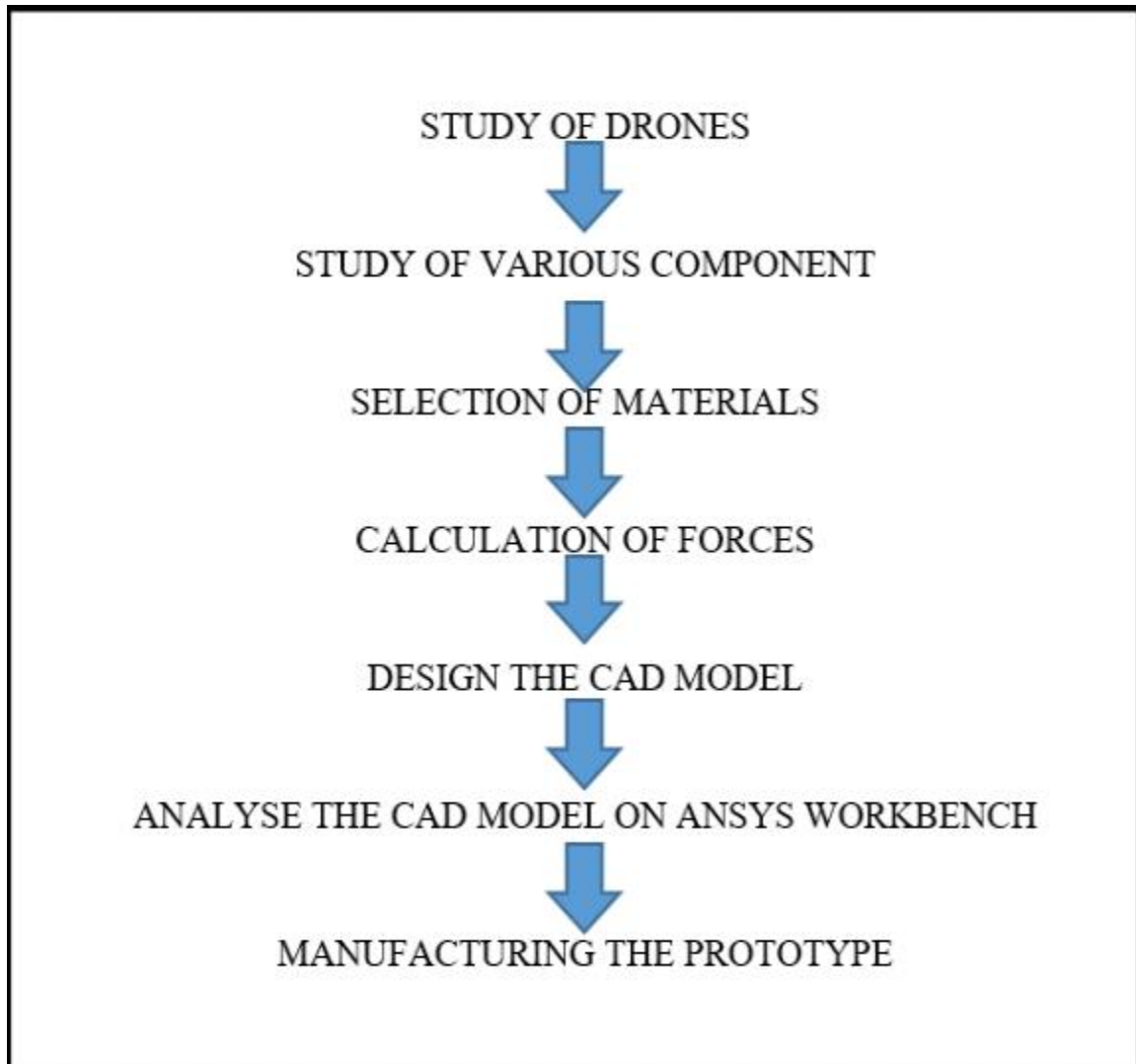
- To make a drone which can be used as a helping hand or equipment by the firefighters.
- To make the drone such that it will be able to carry the load of water with it to a great heights where the cranes or ladders of the fire brigade cannot reach.
- To study various programming language and apply it to make the drone work for fire extinguishing.
- To make the drone such that it can be controlled by any person i.e. easy to handle.

## 2.3 ASSUMPTIONS

As we are building just a prototype our assumptions are

- The drone will be restricted or will fly to a height of 15-20 feet.
- The force due to air is zero.

### III. PROPOSED METHODOLOGY



**FIGURE 1: Flowchart of methodology**



#### IV. CONCLUSION

We have successfully designed a drone that can be used by the fire fighters as an equipment for extinguishing fire. To do so we went through various research papers which helped us to understand which sensors to be used. As we know the main issue that comes across when it comes to drone is the flight time so to cut down this we have replaced the batteries with direct supply from the ground. We have designed an octa-copter as it has higher payload as compared to the quad and hexa versions. We have used various sensors for stabilization like the gyro sensor, PIXHAWK controller. We have even made various calculations of stresses and forces that will be needed to fly the drone. We also studied various motors and which motor will be applicable for our drone.

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## **Fabrication and assembly on custom parts of Hydraulic Braking system used in ATV**

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**Abstract**— In an automobile vehicle, braking system is an arrangement of various linkages and parts which works together in co-ordination to stop or restrict the motion of vehicle. The braking system is the most importance in accordance of conforming the driver's safety. so the components were manufactured after the design and analysis of the brake parts are properly done and also proper material selection is done for parts to manufactured there are three parts of brakes which are manufactured which the other parts are purchased from the market so the brake pedal, brake disc and brake mountings are components which are manufactured by using different manufacturing process, machines etc. [1]. The parts are efficiently manufacture so there is no wastage of material so proper dimensions with weight is calculated and after manufacturing of these parts proper arrangement is the major issue in the Electric ATV as there is a space related constraints and also the drivers ergonomics is taken into consideration after manufacturing of certain parts certain brake parts are arranged such as brake lines so while manufacturing braking parameters all these parameters are taken into consideration so this paper tells how "how fabrication and assembly of braking system is done in Electric ATV" so this paper tells about in short how the production of certain parts takes place and how properly he parts can be arranged in an assembly

**Keywords**— *Braking system, brake disc, brake pedal, brake mountings.*

### **I. INTRODUCTION**

The work presented in this report is based on how the fabrication and assembly of Hydraulic Braking system is done in electric ATV. First thing before manufacturing and fabricating the components are designing and analyzing the components of braking system by the design and analysis department is done and according to that the material selection and also proper manufacturing technique is selected and main focus proper arrangement of brake assembly according to driver ergonomics .driver safety is the main reason for which this system is manufactured so the main factors for selecting the material is good machinability ,magnetic properties , good thermal conductivity we selected different material for brake disc for testing purpose.

#### **1.1 Project Objective: -**

proper working of braking system i.e. subsystem like brake pedal, brake disc and master cylinder mount should not fail at any condition and also the brake assembly should be done in such a way that it should not affect the driver ergonomics and also the assembly should not affect the fabrication of other department in electric all-terrain vehicle. So, we consider all the parameters while fabricating it in our electric ATV.[2]

#### **1.2 About Project: -**

we are doing our project on electric ATV which is an all-terrain vehicle in these we have[ various people working on various system of ATV but we are actually focused on driver safety that is basically provided by the hydraulic braking system so we have design and analyzes this system parts in cad software's parts such as brake disc, brake pedal and master cylinder mount and

brackets required for braking which are manufactured while the remaining parts are brought or directly purchased from car market that are called oem's. In our ATV there is an inboard braking system used in rear side so as to reduce the weight and cost of the vehicle. In these inboard system the brake disc and caliper assembly is mounted on the gearbox basically on the drive shaft so that while braking it would actually stop the transmission system for transmitting the power to the rear wheels of vehicle so for that parts of system the manufacturing is done according to the need of for transmission and brake department work together for that kind of case.[3],[7] Material selected for manufacturing of components are SS 420 and EN8 and the machining technique used for making those components by the help of this material is laser cutting brake disc along with spares were made in laser cutting the time consumption while using this technique was less so other parts were also manufactured by using those technique the after that proper assembly of the parts was done in the vehicle by the help of brackets which were welded on the vehicle for assembly of the components and for connecting the components to the bracket Allen bolts were used for that purpose after assembly of all brake parts bleeding was done and checked whether the braking system is working properly in steady condition that while pressing the actual pedal assembly the and actual testing we see whether the braking system work is properly when the vehicle is in moving condition.[4]

## II. PROBLEM DEFINATION

Manufacturing is a critical phase which should be properly done if any problem takes place while selecting any manufacturing process it may lead to failure of the brake component as in the case we made the pedal assembly components by plasma arc welding but there were some problems in the components which were manufactured by this process and also while welding the brackets or mount of brake assembly there were some issues such as excessive material was introduced in the welded section or due to this expansion or retraction of those brackets takes place which leads to improper assembly or disturb the entire braking system[5]

## III. PROPOSED METHODOLOGY

The braking system can be properly manufactured and assembled by overcoming the above problems by bringing effective solution over this basically first step by selecting proper material for manufacturing of brake components such as brake pedal, brake disc, brackets and mounts for the brake assembly so for brake disc only ss420 sheet was used while the other parts such as pedal, brackets and mounts are made up of en8 sheet as the cost of the material is less and also easy availability after selecting and buying the next step is selecting proper machining operations for manufacturing brake components so laser cutting was considered as plasma arc produced some changes in dimensions so for getting those dimensions we used laser cutting instead of laser cutting but after laser cutting also there were problems so as there were deflection in brake disc due to that high intensity laser so this can be done by using lapping process and then the brackets were welded by the help of normal welding by some packing were placed between the brackets before welding so that the expansion or contraction of the brackets may not place and also due to this proper braking assembly can be done in rear side to reduce the weight inboard braking system is used to make the rear disc the we discussed this with the transmission and according to that the disc is manufactured as this brake disc is to be attached to gear box so if the proper clearance is maintained and main factor is if this is working properly or know. And other parts of braking system are purchase from markets and assembled to the electric ATV so this are the parameters which are considered.[8]



#### IV. MATERIAL SELECTION AND METHOD USED

PARTS	MATERIAL	PROPERTIES	MACHINING
Disc brakes	SS420	Yield strength-380Mpa,density-7.74 g/cm <sup>2</sup> ,thermal conductivity-24.9 W/m/k	Laser cutting
Brake pedal	EN8	Yield strength-450Mpa,Maximum stress-700 to 850 Mpa	Laser cutting
Brackets	EN8	Yield strength-450Mpa,Maximum stress-700 to 850 Mpa	Laser cutting

PARTS	MANUFACTURED /PURCHASED
Master cylinder	Purchased
Brake caliper	Purchased
Brake switch	Purchased
Brake line	Purchased
Brake light	Purchased
Brake oil	Purchased
Brake disc	Manufactured
Brake pedal	Manufactured
Brackets	Manufactured



**FIGURE 1:DISC BRAKE**



**FIGURE 2:DISC BRAKE**





**FIGURE 1: DIFFRENTIAL BRAKE SYSTEM**

## **V. CONCLUSION**

As per the actual design there were some problems while manufacturing the parts so some iteration were done and also we came to know how much material is required and according to that proper arrangement is done in laser cutting display and before actual manufacturing of the design part so the expert in that machining technique help us in changing the design and also told us the problem by this parameters or factor present in this design how the manufactured part may be affected or how the manufacturing technique is affected and the next part is assembly of the parts we came to know what precaution should be taken while welding the brackets.so according to this we conclude that proper precautions must be taken while fabricating and assembling the parts.

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Volume 9

## Review on electric roller skates

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**Abstract**—Now a days As No. of vehicles are increasing, due to which fuel consumption rate increases and also the traffic. Due to which hazardous gases are liberated which leads to air pollution and global warming. In traffic people keep their vehicle ON even if they are not moving which leads to waste of fuel and also liberates harmful gases with no work output. Whereas we can't carry our vehicles wherever we travel such as on platforms, skywalk, workshops, footpath etc. The key of this problem is Electric Roller Skates which has wireless controlling. These skates are simple, reliable and safe. The electric skates is an eco-friendly product, which does not causes any harm to environment. We can control the speed using joystick which is very easy. DC motor and the controller are the main elements of skates. Mechanical brakes are provided for the braking of the skates.

**Keywords**—Electric, Portable, Simple, Skates, Wireless

### I. INTRODUCTION

#### 1.1 Objectives

The project work presented in this paper is based on manufacturing of electric roller skates which will help people to get rid of problems caused due to traffic such as pollution, huge time waste etc. So the system used in this project is ecofriendly which will not harm the environment in any condition. It will also help people those who have problem in leg and not able to walk but they are able to stand can also make use of it for travelling between short to medium distance.

#### 1.2 Productivity

One can ride electric skates on roads, footpaths, platform, malls, big workshop etc. easily. The max speed it can run is 20 km/hr. Battery used is light weight made up of lithium ion cells which has durability of 1hr if used at max speed. It is easy to control with help of joystick which has forward and backward (speed controller) switch. The controller used to adjust speed of skates is wireless. So no stress of handling wires.

It can carry a normal person 60-70 kg of weight. The rectangle hollow frame is designed in which battery, motor driver and Arduino UNO are placed in proper position. The footboard is also provided to keep our legs comfortably. The joystick transmits signal to the electronic wireless circuit to start or stop the DC motor, so the skates would run by the electric power.

Using various types of parts in project such as the battery, the motor driver, Aduino UNO, NRF module, stabilizing wheels, joystick, etc. As there various types of motors in the market but the motor we are using is a DC motor. The reason of using a DC motor is that it gives the sufficient amount of torque which is needed to carry a person .

Also there are various types of batteries in the market such that the lithium ion battery, lead acid battery, lithium phosphate ,lithium silicate but the battery used is a lithium ion battery. The reason of using lithium ion battery is that it is very light in weight and small in size i.e compact. The varying of speed will be operated by the joystick. The module we have used is Arduino UNO as the

function of Arduino is to control the speed variation using NRF module which makes the system wireless. Stabilizing wheel is nothing but the wheels of the normal roller skates as we see in our day to day life.

## II. LITERATURE REVIEW

**Zhongyuan CHEN, XinjianJ,Bin TU ,Inam IBRAHEEM,2019 [1]** has developed roller skating device and electric balance device which include footboard, ground contacting elements, sensors, driving elements and controller. **AbhishekDoiphode, ChetanLakde , Ajit Prasad, RushikeshBoche et.al, 2019 [2]** has described that E-cycle typically incorporates a battery, which can be charged at an ordinary domestic power socket, linked to an electric motor in the bicycle transmission system. **Dr. Antonio Carlos Bento,2018[3]** had studied about Arduino using its own programming language with Arduino software (ide). He has explained that the nodemcu is from the esp8266 family, being one of the easiest to use, and it is not necessary to use another device of the Arduino type because it already has direct connection to wifi, without the need to install new devices, unlike the Arduinouno, which does not have this capability and needs another connections. **P.Viswabharathy, P.Boobalan, M.ArunWingston,2017 [4]** had Fabricated the electric vehicles (EVs) which offer a zero emission, new automobile industry establishment, and economic development, efficient and smart transportation system. This project having a foot controlled steering system to control the vehicle easily. **Nick Lauren et.al, 2007 [5]** have designed Battery-powered, remote-controlled, motor-driven, steer able roller skates. Each skate includes a boot, a transmitter, a base, a driving mechanism, a steering mechanism, a controller, and a receiver.

## III. MATERIAL AND METHOD

Various parts have been used which includes motor, battery, motor controller, joystick, NRF module, stabilizing wheels, bevel gears, bearings. The motor used is a DC motor which is of 12 volts and has a rotation of 1000 rpm. The battery used is a lithium-ion battery which is made up of lithium ion cells and the capacity of the battery is 12 volt 10 ampere hour. This battery is connected to the motor controller. Since, motor controller will also be of 12 volts.

The motor controller an NRF module is connected which is a type of a radio frequency module. NRF module is a device that can be used to receive signals from the joystick. The Nrf24L01 communicates using the serial peripheral interface or SPI bus. Here one NRF module (Transmitter) is connected with arduinouno and joystick to send the signals. These signals will be received by the NRF module (receiver) which is installed on the skates. Motor controller will be further connected to the motor and battery.

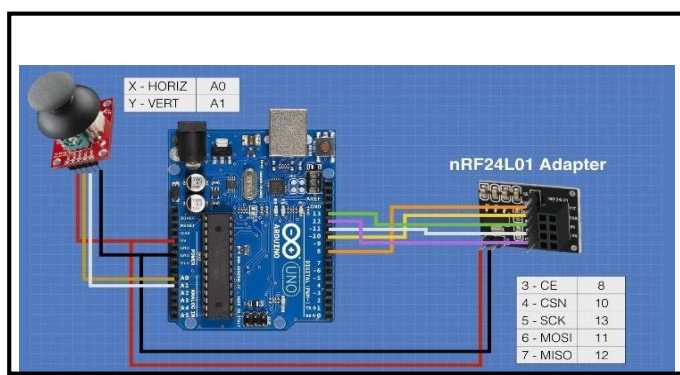
By doing all of the above connections when the button on the joystick is moved ahead it will send a signal which will go from the NRF module connected to the joystick to the NRF module connected on skates, which will be further converted into the volts and then will be given to the motor controller. Also by doing further circuit connections the roller skates are able to move in the reverse direction. Bevel gears are used to transmit the motion from motor to the stabilizing wheels equally. Bearings are used to mount the wheels and gears to the frame. All these components excluding joystick will be mounted in a frame which is made up of wood material. The connection from the skates to the joystick will be wirelessly so the joystick will always be in a hand while riding the roller skates.



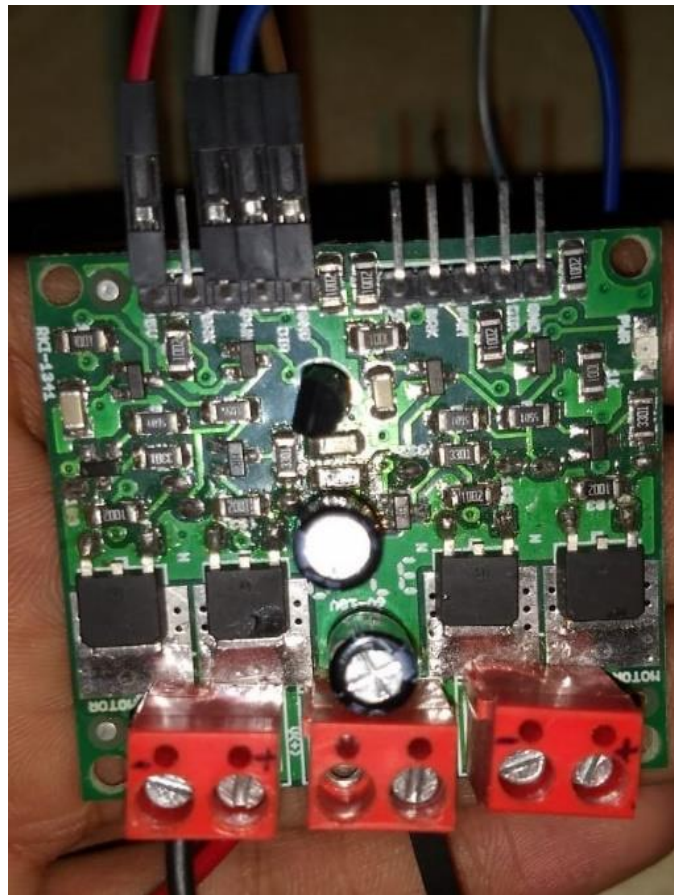
**FIGURE 1: nRF24L01 Module**



**FIGURE 2:DC Motor**



**FIGURE 3: Joy Stick connection**



**FIGURE 4:Motor Driver**

#### **IV. CONCLUSION**

The literature represented in this study describes the importance of having easy transportation techniques from one place to other; it also describes that using a DC motor wheel is more probably very convenient.

Portable roller skates are found to be rare thing especially in between common people in India while electric roller skates may offer an excellent solution for traffic. Also when two legs are separated and not fixed on a vehicle, balancing and braking is easy thus roller skates are better than skateboard. Whereas moving forward in straight poster is comfortable compare to that of moving side way poster.

If roller skates are being used by majority of youngsters travelling would be easy, cheaper and time saving.

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# Design of a Rotary Die Cutter for Production of Complex Seals and Improvement in Delamination Process.

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**Abstract**— Blanking operation is used for the production of seals (wads). Previously blanking operation was carried out by using gravity as a force to blank out the seals. A rotary die cutter has to be designed as manufacturing of complex seals is not possible on traditional machines since they exert large amount of force on the laminated sheet. Blanking operations also have a huge amount of scrap left which cannot be recycled together as it consists of aluminium foil and paper cardboard. Thus in order to tackle this issue, a delamination machine needs to be designed. A seals manufacturing company was selected for this study. The main aim of this project is to design a rotary die cutter for production of complex seals and also improvement in delamination process is desired as it will help in recycling the scrap.

**Keywords**—blanking operation , complex seals , delamination , recycling , rotary die cutter .

## I. INTRODUCTION

Lamination is the technique/process of manufacturing a material in multiple layers, so that the composite material achieves improved strength, stability, sound insulation, appearance, or other properties from the use of the differing materials. A laminate is a permanently assembled object created using heat, pressure, welding, or gluing. The project work presented in this report is based on improvement of a machine such that it can easily delaminate the seals (wads). The process involves heating. PID controller is used to control the temperature variation. Apart from this productivity of complex seals are required by the company for which a roller die cutter with designated complex design has to be fabricated. Arrangement of gear & rollers, speed will be implemented in systematic manner in order to achieve improved productivity.

A long sheet or web of material will be fed through the press into an area known as a "station" which holds a rotary tool that will cut out shapes, make perforations or creases, or even cut the sheet or web into smaller parts. A series of gears will force the die to rotate at the same speed as the rest of the press, ensuring that any cuts the die makes line up with the printing on the material. The machines used for this process can incorporate multiple "stations" that die cut a particular shape in the material. In each of these stations lie one or more of these geared tools or printing cylinders, and some machines use automatic eye registration to make sure the cuts and/or printing are lined up with one another when lower tolerances are required.

### 1.1 Project Objective: -

After researching many journals and patents we have decided to follow these necessary things,

- In order to achieve blanking of complex dies, we have to design a rotary die cutter with considering various factor such as material selection and withstanding wear and tear. We also have to maintain proper pressure while punching operation to avoid wear and tear and to have a proper blanking action.
- In order to achieve delamination process, we have to design a guide way in order to avoid slippage of the scrap sheet. We also have to stabilize the temperature of roller using PID controller and to find the optimum speed to get the proper output and efficiency.

## II. PROBLEM DEFINATION

### 2.1 Problem statement: -

#### a) Problem Definition 1:

After visiting the company for several times at Maauli Associates, there was a problem for production of complex seals as there were no special purpose machine were present which could carry out such kind of task. Due to which there was a chances of loss of order for the company as their clients were demanding such kind of seals. The company requirement was to design a rotary die cutter and its mechanism to perform blanking operation for production of complex seals (wads).

#### b) Problem Definition 2:

At Maauli Associates there was also a problem found that the company was unable to solve the problem of recycling the scrap which would left behind after the production of seals takes place. They had to keep these scrap as part of inventory but keeping it would not be beneficial. With further digging into the matter following causes were identified; Lack of information regarding temperature required to separate board and aluminum foil without burning it also the sheets had holes punched out already . Removal of foil was difficult to carry out without any breakage due to induced strain. In order to perform the delamination task smoothly and efficiently planning for optimum speed of roller was required.

### 2.2 Objective:

#### a) For achieving Blanking of Complex Dies:

- To design a rotary die cutter with considering various factor such as material selection and withstanding wear and tear.
- To maintain proper pressure while punching operation to avoid wear and tear and to have a proper blanking action.

#### b) For achieving Delamination process:

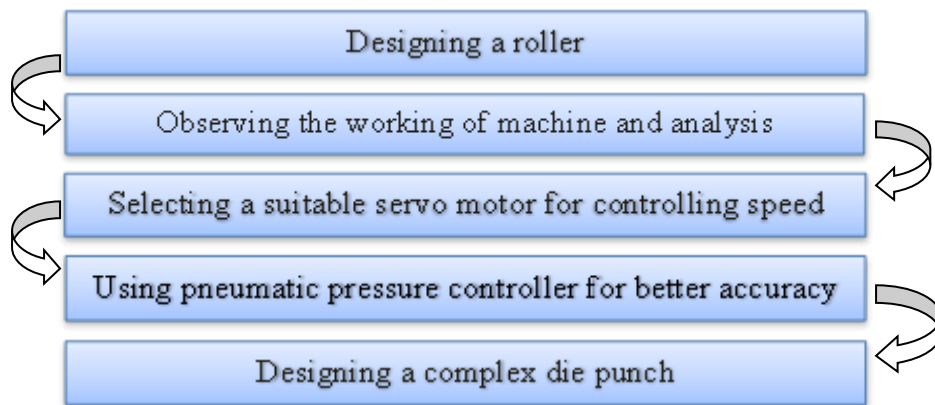
- To design a web aligner in order to avoid slippage of the scrap sheet.
- To stabilize the temperature of roller using PID controller.
- Finding the optimum speed to get the proper output and efficiency.

## III. PROPOSED METHODOLOGY

### 3.1 For blanking of complex seals

The laminated sheets are pulled into the rotary die with help of feed rollers. The sheet then passes through the upper rotary die and lower anvil cylinder which results into the blanking operation. The upper rotary die is controlled by a pneumatic pressure regulator which decides the depth of cut on the laminated sheet. The die is fixed on the upper roller with the help of a magnetic

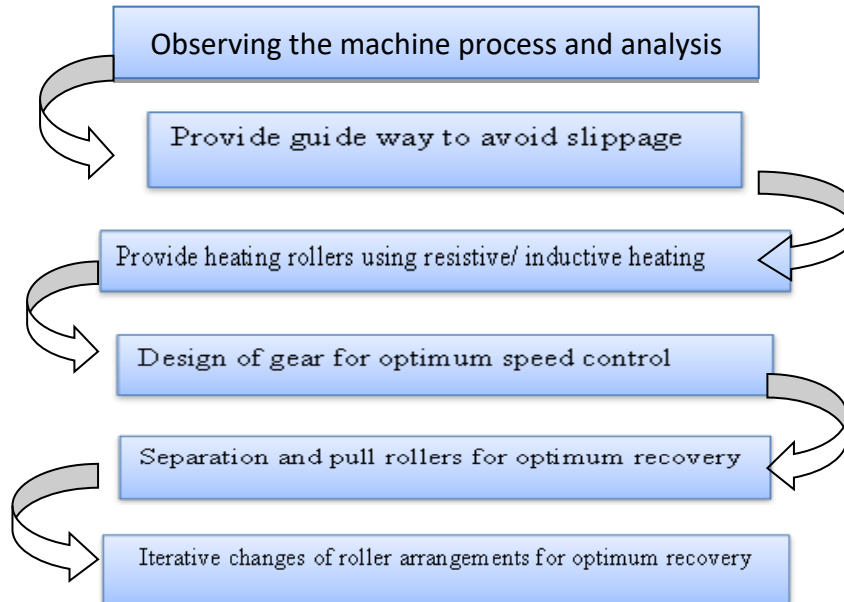
mechanism. During the operation, the blades on the upper die are pressed on the lower anvil cylinder to cut the sheet into a desirable shape. The blanked seals are collected in a carriage below the rotary die cutter.



**FIGURE 1: Flowchart for blanking of complex seals**

### 3.2 For Delamination Process

The scrap generated from the blanking process is placed onto a feed roller. The sheet then passes through a frame of the web aligner which makes sure that the sheet doesn't slip from the path. The web aligner works with the help of a sensor which detects the slip in the sheet alignment and then signals the hydraulic system to pass the fluid into the hydraulic piston fixed onto the frame which adjusts the sheet alignment. The sheet then passes through two rollers. One is a heating roller which uses resistive heating mechanism but inductive heating can also be used. The other roller is a support roller. As the sheet passes through the rollers, the wax binding the aluminium foil and board melts which results into the separation of the foil and the board. The board and foil are collected on two different rollers respectively.



**FIGURE 2: Flow chart for Delamination Process**

#### **IV. CONCLUSION**

This project will help Maauli Associates in production of complex seals which was not possible with the conventional machines. Also with the improvement of delamination process reduce and recycle their scrap which was not possible before due to the inefficiency of that machine and helps them to attract more customers and grow their business. This also helps in saving their money as inventory carrying cost and waste handling cost decreases.

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## **Kaizen Implementation In A Small Scale Industry**

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**Abstract**— Kaizen focuses upon continuous improvement of processes in manufacturing, engineering and various other fields. Kaizen is a word originated in Japan meaning "change for the betterment". Implementation of kaizen has become the core of improvement in processes in various successful companies'. A material handling equipment Supplier Company had problems with low productivity due to various losses including time loss, higher rejection rate of products and using manual operations leading to extra labour work. There is a need to increase the efficiency of the processes in company with simple kaizen activities and optimal cost. Implementation of Kaizen philosophy fits perfectly in tackling these problems. The project focuses on minimizing the time loss by using 5S methodology, and eliminating the rejection of products by improvement machines by small kaizen activities and thus increase the efficiency of the company. Comparison in utilization of time, rate of rejection, strain on employees, before and after implementation of kaizen will validate the success of implementation of kaizen.

**Keywords** - Efficiency, Improvement, Kaizen, Lean Manufacturing, 5S Methodology.

### **I. INTRODUCTION**

In this era of competitive market, it has become very difficult for growth of a small-scale industry. Indian small-scale industries have great contribution in economic growth. Lean manufacturing has proved to be such a tool for improvement of the working culture of these industries. It is an initiative activity, which aims to eliminate/reduce the wastes in human efforts, inventory wastes, speed to market and to become highly responsive to demand of customers while producing superior quality products in the most efficient, effective and economical way. The Lean approach consists of various practices, which aims to improve efficiency, quality and responsiveness to customers. This paper is based on implementation of kaizen philosophy to improve productivity of press shop automation manufacturing company. Small-scale industries face problems due to poor management and less knowledge about efficient techniques for problem solving and overall management of company. The aim of this project is to increase productivity and this can be only done by lean manufacturing tools like '5S', 'KAIZEN', 'PLAN DO CHECK ACT'. Out of all these, '5S' being economical and effective tool was chosen for solving concerned industry.



## II. PROBLEM DEFINATION

### 2.1 Problem Statement-:

**INVENTORY ISSUES:** The Company is struggling with low productivity due to the utilization of less space for actual production and loss of time in search of tools and materials due to improper workplace management.

**TAPPING MACHINE:** The sensor attached to the machine is unable to sense the work piece when the worker disturbs the sensor while placing and removing the work piece. During changeovers, there is an unnecessary effort in removing the sensor

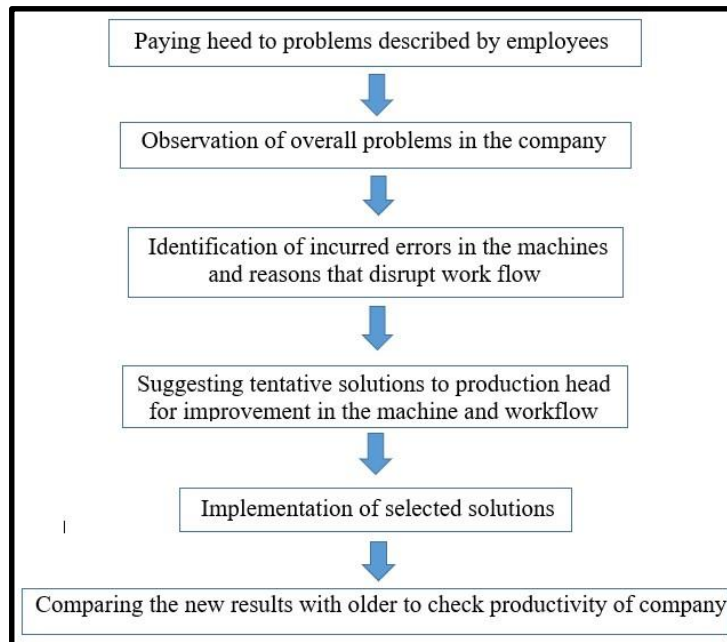
**PRESS MACHINE:** The effort of the worker in pressing the pedal for blanking operation is high resulting in strain on legs.

Lead-time is more due to manual feeding

**STRAIGHTENING MACHINE:** There is a huge rejection ratio in lot of aluminum strips due to process errors in straightening machine.

## III. PROPOSED METHODOLOGY

In order to overcome problems a brief study was carried out and implementation of kaizen Philosophy was finalized in order to improve the productivity.



**FIGURE 1: Flowchart of Methodology**

#### Kaizen changes

In order to eliminate z plane bend error, a groove was provided inside the roller same as the dimensions of the strip so that there is no space for the strip to buckle out from the groove and thereby eliminating the z plane bend.

For the x plane bend the point of contact of the roller with the strip was increased but the distance between the end rollers was fixed. Therefore, the diameter of individual rollers was increased and thereby increasing the number of rollers.

The float between the bearing race and the bolt made the rollers slightly move when the strip used to pass, causing variation in the set alignment of the rollers to avoid this a customized journal pin design was added to eliminate the movement of rollers when fixed to the plate.

The feed rollers were attached to a single gear and whenever the force was applied in tightening the roller it made it to bend slightly on the outer end making it a cantilever, thus this caused the strip to move outward and z bend was observed at the output of the machine. So, a support was provided on the other end of the roller.

The steps for implementation of 5S are as follows:

- SORT**: Sort is the first step, which includes removal of unneeded items whereas keeping the useful ones. Separation of useful and unneeded items in the company and disposal of unneeded item.
- SET IN ORDER**: It decides set locations of the workstations and place to hold tools and equipment so as to reduce time in wasted efforts such as walking, searching, etc.
- SHINE**: Cleaning the workplace and marking the areas.
- STANDARDISED**: A standard work process or method is implied to the workers and has to be followed.
- SUSTAIN**: Maintain the consistency of following the principles set.

After observing the process, found that the sensor which was attached on the periphery of the casing was sensitive and with slight pressure applied by the worker on the casing made it unable to sense the work piece. Also the attachment of sensor with the casing made it difficult while changing the fixture and has to be removed every time the fixture is changed. To eliminate this wasted effort fixing the sensor to a fixed part with an L bracket which will not be in contact with the casing so that there is no fluctuations in sensing the work piece and the need for removing the sensor while disassembly and assembly will be resolved.

To reduce the strain in bending by the worker for picking the work piece a hook was pierced on the wall to hang the sack for easy retrieval of work piece for inserting on the fixtures.

#### IV. CONCLUSION

The literature represented in this study describes the importance of Kaizen in the field of production. In this study, the problem faced by the company will be analyzed using Kaizen approach. The various problems such as production delays will be sorted after implementation of 5S techniques to bring in improvements and better outputs. The kaizen implementation will provide standardization; it will bring in all people working in the organization right from operators to managers to work together as a team in order to eliminate the bottleneck.

Thus, after carrying out stepwise implementation of Kaizen principles in the company, remarkable improvements in productivity, on time deliveries, reduction in lead-time and reduction in inventories can be achieved thereby increasing the profit to the company. Sustaining the methods of kaizen and with continuous improvement will lead to major production of the company.

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## Development of Solar Power Electric Bike

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**Abstract**—Now days the use of fossil fuels increases continuously because of which in future there will be a stage where we are going to lost all these resources completely. Therefore, there are so many organizations or companies which are preferred to used renewable energy sources. Though our bike is running on electric power but our main objective is to charge the battery by means of solar power. When we run this electric bike on road the motor will consume the electric power but also at the same time the battery will charge due to the solar panels provided at overhead of the bike. To overcome the depletion of fossil fuel we causimply use an electric bike, but for charging of battery we need to pay money for its charging purposed. But by using our project idea charging of battery will becomes less costly or free as the solar power is available free<sup>l</sup>y. The remedy solar bike is not only limited to overcome the fossil fuel depletion but it also considered other factors. The consumption of fossil fuels like petrol, diesel etc. creates pollution which adversely effects human health and also causes ozone layer depletion. It will also reduce the running cost as the solar power is available freely<sup>[2]</sup>. For current condition this solar bike may not be that much effective but in coming years it will definitely going to be highly efficient because we all know that after 5-6 years there will be an era of electric vehicles.

**Keywords**—Solar panels, Electric bike, BLDC motor

### I. INTRODUCTION

The work presented in this report is based on utilization of solar power. By considering the unavoidable depletion of fossil fuels, implementation of renewable energy sources has become vital. Taking into account the climate condition of major part of our country solar energy is easily available. Photovoltaic (PV) cells of solar convert the radiation from sun into electric energy which is direct current (DC). But the efficiency of solar panel depends on climate condition such as radiation, temperature, wind speed and appropriate placement of solar panels<sup>[3]</sup>.

#### 1.1 Project Objective: -

The objective of our project is reduced the consumption of fossil fuels like petrol, diesel etc. by running the bike on electric energy. 1.2KW BLDC motor runs on 48V lithium ion battery. Charging of battery is done by means of solar energy which is the main aim. We also provide an extra socket to battery for external charging purpose. In case if climate condition is not so good then we can use this socket for charging. We are doing our project on Hero Honda Passion motorcycle. Here we totally eliminate the use of engine that operates on petrol, for that we disassemble the bike and remove the main parts which includes engine, gearbox, clutch assembly etc. Instead of engine here we used BLDC motor for driving purpose which drives the rear wheel. There are two types of BLDC motors are available, first is simple BLDC motor and another is Hub BLDC motor. By using simple BLDC motor, we need chain drive for rotating rear wheel and Hub motor is directly assembled at wheel<sup>[18]</sup>. So, Hub motor is more efficient than simple one as in case of simple motor due to chain drive some losses may occurred. By considering the total weight of bike including

driver we decided to use 1.5KW motor having speed range between 1500-3000rpm under no load condition. So, with driver or under loaded condition it may give speed up to 700-900rpm which is enough.

## **II. PROBLEM DEFINITION**

### **2.1 Problem statement: -**

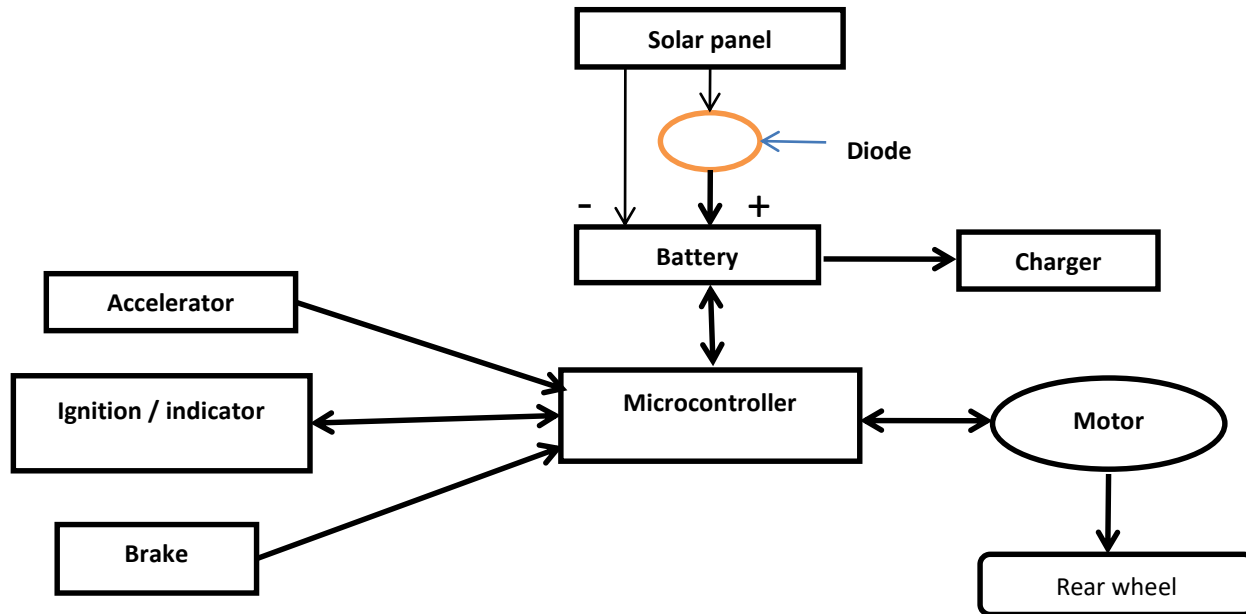
With the inescapable depletion of fossil fuel resources, increased global energy consumption and the critical threat of climate change, the need for efficiently utilizing renewable energy resources has become more vital. After reading research papers it has been found that IC engines are 40% efficient whereas BLDC motors equipped in E-bikes are above 90% efficient in power utilization.

In last few months there are few cars and scooter were manufactured which runs over electric energy<sup>1</sup>. But due to the inconvenience of charging ports that vehicle could not use efficiently. In order to overcome such problem, we think to power this vehicle by means of sunlight (solar). This reduced the consumption of fossil fuels as well as used of electricity by some percent.

### **2.2 Key points: -**

1. To reduced consumption of fossil fuel
2. Reduced pollution
3. Reduced ozone depletion
4. Utilization of natural resources which is freely available

### III. PROPOSED METHODOLOGY



#### 3.1 Solar Panel: -

Silicon wafers cells are used in Polycrystalline solar panel. To build a monocrystalline wafer are assembled into rows and columns to form a rectangle, covered with a glass sheet, and framed together<sup>[10]</sup>. polycrystalline solar cells tend to have a bluish hue to them due to the light reflecting off the silicon fragments in the cell in a different way than it reflects off a pure monocrystalline silicon wafer<sup>[13]</sup>. Similarly, to monocrystalline, polycrystalline panels have different colors for back sheets and frames. Most often, the frames of polycrystalline panels are silver, and the back sheets are either silver or white<sup>[9]</sup>. It has low cost and has low efficiency/performance compared to monocrystalline panels.

#### 3.2 MotorController: -

48v 750w 3 phase rating motor is used. It can be mounted using screws. Low voltage cut down 42v Reverse and Forward Movement both are available in the controller High efficiency and low noise gives smooth motor performance<sup>[8]</sup>. High power mosfets drives the bldc motor with PWM Techniques. Protection for Overheating. latest intelligent micro controller use for high efficiency and smooth motor performance & Controller is having 24 MOSFETS (TUBES)<sup>[5]</sup>

#### 3.3 BLDC Motor: -

A Brushless DC motor or BLDC motor is most suitable for those applications which are in a need of high reliability, high efficiency, more torque per weight<sup>[12]</sup> etc. The BLDC motor has power-saving advantages by comparing with other motor types.



A Brushless DC motor or BLDC motor is the type which is most suitable for applications that require high reliability, high efficiency, more torque per weight etc. The BLDC motor has power-saving advantages relative to other motor types <sup>[6]</sup>.

### 3.4 Battery: -

Lithium Ion batteries <sup>[1]</sup> are compact in size. They have better energy density. They have more charging cycles than Lead acid batteries. 4-6 hrs. of charging time. Lithium Ion batteries can blast on high temperature <sup>[4]</sup>.

## IV. CONCLUSION

As per the literature review, we studied the increasing pollution and many more hazards that are taking place in the environment due to carbon emission in the atmosphere which is harmful. So, to tackle this situation of increasing pollution we can come up with ideas that do not harm the environment and one of them is Electric Vehicles that can be run on renewable energy which are freely available and many more technology can be added in the future to more efficient EVs<sup>[11]</sup>. As Electric Vehicles are eco-friendly and less noisy compared to carbon emitting vehicles, also the solar panels can be used to charge the vehicle when not running. Batteries used in EVs are also an important part of it, mostly now a days Lithium-ion battery are used instead of Lead-acid batteries because the Li-ion has more advantages than the lead acid battery. By 2020-2022, many automotive industries are trying to roll out their Electric vehicles in the market to reduce the pollution and as well as moving for an eco-friendly environment.

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## Overview of Unmanned Cargo Aircraft.

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**Abstract**— The aircraft first invented by wright brothers. Previous 10 years, number of passengers death per kilometer increases. to overcome these problems, new innovation done by scientist which was unmanned aerial vehicle (UAV). UAV used in many sectors such as military, surveillance of geographical boundary ,agricultural ,transportation. In India UAV refused in public sector, but most probably used in military because there is no human interference. So there is no risk to soldier life. In India there is lack of awareness about UAV, sometime the work which not possible with human interference model which did with the model without interference.

**Keywords**— Aircraft, UAV, Unmanned Vehicle, cargo aircraft, RC plane.

### I. INTRODUCTION

The objective of this study is designed compress aircraft and lift the maximum payload with utilizing minimum power within given take off & landing distance. As many conventional UAVs are working on maximum power. So we will increase the efficiency of aircraft, speed of aircraft, and performance of aircraft by using minimum power.

### II. CONSTRAINTS AND REQUIREMENTS

As per the demand & requirements everyone wants effective and faster RC plane, while hunting the requirement we found that electric motor or engine can be used. Here main task is selection of motor to satisfying our requirements. For power source battery is required, so we selected cell battery was one of our first constrained.

Here we focused on the geometrical appearance of RC plane, and not manufactured the huge plane because of capability of selected motor. Every time trial and error method cannot be used because every part is costly so before we must have proper justification. Then we moved towards the selection of suitable airfoil which is essential for plane. Here performance and efficiency of RC plane, depend upon the selection of motor and airfoil. We know the RC plane lifted Avg. of 8- 13 Kg in India. So we decided to lift the payload as 10 Kg as per the theoretical calculation. Here, second main constraint is balancing the RC plane **without gyroscope**. Conventional RC plane carries the same payload but invention purpose we reduce the power upto 1000 watt. Here becomes the big challenge for us that to lift maximum payload maximum power is used but in our aircraft more payload is lifted by less power.

### III. PROPOSED METHODOLOGY

Design plays important role in project. In design, we used the solidworks, Ansys & XFLR softwares for primary calculations and analysis. As per the theoretical calculations and assumptions, we focused on the CAD model and XFLR's solution. If theoretical value and software solution approximately equal to each other then we goes in a right way. After this, we goes for analysis of each part. If design is safe then we follow the next step which is manufacturing. If design is not safe then we go to second iteration till the design is safe. Here we successfully ended with design phase.

Initially, we defined the overall weight of plane including weight of electronics, payload and pylon respectively. Accordingly we framed our wing's parameters such as wing loading, wing area, aspect ratio etc.

#### i. Airfoil Design:

We analyzed foils CH10 and S1223 and we found that foil CH10 gives high  $C_l/C_d$  ratio, less  $C_d$  and low  $C_l$  vs  $\alpha$  ratio and S1223 give high  $C_l$  vs  $\alpha$  value and low  $C_l/C_d$  ratio comparatively. Since we were hunting for a foil with high  $C_l/C_d$  and a high  $C_l$  vs  $\alpha$  value, we had to interpolate both the airfoils and develop a new foil named ARSYA. Inferring Reynold's Number as 4, 50,000 an analysis was performed on the foil to extract various data.

**TABLE 1**  
**AIRFOIL PROPERTIES COMPARISON**

Foil	$C_l$ at $0^\circ$	$C_l/C_d$ at $5^\circ$	$C_m$ vs $\alpha$
ARSYA	1.37	54	-0.19
S1223	1.3	71	-0.24
Ch10	1.2	86	-0.15

#### ii. Wing design:

According to weight and all loads on fuselage and wing, we determined external loads to be applied on wing to stimulate the actual load, which acts on wing and determined the maximum deflection.

**TABLE 2**  
**COMPARISON OF SHAPE OF WING**

Parameter	Weighting	Rectangular	Elliptical	Tapered
Construction	40%	5	2	3
Flight Performance	30%	3	3.5	3
Theoretical Analysis	30%	3	2	2
Total	100%	3.8	2.45	2.7

#### iii. Drag Analysis:

The 3D drag polar on an airplane is given by (from Nicolai's White paper)

$$C_d = C_{dmin} + K' C_l^2 + K'' (C_l - C_{lmin})^2$$

$C_{dmin}$  is found by summing the contribution of each component, as calculated with equation:

$$C_{dmin} = \frac{FF C_f S_{wetted}}{S}$$

The 3D drag polar contribution of each aircraft of the overall  $C_{dmin}$ ,

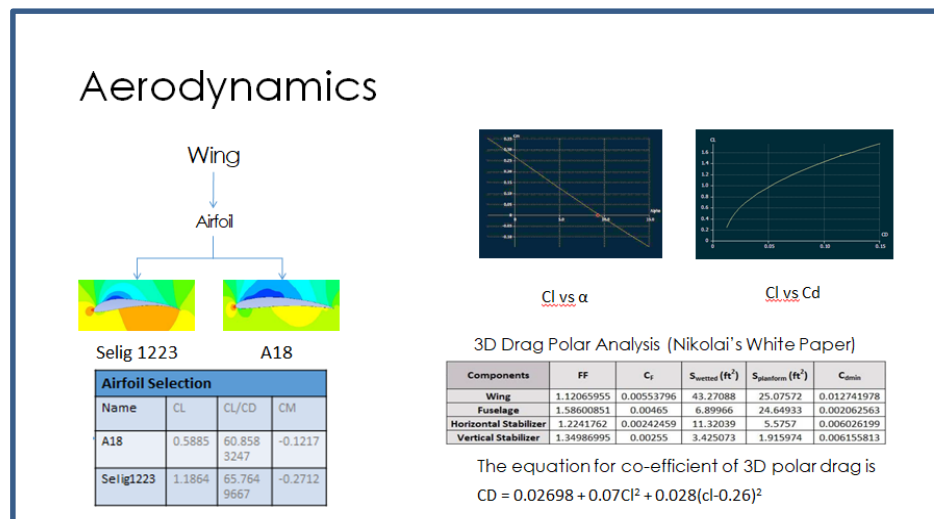
**TABLE 3**  
**PARAMETERS OF PLANE**

Part	Planform	Wetted area	Reference length
Wing	1.17	2.45	2.6
Fuselage	0.19	0.76	1.856
Elevator	0.25	0.51	1
Rudder	0.11	0.19	0.5

Then the inviscid induced drag factor  $K$  is calculated for equation,  $K' = \frac{1}{\pi A R e}$

Now  $C_{lmin}$  is determined as a point of lowest  $C_d$  from the drag polar. Then the viscous drag factor  $K''$  is determined as the slope of the nearly linear relation, shown. Now  $C_{lmin}$  is compared at relevant Reynolds number for the wing and  $K''$  is found. Then this value can be substituted back into equation and airplanes 3D drag lift coefficient for all airfoil.

$$C_d = 0.03 + 0.063 * cl^2 + 0.022 * (cl - 0.44)^2$$



**FIGURE 1: DESIGN AND ANALYSIS**

#### IV. CONTROL SYSTEM:

The transmitter and receiver used in aircraft is JRXG7 (DMSS 2.4GHz). In order to ensure that the servo used to control the aircraft are of adequate size, the following calculation was performed.

$$T = 8.5E - 6 * \left[ C^2 V^2 L \left( \frac{\sin s1 \tan s1}{\tan s2} \right) \right]$$

For the calculation, the airspeed was assume to be the top speed of the aircraft (17 m/s). A conservative assumption that the servo deflection is no more than the 45°, it was determined that the maximum torque required for each aileron would be 34.58 oz-in ,which makes Avionic AV55DMG servo which can provided torque of 138.87 oz-in most eligible for serving the purpose. Also the torque required for elevator and rudder were calculated to be 39.22 oz-in. Hence Avionic AV55DMG servo is used for the purpose.

## V. CONCLUSION

We conclude that the aircraft fly with maximum payload within given constraints. Fabricated model help us to explore application of UAV in various sector. During this project, we enhanced our skill like using different type of tools & software. It will help us to explore various specialization fields like structural Analysis, Computational Fluid Dynamics, and Wood Working etc.

It will not only give students a hand-on experience with hand tools as well as advanced software's but also give them an opportunity to interact with industrial tycoons in the field testing.

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# Problem analysis to convert pp sticks buds manufacturing machine into paper sticks buds manufacturing machine

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**Abstract**— This paper describes various alternatives and modification that can be done to convert polypropylene (plastics) sticks buds manufacturing machine into paper sticks buds manufacturing machine. The project is carried in an industry. As this industry presently produced cotton ear buds in polypropylene (plastics) sticks were to be replaced by paper sticks. Considering the present environmental situation, it was great move to avoid plastic pollution. However this change invited for some challenges to the implementation team. Due to changes in the product different manufacturing process and machinery was needed. This situation presented the need for the purchase of the new machinery. Which machines are not available in India. Machines has to be imported from Switzerland, high initial cost was needed to get these machines. Keeping costs low was the important for the industry considering current economic conditions. Hence, it was decided upon the platform of existing machines. This decision presented company officials with wide range of engineering challenges. Various alternatives for changes to be implemented is discussed in this paper.

**Keywords**—cotton ear buds, environment, paper sticks, polypropylene (plastics).

## I. INTRODUCTION

### 1.1 Background of Project

The project is based on modifications which are done in order to convert the machines from manufacturing polypropylene (plastic) sticks to manufacturing paper sticks. Considering the present environmental situation, it was great move to avoid plastic pollution. However this change invited for some challenges to the implementation team. There is many variations in the dimensions of plastic sticks and paper sticks, so the machine modification to make it compatible to this change is to be done. Secondly the material property and adhesiveness of paper is different, so it is necessary to check for other options of gum. As per presently produced cotton ear buds in polypropylene ( plastic) sticks were to be replaced by paper sticks. Due to changes in the product different manufacturing process and machinery. Which machines are not available in India machines had to be imported from Switzerland, high initial cost was needed to get these machines. Keeping costs low was important for the industry considering current economic conditions. hence, it was decided to develop upon the platform of existing machines. This changes are tackled in this project.

### 1.2 Objective of Study

PP sticks having different specifications that paper sticks, it is not possible to manufacture paper sticks on same machine which are used to manufacture pp sticks. One option is to buy new set of machines which is not viable as the initial cost to as 7.5 crore. To overcome this issue it is decided to modify existing machines to fulfil our purpose to manufacture paper sticks. Alternative that has to be found must be cost effective yet reliable and must deliver the product quality that is expected from the industry.

## **II. PROBLEM DEFINITION**

### **2.1 Problem statement:-**

As per presently produced cotton ear buds in polypropylene (plastics) sticks were to be replaced by paper sticks. Considering the present environmental situation, it was great move to avoid plastic pollution. However this change invited for some challenges to the implementation team. There is many variations in the dimensions of plastic and paper sticks, so the machine modifications to make it compatible to this change is to be done. Secondly the material property and adhesiveness of paper and plastic is different, so it is necessary to check for other options of gum.

## **III. PROPOSED METHODOLOGY**

### **3.1 Removal of Heating and Serration process to avoid damage to paper sticks**

Presently to manufacture the buds, to stick the cotton swab to the plastic sticks, the sticks are heated and serration was done. However in case of paper sticks if heating is done then there is possibility of damaging the sticks, so the process cannot be followed due to risk involved.

The die presently used for plastic sticks cannot be used for paper stick, as for plastic the sticks were to be heated, followed by serration. However this process cannot be used for paper sticks as there is risk of damaging of sticks. This called for updating of die compatible to new process. Heater will be removed and consequently serration will be removed, this will avoid the problem of paper stick getting damaged. However in this we need to search for new type of gum which can be used directly without this process and even will be used with paper sticks without damaging them.

### **3.2 Modification of saddle clip as per requirement and dimensions of paper sticks**

As there is difference in the dimensions of plastic and paper sticks, there was requirement to change the chain of machine. As per the saddle pin also needs to be adjusted to suit the size of paper stick. This all required a new design and evaluation. Considering the dimensional changes such as length, weight etc. the saddle pin was designed accordingly. Also this new design needs to be manufactured and tested, so that it will not bend or damage the paper sticks. The design modification of saddle film is one of the most important aspects of implementation and efforts are taken accordingly.

### **3.3 Modification of clip and chain to resolve belt issue**

Due to different dimensions the present conveying belt cannot be used. The dimension of belt presently used is as per plastic sticks. The belt facilitates the continuous movement of sticks and ensures it rolls over the gum spread. However if the dimension are different then there is a chance that the gum will not be applied to correct position of stick and also there can be concentration of it on some place, calling for rejection. The belt used to manufacture ear buds presently is mounted on chain using saddle pin. To make it compatible to changed size of paper sticks, we need to modify the design of saddle clip and chain; this change will ultimately change the design of belt. The width of belt needs to be adjusted according to the height of sticks. This change will avoid the problem of bending or damaging of the paper sticks.

### **3.4 Modification of die**

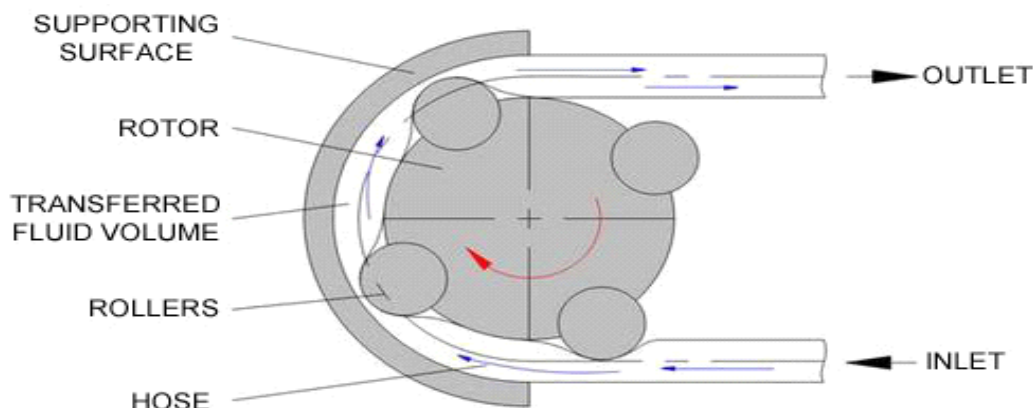
The die presently used for plastic sticks cannot be used for paper stick, as for plastic the sticks were to be heated, followed by serration. However this process cannot be used for paper sticks as there is risk of damaging of sticks. This called for updating of die compatible to new process. The present plastic stick manufacturing die cannot be used as presently the sticks are heated followed by serration which cannot be done in case of paper. So, there is a discussion to have the gum sticking operation in 2 steps. During first step, the application of gum will be done in some quantity which will avoid the sticking of sticks to each other, during second stage of sticking it will increase the finishing of the product. To implement this change there is a requirement to have two new holes, also the position of the holes is required to be designed accurately based on the dimension of stick. The required design for die and required gum is under analysis.

### **3.5 Check for different type of gum**

During preparation of plastic sticks based ear buds, a mixture of IPA + methocyl + water was used. However this mixture's compatibility with paper stick was a doubt. The present gum behaviour against paper sticks is not tested, and this may have risk of damaging a complete lot of paper sticks. Presently used IPA + methocyl + water solution does not hold good with paper sticks. The proportion of this mixture cannot disclose as per companies rule. Tests were performed and accordingly the results were checked which were found not ok, So there is requirement of new gum which can be used for paper sticks, directly also avoiding the process of heating and serration. Presently trials are performed on some examples of gum, shortlisted best on required properties such as viscosity, temperature behavior and adhesiveness. Also after selection of particular gum, the grade of gum has to be tested based on all these the selection can be finalized. This is the most critical aspect of project, the selection of gum should be of proper viscosity as this will directly affect the quality of product.

### **3.6 Change of pump with present available solutions in market**

Presently for manufacturing of plastic sticks ear buds, to ensure uniform application of gum on both sides of sticks Lobe type of pump was used. However due to limitation of pump the uniform distribution was lacking often. This caused rejection of ear buds. Presently many scenarios are observed where the pump has found clotting issues. Also as the pump doesn't have direct contact to gum the clotting issues are observed very often. The selection of pump required a lot amount of attention as it is the prime mover of complete project.



**FIGURE 1: Peristaltic pump working**

#### IV. CONCLUSION

The detailed analysis of the problems faced by the industry suggests that the issues regarding machine conversion are solvable and are practical alternative to the purchase of new machines this can be achieved by application of various mechanical principles. Besides cost effectiveness this project is profitable in many ways, from easy availability of new parts in the country to involvement of maintenance staff in this project which causing relatively less need for training program saving industry time. This report, also describes brief literature review done regarding plastic pollution, die modification for different cases, various paper lamination adhesives, overall equipment analysis and development of rotary pumps. Study in depth literature have led to various alternatives to improve on design of machine and other parameters for conversion of machine from plastic stick for bud manufacturing to paper stick for bud manufacturing.

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## Preparation of diesel from plastic

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**Abstract**— Plastic recycling has become an important issue in today. The waste plastic is produced in large amount. The study focus on the design and fabrication of a machine or setup to convert plastic waste into fuel as a means of waste recycling by means of a process called pyrolysis. It is a solution to problem of waste disposal. These discarded plastic are melted and evaporated first in the reactor up to 400 to 500 degrees. Then this heated plastics evaporates in absence of oxygen which turns it into vapour form. The vapour is then moved to a glass condenser. The condenser is to be selected as a glass type as it has low cost and also it won't react with the vapour of plastics and help it in cooling. After condensation the liquid fuel is collected in the receiver tank and the waste gas is taken out. The diesel fuel is then collected in a container from the receiver tank. The properties of obtained fuel is compared with standard properties.

**Keywords**— diesel, environment, fuel, plastic, pyrolysis, waste

### I. INTRODUCTION

Plastics are basically long hydrocarbon chained organic compounds synthesized from petroleum products. They came across 1862 and become popular in short time because of their wide usability in daily life. Their consumption has been occurring rapidly due to their ability to be simply formed, its light weight and non-corrosive nature. They are inexpensive, easy to store and transport, readily available and hence their usage is increasing which is not good for our environment as well as for us. We all know that plastic is not biodegradable and landfilling is not a suitable option for disposing plastic wastes because of their slow degradation rates and their remains they cause localized flooding, spoils soil and groundwater, affects animal life etc. Because of this factors, various regional and national governments have banned plastics.

As their disposal is the main concern of government nowadays, various recycling and recovering methods have been used to minimize the environmental impacts and to reduce the damage of plastic wastes. Out of them pyrolysis is one of the promising method to recycle waste plastics which involves heating of plastics at elevated temperatures such as 400-600 degree Celsius in the absence of oxygen in a closed container and then cool it by using a condenser to produce fuels. The output we get can be divided into liquid fraction, gaseous fraction and solid residues. Catalysts such as  $\gamma$ -zeolite or natural zeolite are used for better results and to improve the quality of the products. The plastics are of different types such as PP (polypropylene), PE (polyethylene), PS (Polystyrene), HDPE (high density polyethylene), LDPE (low density polyethylene), PVC (polyvinyl chloride) etc.

## II. PROBLEM DEFINATION

### 2.1 Problem statement: -

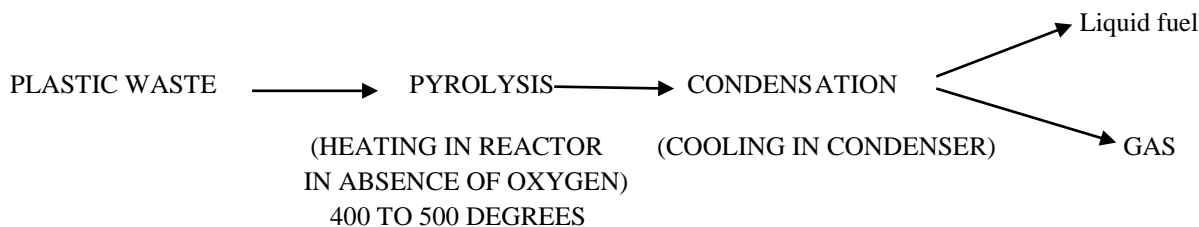
The use of plastics has become one of the biggest environmental problems, as plastic waste does not degrade or degrades at a very slowly which leads to continuous accumulation in landfills. So there must be some ways to get rid of these large amount of plastics in order to transform it into some useful contents. Pyrolysis is one of the process by which we can convert plastic waste into diesel. Pyrolysis is heating of the plastics in absence of oxygen in order to produce fuel. Heated in absence of oxygen as to prevent it from burning. Adding various types of catalysts may also increase and improve the process. Thus two universal problems that are problems of plastic waste and problems of fuel shortage will be tackled.

### 2.2 Objectives: -

1. To convert the plastic waste into diesel
2. By using pyrolysis process and proper condensing plastic can be converted into diesel
3. The main objective is to turn the massive plastic waste that is present into some useful purpose.
4. To develop and fabricate the pyrolysis unit to produce liquid fuel from plastic waste.
5. Compare the properties of diesel fuel produced

## III. PROPOSED METHODOLOGY

### 3.1 Pyrolysis process



### 3.2 Process flow:-

- 1) Collection and segregation of plastic
- 2) Feeding plastic into reactor
- 3) Heating of plastic in absence of oxygen
- 4) Moving of liquid vapour into condenser
- 5) Condensation of vapour in glass condenser
- 6) Collection of liquid in collector tank

## IV. MATERIAL

### 4.1 Various Parts Material and Types

**TABLE 1**  
**TYPES OF PLASTICS TO BE USED AND ITS APPLICATIONS**

Parts	Material / Type
Outer Tank, Reactor Tank	Mild steel
Condenser	Borosilicate Glass
Heater	Nichrome Ceramic Heater
Pipes	Stainless Steel
Temperature Controller	SELEC TC513
Temperature Sensor	J Type Thermocouple
Siemens Power Contactor	Air Break Power Contactor

**TABLE 2**  
**TYPES OF PLASTICS TO BE USED AND ITS APPLICATIONS**

Type Of Plastics	Use
POLYESTER	Textile Fiber.
PET (polyethylene terephthalate)	Carbonated Drink Bottle, Plastic Film.
PE (polyethylene)	Supermarket Bags, Plastic Bottles.
HDPE (High density polyethylene)	Milk Jugs, Detergent Bottle, Thicker Plastic Film, Pipes.
PVC (poly vinyl chloride)	Agriculture (Fountain) Pipe, Guttering Pipe, Window Frame, Sheet For Building Material.
PS (polystyrene)	Foam Use For Insulation Of Roof And Wall, Disposal Cups, Plates, Food Container, Cd And Cassette Box.
PP (polypropylene)	Bottle Caps, Drinking Straws, Bumper, House Ware, Fiber Carpeting And Rope.

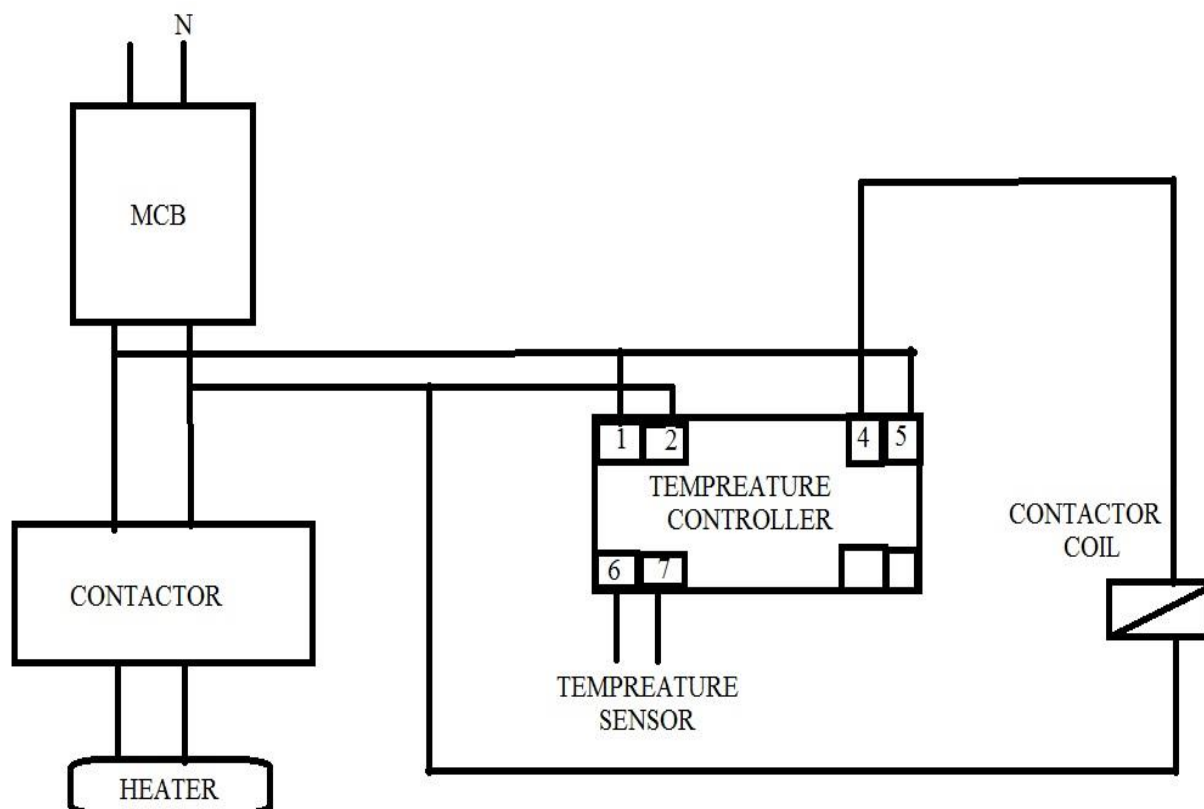
## V. EXPERIMENTAL SETUP

The setup consist of a reactor tank, the outer tank, stainless steel pipes for transfer of medium, glass condenser, heating element and the electrical parts. The plastic is heated in the reactor tank by use of the heater. The heater used is a 3000 watt 230V

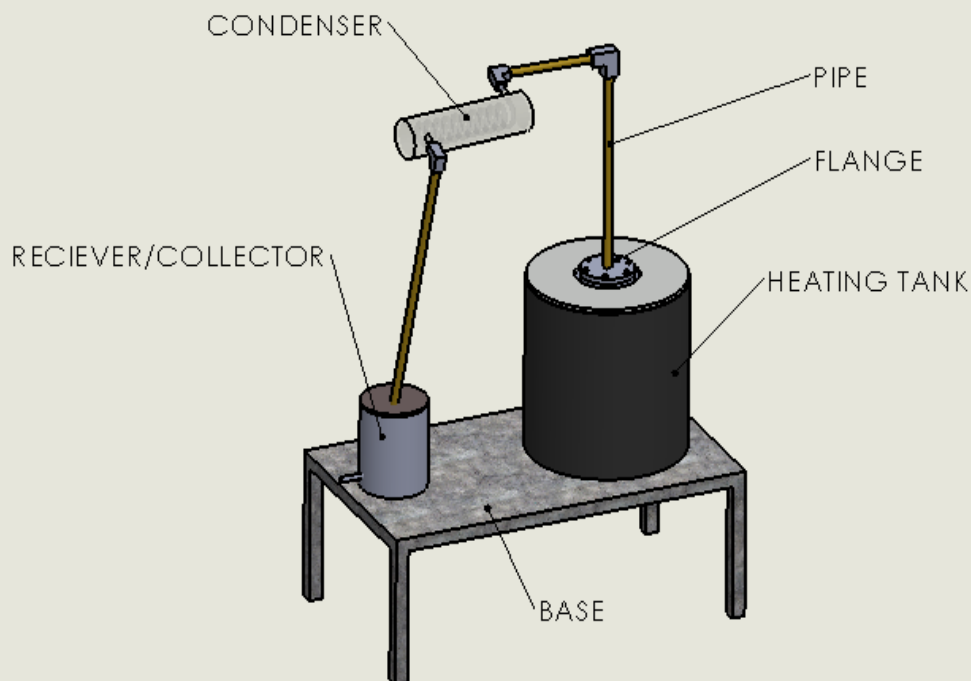
heater. The heater consist of magnetic stainless steel ceramic and Nichrome material. It reaches up to the maximum temperature of 450 degree Celsius. The outer tank and the reactor tank material is mild steel. The condenser used is of glass material. The condenser is Borosilicate Glass Condenser Graham type 500mm Long. The sensor used is M8 J type thermocouple with stainless steel as main sensing element. The wires used are 1.5mm 2.5mm and 3mm core wires. The insulation used is....

For electrical circuit a contactor, MCB, sensing element and temperature controller is used. The temperature controller is selec TC513 series with maximum controllable limit as 500 degree Celsius.

### 5.1 Electrical Circuit :-



**FIGURE 1: Heater and sensor connections circuit**



**FIGURE 2: Solid model of the setup**

## VI.CONCLUSION

In this we tried to focus on the process known as pyrolysis to convert plastic waste into useful forms with the least possible components and cost. The process involves heating of polymeric material under atmospheric pressure using inert atmosphere. The types of plastic studied for are PP, PS, PE, PVC, PET, HDPE, LDPE, etc. After the trial we successfully generated the vapour by heating the oxygen in absence of oxygen. We found that these vapour of plastic are flammable. The vapour when lightened up provides burning effect. Further these vapour will be cooled in condenser to form fuel.

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# Modelling And Control Design Of Shadowbot In Real Time Basis

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**Abstract-** *In the era of rapid industrialization and automation the demand for humanoid robot is increasing day by day due to some restrictions of the tasks which is difficult to perform by humans. So, development of humanoid robot in advanced world is blessing for humans. We are developing a humanoid robot which will exactly imitates the human actions. As the name suggests 'Shadowbot' it will exactly mimic the human action in real time basis as the shadow does. The project is divided into 2 Categories which is Modelling and Controlling of shadowbot. In controlling, with the help of Microsoft Kinect XBOX One shadowbot will imitates human actions in real time basis. Kinect sensor is a posture recognition device which will capture the movements of operator and calculate the local coordinates of postures. With the help of calculated local coordinates, it will make a 2D animations.*

*With the help of V-REP software which is a simulation software and Kinect we will be achieving real time. With the help of Teensy 3.2 microcontroller controller will give command to motor driver and ultimately the actuators will operate and we will get motions. For operating shadowbot robot remotely from certain distance we will be using HC12 or LORA. To operate robot in real time basis we will be buying and implementing some ready to modify advanced gaming technologies in order to complete our project in less time.*

**Keywords –** *Gesture Imitate, Humanoid Robot, Kinect Sensor, V-REP Software, Shadowbot, Human Arm, Humanoid*

## I. INTRODUCTION

In today's world with increase in demand for efficiency and quality of work, the field of robotics has become the integral part in many fields. This field growing tremendously and will evolved more in future too. Development of robot ensures us to put less effort and will saves time too contributing towards the production rate of any industries. In this project, we are making a humanoid robot which will work on a virtual reality. Till today, we have seen the use of Kinect sensor in most of games where you play it and feel as if you are present there. So, by fusing the robotics and gaming technology we will operate the humanoid robot which will actually imitates the direction and actions of the, operator in real time basis. This project will serve the nation at borders by helping our soldiers to stay safe at still fight efficiently with enemies.

## II. PROBLEM DEFINITION

Modelling & control design of humanoid robot to reduce delay time by using Microsoft Kinect XBOX One and V-Rep software for determining global co-ordinates of the postures using shadow features on real time basis. Design model can able to imitate human actions as per given inputs.

## 2.2 Objective

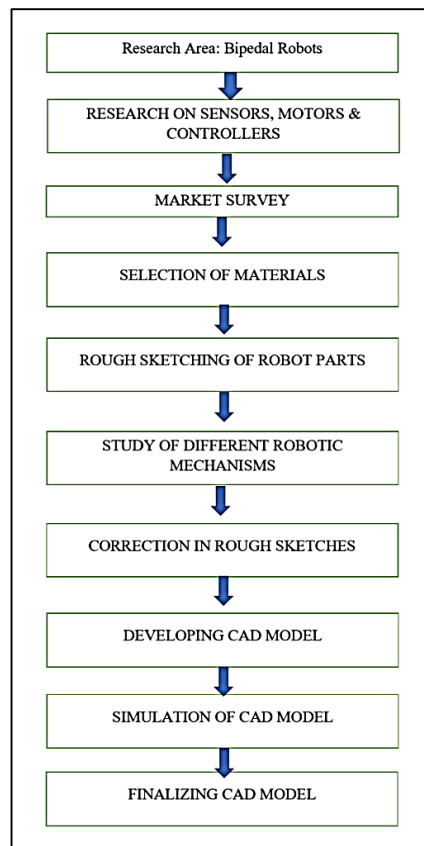
1. To design and develop a Standalone type robot.
2. To lift load with minimum human efforts.
3. To visualize and work from distance.
4. To develop a robot who is statically and dynamically stable.

## III. MATERIAL AND METHOD

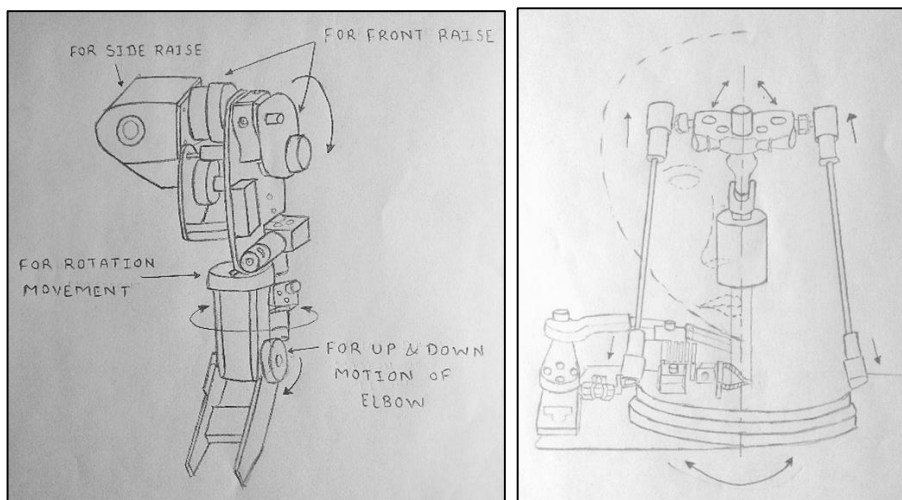
### 3.1 Proposed methodology

#### Approach of Methodology:

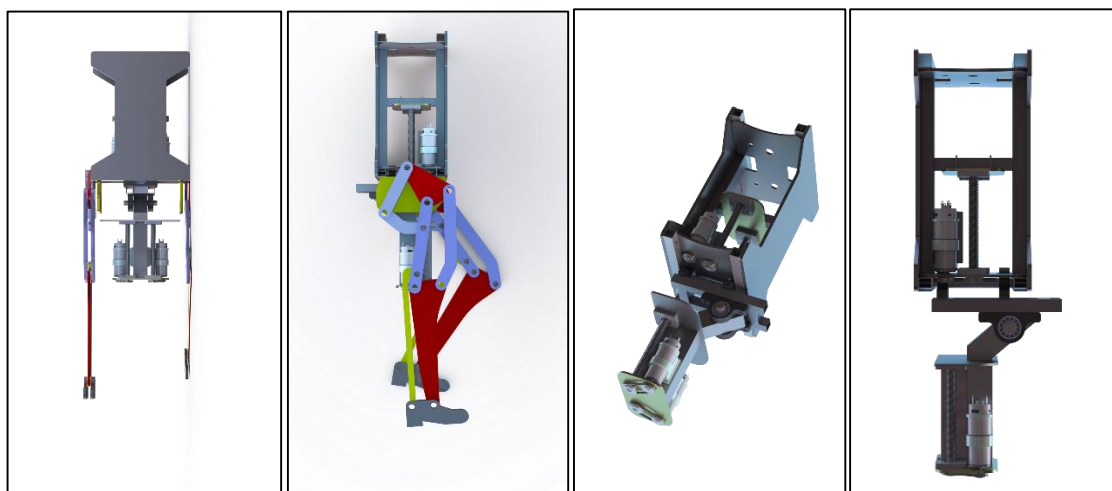
1. Robotics is a very huge field and studying it in a month is not possible so we started our research specifically on bipedal robots, controllers and mechanism.
2. The very first step was to search and download research papers of IEEE transactions and study them.
3. After that we've got rough idea about mechanisms and controllers so we started sketching our idea first. We sketched it and tried to justify the same by developing the robot model in Solidworks.
4. Simultaneously we have done market survey in order to collect some data regarding controllers and materials.
5. We have been developing and changing our model day by day, making it better and better.
6. After that we will try to simulate the same using softwares.



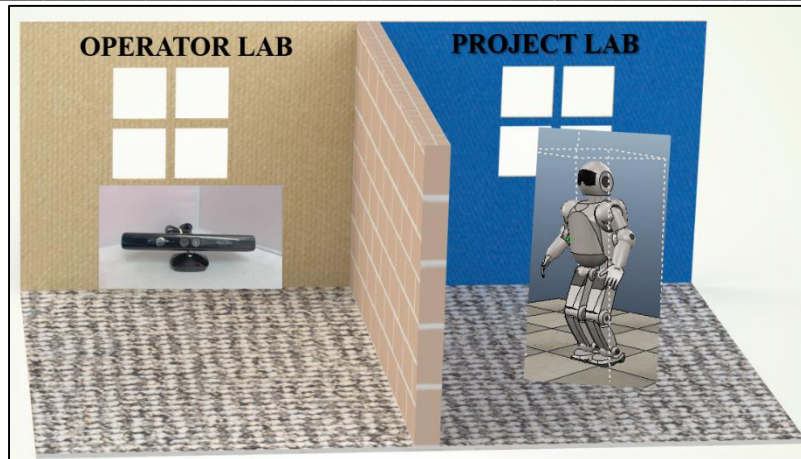
**FIGURE 1: Flow chart of proposed methodology**



**FIGURE 2: Sketches of proposed robot on paper**



**FIGURE 3: Modelling of proposed robot in Solidworks software**



**FIGURE 4: Example of representation of project execution**

### 3.2 MATERIAL SELECTION

We have shortlisted raw material on the basis of their physical as well as chemical properties. We will be using various materials at various joints and parts. We will be using following materials,

Sr. No.	Part	Material
1	Shouder/Waist Joint Casing	EN8 Round Bar
2	Paneling	3 mm Polycarbonate Sheet
3	Upper and Lower Limbs	3-8 mm Acrylic Sheet
4	Support Members	Aluminium Plate and Bar
5	Brackets	3 mm EN8 sheet

**TABLE 1: Material Selection**

Sr. No.	Part	Properties
1	EN 8	Tensile Strength : 500-800 N/mm <sup>2</sup>
2	Polycarbonate	Tensile Strength : 63-70 Mpa
3	Aluminium	Tensile Strength : 124 – 290 Mpa
4	Acrylic	Tensile Strength : 69 Mpa

**TABLE 2: Material Properties**

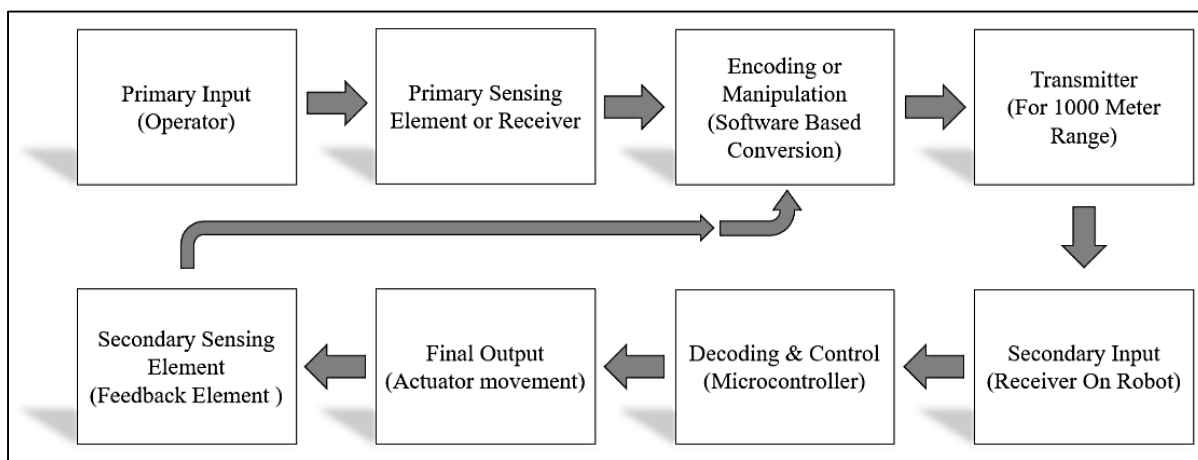
Sr. No.	Electronic Part	Properties
1	Primary sensor (flex , accelerometer )	Operating voltage of FLEX SENSOR: 0-5V Power rating : 0.5Watt (continuous), 1 Watt (peak), Life: 1 million
2	Controlling Board ( Netduino Plus 2 ).	Speed: 168MHz, Code Storage: 384 KB RAM: 100+ KB 10 mbps Ethernet
3	F.P.V. Goggles & Headphones with built in Microphone.	Screen Resolution: 480x272 Frequency Channel: built-in 40CH 5.8GHz A/V automatic search receiver
4	Microcontroller ( Quantity : Multiple. For example: Arduino mega, Teensy 3.2 ).	Voltage range: 1.71 to 3.6 V Flash write voltage range: 1.71 to 3.6 V Temperature range (ambient): -40 to 105°C

**TABLE 3: Electronic Components**

### 3.3 Construction & Working

Construction is divided into two major areas.

1. OPERATING LAB (Source)
  - a. Operator Electronic
  - b. Setup
2. PROJECT LAB (Destination)



**FIGURE 5: Project flow chart**

**Operator :** In Operating Lab, Operator will be standing next to Microsoft XBOX One Kinect 3D Camera Sensor. Operator will be wearing FPV Goggles, Headphones with built in Microphone and few sensors (Flex, Accelerometer etc) on the body. The Operator will be standing on a 360° Treadmill.

**Electronic Setup :** Electronic setup will consist of the Primary Sensing/Receiving, Manipulating and Transmitting element (For example : Microsoft XBOX One Kinect Camera Sensor, HC 12 etc).

**PROJECT LAB :** In project lab, there will be a Robot standing with inbuilt shadow feature and receivers/transmitters (For example : HC 12, Microphone, Speakers) mounted on the body of the robot. In Project Lab, the ShadowBot will replicate operator's movements in real time basis with amplified strength.

#### IV. CONCLUSION

As per our sketches and design we have developed a 3D CAD model in Solidworks software and have checked its movements and motions. We have also tried to develop and test the circuit of our robot digitally on softwares using Arduino and Vrep. Also, during designing we had experienced that there is not enough vacant space available near waist so, we have restricted 1 Degree of freedom near waist and we will be having 42 degree of freedom. We had researched on various controllers and software to obtain our desired aim i.e. to achieve bot operating in real time basis. We will be using Kinect Sensor, Flex Sensor and Accelerometer sensors for determining various movements of robots. From researching various journals, we have also reached to this conclusion that controllers will be playing vital role in our project. We will be using PID controller, teensy 3.2 Microcontroller and IMU to achieve our desired aim.

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# Design and fabrication of compact Cooling Tower

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**Abstract**— We are constructing a cooling tower which will be compact in size, so that it can be easily installed in the internal combustion engine lab. The sole purpose of this project is that, when engines of the lab are used for experiments, they get heated(due to 2<sup>nd</sup> law of thermodynamics) and so to cool them down the water is supplied and circulated around the engines. The engines get cooled and the hot water coming out from the engines side is disposed in the surrounding, due to which a considerable amount of water gets wasted. So by building a cooling tower the hot water can be cooled down and can be re-used for further cooling of the engines.

**Keywords**— 2<sup>nd</sup> law of thermodynamics, fiber reinforced plastic, internal combustion engine, thermodynamics.

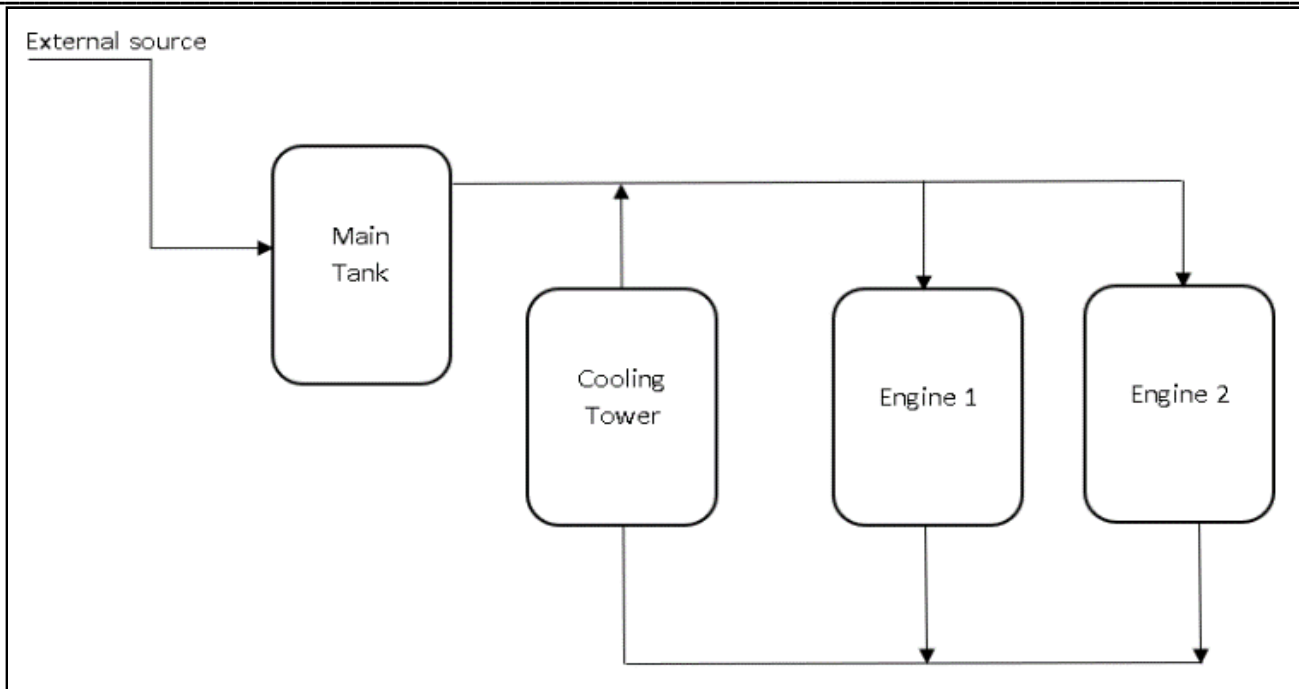
## I. INTRODUCTION

A cooling tower is a specialized heat exchanger in which air and water are brought into direct contact with each other in order to reduce the water's temperature. As this occurs, a small volume of water is evaporated, reducing the temperature of the water being circulated through the tower. Water, which has been heated by an industrial process or in an air-conditioning condenser, is pumped to the cooling tower through pipes. The water sprays through nozzles onto banks of material called "fill", which slows the flow of water through the cooling tower, and exposes as much water surface area as possible for maximum air-water contact. As the water flows through the cooling tower, it is exposed to air, which is being pulled through the tower by the electric motor-driven fan. When the water and air meet, a small amount of water is evaporated, creating a cooling action. The cooled water is then pumped back to the condenser or process equipment where it absorbs heat. It will then be pumped back to the cooling tower to be cooled once again.

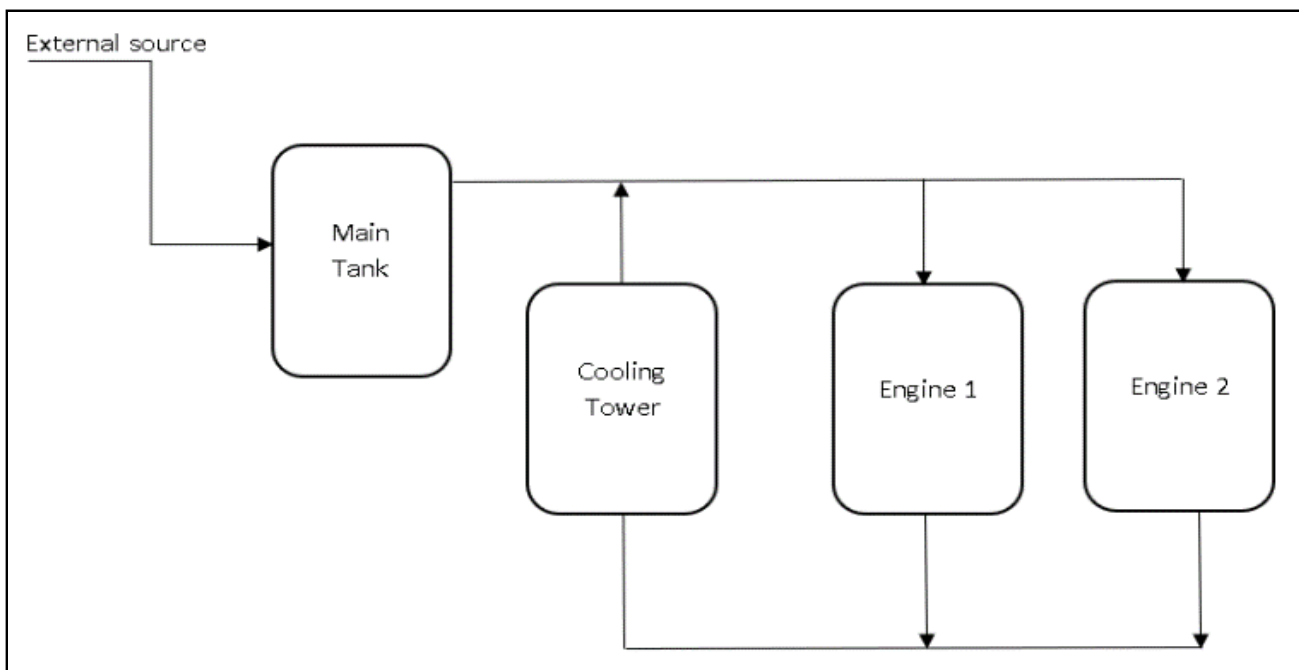
If cooling was only a result of sensible heat transfer, then cooling towers would be enormously large due to massive air flow requirements. Evaporation is the key to maximizing efficiency. The type of heat rejection in a cooling tower is termed as "evaporative", in that it allows a small portion of the water being cooled to evaporate into a moving air stream to provide significant cooling to the rest of that water stream. The heat from the water stream transferred to the air stream raises the air's temperature and its relative humidity to 100%, and this air is discharged to the atmosphere.

## II. PROBLEM DEFINITION

In internal combustion engine lab, there are two test engines, one is petrol engine and another one is diesel engine. These engines are used for experiment purpose. Water circulation system is installed around the setup to provide the cooling effect to the engines. The water which is circulated around the engine, accepts the heat from the engines and becomes hot. But with the lack of cooling system(to cool the water), the hot water itself is again recirculated around the engine. Thus it cannot provide any further cooling to the two engines.



**FIGURE 1: Block diagram of current condition in ICE lab**



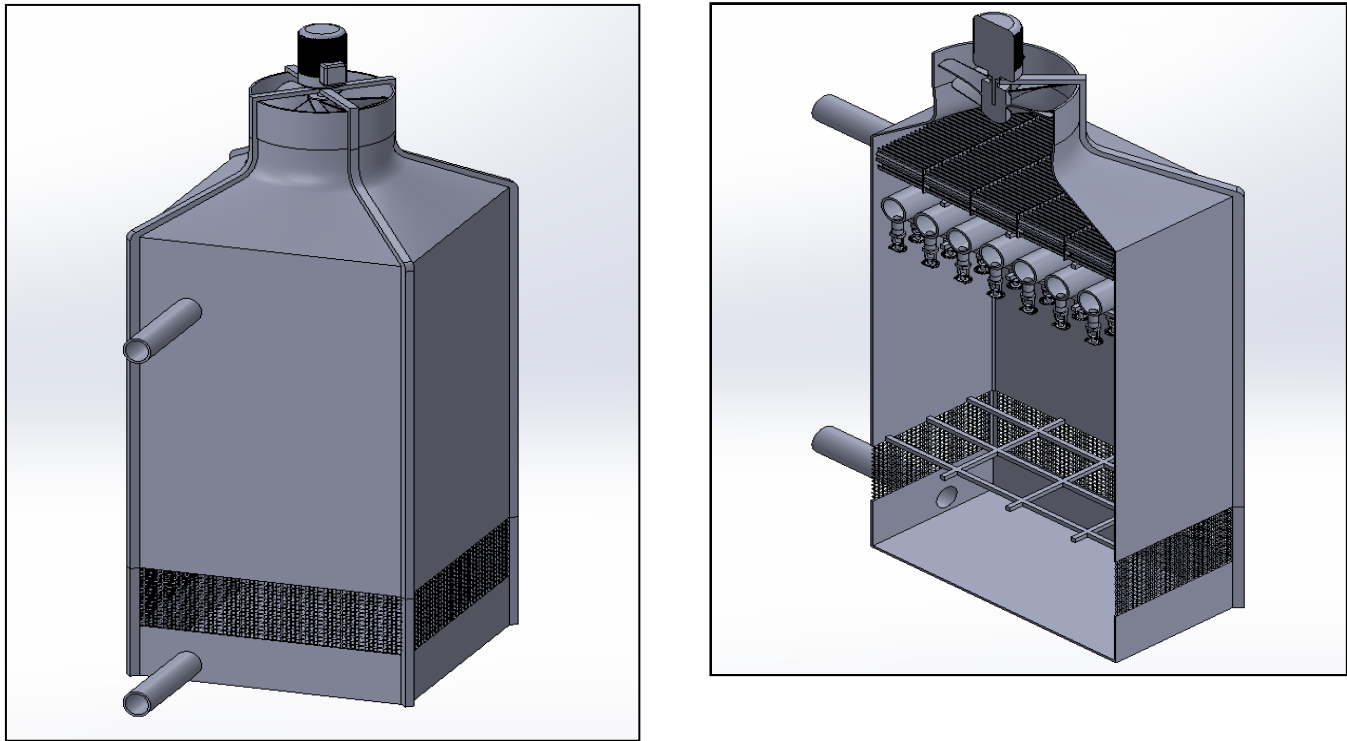
**FIGURE 1: Block diagram of solution after implementation of Cooling Tower**

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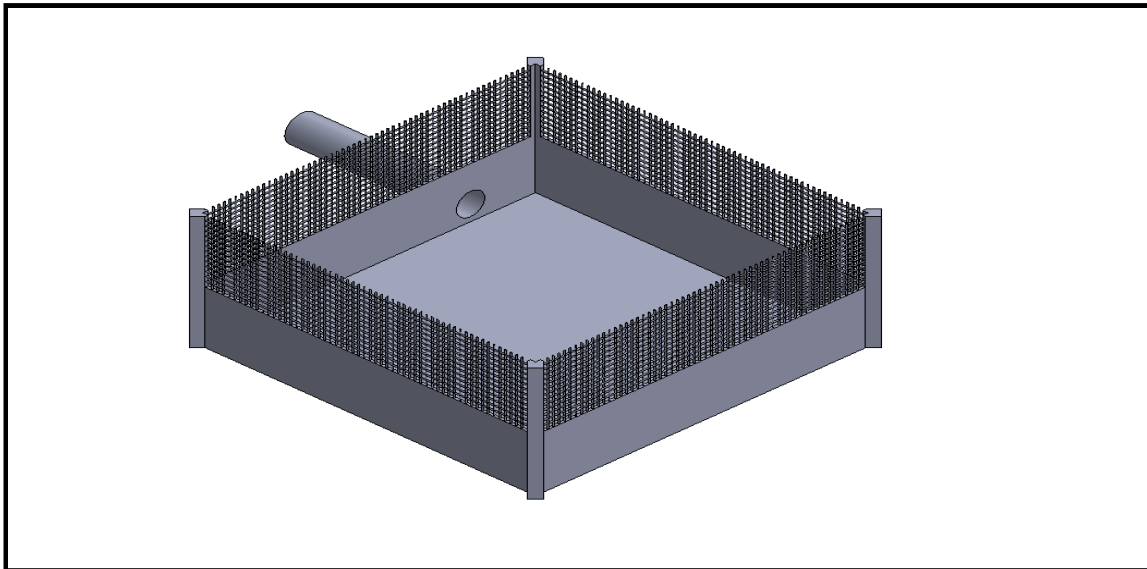
### III. MATERIAL AND METHOD

Design and fabrication of Compact Cooling Tower is carried out in following steps:–

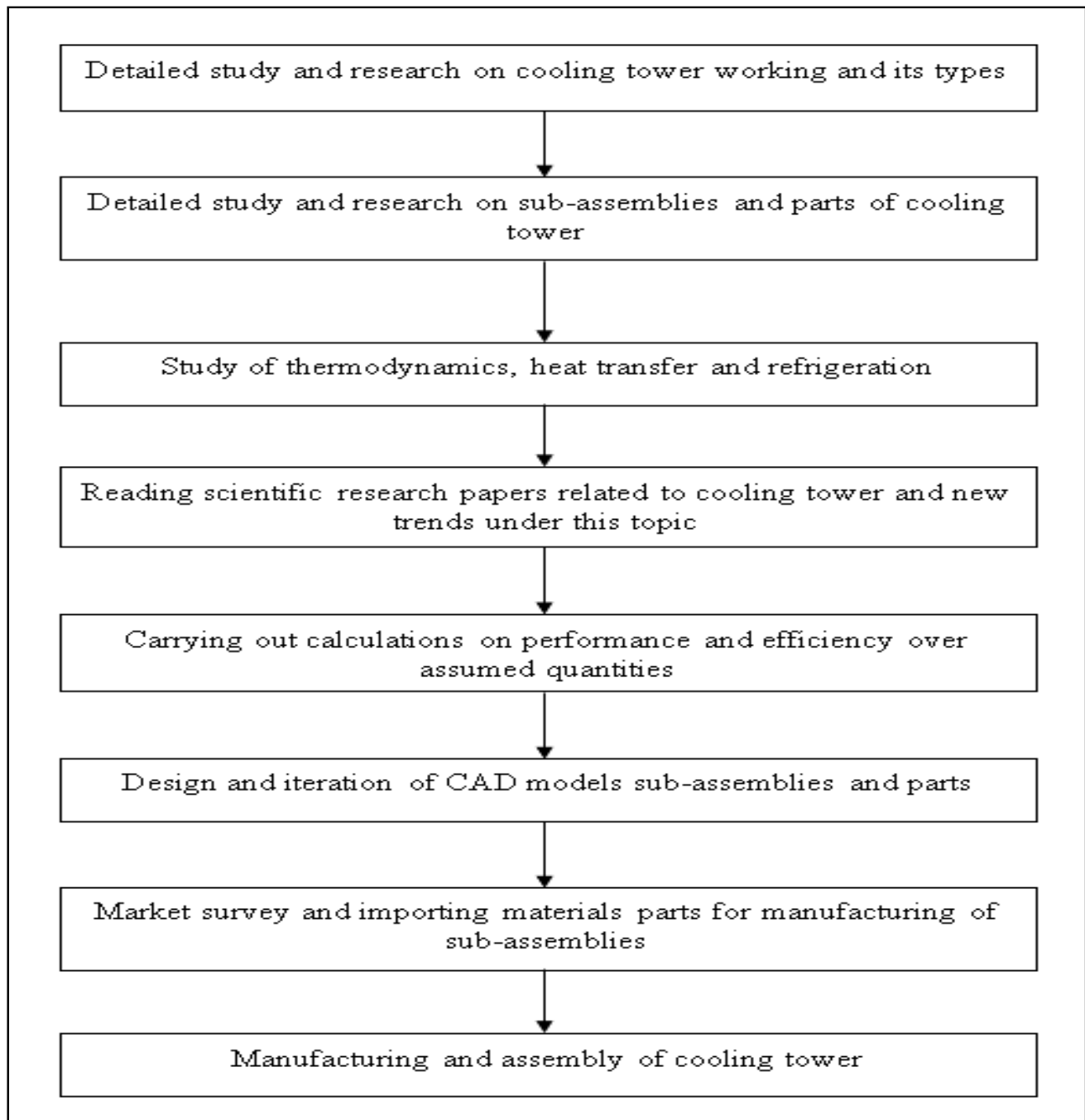
1. Computational design of the cooling tower is created. The design has satisfied all the requirements for the installation at a provided space of the lab. Software used for this purpose was **SOLIDWORKS 2017**. In designing step frame which is the main structure of machine on which all the other parts are to be mounted. Some of the components which are not available in the market are to be designed and analyzed so that they does not fail during operation
2. Required parts were purchased from the market for the construction of sub-assemblies such as header, collector, drift eliminator and suction unit. The parts have a standard size and shape.
3. The parts which are needed for the frame up and development of compact cooling tower and parts which are available in the market has to be ordered because of their standard size such as nuts and bolts, stainless steel fills, exhaust fan, fiber reinforced plastic sheet, multi hole nozzle, PVC pipes, fan regulator, etc.
4. To make the actual frame from the material ordered. In this step the material has to be cut according to the sizes required, welded where ever needed and bolted for the maintenance purpose. After the frame is ready it will have to be checked for any failure before installing other parts such as stainless steel fill, exhaust fan, drift eliminator.  
In design a to make outer frame having dimensions 60x60x160 cm, with inlet and output pipes having diameter 2 inches each attach to main frame.
5. The two halves of the outer body of the cooling tower was created using a manual molding. Molten material used here to create the outer body was fiber reinforced plastic.
6. The frame is setup the next part is to assemble the following components of machine such as stainless steel fill, exhaust fan, drift eliminator, regulator, lower body for collecting cooled water.
7. To check the working of all the electrical components like exhaust fan ,regulator and motor. The purpose of using this material was that it is light in weight, it is resistant to chemical water and its low cost.
8. Sub-assemblies such as header and drift eliminator were constructed and assembled together with outer body.
9. Connections are made for the thermocouple sensors and temperature indicating display.
10. Testing of the cooling tower was done and checking performance.
11. Finishing the outer body of cooling tower by polishing and painting.
12. Cooling tower is all set perform the operation .



**FIGURE 3: Isometric and sectional view of cooling tower assembly in Solid Works**



**FIGURE 4: Isometric view of lower body of cooling tower**



**FIGURE 5 : Flow chart of proposed methodology**

#### IV. CONCLUSION

As we get to know the limitations of conventional cooling towers in the present time, has high lead time and low efficiency. To do so we went through various research papers which helped us to understand the mechanisms and processes. As we get to know the limitations of conventional cooling towers in the present time, has high lead time and low efficiency. We concentrated on reducing lead time and increasing the performance and efficiency. By using the Stainless steel fills and regulator enabled fan, we will achieve efficient cooling from Compact Cooling Tower.

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## **“Portable solar desalination plant”**

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**Abstract**— Desalination is a process of converting sea water into fresh water which can be used by people for their daily uses. Man has always looked for oceans to enjoy the benefit of water. Some of the early discoveries of it is by Aristotle and others. The people of that time came up with distillation and filtration using soil deposits to obtain drinking water from the sea. After that many methods came of desalination like reverse osmosis, etc. and were used and thermal energy method was found cheapest and hence we came to know that we can use this processing a portable desalination plant. The potential of thermal energy is huge all around the world and it has been used in various processes all around. It is used for desalination process which will cure the problem of scarcity of water in the world and mostly in the water drought regions in India. This project is focused on making fresh water from sea water in the cheapest price available and in very small setup.

**Keywords**— Desalination, Thermal Energy, Portable, Scarcity, Cheapest.

### **I. INTRODUCTION**

The Project work presented in this report is based on implementation of portable solar desalination process to decrease the shortage of fresh water. Fresh water resources are going down as the need of water is increasing. The best way to overcome this problem is to use solar energy for desalination The UNEP said in 2012 that 1/3 of the world's population have fresh water resources, while the rest will suffer water shortage by year 2025. According to WHO more than 1.6 billion people in the world will have polluted drinking water. There are still large population around the world who have no availability of drinking water and fresh water is also not distributed geographically. The best thing to do gain some fresh water is to desalinate sea water and convert that into fresh water.

### **II. OBJECTIVES**

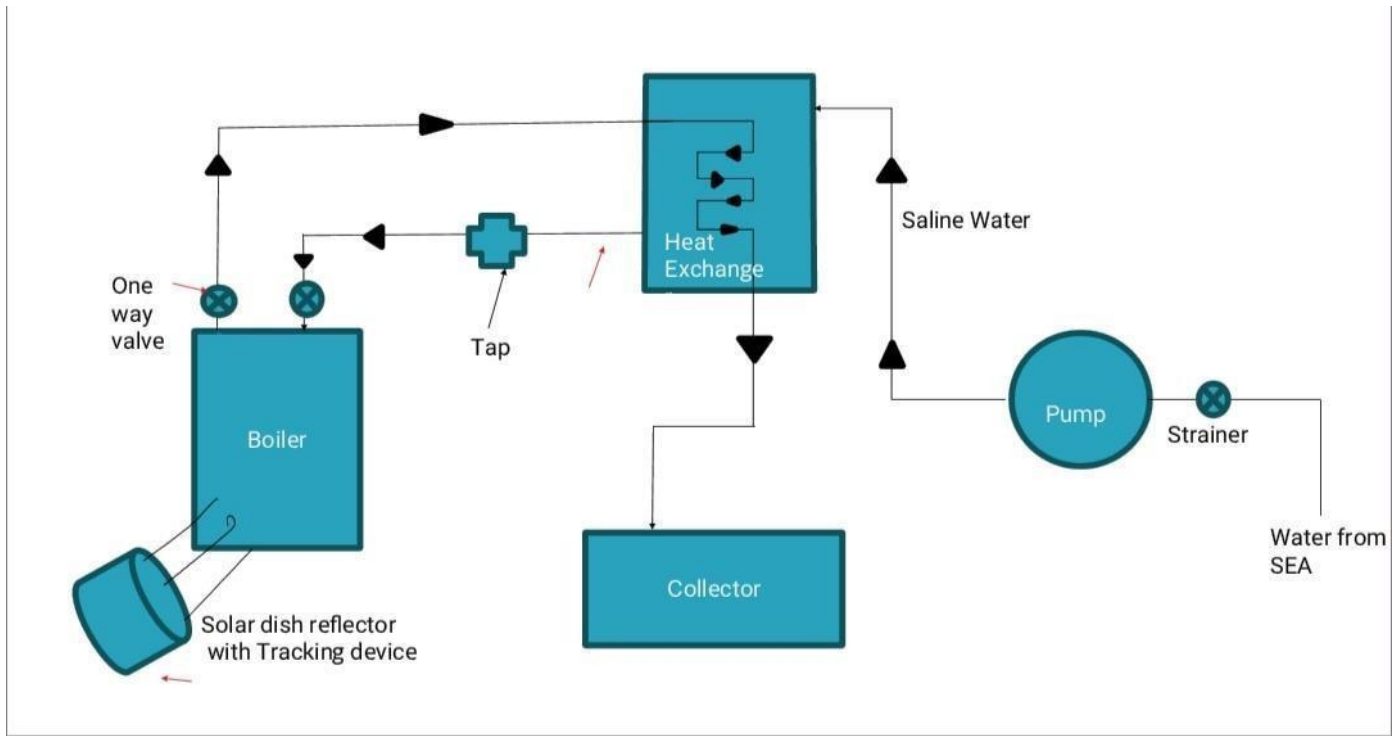
- To create freshwater from sea water by thermal desalination process.
- To remove salt from it
- To extract maximum amount of fresh water from available sea water.
- To deposit brine with less harm to environment.
- To design a cost-effective system.
-

### III. PROPOSED METHODOLOGY

In order to overcome the scarcity of water, we have come to a solution of making thermal water desalination plant.

Reviewing of various research papers, ideas from GOOGLE & some basic books of thermal Engineering we are planning to make the same. As we all know that when water is heated it is converted into vapor and it evaporates. Thus our planning is to collect that vapor via pipe and convert it into water which can be used for drinking purpose.

Block Diagram:



**FIGURE 1:Controller**

Desalination process can be implemented using following steps;

1. Construction: Main parts of Portable Water Desalination plant are Boiler, Solar Parabolic Reflector, Heat Exchanger and a pump. As unit will be of medium size weight of the same will be approximate 30kg
2. The process starts like this: We pump the sea water into the Boiler via Heat Exchanger, thus to remove the dirt particles a filter is installed which remove all the contaminants from the sea water. Then the water will come into the boiler for heating. Heating will be done by the rays of the sun. An parabolic solar reflector is placed beside the boiler. This reflector will focus the sun rays which are parallel to the axis of the reflector to a central point on the boiler.
3. When this rays will be focused on that central point, it will heat the water and evaporation will start. After evaporation vapor will come out of the water which will be collected in a collector. Now there will be a one way valve fitted in the boiler in the way where water will first come into the boiler from tank.
4. One way valve will stop vapor to get into that pipe and then vapor will go into other pipe. It also does not allow external air to come into the boiler which maintains vacuum inside the boiler .During the flow of the vapor into this, pipe heat

will be exchanged between the vapor and the saline water. Now when the vapor temperature will decrease it will turn into droplets of water which will be further collected in the collector.

#### 5. Treatment of brine

The byproduct that we will get after this process will be brine and using of this is also a big process. Brine is basically used as a preservative in meat packaging and pickling. In refrigeration and air conditioning brine is used as a heat transfer media because of their low freezing temperature or as vapor absorbing agents because of their low vapor pressure. So it will be our choice whether to give brine to the industries or privately sell it.

### 3.1 Research

We studied research papers which were published by different researchers to deal with the same problem from the research work we learnt that there are various methods which can be used to resolve difficulty of potable water availability. Out of the research paper we referred, we noticed that thermal desalination was simple and effective in operation if planned properly than rest of the processes

#### 3.2 Problem Identification

Research work carried out by the researchers helped us to identify the problems which were faced by them during their experimentation. Some of the obstacles were:

- Less amount of water generation due to improper design specifications.
- Improper selection of process
- Shortage of rain.
- Unfiltered water generation due to absence of filtration system.

#### 3.3 Strategy And Planning

As per the problems we identified, we initiated to build up our own strategies for design and development of a water desalination system working on the same thermal principle with less limitations and drawbacks. Our strategy includes selection of suitable modules and the processes which lead to adequate amount of water generation.

### 3.4 Calculation

#### 1. PUMP

Discharge required (Q) = 5lit/min

$$Q = 8.33 \times 10^{-5} \text{ m}^3/\text{sec}$$

$$= 8.33 \times 10^{-5} \times 1050 \text{ kg/sec}$$

$$= 0.0874 \text{ kg/sec}$$

$$g = 9.81 \text{ m/sec}^2, h = 12 \text{ m}$$

$$\text{Power (P)} = Q \times g \times h$$

$$= 0.0874 \times 9.81 \times 12$$

$$= 10.28 \text{ watt}$$

Assuming 50% mechanical efficiency,

$$\text{Power} = 20 \text{ watt}$$

## 2. Heat exchanger

Thermal conductivity of ( $C_u$ ) = 385 w/mk

Length of copper tube in Heat Exchanger =  $4 \times 15 \times \pi$

$$= 1.88 \text{ m}$$

Area of copper tube exposing the saline water

$$A = 2 \times \pi \times r \times l$$

$$= 2 \times \pi \times 0.005 \times 1.88 \dots \dots \dots D = 0.01 \text{m} \ \& \ l = 1.88 \text{ r}$$

$$= 0.059 \text{ m}^2$$

Temperature of vapour inside copper tube ( $T_1$ ) = 373 K

Temperature of Saline water ( $T_2$ ) = 303 K

Heat transfer in Heat exchanger ( $Q$ ) =  $K \times A \times \Delta T / L$

$$= 385 \times 0.059 \times 70 / 1.88$$

$$= 846.65 \text{ watt}$$

## 3. Solar parabolic reflector

Latent heat of water = 2260 kJ/kg

Sp. heat of water = 4.21 kJ/kg°C

Mass of water = 1kg

Heat required to raise temp of water to boiling point ( $Q$ ) =  $mC_p \Delta T$

$$= 1 \times 4.21 \times 73$$

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$$= 304 \text{ kJ}$$

Total heat = SH + LH

$$= 304 + 2260$$

$$= 2564 \text{ kJ} \cong 2600 \text{ kJ}$$

We require 2600 kJ in 15

$$\therefore P = \frac{2600}{15 * 60 \text{ minutes.}}$$

$$= 2.88 \cong 3 \text{ kw}$$

#### 4 .PRESSURE GAUGE

Maximum Pressure inside the boiler should be below  $1.40 \text{ kg/cm}^2$

Therefore, we select the pressure gauge of range between

### IV. RESULTS AND DISCUSSION

The proposed methodology directly targets at the desalination of saline water making fresh water available for people. We studied various processes and found this process of thermal desalination cheap and efficient. The parameters to be considered for measure of successful implementation of desalination is the rate of flow, quantity of fresh water produced per day, size of the plant, etc.

The following results are expected after implementing thermal desalination is:

- Fresh water for people
- Fast process
- Size should be less for portability

### V. CONCLUSION

The literature represented in this study describes the importance of fresh water in our life. Today thermal desalination solves all the water scarcity problems in the world. It solves all the problems related to water for the people.

Portable water is a rare thing in some areas. While conventional techniques can meet every demand of water. But conventional desalination processes are expensive to operate which prevent their utilization in remote areas. With the increase in cost of energy and later it will be unavailable, there is a need for cheap desalination system that is suited for small application.

Solar desalination can be the method to decrease the water shortage. Solar energy with desalination process can have a good impact and have a reliable source for portable water.

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# Industry 4.0 Dimensions and – Innovative Solutions in Logistics and Supply Chains Management

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**Abstract**— The aim of this article is to present some ‘smart’ solutions which could be recognised as innovative solutions in both areas: technology and organisation. The above mentioned solutions could be implemented by logistics which, in the era of globalization, plays a very important role. This applies not only to functioning of individual companies, but also to national economies and even the world economy. The phenomenon of competition can now be observed not just in individual companies but in entire supply chains. The pace of development of the modern economy means that companies are forced to constantly introduce more and more new solutions, resulting in innovation driving the progress of the market. This article is a part of research, which considers the problem of implementation of IT solutions logistics.

**Keywords**— Internet of Things; Big Data; Industry 4.0; innovative solutions; logistics

## I. INTRODUCTION

Innovation today is synonymous with progress and modernity in every area – from the social sphere, through the educational system, to the economic sphere in science and economy, looking for new solutions that contribute to competitive advantage in the market and thus raise the level of economic and social development and ensure a high quality of life. “Innovation is the difference between leaders and followers”, Steve Jobs, Apple's famous CEO, would say [9]. Confirmation of this can be seen in graphs presented in the illustration, which show that most of projects. based on innovation and high technologies are implemented in the US and thus the US economy is leading the world economy. The European Union, in order to reduce the gap between itself and the USA in the area of economic development, requires an industrial and technological base to provide the citizens in the EU and beyond its borders solutions for communication and movement in increasingly urbanized areas [13, 14].

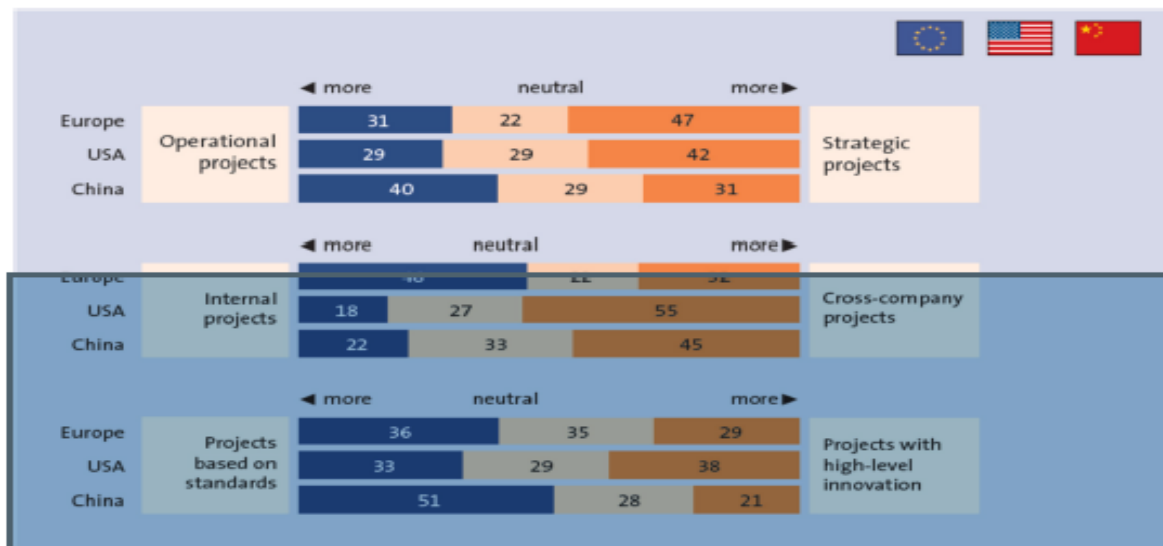


Fig. 1. Project agenda of “Leaders”: Strong focus on strategic, cross-company, and innovation projects.

Source: [12].

FIGURE 1

The concept of innovation comes from the Latin 'innovare' or 'creating something new'. The concept of innovation was introduced to world economic literature by J.A. Schumpeter in 1912; he treated innovation as a factor in economic development, and its inclusion is considered a classic. According to Schumpeter [10], innovations are new combinations which occur in the following cases:

- ☐ Developing a new product or introducing products with new properties to the market
- ☐ Introduction of a new method of production
- ☐ The opening of a new market
- ☐ Acquisition of new sources of raw materials
- ☐ Carrying out a new organization of economic processes.

This definition is the starting point for a discussion about the importance of innovation in the economy. In terms of Schumpeter's definition, where innovation means putting new solutions into practice, the author focused primarily on technical innovation and its impact on the economy. He is the creator of the so-called concept of "Creative destruction", which is a continuous destruction of old structures and the constant development of new, more effective ones. For Peter F. Drucker [5], in turn, "Innovation is the specific tool of entrepreneurs, by means of which the changes make them an opportunity to take up a new business or the provision of new services". In his opinion, "innovation does not have to be technical, it need not even be something material". Yet another definition of innovation can be found in the Operational Programme Innovative Economy, where innovation is understood as putting into practice new or significantly improved solutions regarding a product (good or service), process, marketing or organizational system within a company. There are many definitions of the concept of innovation, however all boil down to determining that innovation is a process and not something that occurs in the short term. It is a process during which something completely new or improved is created, or which transforms something which already exists. It could be said therefore that it is a consequence of the progress of the processes of science and technology. Innovative strategies can raise the level of logistics customer service and logistics services, thereby enhancing the work and its conditions. This results in the shortening of customer service times, and a consequent increase in demand for such services

## II. INNOVATION IN LOGISTICS

Innovation and time are the main competitive advantages [16]. Time, here, is understood as the frequency of the introduction of new or significantly upgraded versions of the product. Its growth changes and shortens the life cycle of such products in comparison to conventional products. The different phases of the life cycle are short in-time and rapid demand-dimension [17]. A consequence of the booming market, which is set up to meet increasing customer demand, has led to changes in the organization of enterprises. The most important are shortening product life cycles. The first generation Volkswagen Golf, for example, was produced from 1974 until 1983. (Convertible version – until 1993, and the Caddyvan until 1992, while in South Africa the car was manufactured continuously until 2009). The latest (sixth) generation VW Golf was produced from 2008 to 2012 (only 4 years). On the other hand, extensions to the range can be seen e.g. cars of the same model are offered with many variations in engine, bodywork and equipment; all this in order to better meet the needs of increasingly informed and demanding customers. In this specific race for customer acquisition companies are seen to offer newer products but with a lower level of quality than the previous versions, a phenomena that is especially noticeable is the consumer goods market. This leads to the creation of simpler, cheaper and more attractive products for the less affluent and less prepared customers. From this premise, it can be assumed that the life cycle of that product will be shorter than its earlier versions. Such products are technologically excellent and good value, however their shelf life is limited. Such market changes have led to the appearance of the phenomenon of disruptive innovation [16]. Innovation in logistics is not, however, solely associated with the involvement of modern IT solutions. A sign of modernity can also be a way of thinking. Innovative solutions in logistics can also manifest themselves in [4]:

- ☐ continuous improvement of a team carrying out innovation and continuous verification of work and commitment
- ☐ constant vigil over the quality of activities
- ☐ constant focus on work of the team which is working on the implemented practices and shared values
- ☐ activities involving the constant search for new and better ways to implement the tasks of logistics
- ☐ satisfaction with work and honesty to customers, elimination of old habits, behaviours and barriers associated with changes in the area of logistics activities.

It follows that the most important drivers of innovation that somehow push companies to create new value in logistics are human resources and organizational culture. As well as citing two breakthrough innovations in logistics, namely the container, which has totally

revolutionized the flow of materials and RFID technology, which has contributed to the transparency of the supply chain, Pfohl also mentions other key success factors:

the structure of regional networks, flexibility, risk management and rotation means increased customer requirements in terms of lead time delivery services, their availability and reliability services prepared in accordance with the needs of consumers, therefore rapid response to their needs segmentation of the supply chain focused on demand and specific needs of customers, which can help to reduce the volume of stocks, and thus – to optimize costs safety requirements and potential hazards in the supply chain risk management in the supply chain strategies for sustainable development of enterprises with regard to environmental aspects.

All of the above factors and trends should be reflected in innovative logistic solutions. Thanks to economies of scale they will be able to lead to solutions that allow logistics operators to meet the requirements of consumers in the twenty-first century.

### III.THE INTERNET OF THINGS

The concept of the Internet of Things was created by a British entrepreneur and founder of start-ups named Kevin Ashton. The idea was formulated in 1999 to describe a system in which the material world communicates with computers (exchanges data) with ubiquitous sensors. Almost a decade later, at the turn of 2008 and 2009, the number of devices connected to the network exceeded the number of inhabitants of our globe. This moment, according to Cisco, is the true birth of the "Internet of Things", referred to more often as the "Internet of Everything". In this approach, a system is created not only of objects but also the processes, data, people, and even animals or atmospheric phenomena – everything that can be treated as a variable [9]. Three distinguishing features of the Internet of things are context, omnipresence and optimization. The first refers to the possibility of an advanced object interaction with an existing environment and the immediate response by it to change. The characteristic of context allows objects to provide information such as location, physical condition or atmospheric conditions. Omnipresence illustrates the fact that objects today are much more than just connections to a user network of human-operators. In the near future, they will communicate with each other on a large scale. Optimization is the expression of the functionality which every object possesses. To fully understand the scale of the phenomenon and the number of devices that can be found within the Internet of Things, below is a list of potential areas where the use of IoT solutions can be seen, according to the classification adopted by O. Vermees and P. Friess [9]:

(Smart) environment is a category of solutions, Internet of Things, which from the daily consumer perspective are the least visible. However, these are the basis for the safe operation of the entire anthropogenic environment (manmade – e.g. Urban, industrial areas, agricultural areas) that make the ecosystem friendly to economic development and the functioning of societies

(Smart) water management, a wide range of issues related to the administration and management of key resources for the functioning of the environment. This category includes, for example: The impact of water resources on the environment, their use and protection deficits, regulation of rivers and protection against floods, waterways, hydropower or security

(Smart) industry is entering the area of the Internet of Things in solutions related to particular sectors of the national economy.

(Smart) production as well as intelligent industry, includes solutions that fall within specific sectors of the economy. These are both issues related to agriculture (e.g. Temperature control and irrigation to prevent drought or the formation of fungi), breeding (monitoring living conditions and grazing livestock), and control of production lines (readers, sensors, video surveillance – useful in the management and inspections) as well as control of the rotation of products on store shelves and in warehouses.

(Smart) transport should be – apart from the above mentioned – a key element of supporting the economy. This category includes issues such as: the location of transported goods (e.g. checking routes of hazardous, delicate or precious materials) control of the conditions of transport (e.g. shock) or storage conditions (e.g. flammable materials)

(Smart) energy includes a number of solutions that enable management of utilities. These include the monitoring of individual consumption, as well as the processes for its production and use (e.g. solar systems, windmills and water management)

(Smart) cities are another area in which the Internet Things can play an increasingly important role. Its capabilities promise a lot of

applications – from the organization of pedestrians and traffic (e.g. monitoring traffic congestion, parking spaces, intelligent roads, providing information about the state of roads, traffic problems, monitoring of weather or accidents on the road), the diagnosis of safety

threats (e.g. vibrations and strength of materials in buildings, bridges, historic buildings), noise, lighting (e.g. adaptive to the level of cloud cover) and waste management (e.g. filling level of containers).

The IoT offers new possibilities in the area of performance. For example, road transport trucks can be automatically controlled to the specification of hosts, which will allow them to operate in predefined intervals and with a standard speed, so as to maximize fuel economy. The Daimler Group has invested in the development of mobile services such as car2go, myTaxi or moovel; General Electric, likewise, has invested in systems to operate equipment and factories use a system called "industrial design" (Internet industry); LG is preparing for "smart homes", producing televisions and household appliances which can connect to the Internet, enriching the offer of related services [7]. With the IoT it is possible to supervise the process of travel of packages and letters. Continuous monitoring allows

the question "where is my package?" to be eliminated. In case of delay, the customer can be informed in advance of complications. In the case of storage in warehouses, intelligent shelving and pallets will become the driving force of modern inventory management. In respect of the carriage of goods – tracking and tracing becomes faster, more precise, predictable and safe. Analysis associated with the development of "connected fleet" can help predict failure and automatically plan moves aimed at improving the supply chain.

#### **IV. BIG DATA – THE DIGITAL REVOLUTION IN LOGISTICS**

Nowadays, through the rapid development of Internet, such a huge amount of information is produced and collected on a daily basis that their processing and analysis is beyond the capabilities of traditional tools. However, there is a technology by which we can conduct analysis and that is Big Data. Big Data allows us to quickly and efficiently manage and use this constantly growing (thanks to reaping information from many different sources) database. The discussed technology allows analysis and separation of the important from the less important – helping to draw conclusions and support effective transfer of knowledge to carry out business objectives. According to Forrester's definition, Big Data consists of four dimensions (i.e. 4V):

#### **V. INNOVATION IN PRODUCTION LOGISTICS – INDUSTRY 4.0**

The consequence of developing the Internet of Things and Big Data is the conception of Industry 4.0. The third industrial revolution, based on the computerization of business processes and information technology supporting manufacturing, has moved into a fourth wave, which has begun to be dominated by intelligent (smart) products, 3D printers or autonomous vehicles. The term "Industry 4.0" refers to the fourth industrial revolution. The first was related to the mechanization of production through steam engines, the second – with the introduction of mass production due to electricity, the third – with the use of IT and electronic controllers for further automation. The term Industry 4.0 was first used in 2011. It is expected that the realization of this vision may take 10-20 years. The "Fourth Revolution" will use digital product models, which will be formed to a large degree in compliance with the requirements of customers, and will be produced in Smart factories.

It is assumed that intelligent factories will largely have the ability to self-plan and self-adapt. The existence of a complete digital product model, together with the methods of its manufacture, model, intelligent factory with its real representation in networked Cyber Physical Systems are key conditions for the success of the "Fourth Revolution".

#### **VI. CONCLUSION**

Nowadays, the vast majority of businesses, including logistics companies, are determined to implement product, technical, technological and organizational innovation. Enterprises are focused on creating value for the customer, who is becoming more aware and demanding in terms of increased customer requirements relating to lead time delivery services, product availability and reliability. The newest solutions such as Internet of Things, Big Data and Industry 4.0 create opportunities to meet the needs of customers and also contribute to the development of logistics and supply chains management.

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# Industry 4.0: Conceptual framework, Scenarios and Application

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**Abstract**— With fast advancements in industry, technology and applications, many concepts have emerged in manufacturing. Industry 4.0 is a strategic initiative recently introduced by the German government. The goal of the initiative is transformation of industrial manufacturing through digitalization and exploitation of potentials of new technologies. An Industry 4.0 production system is thus flexible and enables individualized and customized products. . It is closely related with the Internet of Things (IoT), Cyber Physical System (CPS), information and communications technology (ICT), Enterprise Architecture (EA), and Enterprise In- tegration (EI) The aim of this paper is to present and facilitate an understanding of Industry 4.0 concepts, its drivers, enablers, goals and limitations. Finally it is discussed if Industry 4.0 is really a disruptive concept or simply a natural incremental development of industrial production systems.

**Keywords** — *Cyber Physical System (CPS), Industry 4.0, Internet of Things (IoT), information and communication technology (ICT), Enterprise Architecture (EA)*

## I. INTRODUCTION

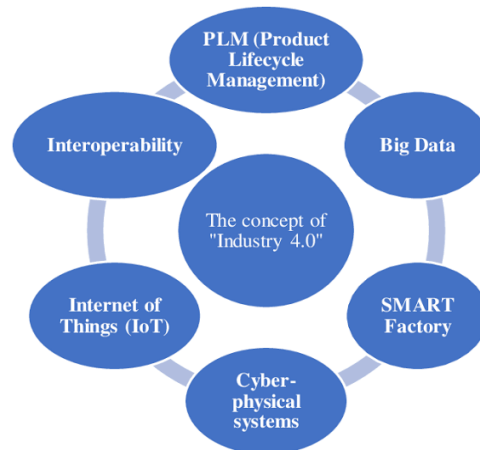
The term "industry 4.0", shortened to I4.0 or simply I4, originated in 2011 from a project of high-tech strategy of the German government, which enhance the computerization of manufacturing.<sup>[1]</sup> The term "Industry 4.0" was introduced in the same year at the Hannover Fair.<sup>[2]</sup> In October 2012 the Working Group on Industry 4.0 presented a set of Industry 4.0 implementation recommendations to the German federal government. The Industry 4.0 workgroup persons and partners are recognized as the founding fathers and driving force behind Industry 4.0. On 8 April 2013 at the Hannover Fair, the final report of the Working Group Industry 4.0 was presented.<sup>[3]</sup> This working group was headed by Siegfried Dais (Robert Bosch GmbH) and Henning Kagermann (German Academy of Science and Engineering). As Industry 4.0 principles have been applied by companies they have sometimes been re-branded, for example the aerospace parts manufacturer Meggitt PLC has branded its own Industry 4.0 research project M4. <sup>[4]</sup> The discussion of how the shift to Industry 4.0, especially digitalization, will affect the labour market is being discussed in Germany under the topic of Work 4.0.

## II. THE VISION AND CONCEPT OF INDUSTRY 4.0

There is a basic consensus among many researchers that the industrial revisions require a long-time period of development and cover the following four aspects, considered as the future manufacturing visions:

- **Factory.** The main components of Industry 4.0, the future factory is going to involve a new integrative, where not only all manufacturing resources (sensors, actuators, machines, robots, conveyors, etc.) are connected and transfer information automatically, but also the factory will become conscious and smart enough to predict and maintain the machines; to control the production process, and to manage the factory system. Many manufacturing processes, like , production planning product design, production engineering and production and services, are going to be simulated as compact, and then connected closely end-to-end, which means these processes are controlled interdependently. This kind of future factory is known as a Smart Factory [5].
- **Business.** Industry 4.0 implies a complete communication network will exist between various resources, customers, companies, supplier, logistics, factories, etc. Every section optimizes their configuration in real-time depending on the demands and status of associated sections in the network, which makes the maximum profit for all cooperatives with the limited sharing resources. In addition, the costs and pollution, raw materials, CO2 emissions, etc., will be reduced. The future business network is influenced by each cooperating section, which could achieve a self-organizing status and transmit the real-time responses [6].

- **Products.** Advantage from Industry 4.0, will be a new type of product generated in manufacturing, that of smart products. These products are used with sensors, processors, and identifiable components which carry information and knowledge to transfer the functional guidance the customers and transmits the uses feedback to the manufacturing system. With these components, many functions can be added to the products, for example, measuring the state of products, carrying this information, tracking the products, and analyzing the results depending on the information. In addition, a full production information can be embedded with product helping product developer in optimizing the design, the prediction, and the maintenance [7].



**FIGURE 1: Concept of Industry 4.0**

- **Customers.** Customers is also a key element under Industry 4.0. A new purchasing method is going to be provided to customers. It allows customers to order whatever function of products, with any number even if only one is. In addition, customers could change their ideas and order at any stage during production even at the last minute with no charge. On the other hand, the benefit from the smart products enables the customer not only to know the production information of the product but also to receive the advice of utilization depending on their own behaviors [8]. Besides all of these planned visions of manufacturing, many researchers and companies have been working on Industry 4.0 in many fields around these concepts [9].

### III. COMPONENTS OF INDUSTRY 4.0

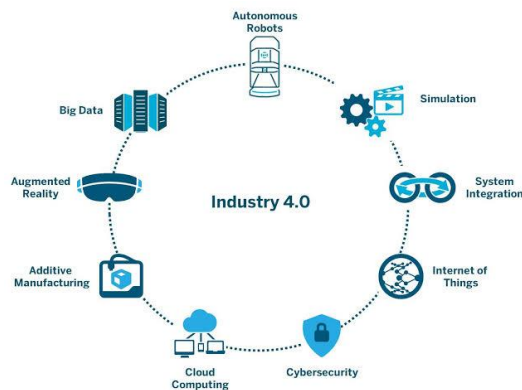
- **The Internet of Things**

The IoT refers to an inter-networking world in which various objects are embedded with electronic sensors, actuators, or other digital devices so that they can be connected for the purpose of collecting and exchanging data [10]. In general, IoT is able to offer advanced connectivity of physical objects, systems, and services, enabling object-to-object communication and data sharing. In various industries, control and automation for machining, robotic vacuums, and remote monitoring can be acquired by IoT. One important technology in IoT is automatic identification (auto-ID) technology, which is used to make smart objects. RFID technology provides one such example. It has been reported that nearly 20.8 billion devices will be connected and making full use of RFID by 2020 [11]. Such a shift will influence most of industry, and especially manufacturing sectors. RFID technology has been used for identifying various objects in warehouses, production shop floors, logistics companies, distribution centers, retailers, and disposal/recycle stages [12]. After identification, such objects have smart sensing abilities so that they can connect and interact with each other through specific forms of interconnectivity, which may create a huge amount of data from their movements or sensing behaviors. The interconnectivity between smart objects is predefined; such objects are given specific applications or logics, such as manufacturing procedures, that they follow after being equipped with RFID readers and tags [13]. RFID facilities not only help end-users to fulfil their daily operations, but also capture data related to these operations so that production management is achieved on a real-time basis.



### • Cyber-physical system

A CPS is a mechanism through which physical objects and software are closely interconnected, enabling different components to interact with each other in a myriad of ways to exchange information. A CPS involves a large number of trans disciplinary methodologies such as cybernetics theory, mechanical engineering and mechatronics, design and process science, manufacturing systems, and computer science. One of the key technical methods is embedded systems, which enable a highly coordinated and combined relationship between physical objects and their computational elements or services [14]. A CPS-enabled system, unlike a traditional embedded system, contains networked interactions that are designed and developed with physical input and output, along with their cyber twined services such as control algorithms and computational capacities. Thus, a large number of sensors play important roles in a CPS. For example, multiple sensory devices are widely used in CPS to achieve different purposes, such as touch screens, light sensors, and force sensors. Nevertheless, integrating several different subsystems is time-consuming and costly, and the whole system must be kept operational and functional. The heterogeneity and complexity of CPS applications result in several challenges in developing and designing high-confidence, secure, and certifiable systems and control methodologies [15].



**FIGURE 2: Components of Industry 4.0**

### • Cloud computing

Cloud computing is a term that used to delivering computational services through visualized and scalable resources over the Internet . The scalability of resources makes cloud computing interesting for business owners, as it allows organizations to start small and invest in more resources . The ideal cloud should have five characteristics: on-demand self-service, broad network access, resource pooling, rapid elasticity, and measured service. This cloud model is composed of four deployment model such as public, private, community, and hybrid and three delivery model like “software as a service,” “platform as a service,” and “infrastructure as a service” Organizations of all kinds and sizes are using cloud computing to increase their capacity with a minimum budget and without investing in licensing new software,

Despite the significant benefits of cloud computing, critical challenges affect the reliability of this ongoing concept. Researchers and service providers have conducted numerous studies to identify and classify problems related to cloud computing. Based on the study, the most important concern about cloud computing is related to privacy subjects and security. Other challenges such as data management and resource allocation, scalability and availability, load balancing [16], migration to clouds and compatibility, and interoperability and communication between clouds reduce the reliability and efficiency of cloud based systems.

### • Information and communications technology

ICT refers to an extended IT that highlights allied communications and the combination of telecommunications and other technologies that are capable to store, transmit, and changing information easy to understand . ICT covers a wide range of computer science and signal-processing techniques such as wireless systems, enterprise middleware, and audio-visual systems. It focuses on information transferring through various electronic media such as wired or wireless communication standards, and is crucial in

intelligent manufacturing, where production operations and decision-making heavily rely on the data. ICT has been found to have a distinct impact on firm organization, such that better ICT for plant managers and workers is associated with more autonomy and a wider span of control. The use of ICT facilitates the handling of information resources and results in cost reduction and the increase of client compliance [17]. In the modern manufacturing sector, large amount of digital devices have access to Internet-based networks. This rapid growth has caused ICT to become a keyelements of manufacturing systems, where the rapid and adaptive design, production, and delivery of highly customized

#### IV. INDUSTRY 4.0 ADVANTAGES

- **Customizations:** Creating a customer-oriented market that is flexible and will meet the population's needs and growing demands fast and efficiently. Manufacturers will not have to communicate within factories and companies and externally to the customers, which in turn fastens the production and delivery processes. It will destroy the gap between the manufacturer and the customer and communication will take place directly between them.
- **Optimization:** Production optimization is a significant advantage of Industry 4.0. A 'Smart Factory' containing thousands of smart devices that can self-optimize will lead to almost zero production downtime. This is extremely critical for industries which use expensive and high manufacturing equipment . Being able to utilize production consistently and continuously, the company will profit; cost-efficient and increased productivity. According to a Price Waterhouse Coopers report "Digitized products and services generate approximately Euro 110 billion of additional revenue per year for the European Industries."
- **Pushing Research:** The adoption of industry 4.0 technologies will influence research in different fields like IT security and will have an impact in particular of the education industry. A new industry will require new skill-sets. Consequently, 'Education and Training' will take a new-shape which caters to such industries which require skilled-labor.

#### IV. INDUSTRY 4.0 DISADVANTAGES

- The IoT security is a major concern. The companies are working to address the security-related loopholes
- Workers working on industry 4.0 based processes need to improve their technical skills and education.
- It requires maintaining integrity of production processes
- It requires educating staff to adopt this 4th industrial revolution. This requires considerable time as well as efforts across the industries.
- There is general reluctance to change to industry 4.0 by company stakeholders

#### V. CONCLUSION

As increasing attention is given to Industry 4.0, intelligent manufacturing is becoming more and more important in the advancement of modern industry and economy. Intelligent manufacturing is considered to be a key future perspective in both research and application, as it provides added value to various products and systems by applying cutting-edge technologies to traditional products in manufacturing and services. Product service systems will continue to replace traditional product types. Key concepts, major components are covered in this paper. I hope that the concepts discussed in this paper will spark new ideas in the effort to realize the much-anticipated Fourth Industrial Revolution.

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# Automation is the Technique to Improve Production Rate

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**Abstract:** Paper represents the increasing the efficiency of production by automation at different levels in industries. Production efficiency is the ratio between the input and the output parameters of the automated production process. Productivity is an effort is made to study the entire layout design of production line right from raw materials stage until finished product output with automation techniques. Production rate improvement is a plan of action towards manufacturing excellence and it is necessary to achieve good financial and operational performance. Productivity becomes the dominant issues in the market place where customers make their buying decisions based on product quality, sometimes they can pay more for what they consider as high quality product. Previously most organisations were using some techniques for increase production rate such as work measurement, method study and, cost reduction, modernization, investment in machine and equipment, re-engineering etc. automation is about speed, accuracy, and precision of the process. There are many levels where we can apply automation for better and accurate output. Automation is one of the most effective technique for reduction in cost, waste, scrap, labour, time, and controlling quality, and improving overall performance of any machine, system or process. This paper talks about concept of automation tools and technique to be used for improving production efficiency and its advantages.

**Keywords – Automation, cost reduction, method study, Productivity, work measurement.**

## I. INTRODUCTION

The technical development based on new technologies, electronic management, artificial intelligence and computer-integrated production activities essentially determines the development of automation. The pursuit of a complex improvement of the technological, auxiliary and information activities and the minimization of the human involvement in the production activity will increasingly become a major factor in the development of automation.[1]. Productivity improvement is to do the right things better by continuous process. Therefore, it is important to adopt efficient productivity improvement technique to ensure individuals and organization's growth in productivity. [2] Recently much competitive business environment, the industry is challenged by the demand for productivity, quality, safety and environmental protection. Tight profit margins and networked manufacturing emphasize the need for integration and global optimization of production facilities. [3]. There are many machines or systems automation is needed for better and accurate result. Automation is one of the most effective technique for cost cutting by elimination some wastes like scrap, reducing labor, , controlling quality, reducing time and improving overall performance of any machine, system or process in any industry with the complete assurance of large annual profit margins [4]. To Monitor and control any process with the help of latest technologies such as software, PLC control system, Robotics, ERP system and incorporating central computer is known as Automation [5].

## II. AUTOMATION

Monitoring and controlling of any process with the assistance of advance technologies like smart control devices, PLC, Robotics, ERP system and incorporating central computer is named Automation [6]. the utilization of control systems and knowledge technologies to scale back the necessity for human add the assembly of products and services, economize (on production and materials costs) and making money (in profits) also can defined as automation. Workflow automation uses software to regulate which eliminating repetitive tasks, gaining efficiency, minimizing errors and reducing costs. Regardless of what the dimensions of business, be assured that automation will add increased productivity and efficiency.

### 2.1 Need of automation

Some of the reasons for need of automation are such as to Achieve more with less, Elimination of human error, Cleaner Technology, Consistency of product, Minimize Energy consumption, Easy diagnosis of fault, Reduction in Resources, Reduction of Peak Loads, Reduction in Effluent, Environment Protection, Improve Safety and Health, Reduce Maintenance (Chemicals, water, energy etc.), Reduce manpower, Data collection and consolidation, Effective application for Complex tasks, Trending and Report generation Reduce Errors, Increase Speed, Increase Productivity -More automation equals more job capacity, shorter delivery times and optimized business operations, Reduced turnaround and fulfilment times add to overall productivity, Remove the Human Element against market- standard job, Reduce Waste, Expand Capabilities -Automating all parts of the workflow will increase capacity, Improve throughput and Optimize equipment use Workflow automation results in expanded capabilities and increased revenue.[7]

### **III. PROBLEM STATEMENT**

Company realise that they should develop their output and productivity to achieve their yearly target by eliminating some causes and production time that affect profit for company. In mass production the product moves from one workstation to to another next workstation for different processes on material in time restriction. Once it's get disturbed due to delay in between two successive workstation it increases the total cycle time in that workstations. Faster station is limited by slowest station. Thus it decreases the rate of productivity. As the demands are not met by the company, automation techniques are used to eliminate waiting time and to reduce cycle time in the present process in production line to achieve the goal of the company.

#### **3.1 Problem and its effect**

The current major problem faced by industry is conventional process time. Industry requires output in minimum time maintaining product accuracy and good quality. For that, company must use advanced technologies such as automation. Due to this cycle time lots of major problem arise. They are as follows:

1. Long cycle times cause high inventories,
2. More cycle time causes higher cost, and poor customer service.
3. Fail to complete order in time.
4. The machining cost is high due to process.
5. As process hour's increases labour cost and product cost increases.
6. Job cannot be delivery on time as cycle time is more.

### **IV. METHODOLOGY FOR IMPLEMENTATION AUTOMATION**

- It is very important to identify the needed and the feasibility of the system to be automated.
- The production cost, the complicity of the machines, the utility requirement of the machines, quality parameters of the products are most important factors to consider while planning for Automation.
- Select the system that has Flexibility, Ease of Programming, Adaptability to change, Expandability, Enhance ability of function, Ruggedness in system, Service back up.
- Performance factor for automation are Response Time, Reliability, Maintainability, Availability and Capability etc.

#### **4.1 Tools for automation**

- **PLC** - A programmable logic controller, PLC, or programmable controller is a digital computer used for automation of typically industrial electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures.
- **SENSORS** - A sensor is a transducer that converts a physical stimulus from one form into a more useful form to measure the stimulus.
- **ACTUATORS** - Hardware devices that convert a controller command signal into a change in a physical parameter.
- **DRIVES** - Whenever something must be moved, a motor is usually at the source of most automated equipment. There are many types of AC and DC motors.
- **SCADA** - SCADA (supervisory control and data acquisition) is a system that operates with coded signals over communication channels so as to provide control of remote equipment (using typically one communication channel per remote station).

#### **4.2 Effect on productivity and quality**

- Increasing production by avoiding manual delays.
- Improving productivity by achieving the optimum efficiency of the machine.
- Avoiding reprocessing and improving the productivity.
- Automation improves the power saving possibilities and hence the cost of product goes down.
- By avoiding manual error it improves the quality of product and hence productivity.
- Automation can give useful data of the machines, which increases the possibility of analyzing the cause of low or poor productivity.

#### **4.3 Advantages**

- Automation is a need for today's competitive market where quality, cost and availability is playing major role.
- Through Automation only we can achieve these parameters and compete in the market.
- Automation increase Productivity and Growth.
- Workflow Automation adds increased capability to any print business, making it possible for you to focus on what you do best.
- Able to produce more jobs. Workflow automation results in more job capacity for shorter delivery times and optimized business operations.
- Workflow automation will help you reduce costs with labor savings. In addition, you will save supplies and toner by avoiding re-do's and makeovers. Good for your bottom line, good for the planet.
- Automating parts of your workflow will increase capacity, improve throughput and optimize equipment use. All this adds up to expanded capabilities and increased revenue.

### **V. CASE STUDY**

#### **5.1 Objectives of the study**

- To study the automation.
- To study need of automation.
- To study increasing Productivity & Quality Of products by implementation of automation in manufacturing sectors

#### **5.2 Area of study.**



Indian Industrial development with the help of make in India project. If Indian industries make excellent quality products properly, Indian industrial development made strong, it helps to Government and we can achieve target. Researcher selects 48 industries from Dhule City of Maharashtra State. I have selected for this research domain industrial personnel belong specially belong to production and quality departments of some reputed organizations of Dule district.

### 5.3 Research Methodology.

The study is based on critical evaluation and analysis of basically Primary Data. The primary sources include industrial personnel. With the help of the questionnaire, detailed discussions were made with the certain sources of primary data to understand their views, thinking and attitude which would help to give the researchers useful recommendations, if any. The questionnaire is processed with the help of statistical tools like tabulations, grouping, percentages, growth rate, averages, etc. Questionnaire is used mainly to analyze the opinion of the industrial personnel

### 5.4 Industrial employee survey .

Industrial Development is very important in Indian economy and increasing employment .Make in India initiative for development of Indian industrialization at world level so for that it is very important to consider opinion of industrial personnel.

### 5.5 Research Area

Researchers' selected small scale and Large scale Industries from Dhul city. Researchers selected 40 small scale industries and 08 large scale industries in Jalgaon city. Researcher collects data through Primary and Secondary sources. Researcher distributes questionnaires among the Industrial personnel Plant manager, Production manager, Quality manager & Maintenance manager in each industry.

### 5.6 Data Analysis

Researcher prepared the questionnaire for Industrial personnel and distributes it among the Industrial personnel Plant manager, Production manager, Purchase manager & Maintenance manager in each industry total 48 industry in which 40are small-scale industries and 08 large-scale industries. After receiving the questionnaire researcher analysis the questionnaire and make four groups of Plant manager, Production manager, Quality manager & Maintenance manager.

**TABLE 1**  
**INFORMATION OF QUESTIONNAIRE**

Sr. No.	Type of Industries	Plant manager	Production manager	Purchase manager	Maintenance manager	Total
1	Small scale	40	40	40	40	160
2	Large scale	8	8	8	8	32
	Total	48	48	48	48	192

From above There are 192 questionnaire received from group two type of industries small scale and large scale industries , after analysis, researcher select 100 % respondents i.e. 192 for study.

### 5.7 Testing of Hypothesis:

To study increasing Productivity & Quality Of products by implementation of automation in manufacturing sectors.

**H<sub>0</sub>** (Null Hypothesis) There is no increasing Productivity & Quality Of products by implementation of automation in manufacturing sectors..

**H<sub>1</sub>** (Alternative Hypothesis) There is increasing Productivity & Quality Of products by implementation of automation in manufacturing sectors.

Chi-square formula for testing hypothesis is as follow:

$$X_2 = \sum_i \sum_j (O_{ij} - E_{ij})^2 / E_{ij}$$

While applying the Formula. Following two tables were prepared.

**TABLE 2**  
  
**TESTING OF HYPOTHESIS**

Sr.No.	Name of Respondent	YES	NO	TOTAL
1	Plant Manager	37	11	48
2	Production Manager	33	15	48
3	Quality Manager	31	17	48
4	Maintenance Manager	27	21	48
	TOTAL	128	64	192

**TABLE 3**  
  
**TESTING OF HYPOTHESIS**

Oij	Eij	Oij-Eij	(Oij – Eij) <sup>2</sup>	( Oij – Eij) <sup>2</sup> / Eij
37	32	5	25	0.78
33	32	1	1	0.03
31	32	-1	1	0.03
27	32	-5	25	0.78
11	16	-5	25	1.56
15	16	-1	1	0.06
17	16	1	1	0.06
21	16	5	25	1.56
			Total	4.86

## VI. CONCLUSION

From the above example, it is often concluded that, from study of process, which is employed in automation, the specified results of improving productivity are often achieved in limited or very less resources reciprocally. With a correct implementation of automation process stated above, problems are often efficiently classified in corresponding area and people techniques are often applied one by one to urge long lasting results along side improved productivity also as margin of profit. Additionally to manufacturing sector, many tools and techniques of automation are often applied to varied other industries and academic institutions to enhance efficiency and productivity.

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# The Techniques of Lean and Green Manufacturing Systems

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**Abstract**— In today's competitive world, almost every manufacturing companies is in the race of earning money on the cost polluting and damaging environment. Lean manufacturing has been used to improve processes, to reduce process waste, to obtain maximum output and to earn profit. Manufacturing companies are concerned with converting materials and labor into goods and services as efficiently as possible to maximize the profit of an organization. It is in order to create optimized versions that make the best use of resources without affecting the services delivered or product created. Green manufacturing is a method of manufacturing that minimizes waste and pollution. Lean manufacturing is the system which aims in elimination of the waste from the system with a systematic and continuous approach. In this research paper the techniques of lean manufacturing system and green manufacturing system has been studied.

**Keywords**— Lean Manufacturing, Green Manufacturing, Waste.

## I. INTRODUCTION

Green manufacturing is the new manufacturing system that involves various practices and green strategies and techniques to make the system more ecofriendly and eco efficient by the use of Lean Manufacturing system. These strategies include creating products/systems that consumes less material and energy, substituting input materials (e.g. non-toxic for toxic, renewable for non-renewable), reducing unwanted outputs and converting outputs to inputs (recycling).

Higher global awareness of environmental risks gives rise to the new green movement or green technology. In addition, the evolving green technology together with more eco-friendly products is helping in realizing the green manufacturing objectives in real practice. Although interest in green manufacturing is increasing more and more within the research and industrial communities. This paper presents techniques for new lean green manufacturing system.

However, the rate at which Green manufacturing systems are being implemented is not keeping pace with the rapid global expanse of the manufacturing industry, and thus over time we are becoming less "sustainable". Lean manufacturing is rapidly spreading around the world as the premier alternative to the outdated mass production model, for producing quality product, at the lowest cost and shortest time. If Green manufacturing can be integrated with Lean manufacturing, such that Lean serves as a catalyst to Green manufacturing implementation, economically and environmentally sustainable manufacturing could be realized [7]

## II. DESCRIPTION

### 2.1 Lean Manufacturing

The aim of lean manufacturing is to eliminate waste from the systems and operations and extracting maximum outputs in minimum inputs. Waste is anything other than the minimum amount of equipment, materials, parts, and working time, which absolutely are vital to production. Waste can take many forms and can be found at any time and in any place. It may be found hidden in policies, procedures, processes and product designs, and in operations. Waste consumes resources but does not add any value to the product value [5]

### 2.2 Green Manufacturing

Green Manufacturing is a method of manufacturing that minimizes waste and pollution. Green manufacturing goals is to utilize minimum natural resources and conserve them for future generations. The benefit of Green Manufacturing is to saves useless

cost, and promotes research and redesign. Thus, green manufacturing refers to how goods and services are produced with limited effects on the environment under present technological and economic challenges.

### **III. TECHNIQUES OF LEANMANUFACTURING**

The various techniques of lean manufacturing are:-

#### **3.1 Kan-ban System or pull-systems**

A Kan-ban is a card containing all the information required to be done on a product at each stage along its path to completion and which parts are needed at subsequent processes. This concept focuses on reducing excess inventories of raw or work- in-process materials which cannot be consumed immediately by the production cycle [1]

#### **3.2 SMED or single minute exchange of dies**

It is a practice that helps the organization to reduce changeover durations in order to adjust the manufacturing process based on product demand. It has the potential to reduce the amount of waste generated from raw and unprocessed materials left over in the manufacturing processes [2]

#### **3.3 5S**

It means Sort (remove that which is not needed), Set In Order (organize remaining things), Shine (clean and inspect working place), Standardize (write standards for above), Sustain (regularly implement the standards).

### **IV. TECHNIQUES OF GREENMANUFACTURING**

The various techniques of green manufacturing are:-

#### **4.1 Changes in production processes:-**

Many major production process changes fall in to the following categories.

- (1) Changing dependence on human intervention.
- (2) Use of a continuous instead of batch process.
- (3) Changing the nature of the steps in the production process.
- (4) Eliminating steps in production process, and
- (5) Changing cleaning process.

#### **4.2 Changes of inputs in the production process:-**

Changes in the inputs is an important tool in green manufacturing. Both major and minor product ingredients and inputs which contribute to production, without being incorporated in the end product, may be worth changing. An example where changing a minor input in production may substantially reduce its environment impact is the use of paints in the production of cars and airplanes. The introduction of powder based and high solids paints substantially reduces the emission of volatile organic compounds [3]

#### **4.3 Internal re-use:-**

The potential for internal re-use is often substantial, with many possibilities for the re-use of water, energy, and some chemicals and metals. Washing, heating and cooling in the counter current process will facilitate the Internal re-use of energy and water.

Closed loop process water recycling which replaces single pass systems is usually economically attractive, with both water and chemicals potentially being recycled [6]

#### **4.4 Better housekeeping:-**

Good housekeeping refers to generally simple, routinized, non- resource intensive measures that keep a facility in good working and environmental order. It include segregating wastes, minimizing chemical and waste inventories, installing overflows alarms and automatic shutoff valves, eliminating leaks and drips and putting collective devices at places where spills may occur, frequent inspections aimed at identifying environmental concerns and potential malfunctioning of the production process, better control on operating conditions (flow rate, temp., pressure, etc.), regular fine tuning of machinery, and optimizing maintenance schedules [2]

### **V CONCLUSION**

This paper aims to study techniques of lean manufacturing and green manufacturing. Lean and green manufacturing concept is one of the best recent practices in today's time. In manufacturing systems focus is laid on waste reduction, so modern management programs like Lean Manufacturing represent today's best practices in manufacturing systems. Although reducing environmental pollution is not the ultimate goal or main focus of lean manufacturing. So, these achievement may not be maximized in the normal system of lean manufacturing.

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# Thermal and mechanical behaviour of Glass epoxy layers – An Experimental and Theoretical approach

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**Abstract:** *The objective of this research work is to investigate the thermo mechanical behavior of glass- epoxy hybrid laminates. Material properties and coefficient of thermal expansion (CTE), exposed to temperature variation, along the principal directions were measured and characterized as temperature function. A theoretical method was proposed, by applying these characterized properties to the classical lamination theory, to predict the change of CTE for a general laminate. The coefficients of thermal expansion of the laminate were measured and compared with those predicted from the experimental results, it is observed that the proposed method is in good agreement with the experimental result*

**Keywords—** *Thermal mechanical analysis; Glass-epoxy hybrid laminate; Coefficient of Thermal expansion;; Material characterization*

## I. INTRODUCTION

Composite materials have their significant place in the field of Aerospace, Aeronautics, Defence, Civil and Marine for their superior behavior such as the unification of modulus and strength, drop in mass and flexibility over design. Glass, Carbon, Kevlar, Natural fibers and other types of fibers have undergone many investigations. However to attain novel properties, several investigators have applied the hybridization technique [1]. Acquiring properties that cannot be achieved by single fiber reinforcement is possible by hybridization [2]. Glass-Kevlar hybrid composites are currently used as structural materials. Besides, low CTE of a composite can facilitate precise alignment and dimensional stability to structures. Understanding of CTE is indispensable to describe the performance and end use application of composite materials [3] and also to be considered in many engineering designs [4]. Numerous investigators studied the CTE of unidirectional composites [5, 6]; some investigated the fiber orientation effect on CTE [7-9].

Since the material is anisotropic, composite materials experience complexity during manufacturing process. One such complexity is due to unknown parameters, such as development of complex stress states, that is, Thermal Distortion resulting from differences in thermal expansion [10]. The basic properties and CTEs of Glass-Kevlar/epoxy were measured and characterized as temperature function. The changes of CTEs were predicted by applying these functions in Classical lamination theory.

## II. MATERIAL AND METHOD

Glass-Kevlar is a plain weave fabric of 320 gsm, in which Kevlar fiber runs in warp direction and Glass fiber through the weft. The lamina is 0.283 mm thick. A total of 11 layers (0.689 kg) were arranged in the same sequence (0, 90), through hand lay-up and fabricated using vacuum bag molding. The fiber contributed to 59.21%, epoxy resin (LY556) to 37.11% and Hardener (HY951) to 3.68%. Vacuum pressure of 14 psi was applied for 20 hours and cured at 120 degree Celsius for 2 hours. The fabricated laminate dimension was 400\*400\*3 mm<sup>3</sup>. Specimens were prepared according to ASTM standard D638 and D696-16 for temperature tensile test and determining CTE respectively. Fig.1. shows the plain weave fabrics, fabricated laminate and coupon specimen for determining the basic properties and CTE. Fig. 2. shows, the schematic of testing equipment for measuring the basic properties and Dilatometer. Uniaxial tension test were performed at room temperature to 100 degree Celsius.. Modulus was calculated from the stress strain curves obtained from the tests at different temperatures. CTEs were measured from dilatometer with temperature ranging from room temperature to 100 degree Celsius.



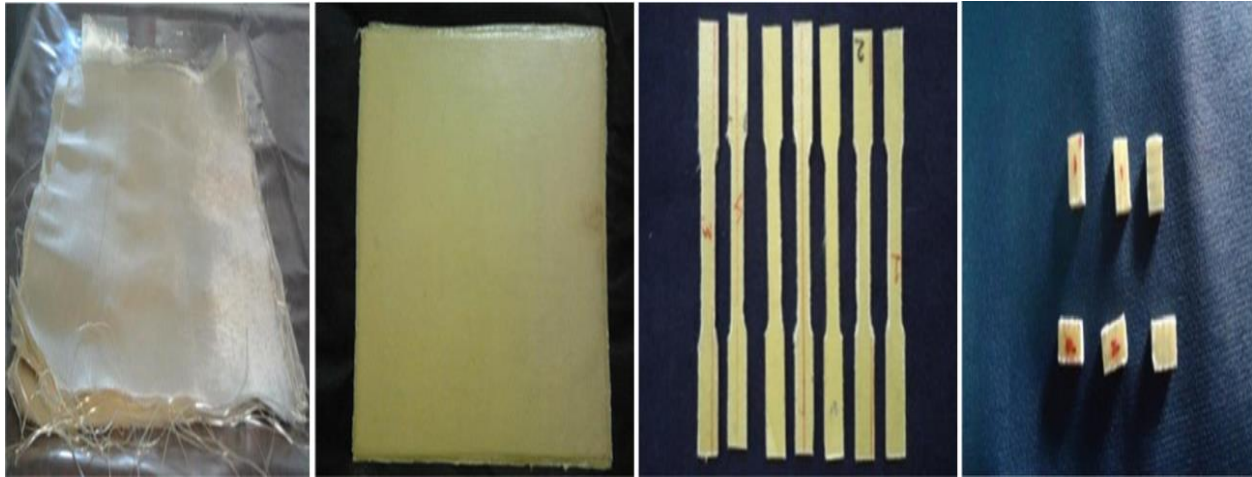


FIGURE 1. (a) Glass-Kevlar plain weave fabrics; (b) Fabricated Laminate; (c) Specimen for tensile test; (d) Specimen for determining CTE.

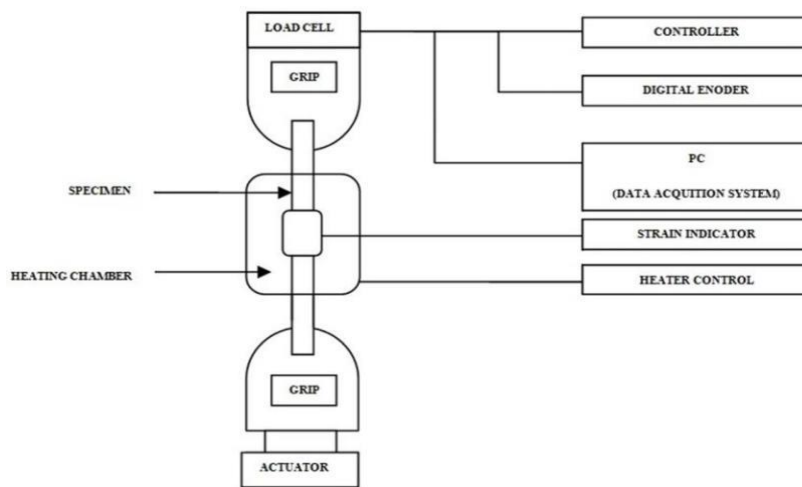


FIGURE1.2(a) Schematic of the uniaxial tension test setup; (b) Dilatometer.

### III. ANALYTICAL FORMULATION

The formulation is derived from Classical lamination theory, where the following assumptions are made

[1] Each lamina is orthotropic

[1] Each lamina is homogeneous

c. A line straight and perpendicular to middle surface remains straight and perpendicular to middle surface during

deformation  $(x y x 0)$

- d. A straight line in Z-direction remains of constant length ( $\epsilon_z=0$ )
- e. A laminate is thin and is loaded only in-plane ( $\sigma_z=\tau_{xy}=\tau_{yz}=0$ )

f. Displacements are continuous and small throughout the laminate

- g. Each lamina is elastic

h. No slip occurs between the lamina interfaces Considering the equations 4.7 to 4.24 derived by Jones [11], Equation 4.22 and 4.33 [11] can also be written in the form, 1 and 2 are the CTEs in the fiber and transverse direction respectively. It should be noted that the values of  $[A']$ ,  $[B']$ ,  $Q$  and  $\{\alpha\}$  are dependent on temperature.

#### IV. RESULTS DISCUSSION AND CONCLUSION

Fig. 3 to 6 shows the young's modulus in longitudinal ( $E_1$ ) and transverse ( $E_2$ ) directions, shear modulus ( $G_{12}$ ) and Poisson's ratio ( $\gamma_{12}$ ) obtained at different testing temperatures respectively.

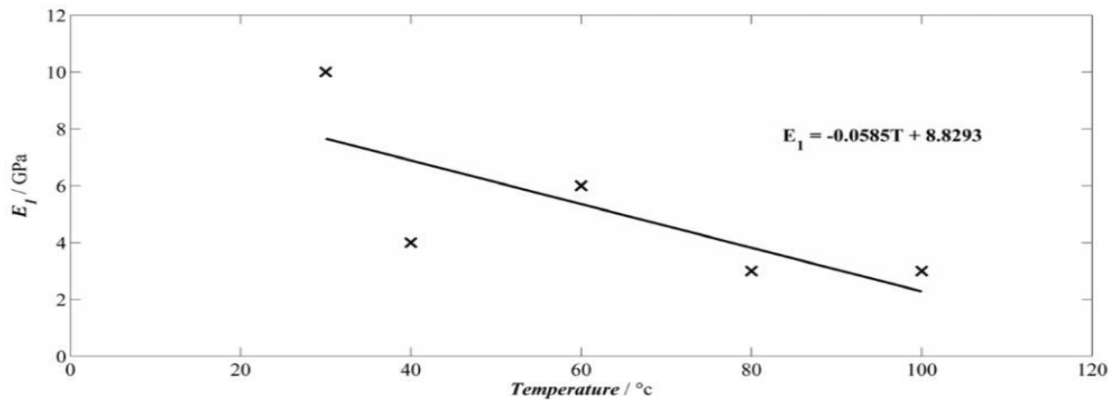


FIGURE. 3. Variation of Young's Modulus in Longitudinal direction with Temperature.

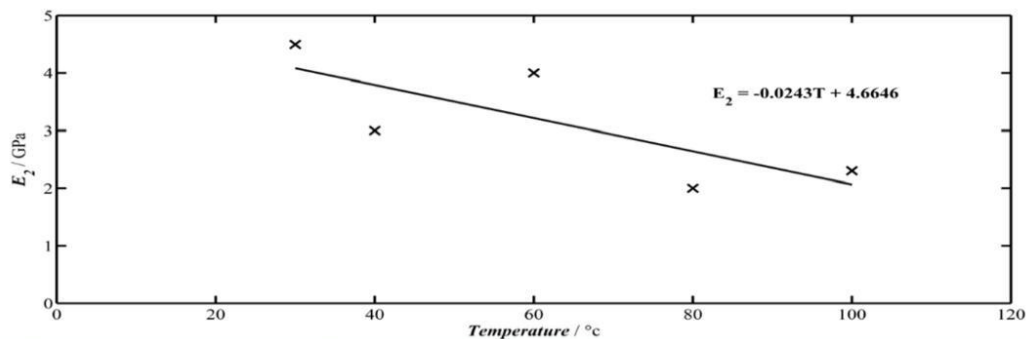


FIGURE. 4. Variation of Young's Modulus in Transverse direction with Temperature.

Young's modulus in longitudinal ( $E_1$ ) and transverse ( $E_2$ ) directions, shear modulus ( $G_{12}$ ) and Poisson's ratio ( $\gamma_{12}$ ) that are obtained through testing, were fitted as Temperature linear functions, for the ease of simple formulations given by equations (17) to (20).

$$E_1 = -0.0585T + 8.8293 \quad (30^\circ\text{C to } 100^\circ\text{C}) \quad (17)$$

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E20.0243T 4.6646	(30°C to 100°C)	(18)
G120.169T 57.82	(30°C to 100°C)	(19)
120.0023T 0.3613	(30°C to 100°C)	(20)

Application of heat, the properties begin to drop initially and the variation is linearly decreasing. On the other hand, if the room temperature is eliminated, the graph would be different for shear modulus and young's modulus. Eliminating the room temperature, the modulus in the longitudinal direction, that is, the Kevlar fibre would not show that much response to the temperature variation, whereas the transverse modulus, that is, the Glass fibre would show variation. This shows the dominating character of Kevlar, when subjected to temperature variation. On viewing the so called matrix dominant characteristics, such as the transverse modulus and the shear modulus, a peculiarity is observed. Though there is a decrease in the transverse modulus, the shear modulus shows a meagre variation as the temperature varies. This is because of pure Hybridization. As a laminate, the properties were at its best, except for the drop in property on the transition from room temperature to an incremental temperature. But the laminate shows a sustainable character as it enters a hot region, especially as nearing to its cure temperature.

### ACKNOWLEDGEMENTS

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# **Effect of cryogenic treatment on mechanical properties and wear behavior of high carbon steel**

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**Abstract**— The aim of the study is to evaluate the effect of deep cryogenic treatment with double tempering on mechanical properties and wear behavior of a grade of high carbon steel. In the study, one set of specimens undergoes conventional hardening and tempering process, while other set of specimens undergoes hardening, deep cryogenic treatment and double tempering process. Different sets of specimens were tested for hardness, impact strength, wear resistance and microstructure. The results of the study suggest that double tempering when performed after deep cryogenic treatment can aid into getting advantage of both improved wear resistance and toughness as compared with conventional hardening and tempering process.

**Keywords**— Cryogenic treatment; hardening; high carbon steel; mechanical properties; tempering; wear resistance.

## **I. INTRODUCTION**

High carbon steel is a grade of carbon steel that contains between 0.70 % to 1.2 % carbon. High carbon steel possess comparatively more hardness and is used in applications where high wear resistance is required. It is used in applications such as taps, gauges, ball bearings, roller bearings, punches, dies, heavy duty gears, etc. Its applications is mainly present in machine parts where high wear resistance, toughness and high load carrying capacity is required. High carbon steel is generally used in hardened and tempered form to achieve the required combinations of properties for given application.

Hardening process is carried by heating the material around 800°C to 850°C in furnace. At this temperature, the pearlite structure is converted to austenite. After austenization, the material is rapidly quenched in oil. Rapid quenching results in conversion of austenite phase to martensite. Even after reaching room temperature, 100 % austenite doesn't get converted into martensite. During the conversion of austenite to martensite there is a large volume expansion. As the martensite plates form during quenching, they surround and isolate small pools of austenite, which deforms to accommodate the lower density martensite. However, for the remaining pools of austenite to transform, surrounding martensite must deform. But the martensite resists the transformation and hence either the existing martensite cracks or the austenite remains trapped in the structure. This trapped austenite in the matrix of martensite even after reaching room temperature is called retained austenite.

Tempering is followed by hardening process to relieve stresses induced during hardening process and to make it less brittle. But tempering process does not have any significant effect on retained austenite. Although, it improves toughness of material.

Retained austenite present in the matrix of martensite is comparatively softer phase and limits the enhancement of properties at certain limit for hardening and tempering process. Also, if the steel is not thermally stabilized, the retained austenite will over an extended period of time transform into martensite. This transformation is accompanied by an increase in volume that is called metallurgical growth. Metallurgical growth will cause a change in dimension and form of parts such as bearings even at room temperature.

One of the potential solutions to eliminate retained austenite and to enhance the properties of high carbon steel is to treat the material further by cryogenic treatment. Cryogenic treatment is supplement process to conventional heat treatment process. In cryogenic treatment, once the material is hardened conventionally and brought to room temperature it is further cooled to temperatures as low as -190°C at a uniform cooling rate (ramp down rate). After required cryogenic temperature is achieved, the material is held at that temperature for particular amount of time (holding time or soaking time) which may vary from 16 hours to 48 hours. After that, the material is brought back to room temperature with uniform heating rate (ramp up rate) [1]. Tempering is followed by cryogenic treatment to relieve stresses induced during treatment.

Many studies have already been done to evaluate the effect of cryogenic treatment mainly on tool steel and some typical alloy steels. The literature emphasis that cryogenic treatment results in enhancement of properties like wear resistance and better tool life performance in case of tool steel [2], [3]. Also, the properties like impact strength, wear resistance, dimensional stability is enhanced in EN 353 which is an alloy steel [4], [5], [6]. Study carried out for optimization of parameters suggests that soaking temperature is the most important parameter that influences the output of the test [7]. Tempering temperature is also plays an important role in final results of cryogenic treatment [8], [9]. It is seen from previous studies that although cryogenic treatment results in significant improvement in wear resistance, it has small amount of improvement on impact strength. To achieve the optimum combination of both improved wear resistance and impact strength, the study takes into consideration double tempering of the material after cryogenic treatment.

The aim of the study is to evaluate the effect of deep cryogenic treatment with double tempering on various mechanical properties and wear behavior of high carbon steel.

## II. MATERIALS AND METHODS

The material considered in the study was EN 31, which is a grade of high carbon steel. EN 31 material was subjected to conventional heat treatment as well as cryogenic treatment. The raw material was procured in the form of Ø10 mm rod and 10 mm side square rod for making various specimens. The raw material was subjected to chemical testing to confirm the grade of the material. Chemical analysis was done by using optical emission spectrometer. The test standards followed for chemical analysis was ASTM E 415:2015 [10]. The chemical test results are as shown in table 1.

**Table 1 – Chemical Analysis Result**

Elements	Results	Required value
% carbon	0.96	0.9 – 1.2
% silicon	0.2	0.1 – 0.35
% manganese	0.32	0.3 – 0.75
% phosphorous	0.015	Max. 0.050
% Sulphur	0.004	Max 0.050
% chromium	1.39	1.00 – 1.60

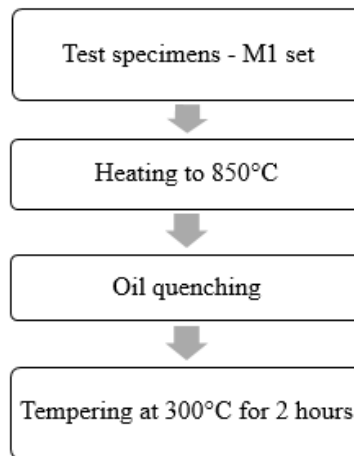
The chemical analysis confirms that the material is EN 31, a grade of high carbon steel. After the chemical test, the test specimens for impact test, wear test and hardness test were prepared as per respective test standards. The specimens of each group were divided into two sets. One set was subjected to conventional hardening and tempering process. The other set of specimens were subjected to hardening, deep cryogenic treatment and double tempering. Differently treated specimens were designated as in table 2.

**Table 2 - Specimen designation**

Specimen	Type of treatment
M1	Conventionally Heat Treated
M2	Deep Cryogenic Treated

### 1.1 Conventional heat treatment.

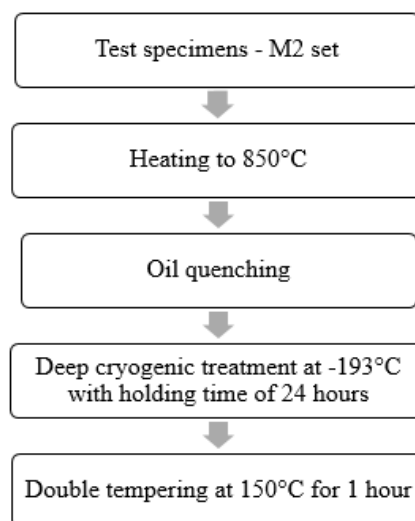
Initially, M1 specimens were treated by conventional heat treatment process of hardening and tempering. Hardening was carried out by heating the material in furnace at 850°C, then rapidly quenching it in oil. Tempering was followed by conventional hardening process. Tempering was done by heating the material at 300°C, holding at that temperature for 1 hour and then the specimen was air cooled. Figure 1 shows the flow of conventional heat treatment process.



**Figure 1 - Conventional heat treatment process**

### 1.2 Deep Cryogenic Treatment

M2 specimens were subjected to deep cryogenic treatment. Cryogenic treatment is the supplement and the substitute of conventional heat treatment. Hence, the material has to undergo conventional hardening process before cryogenic treatment. In the study, the M2 specimens were hardened by heating in furnace at 850°C, then rapidly quenching it in oil. After oil quenching when the material reached to room temperature, it was further cooled till -193°C, with a ramp down rate of 0.5°C/min. Once the material reached to required cryogenic temperature, it was held at that temperature for 24 hours. After that the material was brought back to room temperature with a ramp up rate of 0.5°C/min. Double tempering at 150°C for 1 hour was done after cryogenic treatment. Figure 2 shows the flow of cryogenic treatment process.



**Figure 2 – Deep cryogenic treatment process**

### 1.3 Tests performed to evaluate the properties of M1 and M2

Flat block of 10mm x 10 mm size was considered for hardness test. Conventionally hardened and tempered block (M1) and cryogenic treated block (M2) were tested for their hardness by Rockwell hardness test set up. The test method used was ISO 6508-1:2015 [11].

The standard test specimen prepared for impact test was as per test method IS 1598(1977) [12]. Izod impact strength was performed on M1 and M2 specimens by same test method to evaluate the impact strength of the respective specimen.

Wear behavior of the conventionally and cryogenic treated material was evaluated by performing pin on disk type wear test on specimens M1 and M2. The standards used for test was ASTM G99 standards [13]. The specimens were prepared as per standards. It consisted of a cylindrical pin of Ø10 mm and length 100 mm with grinded spherical ends. The tests were carried out at three different loads 8N, 10 N and 12N and three different sliding distances of 185 m, 370 m and 555 m. The wear behavior of EN 31 pin specimen was tested against abrasive grinding wheel. Figure 5 and 6 shows the standard and machined test specimen for wear test respectively.

The microscopic examination was carried to determine the changes that occur in microstructure of the cryogenic treated material as compared to conventionally treated material. For examining the microstructure, the sample preparation was done by cutting the cross section of M1 and M2 from the Ø10 mm rod. Later, the cut sections were polished by different grades of silicon carbide papers and lapped with the aid of diamond paste on lapping machine. Samples were then etched with 2% nital solution. After sample preparation, the microstructure of the specimen M1 and M2 were observed under trinocular metallurgical microscope. The test methods adapted for sample preparation, carrying out microstructure examination and interpretation of microstructure were ASTM E112:13 [14] and ASM Vol.9: 2004 [15] respectively.

## III. RESULTS AND DISCUSSION

Hardness test results show that there is small amount of improvement in hardness of cryogenic treated specimen. Impact test results show that there is significant improvement in the impact strength of the material which is cryogenic treated and double tempered as compared to hardened and tempered. Table 3 shows results for hardness and impact test of specimens M1 and M2.

**Table 3 - Hardness & impact test results**

Specimen	Hardness in HRC	Impact strength (N.m)
M1	57, 58, 58	26
M2	59, 60, 60	98

The wear test results were evaluated and compared for M1 and M2. It was found from the wear test results that the wear rate is less for cryogenic treated specimen as compared to conventional treated. Figure 7,8 and 9 shows the plot for wear rate that occurs for M1 and M2 specimens at 185 m, 350 m and 555 m sliding distance respectively. The amount of wear increases with increase in load and sliding distance. From the observations obtained from the wear test of M1 and M2 specimens, wear resistance was calculated for each case. Table 4, 5 and 6 shows the comparison of wear resistance of M1 and M2 at 185 m, 350 m and 555 m of sliding distance respectively.

From the results of the wear test of M1 and M2 specimens, it can be said that wear resistance of M2 is significantly more than wear resistance of M1. The percentage improvement in wear resistance of cryogenic treated EN 31 specimen is found to be 65.3 % more on an average when compared with conventionally treated EN 31 specimens.

The microstructure as observed under trinocular metallurgical microscope shows that microstructure of the conventionally treated material have more amount of retained austenite. Whereas, deep cryogenic treatment results in decrease in amount of retained austenite. Also, the structure becomes more uniform. Reduction in retained austenite could be the probable reason for improvement



in wear resistance of EN 31. Also, uniformity in structure might be the reason for improvement in impact strength of EN 31 material. The micrographs at magnification of 100X and 500 X of M1 and M2 specimens of EN 31 are shown in figure 03 and 04.

**Table 4 - Wear resistance at 185 m of sliding distance**

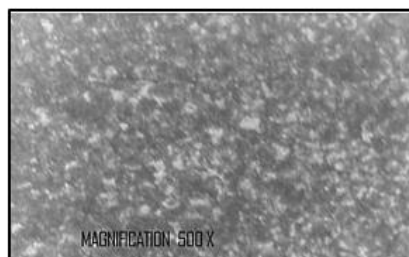
Load	Wear (Loss of weight in kg)		Wear Resistance		% Improvement in wear resistance
	M1	M2	M1	M2	
8	0.06	0.034	271469	445671	64
10	0.103	0.057	197672	332299	67
12	0.137	0.078	178337	291400	65

**Table 5 - Wear resistance at 370 m of sliding distance**

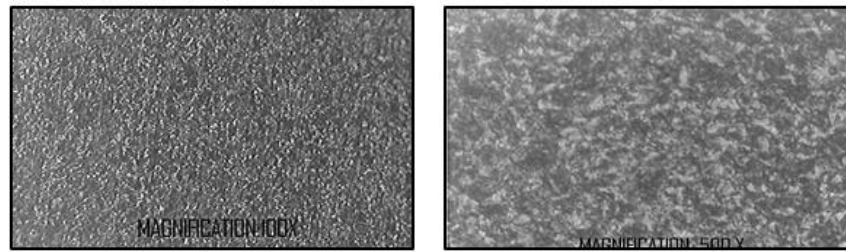
Load	Wear (Loss of weight in kg)		Wear Resistance		% Improvement in wear resistance
	M1	M2	M1	M2	
8	0.104	0.058	313234	522510	68
10	0.132	0.073	308488	518932	68
12	0.172	0.097	284096	468643	66

**Table 6 - Wear resistance at 555 m of sliding distance**

Load	Wear (Loss of weight in kg)		Wear Resistance		% Improvement in wear resistance
	M1	M2	M1	M2	
8	0.1575	0.089	310251	510769	63
10	0.196	0.11	311636	516573	65
12	0.238	0.137	307969	497720	62



**Figure 03 - Microstructure of conventionally treated EN 31 specimen at 100X and 500X magnification**



**Figure 04 - Microstructure of deep cryogenic treated EN 31 specimen at 100X and 500X magnification**

#### IV. CONCLUSION

In the study conducted, deep cryogenic treatment with double tempering on a grade of high carbon steel material was performed. The properties of cryogenic treated material was compared with conventionally treated material. From the results of the study, following conclusions can be drawn:

- i. Deep cryogenic treatment with double tempering of the material results in balanced improvement in wear resistance as well as impact strength of high carbon steel material.
- ii. The impact strength of deep cryogenic treated and double tempered material is found to be 3.7 times more than conventionally treated material.
- iii. The wear resistance also improves due deep cryogenic treated by 65% on an average when compared with wear resistance of conventionally treated material.
- iv. The microstructure of deep cryogenic treated material reveals reduced amount of retained austenite and more uniformly distributed structure as compared with conventionally treated material.

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# Productivity Enhancement by Digital Manufacturing

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**Abstract**— *Digital manufacturing has been considered, over the last decade, as a highly promising set of technologies for reducing product development times and cost as well as for addressing the need for customization, increased product quality, and faster response to the market by integrating various areas of the business functions. This paper describes the information technology systems in manufacturing and employment of Digital Manufacturing methodologies with the aim of improving the flexibility and the efficiency of the organization.*

**Keywords**— *Digital Manufacturing, Information technology, CAD, CAM.*

## I. INTRODUCTION

Improved productivity is an essential goal in any aspect of an enterprise, particularly under overwrought economic conditions. It is a goal that takes on considerably more weight in manufacturing planning processes. Waste and interruptions here can have direct consequences on a company's productivity that affects many things including the ability to meet targeted product launches. Many companies find that their ability to achieve this goal is hampered by obstacles resulting from limited facility resources and variations in employee knowledge and skill, among other issues.

The need for reduced development time together with the growing demand for more customer-oriented product variants have led to the next generation of information technology (IT) systems in manufacturing. Manufacturing organizations attempt to integrate their business functions and departments with new systems in an enterprise database, following a unified enterprise view. These systems are based on the digital factory/manufacturing concept, according to which production data management systems and simulation technologies are jointly used for optimizing manufacturing before starting the production and supporting the ramp-up phases. Digital manufacturing would allow for, first, the shortening of development time and cost, second, the integration of knowledge coming from different manufacturing processes and departments, third, the decentralized manufacturing of the increasing variety of parts and products in numerous production sites, and, fourth, the focusing of manufacturing organizations on their core capabilities, working efficiently with other companies and suppliers, on the basis of effective IT-based cooperative engineering.

## II. ROLE OF IT IN MANUFACTURING

Over the past few decades, the extensive use of IT in manufacturing has allowed these technologies to reach the stage of maturity. The benefits of the new tools have been thoroughly examined and their competence in many applications has been recognized. Their application ranges from simple machining applications, to manufacturing planning and control support. Applying manufacturing tools for enhancing productivity of the company. An example of the introduction of IT, in the manufacturing world, is the concept of computer-integrated manufacturing (CIM). This concept was introduced in the late 1980s, favoring the enhancement of performance, efficiency, operational flexibility, product quality, responsive behavior to market differentiations, and time to market. The inventory control and material requirements planning (MRP) systems were introduced in the 1960s and 1970s respectively. Such systems were further improved with integration of tools capable of providing capacity and sales planning functionalities together with scheduling capabilities and forecasting tools. The result was the introduction of the closed-loop- MRP. The evolution of information systems over the last decade has played a vital role in the adoption of new information technologies in the environment of manufacturing systems.

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## **2.1 COMPUTER AIDED TECHNOLOGIES**

CAD is considered among the technologies that have boosted productivity, allowing faster time to market for the product and dramatically reducing the time required for product development. The CAD systems have become essential to today's manufacturing firms, because of their strong integration with advanced manufacturing techniques. CAD models are often considered sufficient for the production of the parts, since they can be used for producing the code required to drive the machines for the production of the part. Rapid prototyping is an example of such a technology.

Process planning activities determine the necessary manufacturing processes, their sequence in order to produce a given part economically, and competitively. Towards this direction, the computer aided process planning (CAPP) systems have been used for the generation of consistent process plans and are considered as being essential components of the CIM environments. Computer-aided engineering (CAE) systems are used to reduce the level of hardware prototyping during product development and to improve the understanding of the system. Following the development of the CAD systems, the concept of computer-aided manufacturing (CAM) was born. The great step towards the implementation of CAM systems was the introduction of computer numerical control (CNC). Apart from the fact that this new technology has brought about a revolution in manufacturing systems by enabling mass production and greater flexibility, it has also enabled the direct link between the three-dimensional (3D) CAD model and its production. From that point on, CAD and CAM systems have been developed allowing for part design and production simulation. Engineers have the ability to visualize both the part and the production process, to verify the quality of the product and then physically to perform the manufacturing process with minimum error probability. Other systems, such as computer-aided quality systems, have also started to emerge and to become part of the engineering workflow. Product data management (PDM) and product life-cycle management (PLM) systems, on the other hand, allow for performing a variety of data management tasks, including vaulting workflow, life-cycle, product structure, and view and change management. PDM systems are claimed to be able to integrate and manage all applications, information, and processes that define a product, from design to manufacture to end-user support. PDM systems are frequently used for controlling information, files, documents, and work processes and are required to design, build, support, distribute, and maintain products. Typical product-related information includes geometry, engineering drawings, project plans, part files, assembly diagrams, product specifications, numerical control machine-tool programs, analysis results, correspondence, bill of material, and engineering change orders. Digital manufacturing has arrived as a technology and discipline within PLM that provides a comprehensive approach for the development, implementation, and validation of all elements of the manufacturing process, which is foreseen by researchers and engineers to be one of the primary competitive differentiators for manufacturers.

## **2.2 MANUFACTURING CONTROL**

Integration of control systems with CAD and CAM and scheduling systems as well as real-time control, based on the distributed networking between sensors and control devices currently constitute key research topics. New developments in the use of wireless technologies on the shop floor, such as radiofrequency identification (RFID), as a part of automated identification systems, involve retrieving the identity of objects and monitoring items moving through the manufacturing supply chain, which enable accurate and timely identification information.

## **2.3 ENTERPRISE RESOURCE PLANNING**

Enterprise resource planning (ERP) systems attempt to integrate all data and processes of an organization into a unified system. A typical ERP system will use multiple components of computer software and hardware to achieve the integration. A key ingredient of most ERP systems is the use of a unified database to store data for the various system modules. ERP has been associated with quite a broad spectrum of definitions and applications over the last decades. The ERP systems often incorporate optimization capabilities for cost and time savings virtually from every manufacturing process.

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### III. DIGITAL MANUFACTURING IN INDIAN INDUSTRIES

Digital manufacturing is an IT-enabled solution that has been improving the productivity and efficiency of the Indian manufacturers, especially the automotive players. Indian manufacturers such as Tata Motors use this technique to achieve savings on time and cost of at least 20–30 per cent in most of the cases. Most manufacturers still rely on traditional and outdated models of planning. By migrating to advanced planning systems, and using digital technologies, they can gain greater visibility into their manufacturing operations. However, most of the design sector is widely using various design and simulation software so as to design the product with ease and in less amount of time. This data is integrated with the system such that various departments in real time can use it. The last few years have seen SME's recognizing technology as a key business driver, but its adoption is still low, as compared to other countries with large SME setups. This is due to a combination of the following:

- Lack of understanding of business benefits technology can deliver across end-to-end value chains.
- Lack of guidance on the inherent abilities of technologies and how these can be integrated and institutionalized in their businesses.
- Resistance to incurring upfront investment-related costs to implement technology.
- Lack of skilled labor to manage technology setups.

### IV. CONCLUSION

Digitizing is now a priority for most CEOs of industrial companies in India. It is still in its initial phase for most of the SMEs, which is limited to implementing ERP system. By digitizing the essential functions within internal operational processes both revenue growth and operational efficiencies can be achieved.

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# CAD CAM system for manufacturing innovative hybrid design using 3D printing

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**Abstract**— Additive manufacturing, commonly referred to as 3D printing, or layer manufacturing is a very dynamically developing direction in the development of manufacturing technology. The article presents considerations on the possibilities of using 3D printing technology for the production of prototypes of innovative solutions. The special advantage of using 3D printing relies in its ability to produce directly based on the CAD model, whose file is the source of information for generating the incremental control file. It was pointed out that the use of 3D printing makes it possible to finish the elements. It has been pointed out that the specific features of 3D printing were developed with CAM software based on CAD model, which adapts to the capabilities of this technique.

**Keywords**— 3D printing, Additive manufacturing, CAD model .

## I. INTRODUCTION

In the 21st century, the rapid development of functional materials has put higher demands for manufacturing. Unlike traditional subtractive manufacturing processes like drilling, milling, sawing, broaching etc., 3D printing, also known as additive manufacturing (AM), can directly fabricate three-dimensional parts through the sequential layer stacking of materials, thus enabling almost infinite possibilities for rapid prototyping. It has many advantages like near-complete design freedom, flexibility, design complexity and high sustainability. Almost every kind of materials such as metals, ceramics and polymer can be used as raw materials for 3D printing to fabricate various stereoscopic structures. Therefore, 3D printing covers a wide range of fields including biomedicine, mechanical engineering, aeronautics and astronautics, electronic and integrated circuit..

## II. 3D PRINTING

The rapid development of 3D printing technique has introduced many new printing methods. More advanced concepts have been adopted in 3D printing to fabricate faster, cheaper, and smaller printing systems. Generally, all the 3D printing methods follow a basic process of additive manufacturing, (1) 3D modeling through CAD software, 3D scanner, or a photogrammetry procedure; (2) Digitalization of the 3D model by converting it into a STL file; (3) Converting the STL file data into a G-code file which contains the geometrical information of each 2D layer slicing from the 3D model; (4) Printing the materials in a layer-by-layer manner. According to the way the 2D layers of material are deposited, 3D printing can be grouped into four main categories: (i) photopolymerization; (ii) extrusion; (iii) powder based; and (iv) lamination.

## III. METHOD

FDM is a very common 3D printing technique which melts and extrudes thermoplastic filaments to form the final 3D objects. Through adding different fillers into the filaments, this technique can be easily expanded to various composites materials printing. first demonstrated the printability of graphene composite using FDM method. GO and ABS were first dissolved in NMP solution to get a good dispersion between graphene and ABS. After the reduction of GO, G/ABS powder was precipitated from the solution. Then the obtained GO/ABS powder was loaded into an extruder to fabricate the standard 1.75 mm filaments for FDM printing. By carefully controlling the printing temperature and printing parameter, the authors successfully printed various memorable symbols with freestanding structure. Maximum content of graphene at 7.4 wt.% could be achieved by using this method. It is worthy to note that solution mixing is an easy and convenient method for the dispersion of graphene which enables a very good homogeneity from the molecular aspect. Besides, melt blending which depends on a certain machine like two screw extruder is also an important method for the fabrication of graphene-based composites.

SLA is the first employed technique of 3D printing which uses a laser to cure photopolymer with a layer-by-layer manner. Based on the principle of photo curing, now many new methods like DLP, CLIP and 2 PP (two-photon polymerization) etc. have been developed. Two essential issues should be considered for SLA-based composites: (1) Rapid solidification of by light initiated polymerization, which requests a fast light responsive composite resin system; (2) Sufficient low viscosity to allow for the dipping of resin layer, which determines a low graphene content and homogeneous filler distribution. Compared with extrusion-based techniques, a high resolution can be achieved by using SLA-based techniques.

SLS is a kind of powder-based 3D printing technique which sinters a successive thin layer powder with the aid of a high energized laser to build final 3D objects. The common method to print graphene-based composites is by homogeneously mixing graphene powder with the matrix powder, which could be achieved by mechanical or melt mixing. Recently, Developed a template method to print 3D graphene foams (GF) with SLS. First, they prepared the Ni/sucrose mixture powder with a solution mixing method. Sucrose was used as the carbon source and Ni as the catalyst and template for graphene growth. Then by manually placing the mixture of Ni and sucrose onto a platform after laser radiation of each layer, a 3D GF would form during the repeated process.

DIW is an extrusion-based 3D printing technique which involves the deposition of a liquid material ink that rapidly solidifies upon extrusion. For a smooth printing, the ink must possess enough modulus to retain its shape after being extruded. Usually, high viscosity ink has better shaping ability but higher risk of nozzle clogging. So an exquisite ink formulation to achieve high viscosity ink with shear thinning behavior is the essential point for DIW. Recently, many composite inks have been developed for multifunctional applications. Graphene-based inks with improved electrical, mechanical and biological properties can offer enhanced functionality for a wide range of 3D printing applications. Successfully demonstrated a 3D printable graphene (3DG) composite consisting of majority graphene and minority polylactide-co-glycolide for electronic and biomedical applications.

A step in the STL generation known as "repair" fixes such problems in the original model. Generally STLs that have been produced from a model obtained through 3D scanning often have more of these errors. This is due to how 3D scanning works-as it is often by point to point acquisition, 3D reconstruction will include errors in most cases. Once completed, the STL file needs to be processed by a piece of software called a "slicer," which converts the model into a series of thin layers and produces a G-code file containing instructions tailored to a specific type of 3D printer (FDM printers). This G-code file can then be printed with 3D printing client software (which loads the G-code, and uses it to instruct the 3D printer during the 3D printing process). \_Printer resolution describes layer thickness and X-Y resolution in dots per inch (dpi) or micrometers ( $\mu\text{m}$ ). Typical layer thickness is around 100  $\mu\text{m}$  (250 DPI), although some machines can print layers as thin as 16  $\mu\text{m}$  (1,600 DPI). X-Y resolution is comparable to that of laser printers. The particles (3D dots) are around 50 to 100  $\mu\text{m}$  (510 to 250 DPI) in diameter. For that printer resolution, specifying a mesh resolution of 0.01–0.03 mm and a chord length  $\leq 0.016$  mm generate an optimal STL output file for a given model input file. Specifying higher resolution results in larger files without increase in print quality. Construction of a model with contemporary methods can take anywhere from several hours to several days, depending on the method used and the size and complexity of the model. Additive systems can typically reduce this time to a few hours, although it varies widely depending on the type of machine used and the size and number of models being produced simultaneously. Traditional techniques like injection molding can be less expensive for manufac-turing polymer products in high quantities, but additive manufacturing can be faster, more flexible and less expensive when producing relatively small quantities of parts. 3D printers give designers and concept development teams the ability to produce parts and concept models using a desktop size printer.

A drawback of many existing 3D printing technologies is that they only allow one material to be printed at a time, limiting many potential applications which require the integration of different materials in the same object. Multi-material 3D printing solves this problem by allowing objects of complex and heterogeneous arrangements of materials to be manufactured using a single printer. Here, a material must be specified for each voxel (or 3D printing pixel element) inside the final object volume. The process can be fraught with complications, however, due to the isolated and monolithic algorithms. Some commercial devices have sought to solve these issues, such as building a Spec2Fab translator, but the progress is still very limited. Nonetheless, in the medical industry, a concept of 3D printed pills and vaccines has been presented. With this new concept, multiple medications can be combined, which will decrease many risks. With more and more applications of multi-material 3D printing, the costs of daily life and high technology development will become inevitably lower. Metallographic materials of 3D printing is also being researched. By classifying each material, CIMP-3D can systematically perform 3D printing with multiple materials.

The main differences between processes are in the way layers are deposited to create parts and in the materials that are used. Each method has its own advantages and drawbacks, which is why some companies offer a choice of powder and polymer for the material used to build the object. Others sometimes use standard, off-the-shelf business paper as the build material to produce a durable prototype. The main considerations in choosing a machine are generally speed, costs of the 3D printer, of the printed prototype, choice and cost of the materials, and color capabilities. Printers that work directly with metals are generally expensive. However less expensive printers can be used to make a mold, which is then used to make metal parts. ISO/ASTM52900-15 defines



seven categories of Additive Manufacturing (AM) processes within its meaning: binder jetting, directed energy deposition, material extrusion, material jetting, powder bed fusion, sheet lamination, and vat photo polymerization. Some methods melt or soften the material to produce the layers. In Fused filament fabrication, also known as fused deposition modeling (FDM), the model or part is produced by extruding small beads or streams of material which harden immediately to form layers. A filament of thermoplastic, metal wire, or other material is fed into an extrusion nozzle head (3D printer extruder), which heats the material and turns the flow on and off. FDM is somewhat restricted in the variation of shapes that may be fabricated. Another technique fuses parts of the layer and then moves upward in the working area, adding another layer of granules and repeating the process until the piece has built up. This process uses the unfused media to support overhangs and thin walls in the part being produced, which reduces the need for temporary auxiliary supports for the piece. Recently, FFF/FDM has expanded to 3-D print directly from pellets to avoid the conversion to filament. This process is called fused particle fabrication (FPF) (or fused granular fabrication (FGF) and has the potential to use more recycled materials. Powder Bed Fusion techniques, or PBF, include several processes such as DMLS, SLS, SLM, MJF and EBM. Powder Bed Fusion processes can be used with an array of materials and their flexibility allows for geometrically complex structures, making it a go to choice for many 3D printing projects. These techniques include selective laser sintering, with both metals and polymers, and direct metal laser sintering. Selective laser melting does not use sintering for the fusion of powder granules but will completely melt the powder using a high-energy laser to create fully dense materials in a layer-wise method that has mechanical properties similar to those of conventional manufactured metals. Electron beam melting is a similar type of additive manufacturing technology for metal parts (e.g. titanium alloys). EBM manufactures parts by melting metal powder layer by layer with an electron beam in a high vacuum. Another method consists of an inkjet 3D printing system, which creates the model one layer at a time by spreading a layer of powder (plaster, or resins) and printing a binder in the cross-section of the part using an inkjet-like process. With laminated object manufacturing, thin layers are cut to shape and joined together. In addition to the previously mentioned methods, HP has developed the Multi Jet Fusion (MJF) which is a powder base technique, though no laser are involved. An inkjet array applies fusing and detailing agents which are then combined by heating to create a solid layer. Other methods cure liquid materials using different sophisticated technologies, such as stereolithographic. Photo polymerization is primarily used in stereo lithography to produce a solid part from a liquid. Inkjet printer systems like the Objet Polyjet system spray photopolymer materials onto a build tray in ultra-thin layers (between 16 and 30  $\mu\text{m}$ ) until the part is completed. Each photopolymer layer is cured with UV light after it is jetted, producing fully cured models that can be handled and used immediately, without post-curing. Ultra-small features can be made with the 3D micro-fabrication technique used in multiphoton photopolymerisation. Due to the nonlinear nature of photo excitation, the gel is cured to a solid only in the places where the laser was focused while the remaining gel is then washed away. Feature sizes of under 100 nm are easily produced, as well as complex structures with moving and interlocked parts. Yet another approach uses a synthetic resin that is solidified using LEDs. In Mask-image-projection-based stereo lithography, a 3D digital model is sliced by a set of horizontal planes. Each slice is converted into a two-dimensional mask image. The mask image is then projected onto a photo curable liquid resin surface and light is projected onto the resin to cure it in the shape of the layer. Continuous liquid interface production begins with a pool of liquid photopolymer resin. Part of the pool bottom is transparent to ultraviolet light (the "window"), which causes the resin to solidify. The object rises slowly enough to allow resin to flow under and maintain contact with the bottom of the object. In powder-fed directed-energy deposition, a high-power laser is used to melt metal powder supplied to the focus of the laser beam. The powder fed directed energy process is similar to Selective Laser Sintering, but the metal powder is applied only where material is being added to the part at that moment. As of December 2017, additive manufacturing systems were on the market that ranged from \$99 to \$500,000 in price and were employed in industries including aerospace, architecture, automotive, defense, and medical replacements, among many others. For example, General Electric uses high-end 3D Printers to build parts for turbines. Many of these systems are used for rapid prototyping, before mass production methods are employed. Higher education has proven to be a major buyer of desktop and professional 3D printers which industry experts generally view as a positive indicator. Libraries around the world have also become locations to house smaller 3D printers for educational and community access. Several projects and companies are making efforts to develop affordable 3D printers for home desktop use. Much of this work has been driven by and targeted at DIY/Maker/enthusiast/early adopter communities, with additional ties to the academic and hacker communities. Computed axial lithography is a method for 3D printing based on computerized tomography scans to create prints in photo-curable resin. It was developed by a collaboration between the University of California, Berkeley with Lawrence Livermore National Laboratory. Unlike other methods of 3D printing it does not build models through depositing layers of material like fused deposition modelling and stereo lithography, instead it creates objects using a series of 2D images projected onto a cylinder of resin. It is notable for its ability to build an object much more quickly than other methods using resins and the ability to embed objects within the prints.

#### IV. CONCLUSION

In this review, we presented the outlines related to 3D printing graphene-based composites according to various 3D printing techniques. The relationships between fabrication process, structural characteristics and applications of graphene-based composites were summarized intensely. Furthermore, some important simulation and characterization methods for 3D printing were also introduced. 3D printing should never be seen as a standalone process for manufacturing. It strongly depends on the intrinsic properties of different materials.

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# Experimental Study of Press Tool Life to improve the Component quality

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**Abstract**— *The press tool life is major criteria in high volume production of sheet metal components. For a Progressive die, proper tool life and component accuracy are necessity for achieving higher productivity and low cost per component. This paper describes and forms a basis by accumulating factors for tool life selection. The data is based on old tool which was analyzed and its characteristics were studied closely and improvements were made which are a part of this paper. In this work, we use the software UNIGRAPHICS for modelling a progressive tool for Arc Chute plate. Here, a multiple station die with initial operation as trimming and later as parting off is performed. In each stroke, one operation is performed with four punches, thus in one stroke we get four final plates. Thus, factor selection is made easy by specific data made available and the usefulness of the system is demonstrated by sample run of Arc Chute plate analysis. It caters for obtaining the final components conforming to required dimensions and standards.*

**Keywords**- Press tool, Tool life, Arc chute plate, Progressive die, Unigraphics.

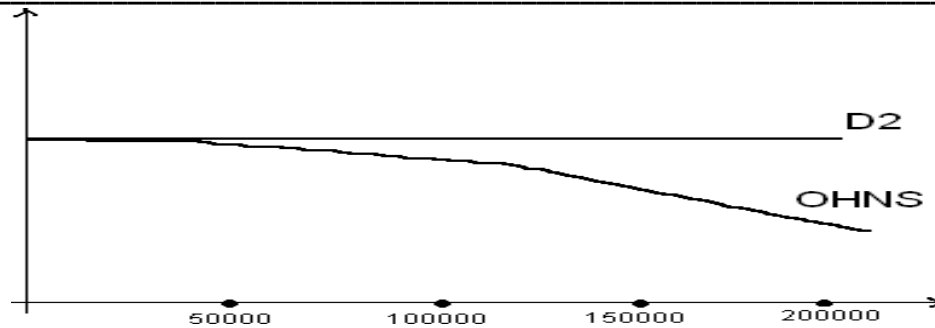
## I. INTRODUCTION

The sheet metal industry plays important role in switchgear industry. Sheet metal processes are important and quick means of producing durable, intricate and accurate components on a large scale. Metal cutting includes separating a piece of predetermined strip material. It contains various processes as blanking, trimming, parting off, notching etc. The tool life and accuracy depend on variety of factors as tolerances, selection of material for tools, amount of cutting force, replaceable die inserts etc.

## II. SELECTION OF MATERIAL FOR DIE AND PUNCH

The material cost accounts for 20% of total cost. Sheet metal industries are given due considerations to reduce the manufacturing costs and hence to reduce the cost of production. Thus selection of proper material for manufacturing of tool components essentially increases the tool life and hence reduces the cost of production. Tool steels find much wide applications in stamping of large volumes of small and medium sized parts are inserts in larger dies. These steels are designed especially to develop high hardness level and abrasion resistance. Both through heat treatment and through existence of hard, stable and complex chromium, tungsten, molybdenum and vanadium carbides, we selected D2 from the AISI table for the modified tool. The old tool had ONHS for punches and dies.

For our tool, the material OHNS vs. D2 is plotted and thus the tool life variation is shown between the modified tool and the old tool. The tool life increased considerably as shown below:



**FIGURE 1: Tool Life Vs Number of Strokes**

Oil Hardened Non-shrinking Steel / Oil Hardened Nickel Steel has chemical composition of carbon content 0.95%, Manganese 1.15%, Chromium 0.5% and Vanadium 0.2%.

#### **2.1 D2 (1.2374)**

Also known as High Carbon High Chromium Steel. HCHCR Steel is widely utilized in punch and dies in metal stamping industry, injection mold tools, and barrel liners in plastic molding industry.

### **III. DESIGN OF TOOL COMPONENTS**

#### **3.1 Land**

Although long life of all tool components is desirable, special attention is given to dies and punches inserts. The term “die life” specifically refers to dimension length of land in a cutting edge. Generally, the press tools are built to manufacture millions of components and expected to be replaced after being ground and shimmed over a period of time. However, sections should be provided for maximum possible use and generally, 3 to 4 mm land is kept with 1/3 to ¼ degree draft angle depending on shape of die, punch and material of sheet. In our previous tool, there was no provision for land. Hence, once punches and dies wore out, we scraped the whole tool. While in modified tool, the land provided was 3 mm which allowed us to grind the height 0.1mm each time and thus using the tool even after wear.

#### **3.2 Excessive Wear**

Abnormal wear can be caused by any of the following conditions:

Cutting clearance: insufficient or excessive. Cutting clearance in old tool was 0.3 mm while in modified tool was 0.108 mm. It produced accurate components for all its tool life.

Punch height: Vertical height is too great in relation to cross-sectional area of the punch

Hardness: Hardness of OHNS was 25-30 HRC. While, after heat treatment hardness of D2, its value is above 50 HRC. This makes new tool tougher to resist the shocks.

#### **3.3 Radial Mounting of Punches**

The cutting force is considered when more components per stroke are expected and more tonnage of capacity press is available. This is a new concept in which slight (about) curve is given to the punches. The mechanism works with principle that the curving portion make the side punches hit slightly before the punches in center. Thus, the cutting force is distributed. Data below show the difference in cutting force of initial tool and modified tool:

Cutting force of tool 1:  $C_f = 163.72$  kN in one stroke. Cutting force of tool 2: 1st stage = 96.26 kN

2nd stage = 130.19 kN Thus, the force is distributed and the tool life increases.

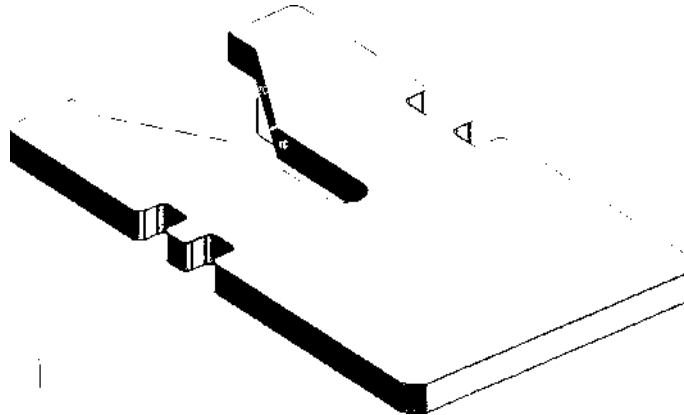
#### **3.4 Replaceable Die Inserts**

Die and punch have maximum forces acting on them. Their wear out can cause replacing of the tool. Also their edges must be sharpened from time to time so as to have proper shearing action. The die and punch are made replaceable to have easy maintenance. Thus, they are screwed to the die set for easy replacing.

#### IV. DESIGN OF PRESS TOOL

Design procedure actually starts with the component details given by the customer. Then after analyzing the required component details, various operations to be performed on the component and various concepts that are related to actual design are considered. After going through the above phases, the tool design gets started after detailed discussion with the manufacturing department.

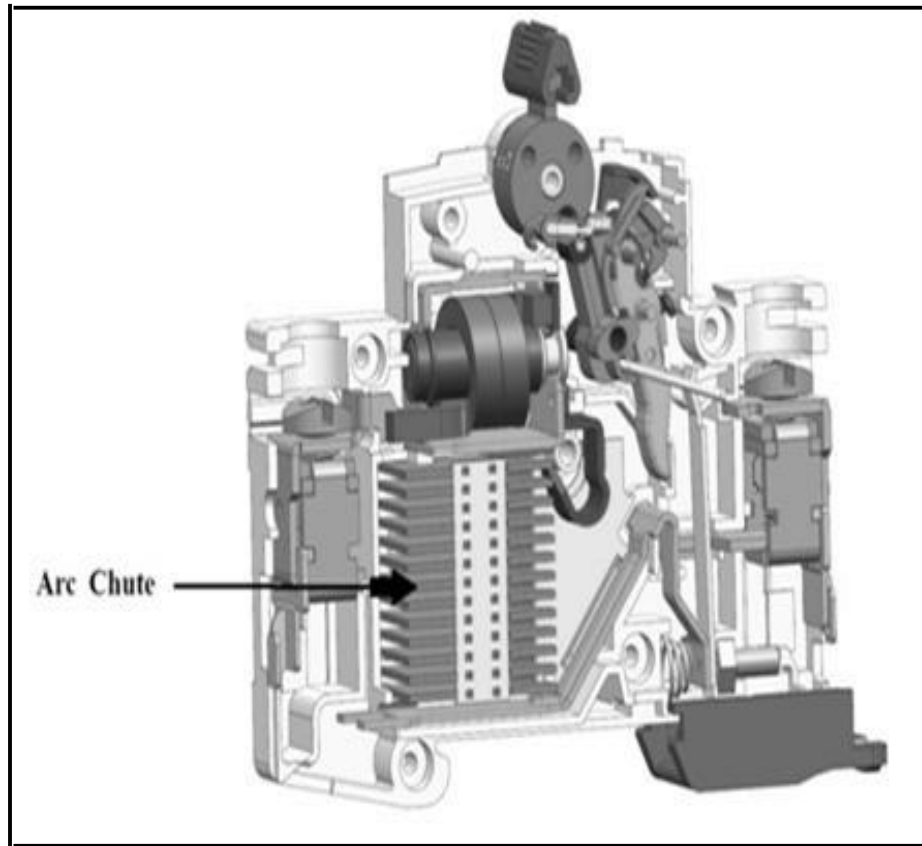
##### 4.1 Component Drawing and Location of Arc Chute



**FIGURE 3: Component drawing**

The general press tool construction will have following elements:-

- Shank: It is used to locate the press tool in press for alignment purpose.
- Top Plate: It is used to hold top half of the press tool with press slide.
- Punch Back Plate: This plate prevents the hardened punches penetrating into top plate.
- Punch Holder: This plate is used to accommodate the punches of press tool.
- Punches: To perform cutting and non-cutting operations either plain or profiled punches are used.
- Die Plate: Die plate will have similar profile of the component where cutting dies usually have holes with land and angular clearance and non-cutting dies will have profiles.
- Die Back Plate: This plate prevents the hardened Die inserts penetrating into bottom plate.
- Guide Pillar & Guide Bush: Used for alignment between top and bottom halves of the press tools.
- Bottom plate: It is used to hold bottom half of the press tool with press slide.
- Stripper plate: it is used to strip off the component from punches.
- strip guides: It is used to guide the strip into the press tool to perform the operation



**FIGURE 4: Location of Arc Chute**

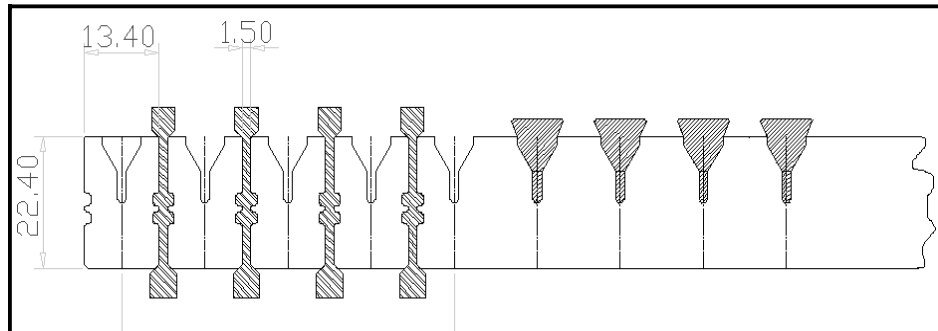
Arc chute is the critical component of MCB which is used to cool and extinguish the arc that occurs during short circuit overload condition. The location of Arc Chute in MCB is as shown.

Thickness of plate is 0.8 mm and main objective was to design and manufacture of press tool for medium batch long run press tool for Arc-Chute component.

In the design of die set, the 1<sup>st</sup> step is to prepare various configurations of strip layout possible. Strip layout is the position of the component in the metal strip & their orientation with respect to each other. After strip layouts are prepared, we select the most feasible layout for the given application. Piercing involves cutting of clean holes with a resulting scrap slug. The operation is called die cutting and can also produce flat components where the die, the shaped tool, is pressed into a sheet material employing a shearing action to cut holes. This method can be used to cut parts of different sizes and shapes in sheet metal, leather and many other materials. are similar, in that a discrete part is cut from a sheet or strip of metal along a desired geometric path. The difference between a cutoff and a parting is that a cutoff can be nestled perfectly on the sheet metal, due to its geometry. With cutoffs, the cutting of sheet metal can be done over one path at a time and there is practically no waste of material. With partings, the shape can not be nestled precisely. Parting involves cutting the sheet metal along two paths simultaneously. Partings waste a certain amount of material, that can be significant.

**The factors which influence the strip layout are:**

Economy of material direction of material grain or fiber, strip or coiled stock, direction of burr, press used, production required and die cost. The most appropriate strip layout is also based on the scrap produced.



**4.2 Types of Scraps**

- 5 **4.2.1 Design scrap:** This scrap is produced due to the functional requirement of the component. This scrap cannot be eliminated.
- 6 **4.2.2 Tool scrap:** This scrap is produced due to the arrangement of components in strip layout. This must be kept minimum as possible. In the old tool we had tool percentage scrap 29.77% and in new tool 24.5%.

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**8 V. MANUFACTURING**

- 9 Manufacturing of blanking dies with utmost precision and properly sharpened with correct amount of clearance between punch and die is the most important, as improper clearance can throw off entire press operation. Manufacturing procedure actually starts with ordering of raw material according to the tool drawing and pre-machining it to approximate sizes of various plates. Then precision machining is done so that the machined plates are within tolerances. After going through the above phases, the tool gets assembled after detailed inspection of each plate. Various manufacturing operations involved in the Press tool are Lathe work, Conventional Milling- drilling, Grinding, Jig boring, Wire-EDM.

**VI. RESULT AND DISCUSSION**

**6.1 Result**

Using progressive die of 2-stage operations, we have manufactured the Arc chute plate by efficient strip layout and by considering various parameters as optimum cutting clearance, land for shim, tool steels for various components, stripper plate, crop punch, radial punch and floating stripper. Results obtained from this tool trial and component inspection process are listed as below:

**Table 1. Results of Tool Trial and Component Inspection**

Sr.No.	Parameters	Single stage die (Old tool)	Progressive die (New tool)
1	Component dimensions	Accurate during initial tool trials but inconsistent after as early wear and tear of tool takes	Accurate, consistent and conforming to the customer drawing.



2	Component cutting edge finish at the shear plane side	No uniform cutting layer patterns are observed as the cutting force acting is large and not concentrated due to normal clearance.	Uniform cutting layer pattern as cutting force is divided into 2 stages and concentrated force at cutting edge due to the close clearance.
3	Tool life	Tool life is 1 lacs components	Tool life is 10 lac components
4	Component scrap	Is higher as it has front and back scrap	Is lower as it contains only scrap bridge and no front and
5	Productivity	Uniform during initial trial and then of decreasing order	Uniform throughout

## 6.2 Discussion

### Component dimensions

The component dimensions in a single stage die are conforming to original dimensions but the variation in dimension starts with wear of tool. While, in progressive die, regrindable land is accommodated so as to have same clearance and component accuracy. Thus the progressive die accounts for wear of sharp edges increasing the tool life considerably.

### Component finish at the shear plane side

The definite pattern for shearing showing varying intensities of cutting force as punch hits the work piece is not observed in single stage tool as the cutting force is too large. While in this case, we have multiple stations which reduces the direct effect of cutting force by dividing it to various punch operation.

### Tool life

Tool life of conventional tool is less as it has to be replaced whole if a single defect is present in the tool. While in progressive die, we provide for shim by extra land allocation and replaceable inserts provide for easy maintenance and which ultimately result in higher tool life.

### Scrap reduction

The front and back scrap are component scrap which adds to the waste cut off parts. This was too much high in old tool so as to replace it for better & in long run.

### Productivity

It is constant during initial phase and decreases ultimately. While in progressive die, there is high production rate and hence high product effectiveness.

## VII. CONCLUSION

By introducing progressive die for Arc Chute operation.

By using two stage tool die, the tool life is 3 -12 lac components.

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Also, the accuracy of the component is high due to use of precision machine for production of the punch and die. The provision for replaceable inserts has made the maintenance simple.

Plate, it is concluded that the tool is very feasible for the medium batch capacity and efficient in

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# Experimental Analysis and Optimization of EDM Process Parameters

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**Abstract**— The paper presents the experimental analysis and multi-response optimization of EDM process parameters during machining of Nimonic 90 work material. The experiment has been conducted at different parametric setting considering discharge current, pulse-on-time and pulseoff-time as process parameters. Taguchi L9 orthogonal array has been used for experimental design. The effect of various parameters on response such as material removal rate and surface roughness has been studied with the help of suitable plots. The Grey Relational Analysis has been utilised for obtaining the optimal parametric combination.

**Keywords** -Pulse-on-time,Pulse off-time,material removal rate, clattering and vibration, surface roughness, electrical discharge machining

## I. INTRODUCTION

### 1.WIRE ELECTRICAL DISCHARGE MACHINING PROCESS:

Wire Electrical Discharge Machining (W-EDM) is widely used manufacturing process used to machine conductive materials due to its capability of producing intricate and complex shapes irrespective of hardness and toughness of material. It can produce more complex two and three dimensional shapes through conducting materials This process is extensively used in mould and die making industries, nuclear industry, aerospace industry etc. .In WEDM (wire electrical discharge machining) material removal takes place due to electro thermal process. A series of electrical pulses generated by pulse generator unit is applied between the work piece and travelling wire electrode which generate series of discrete sparks between the electrode and work piece. While the machining is continued, the machining zone is continuously flushed with water passing through the nozzles on both sides of the work piece.

## II. PROBLEM DEFINITION

In CNC Wire electrical discharge machine, Process parameters like pulse on time(Ton), pulse off time(Toff), Input Current(Ip), wire feed rate(Wf) play an important role as it affects the MRR (material removal rate) and Surface roughness. Most of the times this machines are operated by workers; If process parameters are not set properly then it results in low MRR as well as Surface finish. If at some point amount of stock removed from the electrode becomes greater than the amount being removed from the work PIECE, the wire electrode breaks and discharge is stopped. The overall objective is to produce high quality product at low cost to the manufacturer. Optimization is a process that finds a best, or optimal, solution for a problem of process parameters is the best way to solve this problem. Taguchi L9 Orthogonal array and Grey Relational analysis used to set optimal set of parameters.

Taguchi Proposed to acquire the characteristics data by using orthogonal arrays, and to analyse the performance measure from data to decide the optimal process parameters. The designed matrix of input parameters with output parameters such as MRR (material removal rate) and Surface roughness (Ra) for HCHCR-D2 (High carbon high chromium steel) shown in table 4.2. Selection of a particular OA is based on the number of levels of various factors. Here, Number of levels (L)=3 and No of factors(f)=4 therefore Degree of Freedom (DOF) can be calculated by using Eq. as  $DOF = f \times (L-1) = 8$ , the orthogonal array should be equal to or greater than DOF, here  $9 > 8$  hence L9. Each machining parameter is assigned to a column of OA and 9 machining parameter combinations are designed.

**Table 4.1:** Designed matrix of input and output parameters

Trial No	Ton	Toff	Ip	Wf	MRR (gm/min)	Ra(μm)
1	127	45	210	3	0.66	1.9
2	127	46	220	4	0.92	2.1
3	127	47	230	5	1	2.7
4	128	45	220	5	0.66	1.8
5	128	46	230	3	1.06	1.9
6	128	47	210	4	0.82	1.3
7	129	45	230	4	1.12	1.4
8	129	46	210	5	0.82	1.8
9	129	47	220	3	1.12	1.5

- **Grey relational Analysis:**

The grey analysis was first proposed many decades ago but has been extensively applied only on the last decade. Grey analysis has been broadly applied in optimizing the performances involving multiple responses. The multi-objective problem can be converted into single objective optimization using GRA technique.



**Fig. 4.1:** purpose of grey relational analysis

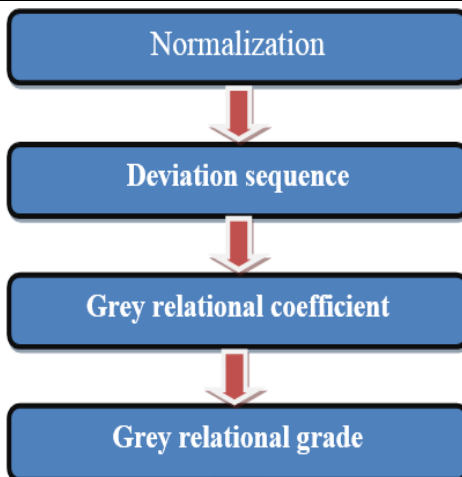
In Grey relational analysis, experimental data i.e., measured features of quality characteristics are first normalized ranging from zero to one. This process is known as Grey relational generation. Next, based on normalized experimental data, Grey relational coefficient is calculated to represent the correlation between the desired and actual experimental data. Then overall Grey relational grade is determined by averaging the Grey relational coefficient corresponding to selected responses. The overall performance characteristic of the multiple response process depends on the calculated Grey relational grade. This approach converts a multiple response process optimization problem into a single response optimization situation with the objective function is higher Grey relational grade. The optimal parametric combination is then evaluated which would result highest Grey relational grade.

- **4.2.1 Steps in GRA**

Table 4.1: Process parameters with their levels.

Sr. No	Process Parameters	Unit	Level 1	Level 2	Level 3
1	Pulse on time(Ton)	μs	127	128	129

2	Pulse off time(Toff)	μs	45	46	47
3	Input current(Ip)	A	210	220	230
4	Wire feed(Wf)	m/min	3	4	5



**FIGURE. 4.2: Steps in GRA**

### (a) Normalization:

It is the first step in the grey relational analysis; a normalization of the S/N ratio is performed to prepare raw data for the analysis where the original sequence is transferred to a comparable sequence. Linear normalization is usually required since the range and unit in one data sequence may differ from the others. A linear normalization of the S/N ratio in the range between zero and unity is also called as the grey relational generation. Further analysis is carried out based on these S/N ratio values. When the range of the series is too large or the optimal value of a quality characteristic is too enormous, it will cause the influence of some factors to be ignored. The original experimental data must be normalized to eliminate such effect. There are three different types of data normalization according to whether we require the LB (lower-the-better), the HB (higher-the-better) and NB (nominal-the-best). The normalization is taken by the following equations.

#### (a) HB (higher-the-better)

$$x_i(k) = \frac{y_i - \min y_i(k)}{\max y_i(k) - \min y_i(k)} \dots\dots\dots(4.1)$$

#### (b) LB (lower-the-better) :

$$x_i(k) = \frac{\max y_i(k) - y_i(k)}{\max y_i(k) - \min y_i(k)} \dots\dots\dots(4.2)$$

(c) **NB (nominal-the-best) :**

$$X_i^*(k) = \frac{y_i(k) - y_i}{\max y_i(k) - y_i(k)} \dots\dots\dots(4.3)$$

Here,  $i = 1, 2, \dots, m$ ;  $k = 1, 2, \dots, n$

Where  $x_i(k)$  is the value after the grey relational generation,  $\min y_i(k)$  is the smallest value of  $y_i(k)$  for the  $k^{th}$  response, and  $\max y_i(k)$  is the largest value of  $y_i(k)$  for the  $k^{th}$  response. An ideal sequence is  $x_0(k)$  for the responses. The purpose of grey relational grade is to reveal the degrees of relation between the sequences say,  $[x_0(k) \text{ and } x_i(k)]$ ,  $i = 1, 2, 3, \dots, 9$ .

(b) **Determination of deviation sequences  $\Delta_{0i}$  :**

The deviation sequence is the absolute the reference sequence  $x_0(k)$  and the comparability sequence  $x_i(k)$  after normalization. It is determined using

$$= |x_0(k) - x_i(k)| \dots\dots\dots(4.4)$$

(c) **Calculation of grey relational coefficient (GRC)**

GRC for all the sequences expresses the relationship between the ideal (best) and actual normalized S/N ratio. If the two sequences agree at all points, then their grey relational coefficient is 1.

$$\xi_i(k) = \frac{\Delta_{min} + \theta \Delta_{max}}{\Delta_{0i}(k) + \theta \Delta_{max}} \dots\dots\dots(4.5)$$

Where,  $\Delta_{0i} = \|x_0(k) - x_i(k)\|$  = difference of the absolute value  $x_0(k)$  and  $x_i(k)$  ;  $\theta$  ; is the distinguishing coefficient  
 $0 \leq \theta \leq 1$ ;  $\Delta_{min} = \forall j^{min} \in i \forall k^{min} \|x_0(k) - x_j(k)\|$  = the smallest value of  $\Delta_{0i}$  ; and  $\Delta_{max} = \forall j^{max} \in i \forall k^{max} \|x_0(k) - x_j(k)\|$  largest value of  $\Delta_{0i}$ . Comparability sequence and  $\zeta$  is the distinguishing coefficient. The value of  $\theta$  can be adjusted with the systematic actual need and defined in the range between 0 and 1,  $\theta \in [0, 1]$ . It will be 0.5 generally.

(d) **Determination of grey relational grade (GRG)**

The overall evaluation of the multiple performance characteristics is based on the grey relational grade. After averaging the grey relational coefficients, the grey relational grade can be computed as:

$$\gamma_i = \frac{1}{n} \sum_{k=1}^n \xi_i(k) \dots\dots\dots(4.6)$$

Where, n = number of process responses.

If the two sequences agree at all points, then their grey relational coefficient is 1 everywhere and therefore, their grey relational grade is equal to 1. In view of this, the relational grade of two comparing sequences can be quantified by the mean value of their grey relational coefficients and the grey relational grade. The grey relational grade also indicates the degree of influence that a comparability sequence could exert over the reference sequence. Therefore, if a particular comparability sequence is more important than the other comparability sequences to the reference sequence, then the grey relational grade for that comparability sequence and reference sequence will be higher than other grey relational grades.

The higher value of grey relational grade corresponds to intense relational degree between the reference sequence  $x_0(k)$  and the given sequence  $x_i(k)$ . The reference sequence  $x_0(k)$  represents the best process sequence. Therefore, higher grey relational grade means that the corresponding parameter combination is closer to the optimal.

Based on Taguchi's L9 Orthogonal Array design, the predicted data provided can be transformed into a signal-to-noise (S/N) ratio; based on three criteria. The loss function (L) for objective of HB and LB is defined as follows

$$L_{HB} = \frac{1}{n} \sum_{i=1}^n \frac{1}{y_{MRR}^2} \quad \dots\dots\dots(4.7)$$

$$L_{LB} = \frac{1}{n} \sum_{i=1}^n y_{SR}^2 \quad \dots\dots\dots(4.8)$$

Response values		S/N Ratio	
MRR(gm/min)	Ra(μm)	MRR(dB)	Ra(dB)
0.66	1.9	-3.60912	-5.5751
0.92	2.1	-0.72424	-6.4444
1	2.7	0	-8.6273
0.66	1.8	-3.60912	-5.1055
1.06	1.9	0.506117	-5.5751
0.82	1.3	-1.72372	-2.2789
1.12	1.4	0.98436	-2.9226
0.82	1.8	-1.72372	-5.1055
1.12	1.5	0.98436	-3.5218

**Table 4.3 Signal-to-Noise Ratio**

Trial No	S/N Ratio		Normalized S/N Ratio	
	MRR(db)	Ra(db)	MRR	Ra
1	-3.6091	-5.5751	0	0.51921755
2	-0.7242	-6.4444	0.628037292	0.656151699
3	0	-8.6273	0.785704938	1
4	-3.6091	-5.1055	0	0.4452428
5	0.50612	-5.5751	0.895886568	0.51921755
6	-1.7237	-2.2789	0.410450818	0
7	0.98436	-2.9226	1	0.101394498
8	-1.7237	-5.1055	0.410450818	0.4452428
9	0.98436	-3.5218	1	0.195790518

**Table 4.4: Normalization**

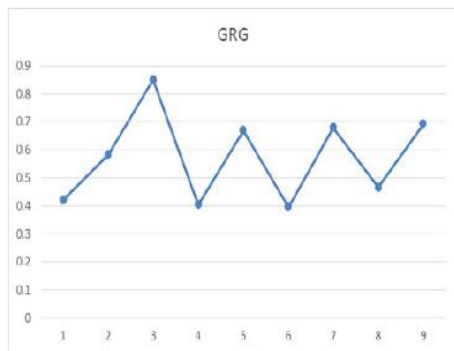


Trial No	Deviation Sequence		Grey Relational coefficient	
	MRR	Ra	MRR	Ra
1	1	0.48078	0.333333	0.5097971
2	0.372	0.34385	0.573419	0.5925236
3	0.2143	0	0.699991	1
4	1	0.55476	0.333333	0.4740427
5	0.1041	0.48078	0.827659	0.5097971
6	0.5895	1	0.458905	0.3333333
7	0	0.89861	1	0.357499
8	0.5895	0.55476	0.458905	0.4740427
9	0	0.80421	1	0.383374

Table 4.6: Grey relational Coefficient

Expt. No	Process Parameters					Grey Relational Grade
1	127	45	210	3		0.421565192
2	127	46	220	4		0.582971289
3	127	47	230	5		0.84999542
4	128	45	220	5		0.40368804
5	128	46	230	3		0.668728092
6	128	47	210	4		0.396119365
7	129	45	230	4		0.678749476
8	129	46	210	5		0.466474072
9	129	47	220	3		0.691686998

Table 4.6: Grey relational grade



symbol	Parameter	Grey Relational Grade			Main Effect	Rank
		Level 1	Level 2	Level 3		
A	Ton	0.6182	0.4895	0.6123	0.1287	3
B	Toff	0.5013	0.5727	0.6459	0.1446	2
C	Ip	0.5709	0.5594	0.7325	0.1616	1
D	Wf	0.594	0.5526	0.5734	0.0414	4

Table 4.7: The Main Effects of the Factors on the Grey Relational G

The mean of the grey relational grade for each level of the machining parameters is summarized and shown in Table 4.7

The larger the grey relational grade, the better is the multiple performance characteristics. However, the relative importance among the machining parameters for the multiple performance characteristics still needs to be known, so that the optimal combinations of the machining parameter levels can be determined more accurately. Table 4.7, the optimal parameter combination was determined as A1(pulse on time)-B3(pulse off time)-C3(Input current)-D1(wire feed rate).

#### 4.2.2 Confirmation Test:

The purpose of the confirmation experiment is to validate the conclusions drawn during the analysis phase. After determining the optimum level of process parameters, a new experiment is designed and conducted with optimum levels of CNC W-EDM parameters obtained.

	Predicted	Experimental	Error
MRR(gm/min)	0.99	1.06	0.07
Ra(μm)	2.22	2.26	0.04

Confirmatory experiments were performed using the optimum values and it was found that experimental response values were close enough to predicted values.

These values and percentage error between actual and predicted values of the responses are given in table 4.8 The percentage error between the actual and predicted values of the responses falls below 5%, which shows that the optimized value of CNC W-EDM process parameters obtained is good enough for achieving the target set during the experiment. The comparison again shows the good ,

## IV. CONCLUSIONS

Taguchi's L9 orthogonal array and Grey relational analysis were applied to improve the multi response characteristics such as MRR (material removal rate) and Surface roughness (Ra)

(a)The optimal parameter combination determined as A1(pulse on time)-B3(pulse off time)-C3(Input current)-D1(wire feed rate),Table 5.5

(b)Input Current(Ip) has maximum influence on both MRR and Surface Roughness.

(c) MRR and Surface Roughness increases with increase in Input Current (Ip).

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# Implementing 5S, Kaizen And Quality Control Tools For Quality Improvement

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**Abstract**— The purpose of this research is to use 5S, Kaizen and Quality control tools to assist manufacturing organization to become more productive and more efficient by reducing waste and by improving continuously. Producing high quality of products and services is one of the key concerns in order to keep up with the competition in the global markets. The main objective of manufacturing industries today is to increase productivity through system simplification and incremental improvements. Improvement can be achieved by either better control or by raising standards. Increasing productivity and profitability are main objectives of any organization. Many tools and techniques are used to reduce rejections and defects of product. So a simple approach has been adopted to create the teams for implementing 5S, Kaizen and Quality Control tools. This system helps to organize a workplace for efficiency and decrease wasting and optimize quality and productivity via monitoring an organized environment and to find the total rejection of a component from a list of defective components so as to limit from exceeding the rejection target to avoid waste. The study highlights that there is possibility of systematic application of all of these tools in the frame of company's overall quality management system.

**Keywords**—Improvement, Kaizen, Manufacturing, Quality Control Tools, 5S

## I. INTRODUCTION

Improving customer service, making operation faster, more operation and reduction in costs are the challenges faced by manufacturers today and to meet these challenges many companies are searching to improve their ability to compete globally. Wastage during production process is rapidly growing day by day in industries. There are different techniques of waste reduction and performance enhancement like Kaizen and 5S and Quality Control Tools. The word KAIZEN comes from a Japanese words KAI (change) and ZEN (good) which originated in 1950. "The essence of Kaizen is simple and straight forward: Kaizen means improvement involving everyone, including both managers and workers". The Kaizen methods are internationally acknowledged as methods of continuous improvement, through small steps of the economical results of the company. The small improvements applied to key processes will generate the major multiplication of the company's profit while constituting a secure way to obtain the clients loyalty. Continuous improvement is one of the core strategies for excellence in production and is considered vital in today's competitive environment. 5S is a technique originated in Japan and it was first developed by Hiroyuki Hirano. 5S is a system in which to reduce work and optimize productivity and quality through maintaining orderly workplace. The 5S technique is included within Kaizen. It is the methodology of creation and maintaining well organized, clean, high effective and high quality workplace. The benefit of good workplace include the prevention of defects, prevention of accidents and the elimination of time wasted for searching tools, documentation and other ingredients of manufacture. The Seven Basic Tools of Quality also called as 7QC Tools originated in Japan when the country was undergoing major quality revolution and had become a mandatory topic as part of Japanese's industrial training program. These tools which comprised of simple graphical and statistical techniques were helpful in solving critical quality related issues. These tools were often referred as Seven Basic Tools of Quality because these tools could be implemented by any person with very basic training in statistics and were simple to apply to solve quality- related complex issues. The 7 QC tools are: cause and effect diagram, check sheet, control chart, histogram, pareto chart, scatter diagram and process control of flow chart.

## II. PROBLEM STATEMENT

The problems arising in different departments due to which the productivity is decreased are discussed as follows:

### a. Purchase Department

The Purchase department keeps all the information regarding the dyes and punches which is to be used during production. There was no proper place to keep those dyes and punches. Only numbering was given to them. Because of this, whenever there would be need of those dyes and punches in the production department, there used to be a lot of problem in searching. Hence there used to be loss in time due to no proper location of it. And after the use of those dyes and punches the workers in the production department used to keep them anywhere at the workplace which caused missing of few punches and increased the chances of accidents. Hence the main problem faced by purchase department was managing those dyes and punches properly at a place. There was an urgent need to reduce this problem as it was increasing day by day due to lack of proper location which led to time consumption.

### b. Production Department

In the production department there were few components which were consuming unnecessary space, some were kept in excess which were actually unwanted whereas some were obsolete. Due to this there was problem arising in material handling of new stock and also there was space requirement for new processed components. There was no tool board and so tools used to go missing which led to scarcity of tools and hence tools used to be kept at storage department. This used to create problem during tool requirement as workers had to run to storage department for their tools. This led to time loss in production.

### c. Quality, Assembly and Testing department

The quality department also faced some problems as there was no specific place for tested components to be kept and problem was arising regarding spoiling of finished products and damage which was a loss to the industry. There was no tool shadowing. The main issue faced by quality department was customer complaints about the product delivered. Some of the customer complaints were:

Blow holes, Body leakage, Plunger leakage, Bottom nut leakage, Plunger spring damage, Diaphragm damage, Body seat leakage, Body pin hole leakage, Internal cracks, Forging defects, Dents and Scratches

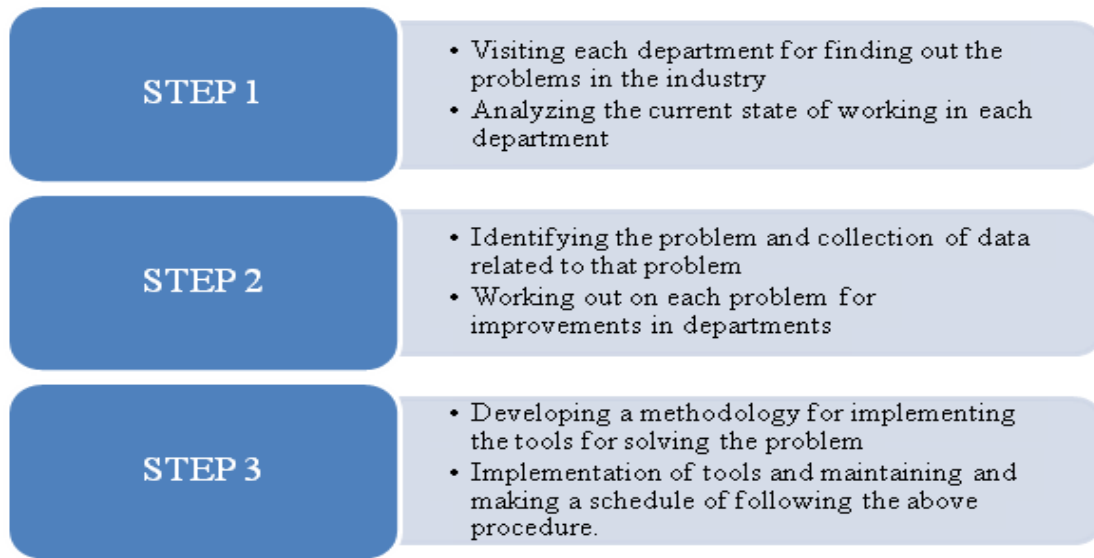
Target was to reduce these customer complaints. For achieving this, each and every complaint needed to be studied by testing those components and root cause of the complaint had to be found so as to give proper explanation to the customer with the guarantee that such issues will not be rising in the future. For this proper co-ordination between workers and departments was required for total customer satisfaction.

## III. METHODOLOGY

### 3.1 5S

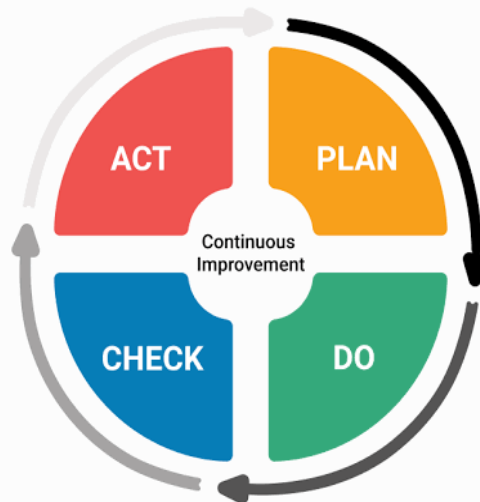
**TABLE 1**  
**5S**

Japanese	English	Translation	Meaning
Seiri	Sorting	Organize	Creating a difference between wanted, unwanted, obsolete items and removing unnecessary items
Seiton	Storing	Order	Arranging the items in a systematic order within the reach of the user
Seiso	Shining	Clean	Cleaning the workplace for avoiding accidents
Seiketsu	Standardizing	Standardize	Maintaining the above 3S's
Shitsuke	Sustaining	Self Discipline	Making a habit of maintaining the above 4S's



**FIGURE 1: 5S implementation methodology**

### 3.2 Kaizen



**FIGURE 2: PDCA Cycle for Kaizen**

### 3.3 Quality Control Tools

Quality control tools especially pareto analysis is done for rejection management in the quality department. When the processed components are produced from the production department then they are checked first in the quality department before packaging and dispatch to the customers. During this process, some components are found to be physically damaged, consisting of blow holes, leakages, etc which are rejected due to defects. These defective components are classified into rework and rejected components. Small defective components are stated as rework and are thrown in scrap whereas body (assembly) components if defective are classified into rejected and are sent for melting i.e. reusing the metal. The components contributing to 80% of rejection from overall

rejected components are considered and pareto analysis is done to check for rejection whether crossing their target percentage. This is done on quarterly basis and the data is everytime compared to the previous rejection management analysis.

## IV. IMPLEMENTATION

### 4.1 5S

#### 4.1.1 Seiri (sort-1S)

Sorting aims for removing all the unwanted materials from the workplace. After sorting the unwanted materials from workplace, they are placed in the red tag area and the details are noted on the red tag card after which they are either moved to scrap yard or located properly or rectified or segregated or returned to the supplier.



**FIGURE 2: Red Tag Card(front)**



**FIGURE 3: Red Tag Card(back)**

#### 4.1.2 Seiton (set in order-2S)

Set in order aims at placing everything at its place. After sorting the specific location is defined for the useful material and located in the predefined order.



**FIGURE 4 : Tool Shadowing in drawers**



**FIGURE 5: Tool Board**

#### 4.1.3 Seiso (Shine-3S)

Shine aims at keeping cleanliness at workplaces, workstations, offices, stores, passage, gangways etc in the organization.



Before



After

**FIGURE 6: Formation of gangway at shop floor**

#### 4.1.4 Seiketsu (Standardize-4S)



To strictly follow the first '3S' in the daily routine. Standardize aims for preparation of standard method to continue to follow the first '3S' effectively in the organisation.



#### 4.1.5 Shitsuke (Sustain-5S)



Sustain aims for maintaining the implemented '5S' system effectively. Thus in short, sustain defines the discipline for employees to strictly follow the implemented '5S' in the organization to obtain the required result. For sustaining the '5S' technique effectively and to strictly adhere to it in the organization, internal audits as well as surprise audits are conducted periodically.

#### 4.2 Kaizen

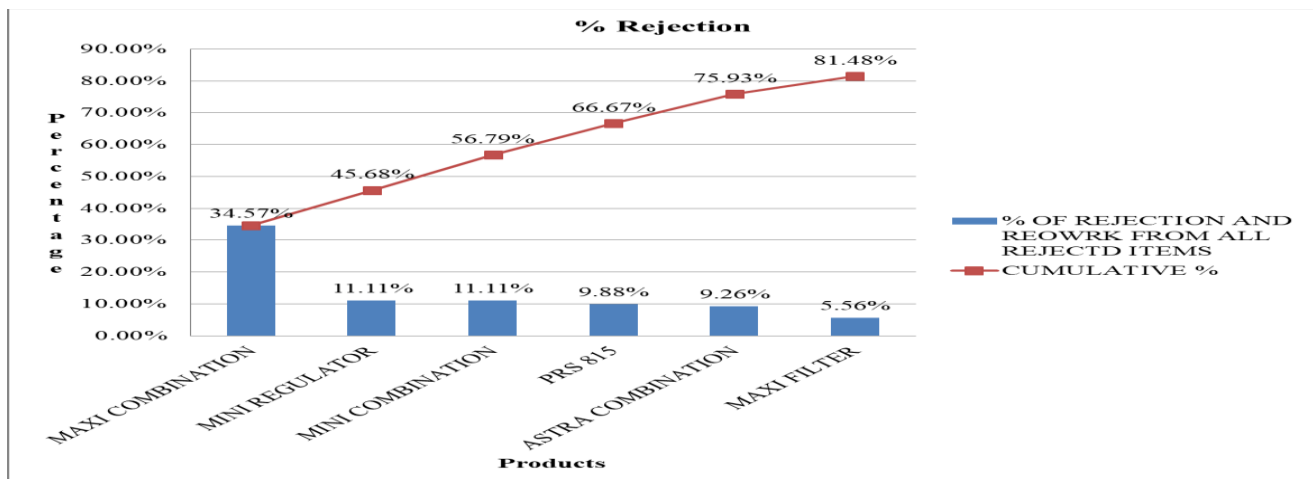
Kaizen No.	Start date	Implementation Area	Team members	Kaizen for	
1.	10 <sup>th</sup> Sept 2016	Production	1. Sagar 2. Pednekar	Machine Quality Cost reduction Health & safety	Tools & Jigs ✓ Material handling Delivery Personal efficiency
Problem description		AFTER			
BEFORE (text, pictorial, graphical)		(text, pictorial, graphical)			
					
Unwanted parts stored which can be either discarded or thrown in scrap		These unwanted components present in excess are thrown in scrap keeping only required amount for use.			
Root cause/s identification		Results / Benefits			
1. Maxi combination high pressure piston 2. Hand level bracket 3. 3/8 dust filter		Large space consume by this components is now in use to keep other parts.			
Action to be taken		Standardization			
Move to scrap		Check over whether these unwanted components do not go in excess to avoid use of unnecessary space			
To be completed by: 17 <sup>th</sup> Sept 2016		Sign off		Date: 18 <sup>th</sup> Sept 2016	

Kaizen No.	Start date	Implementation Area	Team members	Kaizen for	
3.	10 <sup>th</sup> Sept. 2016	Quality and Assembly	1. Chinmay 2. Mahesh	Machine Quality Cost reduction Health & safety	Tools & Jigs Material handling Delivery Personal efficiency
Problem description		AFTER			
BEFORE (text, pictorial, graphical)		(text, pictorial, graphical)			
					
Raw materials and components need to be segregated		Raw materials and components have been segregated to avoid mixing for easy use			
Root cause/s identification		Results / Benefits			
1. Metal components 2. Parts made up of polycarbonate 3. Plastic components 4. Brass components		Clear visibility of Raw materials and finished components for further testing			
Action to be taken		Standardization			
Location of raw materials and finished components to be changed		Weekly check over they are at their respective location or not			
To be completed by: 17 <sup>th</sup> Sept 2016		Sign off		Date: 18 <sup>th</sup> Sept 2016	

**FIGURE 7: Kaizen sheet for Production and Quality**

#### 4.3 Quality Control Tools

For rejection management of 80% of defective components from total rejected components, pareto analysis is done to check the highest defective component and to check for rejection whether crossing their target percentage. For rejection management of 80% of defective components from total rejected components, pareto analysis is done to check the highest defective component and to check for rejection whether crossing their target percentage.



**FIGURE 8: Pareto analysis on Rejected material**



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## V. CONCLUSION

Tools and techniques for eliminating waste quality improvement, helps manufacturers to improve the productivity of their enterprises by reducing defects. The manufacturing firms should develop their general plans and schedules according to the nature of their production to be able to reduce production costs. Hence by implementing Kaizen and 5S there has been a lot of improvement in the process flow due to better usage of workplace, stock confinement, prevention from losing tool, increased efficiency, process development by cost reduction, travel time of materials has been reduced, improvement in safety, improvised working conditions for workers, increase of awareness and morale, etc . So the target of implementing these tools quality improvement has been achieved in the industry by giving total customer satisfaction.

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# Review study of Mechanical properties under Friction Stir Welding of Titanium Alloy (Ti-6Al-4V)

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**Abstract**— Friction Stir Welding was invented in early 90's at TWI (The Welding Institute in Cambridge, UK) which is a solid state welding process; early used to weld aluminum alloys, now adopted for high resistant materials. Joining titanium alloys by conventional fusion welding processes resulted in several difficulties because of high material reactivity with nitrogen, oxygen and hydrogen along subsequent embrittlement of the joint. However FSW serves high quality and cost effective solution. Mechanical properties of joints are stringently associated to the microstructural evolutions, with respect to phase change, occurring during the process. Here a 3mm plate of Ti-6Al-4V having yield stress of 920 MPa, ultimate tensile stress of 1050 MPa and micro hardness 351 HV is welded by FSW with W25Re tool. The Micro hardness and Ultimate tensile stresses are observed at different rotational speeds of tool.

**Keywords**— Friction Stir Welding, Yield Strength, Elongation, Ultimate Tensile Strength and Stir Zone.

## I. INTRODUCTION

Titanium and titanium alloys finds a huge demand in aerospace industry due to their high strength-weight ratio and also their good corrosion resistance. Yet, titanium alloys has lower ductility with respect to steels and are among the materials whose welding is difficult. Presently titanium and titanium alloys are welded by tungsten arc welding (TIG), metal arc welding (MIG) along with laser beam welding and plasma arc welding. It is impossible to avoid development of residual stresses, large distortion, and brittle cast structures, using these conventional fusion welding techniques. Also, there is possibility of contamination of such alloys by air, hydrogen, forming brittle compounds by absorbing oxygen and nitrogen. Friction Stir Welding (FSW) of titanium alloys serves as a high quality and cost efficient solution. Following figure 1 shows schematic representation of friction stir welding.

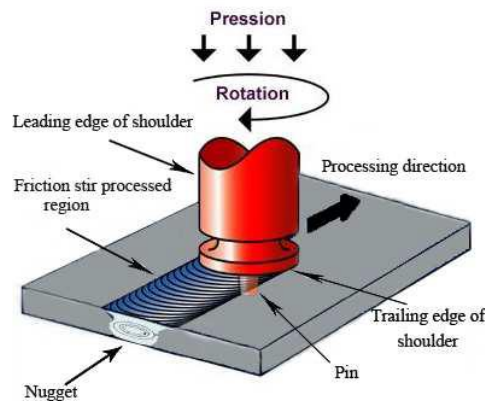


FIGURE 1: Schematic of FSW [1]

## II. MATERIAL AND METHOD

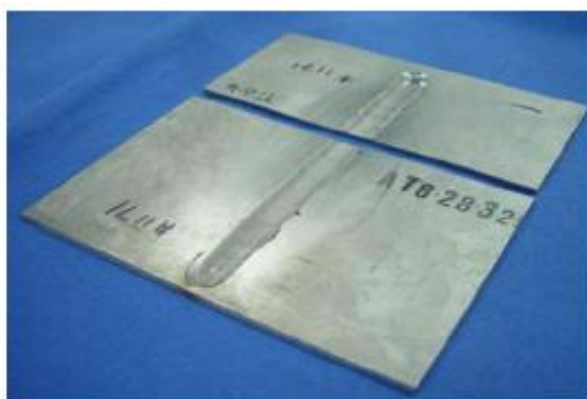
### 1.1 Material

Titanium alloy Ti-6Al-4V are joined by friction stir welding process. Ti-6Al-4V titanium alloy is difficult to be welded by fusion welding processes which lead to several weld defects. Table 1 shows the chemical composition of Ti-6Al-4V titanium alloy.

**TABLE 1**  
**CHEMICAL COMPOSITION OF TITANIUM ALLOY (TI-6AL-4V)**

Chemical Composition.	Al	V	C	Fe	N	O	H
Weight in %	6.09	4.02	0.011	0.14	0.008	0.14	0.0023

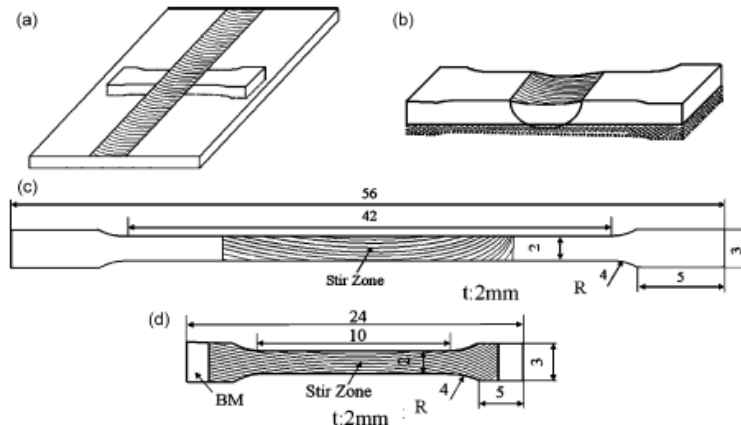
Yu Zang [2] performed friction stir welding of 3mm Ti-6Al-4V plates using a molybdenum based alloy tool having convex shoulder with step spiral patterns on surface to enhance stirring effect. Argon gas used as shielding gas. M Ramulu [3] evaluated friction stir welded (FSW) and friction stir welded-superplastically formed Ti-6Al-4V alloy sheets having thickness ranging between 2 to 2.5 mm. The titanium sheets were welded and tested (in both stress relieved and superplastically formed condition. Jianqing Su [4] performed friction stir processing on 2 mm thick Ti-6Al-4V sheets using various processing parameters including tool rotational speed and tool traverse speed with W-1%La<sub>2</sub>O<sub>3</sub> tool to produce defect-free friction stir processed materials. Paul Edwards [5] investigated properties of 6mm thick Ti-6Al-4V alloy plate by FSW processing tool made of tungsten lanthanum (W-La) alloy carrying all the welds at constant rotational and welding speeds. A.Steuwer [6] reported welding of 3mm thickness of Ti-6Al-4V alloy in a mill annealed condition, i.e. soaked for 2 h at 750 °C and air cooled.



**FIGURE 2: Typical Ti-6Al-4V FSW Joint [3]**

### 1.2 Method

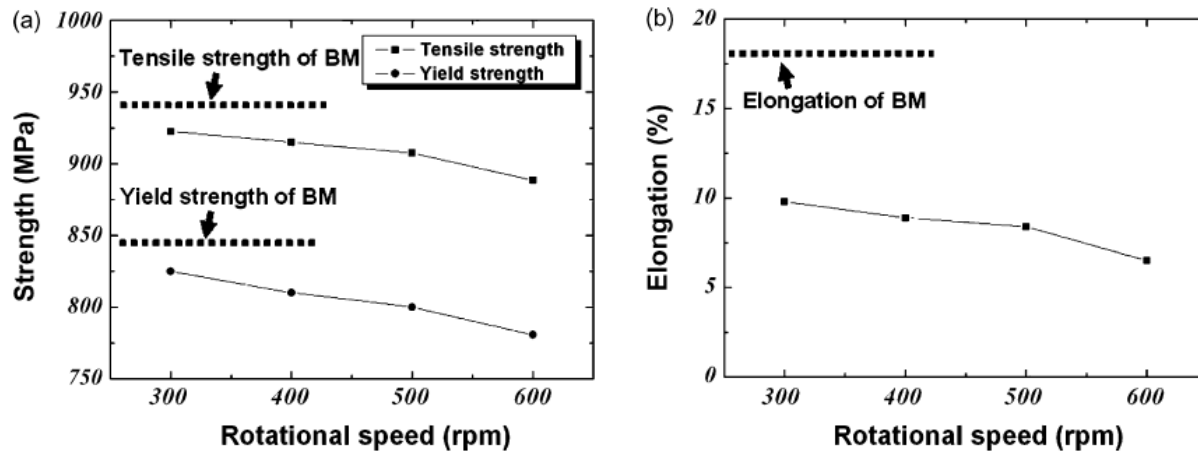
Friction stir welding technique is used to join Ti-6Al-4V alloy due to its solid state method of joining utilizing friction between the material being joined, and a rotating non-consumable tool which generate the needed heat to plasticize and mix material. The high speed of rotational tool causes friction and heat in base metal and joins the plates. As it provides defect free weld due to absence of fusion welding FSW has got tremendous demand in market. The tool has some major parts like shoulder and pin/plunge which penetrates into the weld joint during welding process. Argon gas is used as shielding medium while welding which is supplied around the tool during process. According to Yu Zang [2] test specimens are cut in bone like shape by as shown in figure 3. As per M .Ramulu [3] 250 kN capacity 5585 Instron Load used for testing specimen for calculating tensile strength, yield strength, Young's modulus and elongation. In the paper by Jianqing Su [4] samples were examined by optical microscopy (OM) and scanning electron microscope (SEM), FEI Nova Nanosem 230 equipped with EDAX-TSL orientation imaging micro- scopy (OIM) system for electron backscatter diffraction (EBSD) analysis.



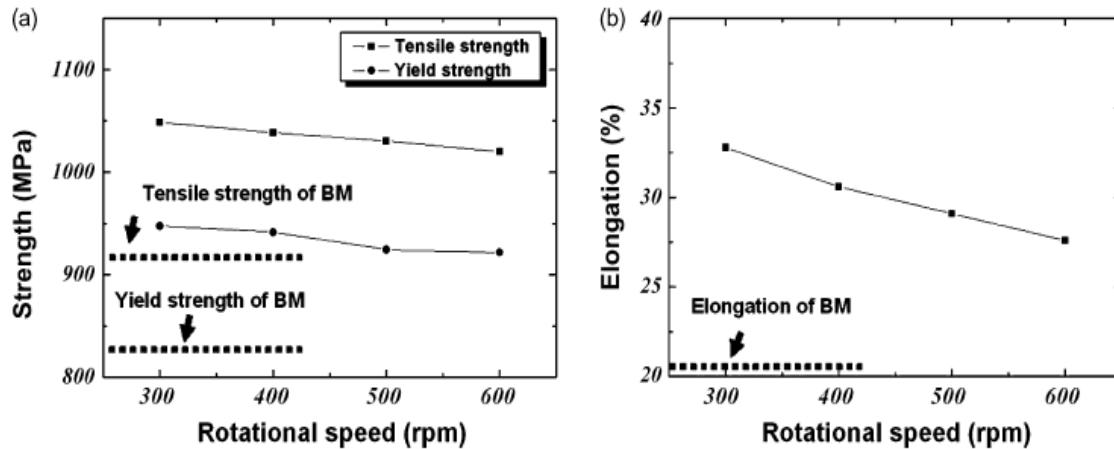
**FIGURE 3: (a) and (b) illustrates the procedure for cutting tensile specimens. (c) Shows configuration of the transverse tensile specimen and (d) show the smaller tensile test specimen [2]**

### III. RESULT

As noted by Yu Zang [2] the SZ exhibited much higher mechanical properties than the base material, while the HAZ was the weakest in the weld, and its properties were representative of the transverse tensile properties of the weld. By M. Ramulu [3] friction stir welds in Ti-6Al-4V alloy possess higher ultimate tensile and yield strengths compared to the properties of parent material. According to Jiaqing Su [4] when compared with the base material, the stir zones of friction stir processed samples showed superior tensile strength and comparable ductility. As per noted by Paul Edwards [5] heat treatment temperatures under 870 C improving higher tensile strengths and elongations with good fatigue life.



**FIGURE 4: Rotational speed effect on transverse tensile properties: (a) tensile strengths and (b) elongation [2]**



**FIGURE 13: Rotational speed effect on tensile properties of the SZ:**  
 (a) tensile strengths and (b) elongation. [2]

Table 2 represents the mechanical properties exhibited by Ti-6Al-4V after FSW application. It shows the evaluations done by different authors in investigation of tensile strength, yield strength, and elongation along with the tool material and tool dimension specifications.

**TABLE 2**  
**MECHANICAL PROPERTIES EXHIBITED BY Ti-6Al-4V**

W/p Thic-kness (mm)	Tool Mat.	Tool Pin Length in mm	Tool Pin Dia. (mm)	Tool Shoulder Dia. in mm	Tool Rotational Speed (rev/min)	Tool Travel speed (mm/m in)	Tensile Strength (MPa)	Yield Strength (MPa)	Elong. in %	Ref.. No.
3	Mo alloy	-	5.1 to 3	15	300 to 600	60	BM - 978, SZ 1025 to 1050	BM - 845, SZ-920 to 950	BM = 18, SZ- 27.5 to 33	2
2 to 2.5	-	-	-	-	150 to 490	75 to 150	BM - 1149 ± 58.7	BM- 1103 ± 39.5	BM = 9.3 ± 1.5	3
2	W-1% La2O3	1.7	6.3	10.1	800 to 1000	25.4 to 101.6	BM- 1014.7 ± 4.55, SZ- 1156.2 ± 0.0 to 1042.9 ± 15.0	BM - 941.8 ± 24.7, SZ- 1067.4 ± 31.4 to 936.8 ± 20.5	BM = 23.1 ± 1.3, SZ- 23.6 ± 0.7 to 19.9 ± 0.5	4
6	W-La	-	-	-	250	100	BM= 994 to 1045, SZ= 980 to 1016	BM - 939 to 978, SZ= 923 to 971	BM = 9 to 16, SZ=7 to 17	5
3	-	2.9	8	14	300 to 600	45 to 165	BM= 1000, SZ= 1002 to 1059	BM - 962	BM = 18, SZ= 3 to 12	6

#### IV. CONCLUSION

From this review it can be concluded that the mechanical properties carried by base metal in as received condition gets changed in the stir zone or weld nugget after friction stir welding process. The stir zone exhibited improvement in mechanical properties with higher tensile strength and yield strength.

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# Productivity improvement by using MOST in sheet metal Industry

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**Abstract**— In A Micro Scale Manufacturing Enterprise (MSME) for mechanical and manual assembly lines, which can be applied similarly well to single, multi- and mixed-product assembly lines with either deterministic operation times or stochastic operation times. The methodology starts from a appropriate assembly system selection and afterward decides suitable cycle times, parallel workstation requirements, and parallel line application for the type of assembly system being selected. An efficient number of workstations are decided with the aid of workstation combining options liable upon the truthful data provided. The end outcome is the detailed design of a manufacturing assembly line.

**Keywords**— ***MOST, Productivity, improvement, technique, sheet metal.***

## I. INTRODUCTION

Work measurement is a methodical procedure for the analysis of work and determination of time required performing main tasks in processes, it is characteristically based on time standards for manual tasks. The problem of the Methods Time Measurement (MTM) system in the 1940s was a significant step forward in analytical work measurement. It is defined as 'a technique which analyses any manual operation or method into the basic motions required to perform it. MTM assigns to each motion a predetermined time standard which is determined by the nature of the motion and the conditions under which it is made. One of the main problems in applying MTM to industrial operations is that it is very tedious and time overwhelming, since a work analyst must observe and manuscript each movement in great detail. In addition, such method produces large amounts of data which must be managed. The development and release of the MOST in the 1960s improved many of these problems, since it is much simpler and more efficient. It classifies all human movements into three basic categories, and the description of each category is done by assigning values to only a few standard parameters. It is the latest work measurement technique that can be effortlessly implemented and practically maintained to not only estimate the standard time but also improve methods and maximize the resource utilization.

**MOST Methodology:** MOST is the newest work measurement technique that can be effortlessly implemented and practically upheld to estimate the standard time and also improve methods which maximize the resource utilization. It was originally industrialized by H. B. Maynard & Company Inc. and has three forms: Basic MOST for the activities between 20 sec to 2 min, Mini MOST for the activities shorter than 20 sec, and Maxi MOST for the activities above 2 min. MOST focuses on three types of object movements Such as General Move, Control Move, and Tool Use which are briefly explained hereunder

## II. METHODOLOGY

### Maynard Operating Sequencing Technique (MOST)

(a) Important Component of MOST

(b) Types of Sequence

**(a) Important Component of MOST** Takt is a German word meaning "Conductors Baton". Takt time matches the speed of the manufacturing process to customer demand. Each manufacturing process works to the takt.

$$\text{Takt} = \text{Total time available} / \text{Total customer demand}$$

**(b) Types of Sequence** Sequence models signify the sequence of events that occurs when an object is moved or a tool is used. Predefined sequence models signify different types of activities.



**General Move (moved freely through space):-** spatial displacement of an object. The object follows an unrestricted path through the air.

**Controlled Move (movement restricted; attached or in contact):-** The movement of objects along a controlled or restricted path.

**Tool Use (using common hand tools):** - Combination of General Moves and Controlled Moves

### III. FIGURES AND TABLES

**TABLE I**  
**OPERATION DESCRIPTION (UTENSIL- OIL SPOON CUP)**

Op. no	Operation description (Utensil- Oil spoon cup)	Most time (Sec)
1	Punching operation	3.2
2	Drawing operation	3.5
3	Edge cutting operation	4.2
4	Internal buffing operation	7.2
5	External Buffing operation	5.7
6	Notching operation	4.1
	<b>Total Time</b>	<b>27.9 sec</b>

**TABLE II**  
**OPERATION DESCRIPTION (UTENSIL- OIL SPOON HANDLE)**

Op. no	Operation description (Utensil- Oil spoon handle)	Most time (Sec)
1	Punching operation	3.4
2	Drawing operation	3.5
4	Upper buffing operation	7.2
5	Lower Buffing operation	7.2
6	Bending	3.1
	<b>Total Time</b>	<b>24.5 sec</b>

**TABLE III****OPERATION DESCRIPTION (UTENSIL- OIL SPOON ASSEMBLY)**

Op. no	Operation description (Utensil- Oil spoon Assembly)	Most time (Sec)
1	Spot welding	5.4
2	Packaging	6.5
	<b>Total Time</b>	<b>11.9 Sec</b>

#### IV. CONCLUSION

We will obtain below out come after completed product assembly line with the help of Trupti Metal Work. Operating time of the operation description (Utensil- Oil spoon cup) is 27.9 sec and Operation description (Utensil- Oil spoon handle) is 24.5sec and Operation description (Utensil- Oil spoon assembly) is 11.9sec. MOST and line balancing of assembly line some problem is solved.

- Decreases process time of the product
- Drop of workstations
- Decreased work-in-progress inventory
- Minimizing of lead time
- Decrease of capital and operating costs

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# A review paper on combustion chambers in CI Engines

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**Abstract**— CI engines are widely used in stationary as well as mobile applications. Stationary applications include typical gen-set, etc. and mobile applications include heavy automobiles, forestry equipments, etc. as well as other applications in day-to-day life. Since the turbulence is necessary for better mixing and the fact that it can be controlled by shape of the combustion chamber, makes this review paper necessary. This paper re-visits and draws on the essentials of combustion chamber, their design, influence in combustion process, timing, etc. This paper is meant to emphasize research on newer designs requirement for combustion chambers. CI engines find widespread applications due to their robustness, high compression ratio and hence high thermal efficiency and usage of non-volatile fuel generally diesel oil.

**Keywords**— Combustion chamber, compression ignition, swirl, squish.

## I. INTRODUCTION

The compression ignition engine is an internal combustion engine that uses the increase in temperature in the compression stroke to ignite a fuel charge (fuel-air mixture). This is also called auto-ignition. These engines are always fuel injected. Air is drawn into the cylinder through the intake manifold and compressed by the piston. The most important function of the CI engine combustion chamber is to provide proper mixing of fuel and air (called carburetion) in a short time to lessen the ignition lag phase. In order to achieve this, an organized air movement called air swirl is provided to produce high relative velocity between fuel droplets and air. When the liquid fuel is injected into the combustion chamber, the spray cone gets disturbed due to the air motion and turbulence inside. The onset of combustion will cause an added turbulence that can be guided by the shape of the combustion chamber. Swirl is defined as organized rotation of charge about the cylinder axis. Swirl is created by bringing an intake flow into the cylinder with an initial angular momentum. Swirl is used in CI engine concepts to promote more rapid mixing between the inducted air charge and the injected fuel. Swirl is also used to speed up the combustion process and in two-stroke engines, it improves scavenging. Squish is the name given to the radially inward or transverse gas motion that occurs towards the end of the compression stroke when apposition of piston face and cylinder head approach each other closely

## II. TYPES OF CHAMBERS

**1. Direct Injection (DI) :** Type It is also called an open combustion chamber. An open combustion chamber is defined as one in which the combustion space is essentially a single cavity with little restriction on one part of the chamber to the other and hence with no large difference in pressure between parts of the chamber during the combustion process. DI chambers are of following types:

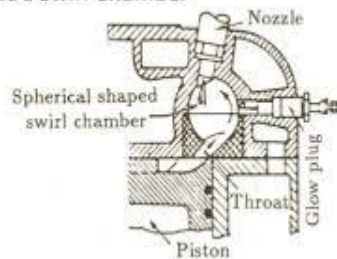
- A. **Shallow Depth Chamber:** The depth of the cavity provided in the piston is quite small. This chamber is usually adopted for large engines running at low speeds. Since the cavity diameter is very large, the squish is negligible.
- B. **Hemispherical Chamber:** This chamber also gives small squish. However, in this case desired squish can be obtained by varying depth to diameter ratio.

- C. Cylindrical Chamber: This design was attempted in recent diesel engines. The swirl is produced by masking the cone for nearly 180° of circumference. In this case also, squish can be varied by varying the depth.

**2. Indirect Injection (IDI) :Type** In this type of combustion chambers, the combustion space is divided into two parts – main cylinder and cylinder head connected by restricted passages. This creates considerable pressure differences between them during the combustion process. IDI chambers are of following types:

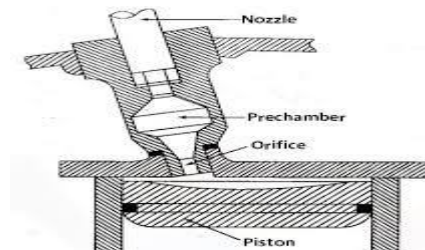
A. Swirl Chamber: Swirl chamber consists of a spherical shaped chamber separated from the engine cylinder and located in the cylinder head. Into this chamber, about 50% of the air is transferred during the compression stroke. A throat connects the chamber to the cylinder which enters the chamber in a tangential direction so that the air coming into this chamber is given a strong rotary movement inside the swirl chamber and after combustion, the products rush back into the cylinder through same throat at much higher velocity. This causes considerable heat loss to walls of the passage which can be reduced by employing a heat insulated passage. However, in this type of combustion chambers even with an insulated passage, the heat loss is greater than that in an open combustion chamber which employ induction swirl. This type of combustion chamber finds its application where fuel quality is difficult to control, where reliability under adverse conditions is more important than fuel economy. The use of single hole of larger diameter for the fuel spray nozzle is often important consideration for the choice of swirl chamber engine.

Ricardo's Swirl Chamber



**FIGURE 1**

B. Pre-combustion Chamber: A typical pre-combustion chamber consists of an anti chamber connected to the main chamber through a number of small holes (compared to a relatively large passage in the swirl chamber). The pre-combustion chamber is located in the cylinder head and its volume accounts for about 40% of the total combustion, space. During the compression stroke the piston forces the air into the pre-combustion chamber. The fuel is injected into the pre-chamber and the combustion is initiated. The resulting pressure rise forces the flaming droplets together with some air and their combustion products to rush out into the main cylinder at high velocity through the small holes.



**FIGURE 2**

Thus it creates both strong secondary turbulence and distributes the flaming fuel droplets throughout the air in the main combustion chamber where bulk of combustion takes place. About 80% of energy is released in main combustion chamber. The rate of pressure rise and the maximum pressure is lower compared to those in open type chamber. The initial shock if combustion is limited to pre-combustion chamber only. The pre-combustion chamber has multi fuel capability without any modification in the injection system because the temperature of pre-chamber. The variation in the optimum injection timing for petrol and diesel operations is only 2 deg. for this chamber compared to 8 to 10 deg in other chamber design.

### III. RELEVANCE WITH CURRENT PRACTICES

CI applications include modern day diesel engines. Some of the common diesel engines used by automobile organizations like Hyundai, Honda, Volkswagen Group, Ford use diesel engines viz. CRDi, i-DTEC, TDi, Duratorq which are way more efficient and clean due to improved combustion chamber design as one of the factors. Even engines using bio-diesel focus on combustion chamber design for increase in efficiency needless to mention the eco-friendliness. The new i-DTEC clean diesel engine was introduced to the North American market in 2009 subsequently coming to India as well. The i-DTEC engine reduces noxious exhaust emissions while boosting power and fuel efficiency. A combination of optimized combustion chamber design and reduced injection time results in a clean, quiet engine that delivers excellent performance for an enjoyable driving experience.

### III.CONCLUSION

This review paper gives an insight into the importance and effects of good combustion chamber design. There is a strong necessity of research and innovation in combustion chamber design as with advent of new technologies in engine and fuel type innovations, this is indispensable. Moreover, whatever is the type of fuel, technology or engine used in present or in future,

combustion will be always there as through combustion of fuel only, power is generated. Hence study of combustion chamber is of prime importance and that too in CI engines because their applications are varied and widespread

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# Parametric optimization of MIG Welding

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**Abstract**—The Hot Rolled Low Carbon steel is widely use material in automobile industry. Joining of metal for different parts is done by GMAW. Process parameter greatly affects the welded joint strength. This paper presents the case study to investigate the ongoing MIG welding process carried out by industrial firm in its welding protocol, by suggesting alternative effective method to achieve better strength with improved process parameters. These suggestions are achieved by investigating parameters like welding voltage, current and shielding gas.

**Keywords**— MIG, low carbon steel, optimization, parameters.

## I. INTRODUCTION

Welding is most important methods of joining of two similar or dissimilar metals with or without application of pressure. In Gas metal Arc Welding (GMAW) also known as Metal Inert Gas welding an electric arc is established between the workpiece and consumable wire electrode.<sup>[1]</sup> The arc melts the wire as it is fed to the weld puddle. The weld metal is shielded from the atmosphere by an inert gas like argon, helium or an argon-helium mixture. No external filler metal is required because the metallic electrode provides arc as well as filler metal. MIG welding is semi-automatic process in which arc length of electrode and feeding of wire is automatically controlled.

## II. PROBLEM STATEMENT

GMAW is currently one of the most popular welding methods, especially in industrial environments. It is used extensively by the sheet metal industry and, by extension, the automobile industry.<sup>[2]</sup> There, the method is often used for arc spot welding, thereby replacing riveting or resistance spot welding. It is also popular for automated welding, in which robots handle the work pieces and the welding gun to quicken the manufacturing process. A wide range of materials joined by Gas metal arc welding:-similar metals, dissimilar metals, alloys, and non-metals. In the present scenario demand of the joining of similar materials continuously increases due to their advantages, which can produce high yield strength, deeper penetration, continuous welding at higher speed and small welding defects. Taguchi method has been acknowledged by some literature for optimization of MIG welding process parameter. There is not much research done on joining of hot rolled low carbon steel (IS 1079 HR2) by MIG welding. As this material is widely use in Automobile industry for manufacturing of small essential component.<sup>[3][4][5]</sup> The different combination of process parameters gives different strength to joints. The scope of case study is to evaluate the effectiveness of welding process parameters on the ultimate strength of joints

## III. MATERIAL AND METHOD

Optimization of process parameters is the key step in the Taguchi method for achieving high quality without increasing cost. This is because optimization of process parameters can improve quality characteristics and the optimal process parameters obtained from the Taguchi method are insensitive to the variation of environmental conditions and other noise factors. The S/N ratio in Taguchi's method is calculated by giving formulas.<sup>[6]</sup>

(i) Smaller the better

$$\eta = -10 \log [(\Sigma Y_i^2) / n] \quad (1)$$

(ii) Larger the better

$$\eta = -10 \log [(\Sigma 1/Y_i^2) / n] \quad (2)$$

### 3.1 Material used

In current case study the IS 1079 HR 2 (hot rolled low carbon steel) material is use to find effectiveness of parameters.

**TABLE 3.1**  
**CHEMICAL COMPOSITION IS 1079 HR2 STEEL**

C	Mn	Si	S	P	N
%	%	%	%	%	%
0.1200	0.500	0.150	0.040	0.040	90

### 3.2 PROCESS VARIABLE AND THEIR LIMITS

The working range of the parameters for subsequent design of experiment, based on Tagchi's L9 orthogonal array (OA) design have been selected.<sup>[7]</sup> In the present experiment study, welding current, welding voltage and gas flow rate(CO2) have been considered as process variables. The process variables with their units are listed in table 3.2

**TABLE 3.2**  
**PROCESS PARAMETERS AND THEIR LEVEL**

FACTORS	UNIT	LEVELS OF FACTOR		
		0	1	2
WELDING CURRENT	AMP	75	100	150
WELDING VOLTAGE	VOLTS	24	27	30
GAS FLOW RATE	L/MM	12	20	25

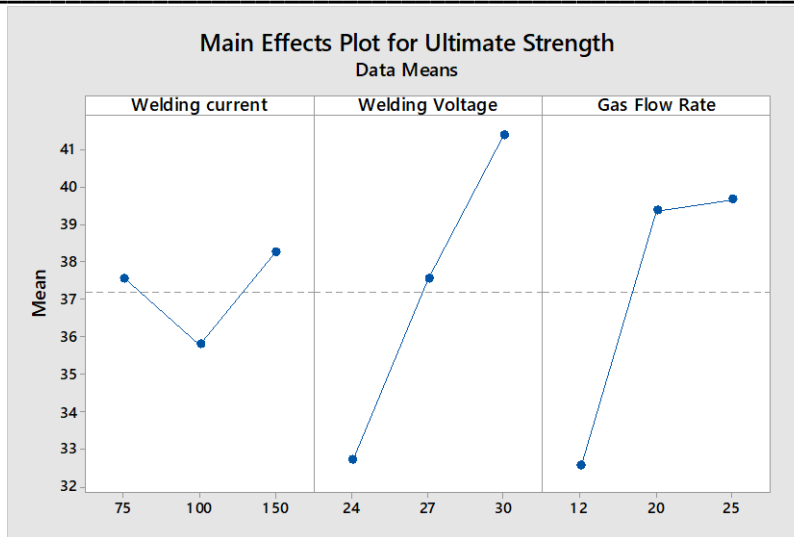
## IV. RESULT AND DISCUSSION

All the experimental results are analyzes by statistical tool MINITAB software of latest version 18. First of all the input parameters are defined in the software as per their corresponding value and then give the responses data to optimize. here, the main objective of the problem to maximize the Tensile Strength. So, the criterion of Larger-the- better is adopted for the optimization of Tensile strength.

### 4.1 Analysis of Tensile strength

Observing all the nine experiments and the applying Taguchi method on the result using MINITAB 18, We can draw the following table describing the S/N ratio and mean for the tensile strength. Effect of Welding current on Tensile strength:- From the table 4.5 & 4.6 we observe that Tensile strength shows pattern on the range from 75 amp to 150 amp. We get maximum strength of welding joint at 150 amp. From the s/n ratio we see that the value increases gradually at the range of 100 to 150.It lies between the 31-32.





**Figure 4.1 Process parameters VS Mean of Tensile strength**

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# Implementation of Kaizeni Small & Medium Scale Industries With aid of Avix Software

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**Abstract—** *The Kaizen method of continuous improvements is an originally Japanese management concept for continuous improvement. Nowadays many industries are run inefficiently which in turn affects the productivity and causes various delays. Hence our aim is to implement Kaizen and increase the productivity, reduce the delay time and ensure smooth running of the industry. One of the ways this can be achieved is with the help of 5S principle which consists of sorting, setting things in order, shine, then comes standardization and finally sustaining over a long period of time.*

*As versed for quite a lot of years in Japan, Kaizen also includes other ideas like total quality control, group activities on a small scale, as well as just in time manufacturing. Along with time, it also improves the waste management capabilities, reduces unnecessary hard work and humanizes workplace.*

*In India, Kaizen wasn't being practiced on a large scale but as time has passed by industries have embraced the philosophy and have begun to explore the possibilities of implementing the Kaizen principle which in turn will result in better and more successful workplace.*

**Keywords—***Better Productivity, Five S, Kaizen, Sustainability, Waste Reduction*

## I. INTRODUCTION

We live in a busy, fast running world where time management has always been an issue and when it comes to industries, time wastage in between and during processes has been a major problem. The industry we have selected is named Guardwel which suffers from many of those problems during its manufacturing of Fire Resisting Filing Cabinets.

Time wastage in turn hinders the production efficiency and affects the rate of production, and causes delays. So to tackle this, we are going to implement the Kaizen principle using a software in order to increase the manufacturing efficiency and reduce the wastage of time so as to the better working of industries.

The work presented in this paper is based on kaizen principle and implementing it for better and more efficient working in the industry.

The software named AVIX is used for analyzing and implementing the results we acquire with it. AVIX helps us in finding various times and their usefulness and classifies it according to their types in a pie chart. With the help of it, we get the run time of the whole manufacturing process from beginning to the end.

Hence our goal is to study the operations from start to end, analyse this with the help of AVIX, get the result and then proceed to implement the Kaizen , 5S principle and line balancing.

## II. PROBLEM DEFINITION

### 2.1 Problem Statement

Industry we are studying is affected on a daily basis with various waste management problems, as well as delays which in turn ends up affecting the productivity. Hence our aim is to analyze these problems with AVIX and tackle the results we get accordingly.

### 2.2 Objectives

1. To increase the efficiency
2. To reduce time wastage in transitioning from one manufacturing processes to another
3. Waste management
4. Reduce unnecessary hard work
5. Humanize the workplace
6. Safety improvements

## III. ANALYSIS

### 3.1 Study of layout

Our first step was to make a rough layout of the industry, so we can get the sense of where the machines have been positioned, along with an idea of where materials are kept, where they're taken when the process is finished.

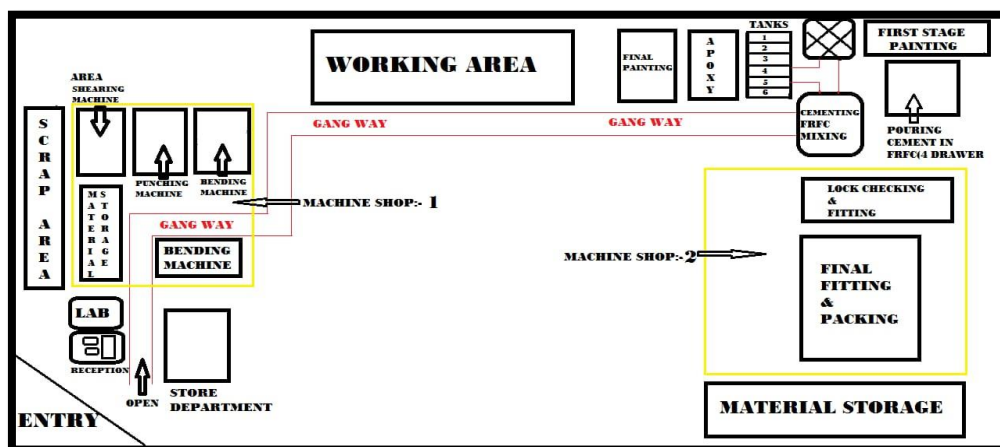


FIGURE 3.1 Ground floor workshop

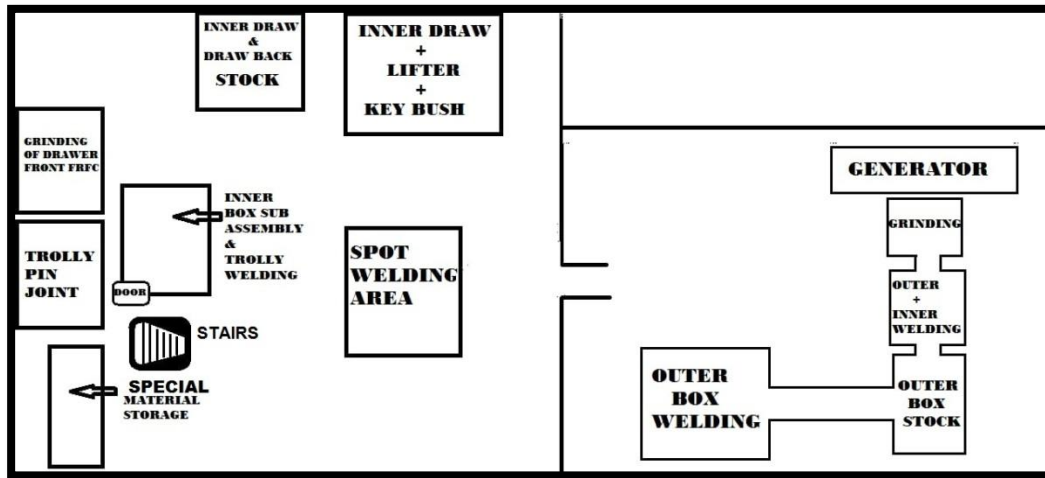


FIGURE 3.2 First floor work shop

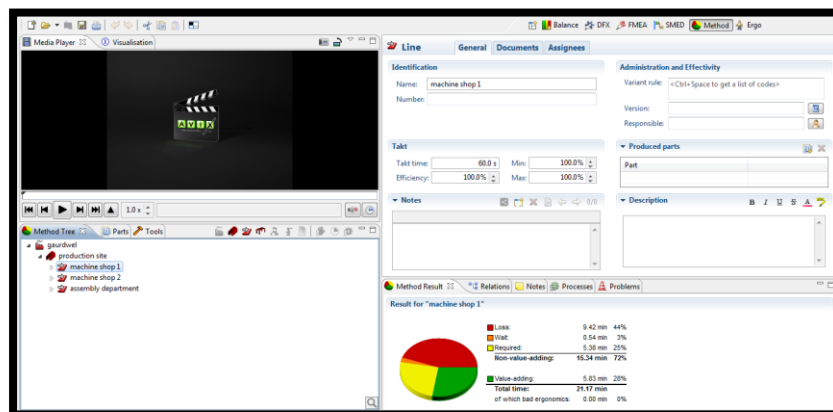
### 3.2 Study analysis of processes

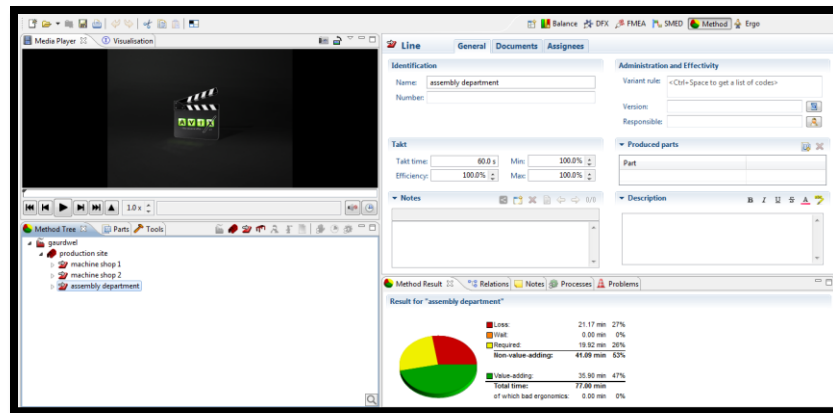
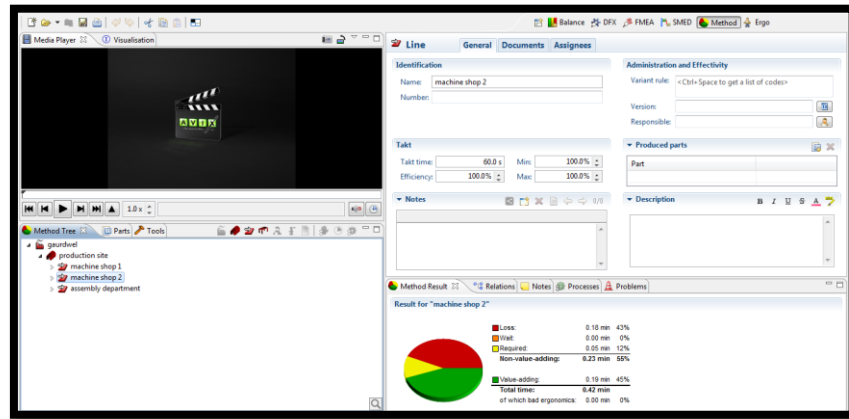
The next step includes video shooting of various things like; material taken from storage to the place of operation is to be performed at the start, manufacturing operations done by the workers; after a process is finished, the product being transferred from one process to another.

### 3.3 Analysis with AVIX

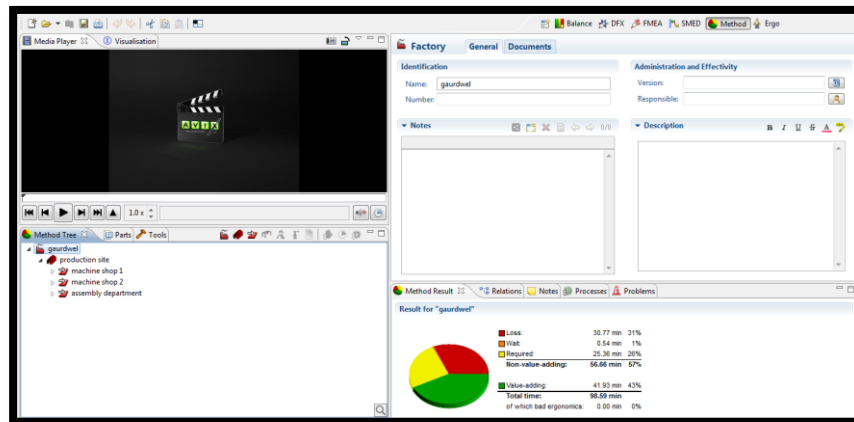
After study analysis of various operations, we upload those videos into the AVIX software and analyze them. Initially we analyze step by step movements and arrange them based on various categories such as losses, required but don't add any value, waiting and value addition. We do this for every operation there is and after doing this for various operations we get the pie chart of the whole operations. So by analysis of that pie chart we understand how many losses occur in the operations and so we can work on reducing those through the implementation of Kaizen.

After study analysis of all three machine shops we get:





After analysis of whole manufacturing operation we get:



So after this, once we have all the data we get all the data that is symbolized as follows:

Green- Value added

Yellow- Required

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Red- Loss

Orange- Waiting

#### **IV. IMPLEMENTATION OF 5S**

Hence after getting all the losses we find the best possible way to implement 5S through which we sort, set in order, shine, standardize and sustain.

#### **V. CONCLUSION**

As we have studied and analyzed the processes from start to end in detail, we have achieved the run time of the whole four drawer fire resisting filing cabinet making operation from start to end which has helped us achieve the time that adds value, one which doesn't add any value but is necessary and finally the one that is total waste and needs to be eliminated. Hence, we can now start exploring ways to eliminate the time wasted which in turn will increase efficiency of the industry as well as reduce production time.

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# Survey of Exophalanx in Robo Using Haptic Feedback System: A Review

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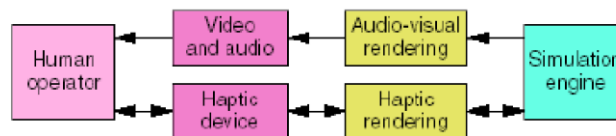
**Abstract**— “HAPTICS”-- a technology that adds the sense of touch to virtual environment .Haptic interfaces allow the user to feel as well as to see virtual objects on a computer, and so we can give an illusion of touching surfaces, shaping virtual clay or moving objects around. In this paper, we explicate how sensors and actuators are used for tracking the position and movement of the haptic device moved by the operator. Then, we move on to a few applications of Haptic Technology. Finally, we conclude by mentioning a few future developments.

**Keywords**— Sense of touch, holography in haptics, haptics, tactile feedback, exophalanx in robo, haptic rendering, virtual object.

## I. INTRODUCTION

Haptics refers to sensing and manipulation through touch. The word comes from the Greek ‘haptesthai’, meaning ‘to touch’. The history of the haptic interface dates back to the 1950s, when Goertz (1952) proposed a master-slave system. Haptic interfaces were established out of the field of tele- operation, which was then employed in the remote manipulation of radioactive materials. The ultimate goal of the tele-operation system was "transparency". That is, an user interacting with the master device in a master-slave pair should not be able to distinguish between using the master controller and manipulating the actual tool itself. Early haptic interface systems were therefore developed purely for telerobotic applications.

### 1.1 WORKING OF HAPTIC DEVICES



**FIGURE 1.1: Architecture for Haptic Feedback**

Basic architecture for a virtual reality application incorporating visual, auditory, and haptic feedback.

- Simulation engine: Responsible for computing the virtual environment’s behavior over time.
  - Visual, auditory, and haptic rendering algorithms: Compute the virtual environment’s graphic, sound, and force responses toward the user.
  - Transducers: Convert visual, audio, and force signals from the computer into a form the operator can perceive.
  - Rendering: Process by which desired sensory stimuli are imposed on the user to convey information about a virtual haptic object.
- The human operator typically holds or wears the haptic interface device and perceives audiovisual feedback from audio (computer speakers, headphones, and so on) and visual displays (a computer screen or head-mounted display, for example). Audio and visual channels feature unidirectional information and energy flow (from the simulation engine towards the user) whereas, the haptic modality exchanges information and energy in two directions, from and toward the user. This bi directionality is often referred to as the single most important feature of the haptic interaction modality.

Haptic Technology promises to have wide reaching applications as it already has in some fields. For example, haptic technology has made it possible to investigate in detail how the human sense of touch works by allowing the creation of carefully controlled haptic virtual objects. Haptics technology can be used to train people for tasks requiring hand-eye coordination, such as surgery and space ship maneuvers. Although haptic devices are capable of measuring bulk or reactive forces that are applied by the user, it should not to be confused with touch or tactile sensors that measure the pressure or force exerted by the user to the interface.



Through haptic interface, human can interact with the computer through body sensation and movement. Several applications such as surgical training, gaming etc use haptic technology. Haptic technology has made it possible to investigate in detail how the human sense of touch works by allowing the creation of carefully controlled haptic virtual objects.

## II. LITERATURE REVIEW

### 2.1 HISTORY:

One of the earliest applications of haptic technology was in large aircraft that use servomechanism systems to operate control surface. Such systems tend to be "one-way", meaning external forces applied aerodynamically to the control surfaces are not perceived at the controls. Here, the missing normal forces are simulated with springs and weights. In lighter aircraft without servo systems, as the aircraft approached a stall the aerodynamic buffeting (vibrations) was felt in the pilot's controls. This was a useful warning of a dangerous flight condition. This control shake is not felt when servo control systems are used. To replace this missing the angle of attack is measured and when it approaches the critical stall point, a stick shaker is engaged which simulates the response of a simpler control system. Alternatively, the servo force may be measured and the signal directed to a servo system on the control, known as force feedback. Force feedback has been implemented experimentally in some excavators and is useful when excavating mixed material such as large rocks embedded in silt or clay. It allows the operator to "feel" and work around unseen obstacles, enabling significant increases in productivity.

The first US patent for a tactile telephone was granted to Thomas D. Shannon in 1973.<sup>[3]</sup> An early tactile man-machine communication system was constructed by A. Michael Noll at Bell Telephone Laboratories, Inc. in the early 1970s and a patent issued for his invention in 1975.

### 2.2 Design By Generation :

Haptics are enabled by actuators that apply forces to the skin for touch feedback, and controllers. The actuator provides mechanical motion in response to an electrical stimulus.

**First :** Most early designs of haptic feedback use electromagnetic technologies such as vibratory motors, like a vibrating alert in a cell phone or a voice call in a speaker, where a central mass is moved by an applied magnetic field. These electromagnetic motors typically operate at resonance and provide strong feedback, but produce a limited range of sensations and typically vibrate the whole device, rather than an individual section.

**Second :** Second generation haptics offered touch-coordinate specific responses, allowing the haptic effects to be localised to the position on a screen or touch panel, rather than the whole device. Second generation haptic actuator technologies include electroactive polymers, piezoelectric, electrostatic and subsonic audio wave surface actuation. These actuators allow to not only alert the user like first generation haptics but to enhance the user interface with a larger variety of haptic effects in terms of frequency range, response time and intensity. A typical first generation actuator has a response time of 35-60ms, a second generation actuator has a response time of 5-15ms. User studies also showed that haptic effects with frequencies below 150 Hz are preferred by users. Frequencies of 250-300 Hz, which is the typical range of electromagnetic systems are well suited for alerts but are perceived as annoying over time, which is why first generation haptic systems used to enhance the user interface are often deactivated by the users.

**Third:** Third generation haptics deliver both touch-coordinate specific responses and customisable haptic effects. The customisable effects are created using low latency control chips.

To date two technologies have been developed to enable this; audio haptics<sup>1</sup> and electrostatic haptics. A new technique that does not require actuators is called reverse electrovibration. A weak current is sent from a device on the user through the object they are touching to the ground. The oscillating electric field around the skin on their finger tips creates a variable sensation of friction depending on the waveform, frequency, and amplitude of the signal.

**Fourth:** Fourth generation haptics deliver pressure sensitivity, enabling how hard you press on a flat surface to affect the response. There are currently no commercially available (as of May 2013) platforms that use this functionality, but the technology is in development by a number of firms. KDDI and Kyocera jointly announced in 2011 that they were collaborating on research. And, at the Future World Symposium electronics industry conference, 2012, HiWave's (haptics division now spun out to become Redux) CEO stated that the company was also working on pressure-sensitive technology.

In June 2013 a fourth generation haptics demonstration platform, called Bulldog, was announced in the UK electronics publication Electronics Weekly. This took the force exerted by a finger into consideration when delivering the haptic feedback and gave three levels of feedback from a flat panel.

Haptic interfaces are divided into two main categories:

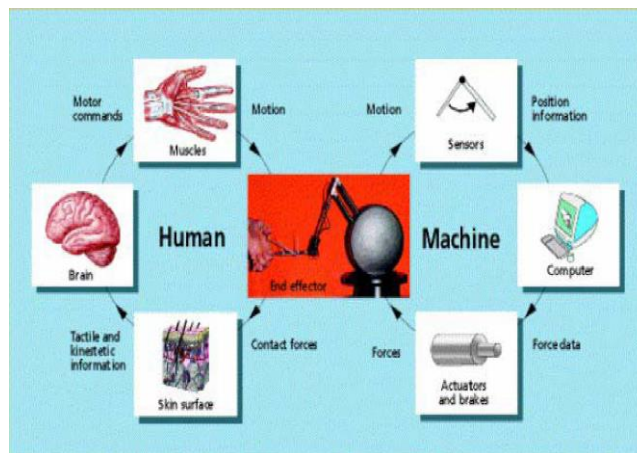
- ☐ Force feedback
- ☐ Tactile feedback

Force feedback interfaces are used to explore and modify remote/virtual objects in three physical dimensions in applications including computer-aided design, computer assisted surgery, and computer-aided assembly. Tactile feedback interfaces deals with surface properties such as roughness, smoothness and temperature.



**FIGURE 2.1 Tactile and Force Control**

### 2.3 WORKING OF HAPTICS



**FIGURE 2.2: Basic Configuration of Haptics**

Basically haptic system consists of two parts:

- ☐ Human part
- ☐ Machine part

From the above figure 1, human part (left) controls the position of the hand, while the machine part (right) exerts forces from the hand to simulate contact with a virtual object. Also both the systems will be provided with necessary sensors, processors and actuators. In the case of the human system, nerve receptors performs sensing, brain performs processing and muscles performs actuation of the motion performed by the hand while in case of the machine

system, the above mentioned functions are performed by the encoders, computer and motors respectively [2].

### 2.4 Haptic Devices

Haptic devices (or haptic interfaces) are mechanical devices acts as mediator in communicating between the user and the computer. Haptic devices allow users to touch, feel and manipulate three-dimensional objects in virtual environments and tele-operated systems. Haptic devices are input-output devices that track a user's physical manipulations (input) and provide realistic touch sensations coordinated with on-screen events (output).

Examples of haptic devices include consumer peripheral devices equipped with special motors and sensors such as force feedback joysticks and steering wheels and more sophisticated devices designed for industrial, medical or scientific applications such as PHANTOM device.

Typically, a haptics system includes;

- ☐ Sensor(s)
- ☐ Actuator (motor) control circuitry
- ☐ One or more actuators that either vibrate or exert force
- ☐ Real-time algorithms (actuator control software, which We call a “player”) and a haptic effect library

- Application programming interface (API), and often a haptic effect authoring tool
- The Immersion API is used to program calls to the actuator into your product's operating system (OS).

When the user interacts with your product's buttons, touch screen, lever, joystick/wheel, or other control, this control position information is sent to the OS, which then sends the play command through the control circuitry to the actuator.

#### **Phantom Device :**

The above figure 2.2 shows Phantom device. PHANTOM haptic interface is one of the widely used haptic devices. This device measures a user's finger tip position and exerts a precisely controlled force vector on the finger tip. The device has enabled users to interact with and feel a wide variety of virtual objects and will be used for control of remote manipulators [3].



**FIG 2.3 PHANTOM**

### **2.5 Human Senses**

It is believed that vision and audition convey the most information about an environment while the other senses are more subtle. Because of this, their characteristics have been widely investigated over the last few decades by scientists and engineers, which have led to the development of reliable multimedia systems and environments.

**Vision :** The visual sense is based on the level of absorption of light energy by the eye and the conversion of this energy into neural messages. The acceptable wavelength range for human eyes is between 0.3 and 0.7  $\mu$ m (1  $\mu$ mD10\_6m). The temporal resolution sensitivity of the human visual system is biologically limited and not sufficient to detect the presentation of sequential video frames past a certain speed. This is the reason why we do not perceive a digital movie as a series of still images, but rather as moving pictures.

**Audition:** The human auditory system transmits sound waves through the outer, middle, and inner ears. This sound wave is transformed into neural energy in the inner ear. It is then transmitted to the auditory cortex for processing. The audible frequency of humans ranges from 16 to 20,000Hz and is most efficient between 1,000 and 4,000Hz.

**Touch:** The sense of touch is mainly associated with active tactile senses such as our hands. Such senses can be categorized in several ways, and they have a link to the kinesthetic senses. According to Heller and Schiff, touch is twenty times faster than vision, so humans are able to differentiate between two stimuli just 5ms apart; Bolanowskiet al. found that touch is highly sensitive to vibration up to 1KHz, with the peak sensitivity around 250 Hz; and skin receptors on the human palm can sense displacements as low as 0.2  $\mu$ m in length

**Haptic Feedback:** Haptic / Tactile feedback (or haptics) is the use of advanced vibration patterns and waveforms to convey information to a user or operator. Haptic feedback has two major benefits for manufacturers. Firstly, it can improve user experience. Even everyday products are now being built with touch displays and interfaces. They are cheaper to construct than control panels with buttons or switches, and designers can make context specific user interfaces simply by changing the graphical layout on the screen.

## **III HAPTICS CONCEPTS**

### **3.1 Concepts**

Tactile cues include textures, vibrations, and bumps kinesthetic cues- include weight, impact. In the following section, we present some crucial concepts and terminology related to haptics:

**Haptic:** Haptic is the science of applying tactile, kinesthetic, or both sensations to human-computer interactions. It refers to the ability of sensing and/or manipulating objects in a natural or synthetic environment using a haptic interface.

**Cutaneous:** Relates to or involving the skin. It includes sensations of pressure, temperature, and pain

**Tactile:** Pertaining to the cutaneous sense, but more specifically the sensation of pressure rather than temperature or pain.

**Kinesthetic:** Relates to the feeling of motion. It is related to sensations originating in muscles, tendons, and joints.

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**Force Feedback:** Relates to the mechanical production of information that can be sensed by the human kinesthetic system.

**Haptics or Haptic Technology:** An emerging interdisciplinary field that deals with the understanding of human touch (human haptics), motor characteristics (machine haptics), and with the development of computer controlled systems (computer haptics) that allow physical interactions with real or virtual environments through touch.

**Haptic Communication:** This means by which humans and machines communicate via touch. It mostly concerns networking issues.

**Haptic Device:** It is a manipulator with sensors, actuators, or both. A variety of haptic devices have been developed for their own purposes. The most popular are tactile-based, penbased, and 3 degree-of-freedom (DOF) force feedback devices.

**Haptic Interface:** This consists of a haptic device and software-based computer control mechanisms. It enables human-machine communication through the sense of touch. By using a haptic interface, someone can not only feed the information to the computer but can also receive information or feedback from the computer in the form of a physical sensation on some parts of the body.

**Haptic Perception:** This is the process of perceiving the characteristics of objects through touch

**Haptic Rendering:** This is the process of calculating the sense of touch, especially force. It involves sampling the position sensors at the haptic device to obtain the user's position within the virtual environment. The position information received is used to check whether there are any collisions between the user and any objects in the virtual environment. In case a collision is detected, the haptic rendering module will compute the appropriate feedback forces that will finally be applied onto the user through the actuators. Haptic rendering is, therefore, a system that consists of three parts, a collision detection algorithm, a collision response algorithm, and a control algorithm.

#### **Sensors and Actuators:**

A sensor is responsible for sensing the haptic information exerted by the user on a certain object and sending these force readings to the haptic rendering module. The actuator will read the haptic data sent by the haptic rendering module and transform this information into a form perceivable by human beings .

### **3.2 Tele Operations**

**Tele-Haptics:** This is the science of transmitting haptic sensations from a remote explored object/environment, using a network such as the Internet, to a human operator. In other words, it is an extension of human touching sensation/capability beyond physical distance limits.

**Tele-Presence:** This is the situation of sensing sufficient information about the remote task environment and communicating this to the human operator in a way that is sufficient for the operator to feel physically present at the remote site. The user's voice, movements, actions, etc. may be sensed, transmitted, and duplicated in the remote location. Information may be traveling in both directions between the user and the remote location .

**Virtual Reality (VR):** This can be described as the computer simulation of a real or virtual world where users can interact with it in real time and change its state to increase realism. Such interactions are sometimes carried out with the help of haptic interfaces, allowing participants to exchange tactile and kinesthetic information with the virtual environment.

**Virtual Environment (VE):** This is an immersive virtual reality that is simulated by a computer and primarily involves audiovisual experiences. Despite the fact that the terminology is evolving, a virtual environment is mainly concerned with defining interactive and virtual image displays.

**Collaborative Virtual Environments (CVE):** This is one of the most challenging fields in VR because the simulation is distributed among geographically dispersed computers. Potential CVE applications vary widely from medical applications to gaming.

**Simulation Engine:** This is responsible for computing the virtual environment behavior over time .

### Collaborative Haptic Audio Visual Environment (CHAVE):

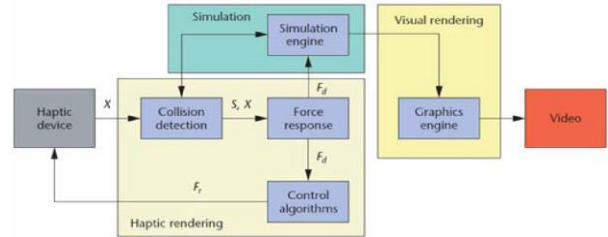
In addition to traditional media, such as image, audio, and video, haptics as a new media plays a prominent role in making virtual or real-world objects physically palpable in a CVE. A CHAVE allows multiple users, each with his/her own haptic interface, to collaboratively and/or remotely manipulate shared objects in a virtual or real environment.

Figure 3 consists of three blocks, Haptic Rendering, Visual modeling and Simulation. Haptic rendering is divided into three blocks.

**Control Detection Algorithm:** Detects collision between objects and avatar in the virtual environment and yield information.

**Force Response Algorithm:** Computes interaction between the virtual objects and avatar when the collision is detected

**Control Algorithms:** Command the haptic device in order to minimize the error between ideal and application forces.



**Figure 3.1: Haptic system block diagram**

## IV CONCLUSION

Haptic is the future for online computing and e-commerce, it will enhance the shopper experience and help online shopper to feel the merchandise without leave their home. Because of the increasing applications of haptics, the cost of the haptic devices will drop in future. This will be one of the major reasons for commercializing haptics. With many new haptic devices being sold to industrial companies, haptics will soon be a part of a person's normal computer interaction.

We finally conclude that the haptic technology is the solution for interacting with the virtual environment and used widely in many applications. Haptic device acts as an input and output device tracking user physical manipulations as an input and providing realistic touch sensations as an output coordinated with onscreen events. As technology evolves and computer power grows, haptic devices and effects evolve and get more realistic. This technology has proved that virtual objects can also be touched, felt and controlled. This technology must be made available for the affordable cost and the haptic devices must be made simpler and easier to use.

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# Contribution to International Development

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**Abstract**— *International development or global development is a broad concept denoting the idea that societies and countries have different levels of "development" on an international scale. It is the basis for international classifications such as developed country, developing country and least developed country, and for a field of practice and research that in various ways engages with international development processes. There are, however, many schools of thought and conventions regarding which are the exact features constituting the "development" of a country. Historically, development has often been largely synonymous with economic development. More recently, writers and practitioners have begun to discuss development in the more holistic and multi-disciplinary sense of human development. Other related concepts are, for instance, competitiveness, quality of life or subjective well-being.*

**Keywords**— *global competitiveness, economic development, Sustainable development, water security, capacity building.*

## I. INTRODUCTION

International Development isn't anything but difficult to define and envelops an expansive scope of controls and tries to improve the personal satisfaction of individuals around the globe. It incorporates both monetary and social advancement and incorporates numerous issues, for example, philanthropic and outside help, neediness easing, the standard of law and administration, nourishment and water security, limit building, medicinal services also, instruction, ladies and kids' privileges, catastrophe readiness, framework, and maintainability. The Sustainable Development Goals (SDGs) may not demonstrate fit for changing the advancement business by 2030 and there is no sign yet that they are serving to create more prominent financing.

## II. PATTERN OF INTERNATIONAL DEVELOPMENT

The evidence suggests that the pace of global poverty reduction is slowing. There has been a snowball effect of aid agencies celebrating the rapid reduction of global poverty over the last 20 years, but this snowball is fast changing course. Global poverty has indeed shrunk rapidly, as we anticipated in Horizon 2025, but we see an end to this trend within the next five years. By then, the vast pools of extreme poverty in Asia will be largely drained, while poverty will continue to rise in fragile states, mainly in Africa. The three major classifications of the countries of the world focusing primarily upon their levels of development are discussed by Tovar (1985:22-23), and that is the basis for these paragraphs. The United Nations classification system identifies three major groups among the Third World, the 42 poorest countries designated as the "least developed," 88 non-oil-exporting countries which are designated "developing nations," and the 13 petroleum-rich OPEC countries whose national incomes increased so dramatically during the 1970's--but have, in many cases, since declined as dramatically. Another is the classification system of the Organization for Economic Cooperation and Development (OECD) in Paris, which classifies countries into 62 Low Income Countries (LIC's), 73 Middle Income Countries (MIC's), 11 Newly Industrialized Countries (NIC's), and the 13 members of OPEC.

The expansion in business commitment being developed, especially in the foundation segment, is a twofold edged sword for help organizations. Center business thought processes are driving firms to give more consideration to the SDGs, and this energy is snowballing with ever more noteworthy quantities of CEOs utilizing the SDGs as an edge. Business commitment is far beyond the sway altruism approaches we canvassed in 2012 and which have developed since, though not astoundingly. The discussion about the limits of business obligation regarding maintainable advancement has a long and checkered history: the pendulum is swinging back towards perceiving significant win-win openings, particularly, however not just, in green innovation. No place being developed is the job of business more anxiously foreseen than in the arrangement of framework. New private interest in foundation ventures rose from \$40 billion out of 2002 to around \$220 billion out of 2012, to a great extent in media communications and vitality. From that point forward, be that as it may, venture has fell, arriving at under \$30 billion in the primary portion of 2016. To some extent, this reflects harder post-emergency administrative measures on bank financing. Mixed money is confounded further by the missing reactant job of multilateral advancement banks (MDBs), in spite of talk despite what might be expected. In the primary portion of 2016, MDBs upheld just \$1.2 billion in framework ventures with private support (World Bank, 2016b). This came about both from discouraged interest for credit and supply-side limitations on the MDBs' value base and additionally trustee proportions.

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### III. RECOMMENDED SOLUTIONS

Governments should explain how and to what degree universal financing is assigned to non-help national offices, for example, wellbeing, condition or migration. To handle worldwide difficulties viably, unbending 'graduation' rules connecting help to nation pay levels must offer approach to more nuanced 'degree' instruments, by which moderately happier middle-income nations can be co-selected to help understand local furthermore, worldwide difficulties, such as flooding vagrant streams and unfeasible carbon emanations. Western guide organizations need to manufacture a 'serious commitment system' with China in reciprocal improvement participation, and to increase joint effort with the global foundations that China supports.

### IV. CONCLUSION

A world in 2025 where help organizations can highlight achievement in lessening delicacy (and thus worldwide destitution), assembling business, tending to atmosphere and outcast issues at scale, while likewise regarding national possession and new geopolitical substances, will be where help offices will flourish and appreciate well known help. On the other hand, shortcomings right now vulnerabilities for help offices.

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# Investigation of Micro hardness and Microstructural properties of Friction Stir Welded Pure Titanium Joint-A Review

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**Abstract** Friction Stir Welding is a solid-state joining method implemented to join Titanium Alloys utilizing friction heat to join titanium sheets. Friction Stir welding avoids most of the solidification defects which are encountered in other types of fusion welding processes. Mostly Friction Stir Welding is carried out on materials having low melting points such as aluminium, magnesium. Nowadays Friction Stir welding is implemented in the joining of titanium and its alloys which has ever-increasing demand in aerospace, chemical, and nuclear industries. Since Titanium Alloys exhibits a high melting point, special types of tools are used made of tungsten. This paper presents a review of investigations by various authors in which pure titanium plates are welded by friction stir welding process using different tool material, carried at various welding and rotating speeds. The microstructural characteristics and microhardness are reported in the base metal and stir zone at various welding speeds.

**Keywords—** Friction Stir Welding, Microhardness, Microstructural Characteristics and Stir Zone.

## I. INTRODUCTION

Friction Stir Welding was invented in early 90's at TWI (The Welding Institute in Cambridge, UK). Friction Stir Welding is a novel process being getting popularized and adopted because it's a solid-state method of joining, utilizing friction between the material being joined, and a rotating non-consumable tool which generate the needed heat to plasticize and mix material. The problems encountered with traditional fusion welding processes are avoided by FSW, which produce defect-free welds having excellent properties, also in some materials with poor fusion-weldability. Therefore, most of the solidification defects usually encountered with other welding methods are avoided by FSW. Hence it is mainly performed on alloys having low melting point such as aluminium and magnesium. FSW is still rarely studied on titanium alloys because of requirement of more expensive experimental resources such as a cooling system or expensive welding tools. Since it has tremendous advantages, FSW has got attentions from various industrial fields. The most important parameters in FSW are the tool material and its configuration and dimensions especially in FSW of high temperature materials such as Ni and Ti. The tool plays three major roles in the formation of the joint: (1) heat the weld zone by friction and plastic deformation, (2) extrude the materials from the front to the rear portion of the pin, and (3) forge the plasticized materials by its shoulder.

Titanium and its alloys are largely used in aerospace, chemical and nuclear industry because of high specific strengths and good erosion resistance. With the demanding utilization of Titanium and Titanium alloys, its bonding became progressively essential. The implementation of traditional technique of fusion welding process to titanium, produced development of a brittle cast structure, distorted shape and higher residual stress value. Thus, the solid state bonding techniques are furthermore convenient for weaving the complications in relation with the welded materials melting.

## II. MATERIAL AND METHOD

### 2.1 Material

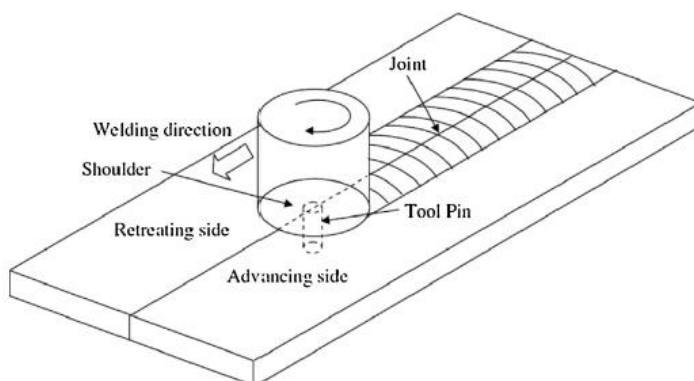
Won Bae Lee [1] examined that friction stir welding of pure titanium sheets of 5.6mm thickness using TiC tool and a cooling water system. Yu Zang [2] prepared study on pure titanium 3mm thick friction stir processed material with Polycrystalline cubic Boron Nitride (pcBN) tool having shoulder diameter of 15mm, plunge depth of 2mm, probe diameter of 5.1 mm, and length of 1.7 mm with rotational speed= 200 rpm, traverse speed= 50mm/min, Argon gas used as shielding agent. Hidetoshi Fujii [3] performed study on joining of pure titanium having 2mm thickness by FSW using tungsten carbide based alloy tool with specifications as shoulder diameter 15mm, probe diameter 6mm and probe length 1.8mm having rotational speed 200 rpm, welding speed 50 to 300 mm/min under the argon gas shield. S. Mironov [4] studied microstructural evolution of FSW'ed 3mm titanium with Molybdenum based alloy tool (shoulder diameter=15 mm and a pin, tapered from 5.1 mm at the shoulder to 3 mm at the pin tip, plunge depth=2 mm) at 400 rpm. S. Mironov [5] characterized friction stir welding of pure titanium 2mm thick joint by CW & HSS tool with tilt angle of 2.5° and tool size Pin Length-1.8mm, Pin Diameter- 4 to 6 mm, Shoulder Dia- 16mm with argon shielding gas. The chemical composition of pure titanium as follows in Table 1.

**TABLE 1**  
**CHEMICAL COMPOSITION OF PURE-TI**

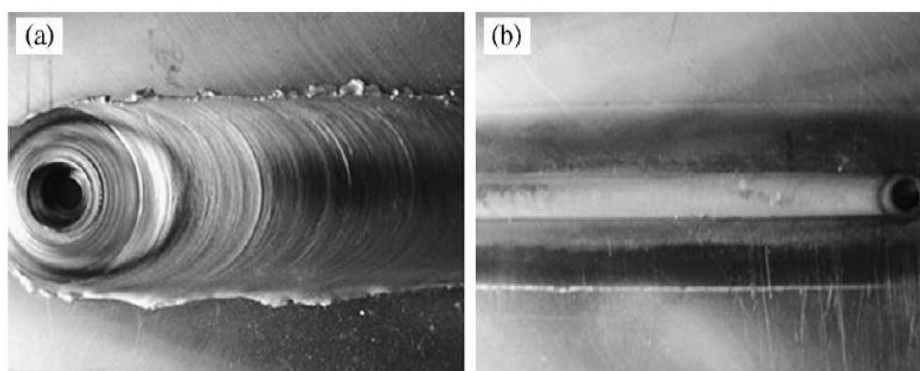
Chemical Composition	C	B	O	N	Fe
Weight in Percentage (%)	0.007	0.0013	0.08	0.004	0.05

### 2.2 Method

Figure 1 shows the representation of Friction Stir welding process. According to Won Bae Lee [1] the microstructures observed by OM (Optical Microscopy) and TEM (Transmission Electron Microscopy). The polished cross-sectional weld specimens were chemically etched using a mixture of HF (5 ml), HNO<sub>3</sub> (5 ml) and H<sub>2</sub>O (70 ml), figure 2 shows upper and bottom surface of friction stir welded pure Ti. In the study by Yu Zang [2] FSW of titanium was carried out under Argon gas shielding with use of optical microscopy (OM) under polarized light and SEM (scanning electron microscopy) for microstructure characterization. The specimen is cut at 90° with welding direction and ground mechanically using water abrasive paper, polished with size 6, 3 and 1 µm diamond paste. The investigation by Hidetoshi Fujii [3] used optical microscopy (OM), electronic backscattering diffraction (EBSD) and TEM (transmission electron microscopy) to observe microstructure. The Vickers microhardness measured with a load of 0.98N for a dwell time of 15 s along the centerlines of the cross-section with an interval of 0.5mm. As per S. Mironov [4] the OM studies were carried out using a Nikon Optiphot-100 optical microscope. EBSD analysis with high resolution was carried with a Hitachi S-4300SE FE-SEM (equipped with TSL OIM™ EBSD system). According to S. Mironov [5] before friction stir processing the plates were ground on surface, the microstructures of friction stir processed samples & untreated pure Ti were noted using a JEOL JSM-840A SEM (scanning electron microscope) and Mott–Schottky analysis were conducted in a phosphate buffer solution and the Vickers microhardness test was conducted with a load of 250 kgf having dwell time of 15s.



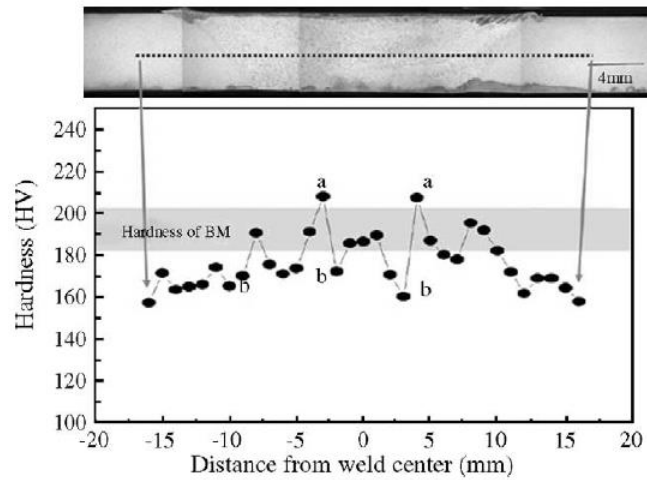
**FIGURE 1: Schematic of Friction Stir Welding Process [6]**



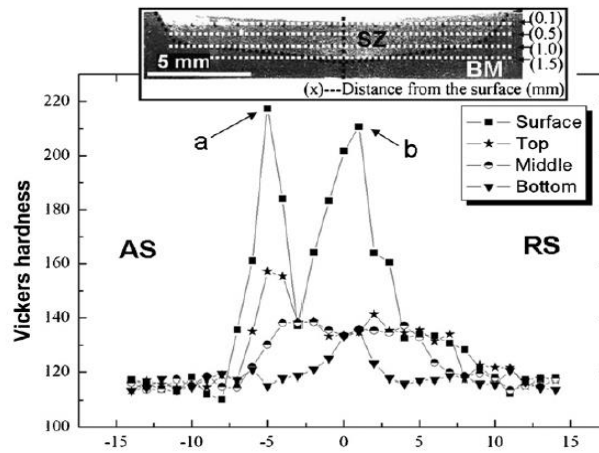
**FIGURE 2: Friction Stir Welded Pure Ti (a) Upper Surface and (b) Lower Surface [1]**

### III. RESULT

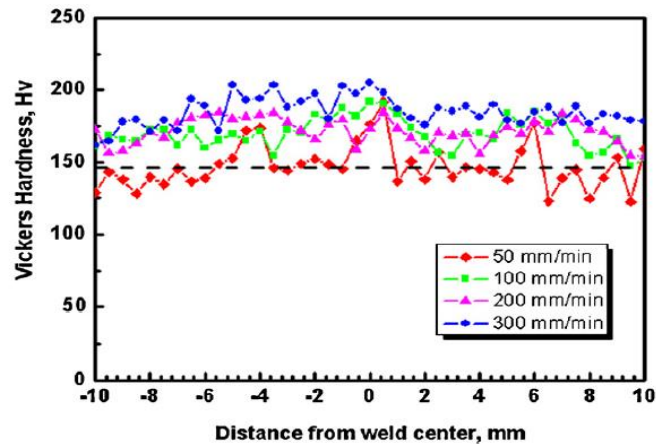
Won Bae Lee [1] concluded that microstructure of the weld nugget was described by the presence of coarsened grains and mechanical properties of the FSW Ti joints found close to those of the base metal. From Yu Zang [2] we come to result that the microstructure and hardness in a 3- mm thick cp-Ti friction stirred examination the stir zone characterised by fine grain size structure with highest hardness. As per Hidetoshi Fujii [3] the experimental hardness noted higher than the calculated one with microstructure in stir zone less than 6.4  $\mu\text{m}$ . S. Mironov [4] stated that his study examined the grain structure evolution during FSW of commercial purity titanium, where in the stir zone formation of strong structure took place and the grain structure produced was close to the texture evolution. By S. Mironov [5] it was stated that microstructure was characterized by the effects of multipass FSP on the electrochemical response and behaviour of pure ti in presence of phosphate buffer solution. Multipass FSP reduced the grain size remarkably down to submicron range due to dynamic recrystallization phenomena which resulted in increase in great potential of corrosion resistance with favourable values. Also difference found in hardness of base metal and stir zone, in which hardness in stir zone found to be higher than base metal. Figure 3 (A)-(C) represents Vickers hardness which resulted in higher hardness in stir zone than base metal. Figure 4 shows the microstructural changes in which as welding speed increases the grain size goes on becoming finer in stir zone. Table 2 represents the hardness and microstructure of different experiments held on pure titanium.



**FIGURE 3(A)[1]**

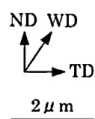
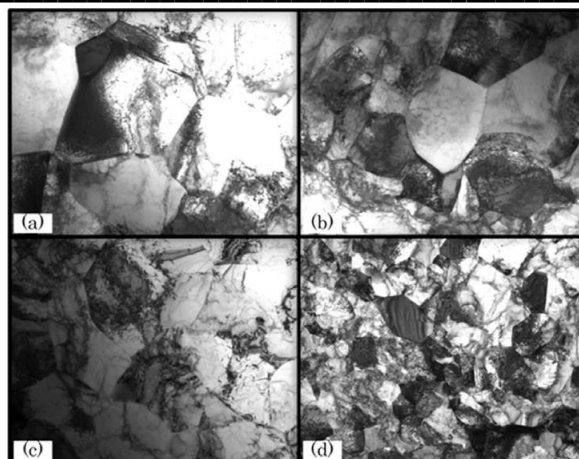


**FIGURE 3(B)[2]**



**FIGURE 3(C)[3]**

**FIGURE 3:** vicker's hardness in stir zone and base metal of titanium (a) won-bae lee [1], (b) yu zang [2], (c) hidetoshi fujii [3]



**ND = NORMAL DIRECTION**

**WD = WELDING DIRECTION**

**TD = TRANSVERSE DIRECTION**

**FIGURE 4:** microstructure of the stir zone sown by transmission electron microscopy at different welding speeds (a) 50mm/min, (b) 100mm/min, (c) 200mm/min, (d) 300mm/min [3]

**TABLE 2**  
**HARDNESS AND MICROSTRUCTURE OF PURE TITANIUM**

Sr. No.	Paper Name	Hardness	Microstructure
01.	Microstructural investigation of friction stir welded pure titanium	-	BM- 25 μm
02.	Stir zone microstructure of commercial purity titanium friction stir welded using pcBN tool	BM-115 HV, SZ-140 HV	BM- 30μm , SZ- 13μm
03.	Investigation of welding parameter dependent microstructure and mechanical properties in friction stir welded pure Ti joints	BM- 146 HV, SZ- 150 to 190 HV	BM- 10 μm, SZ- 3.5 to 6.3 μm
04.	Development of grain structure during friction stir welding of pure titanium	-	BM- 8.9μm to 24 μm, SZ- 4.6 μm to 8.6μm
05.	Passive and electrochemical response of friction stir processed pure titanium	BM= 150HV, SZ= 240 to 375 HV	SZ= 25 μm

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#### IV. CONCLUSION

From this review study it can be concluded that application of friction stir welding of pure titanium with high strength tool material is always superior as compared to conventional fusion welding processes as FSW gives defect free product . The friction stir processing of titanium leads to enhanced hardness in stir zone than base metal and also provides fine grain structure in stir zone.

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## Design and Analysis of Plastic Pocket Automotive

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**Abstract**— *Plastics structures often undergo permanent deformations at support location such as ribs, bosses etc. Remaining area of part barely takes loads as compared to these stiffened locations. Hence, achieving optimum design through FEA helps in reducing number of prototypes required for testing. CAD designing of plastic component will be done using CATIA V5 software. Discretization (Meshing) will be done with help of tetrahedron/hexahedron elements using Ansys Workbench. Nonlinear simulation will be carried out using variation in stiffening ribs. Final design will be manufactured using 3D printing technology. Specimen will be tested on UTM for Denting (Compression) test. Comparative analysis of Reaction forces will be made between simulation and experimental results. Results and conclusions will be drawn. Suitable future scope will be suggested.*

**Keywords**— *Plastic Structures, FEA, CATIA, UTM, Reaction forces*

### I. INTRODUCTION

The concept of 3D printing manufacturing process covers a variety of processes in which material is joined or solidified under computer control to create 3D object, with material being added together (such as liquid molecules or powder grains being fused together), typically layer by layer. In the 1990s, three dimension printing techniques were considered suitable only for the construction of functional or aesthetical prototypes and a more correct term was prototyping. Now days, the correctness, repeatability and material range have increased to the point that some 3D printing processes are considered viable as an industrial production technology, whereby the term additive manufacturing can be used equally with 3D printing. One of the key advantages of three dimension printing is the ability to produce very complex shapes or geometries, and a prerequisite for producing any three dimension printed part is a digital three dimension model or a CAD file.

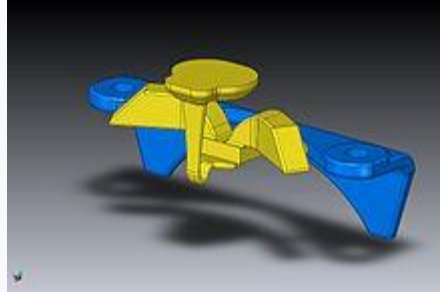
The most commonly used 3D Printing process is a material extrusion approach called fused deposition modelling (FDM). Metal Powder bed fusion has been gaining prominence lately during the immense function of metal parts in the 3D printing industry. In 3D Printing, a three-dimensional object is built from a computer-aided design (CAD) model, usually by successively adding material layer by layer, unlike the current machining process, where material is removed from a stock item, or the casting and forging processes which date to antiquity.

3D printing technology basically referred to a process that deposits a binder material onto a powder bed with inkjet printer heads coat by coat. Now days, the term is being used in popular vernacular to encompass a wider collection of additive manufacturing techniques. United States and global technical standards use the official term *additive manufacturing* for this broader sense.



## General Principles:

### Modelling



**FIGURE 1: CAD model used for 3D printing**



**FIGURE 2: 3D models can be generated from 2D pictures taken at a 3D photo booth.**

printable models of three dimension may be created with a computer-aided design (CAD) package, via a 3D scanner, or by a plain digital camera and photogrammetric software. 3D printed models created with CAD result in reduced errors and can be corrected before printing, allowing verification in the design of the object before it is printed. The manual modeling process of preparing geometric data for 3D computer graphics is similar to plastic arts such as sculpting. 3D scanning is a process of collecting digital data on the shape and appearance of a real object, creating a digital model based on it.

CAD models can be saved in the stereo lithography file format (STL), a de facto CAD file format for additive manufacturing that stores data based on triangulations of the surface of CAD models. STL is not tailored for additive manufacturing because it generates large file sizes of topology optimized parts and lattice structures due to the large number of surfaces involved. A newer CAD file format, the Additive Manufacturing File format (AMF) was introduced in 2011 to solve this problem. It stores information using curved triangulations.

### Printing

Before printing a 3D model from an STL file, it must first be examined for errors. Most CAD applications produce errors in output STL files,[29][30] of the following types:

1. holes;
2. faces normals;
3. self-intersections;
4. noise shells;

## 5. manifold errors.

A step in the STL generation known as "repair" fixes such problems in the original model. Generally STLs that have been produced from a model obtained through 3D scanning often have more of these errors. This is due to how 3D scanning works-as it is often by point to point acquisition, 3D reconstruction will include errors in most cases.

Once completed, the STL file needs to be processed by a piece of software called a "slicer," which converts the model into a series of thin layers and produces a G-code file containing instructions tailored to a specific type of 3D printer (FDM printers). This G-code file can then be printed with 3D printing client software (which loads the G-code, and uses it to instruct the 3D printer during the 3D printing process).

Printer resolution describes layer thickness and X–Y resolution in dots per inch (dpi) or micrometers ( $\mu\text{m}$ ). Typical layer thickness is around 100  $\mu\text{m}$  (250 DPI), although some machines can print layers as thin as 16  $\mu\text{m}$  (1,600 DPI). X–Y resolution is comparable to that of laser printers. The particles (3D dots) are around 50 to 100  $\mu\text{m}$  (510 to 250 DPI) in diameter.<sup>[citation needed]</sup> For that printer resolution, specifying a mesh resolution of 0.01–0.03 mm and a chord length  $\leq 0.016$  mm generate an optimal STL output file for a given model input file. Specifying higher resolution results in larger files without increase in print quality.

## II. LITERATURE REVIEW

Samy J. Ebeidet al. Carbon Black filled Acrylonitrile Butadiene Styrene (ABS) was used to prepare a polymer composite by Fused Deposition Modeling (FDM) technology. The effect of printing setup on the strain sensing behavior of the composite was investigated, targeting the fabrication of a functionalized composite that is able to detect stress or strain changes in engineering members. Experimental work revealed that internal stresses can be detected based on monitoring the change in resistance as a response to strain. Measurements across sample thickness were found to be most suitable for making general statements about the resistivity of the samples. Hereby, the resistance depends on the intrinsic and the process specific properties of the material. The printing setup was systematically varied in terms of raster angle and gap width. to yield the most sensitive constellation for conductivity. The use of a negative gap between the individual rasters in combination with a raster angle of  $\pm 45^\circ$  was observed to have a positive influence on intensifying the detected signals, making this constellation most sensible for strain sensing applications. Hence, the intrinsic properties of material were enhanced by the adequate selection of processing parameters. This study shows that the functionalized composite can be used as a strain sensor as for health monitoring purposes, to give an example.[1].

B. Read et al. Computer methods based on finite element analysis are able to predict the performance of plastics under impact loading. Although the accuracy of results depends on the model used to describe the deformation behaviour of the polymer, whichever model is used, the analysis requires stress/strain data over a wide range of strain rate. These data are most conveniently measured in tension, but procedures are currently not available for determining results at high strain rates. ISO standards for tensile property measurement are applicable for strain rates up to around 0.1 s<sup>-1</sup>. To simulate behaviour under impact, data are required at rates that are 3 or 4 orders of magnitude higher than this. For accurate data acquisition at these higher rates, attention needs to be paid to apparatus design in order to minimise contributions from transient forces arising from resonances and the propagation of shock waves in the apparatus. In addition, procedures and extensometers are not routinely available for determining strains at the higher rates of deformation. This paper illustrates the acquisition of data over a wide range of strain rates through a combination of measurements at low and moderate strain rates with extrapolation of these data to higher rates. In order to maximise accuracy at moderate strain rates, suitable designs need to be selected for the transducers, the test specimen geometry and the test assembly. Extrapolation is achieved by the use of mathematical functions to model the stress/strain curves and their rate dependence. Reference is also made to the development of a new materials model for describing the deformation behavior of toughened plastics at large strains. © 2001 NPL. Published by Elsevier Science Ltd. All rights reserved.[2].

C. Dumaset al. Multiaxial fatigue behavior of polypropylene pipes is investigated under tension and torsion loading with or without mean stress. Fatigue limit is experimentally determined and compared to self-heating curve method. A multiaxial fatigue criterion is proposed and shows that the fatigue behavior of this semi-crystalline polymer seems to be governed by the von Mises maximum stress. [3].

Tiantian Li, et al. We combine 3D printing technique, numerical analysis, and experiments to design a new class of sandwich composites that exhibit various bending behaviors. These programmed sandwich structures contain 3D printed core materials with truss, conventional honeycomb, and re-entrant honeycomb topologies. Three-point bending tests are performed to investigate the bending behavior of these sandwich composites with two types of carbon fiber reinforced polymer face sheets. Under bending deformation, sandwich composites with truss core materials provide highest flexural stiffness and strength that are desirable in structural components. The sandwich composites with re-entrant honeycomb core exhibit a sequential snap-through instability

which significantly enhances the energy absorption abilities. Our experimental and numerical results indicate that architected core structures can be utilized to tailor the bending properties as well as failure mechanisms. These findings offer new insights into the study of nonlinear mechanical response of sandwich structures, which can benefit a wide range of industries and applications[4].

Tiantian Li, et al. Interpenetrating phase composite (IPC), also known as co-continuous composite, is one type of material that exhibits an unusual combination of high stiffness, strength, energy absorption, and damage tolerance. Here we experimentally demonstrate that IPCs fabricated by 3D printing technique with rationally designed architectures can exhibit a fracture toughness 16 times higher than that of conventionally structured composites. The toughening mechanisms arise from the crack-bridging, process zone formation and crack deflection, which are intrinsically controlled by the rationally designed interpenetrating architectures. We further show that the prominently enhanced fracture toughness in the architected IPCs can be tuned by tailoring the stiffness contrasts between the two compositions. The findings presented here not only quantify the fracture behavior of complex architected IPCs but also demonstrate the potential to achieve tailor able mechanical properties through the integrative rational design and the state-of-the-art advanced manufacturing technique.[5].

### III. PROBLEM STATEMENT

Plastics structures often undergo permanent deformations at support location such as ribs, bosses etc. Remaining area of part barely takes loads as compared to these stiffened locations. Hence, achieving optimum design through FEA helps in reducing number of prototypes required for testing.

### IV. OBJECTIVES

1. To prepare CAD design using Catia V5
2. To design various models with variation in rib design
3. To select suitable material available in 3D printers for manufacturing
4. To perform Meshing and Nonlinear (Material and Contact) Analysis
5. To 3D print single specimen using suitable printer for Testing purpose
6. To perform Compression test on UTM for extracting Reaction forces vs deflection plots
7. To make comparative analysis between FEA and Experimental results
8. Results & Conclusion

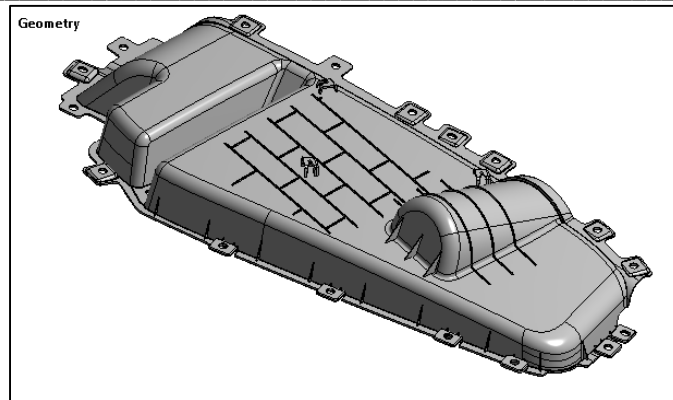
### V. METHODOLOGY

Step 1: - I started the work of this project with literature survey. I gathered many research papers which are relevant to this topic. After going through these papers, I learnt about the Plastic Component.

Step 2: - After learning the concept, the 3 D Model and drafting will be done with the help of CATIA software.

Step 3: - The experimental testing was carried out after making the assembly of the project.

Step 4: - After making the testing the result & conclusion was drawn.

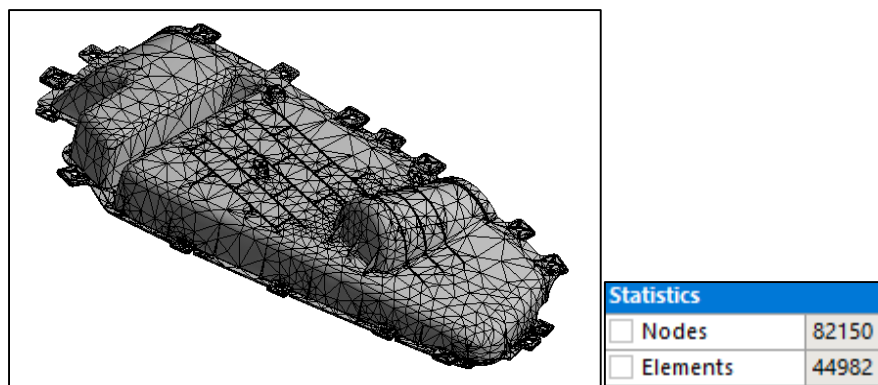


**FIGURE 3: Cad Model Of Plastic Pocket Automotive With Brick Stiffeners**

Material properties of plastic pocket

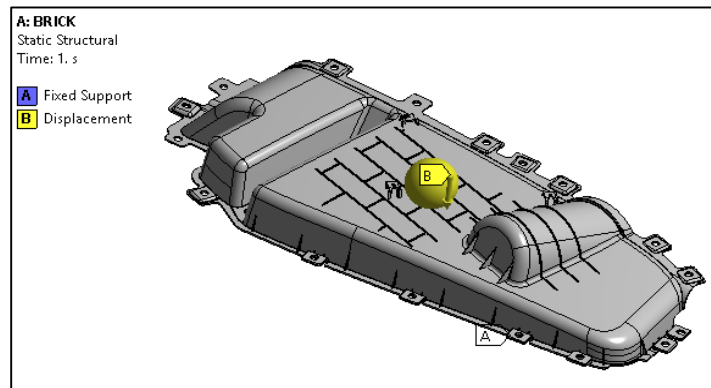
Properties of Outline Row 3: POLYPROPYLENE			
	A	B	C
1	Property	Value	Unit
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3	Isotropic Elasticity		
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5	Young's Modulus	1500	MPa
6	Poisson's Ratio	0.3	
7	Bulk Modulus	1250	MPa
8	Shear Modulus	576.92	MPa

MESH



**FIGURE 4: Meshing Of Plastic Pocket Automotive With Brick Stiffeners**

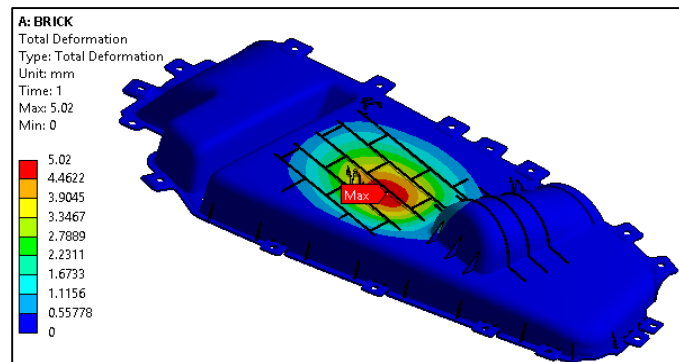
## BOUNDARY CONDITION



**FIGURE 5: Boundary condition Of Plastic Pocket Automotive With Brick Stiffeners**

For boundary condition for model bottom surface of plastic pocket is fix and steel ball is applied on upper side

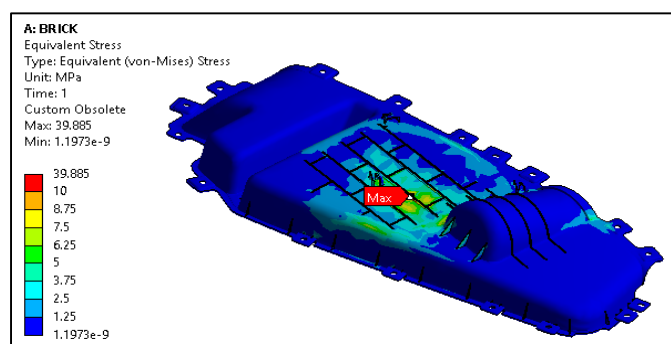
## TOTAL DEFORMATION



**FIGURE 6: Total Deformation Of Plastic Pocket Automotive With Brick Stiffeners.**

maximum deformation of plastic pocket Automotive With Brick Stiffeners is 5.02 mm.

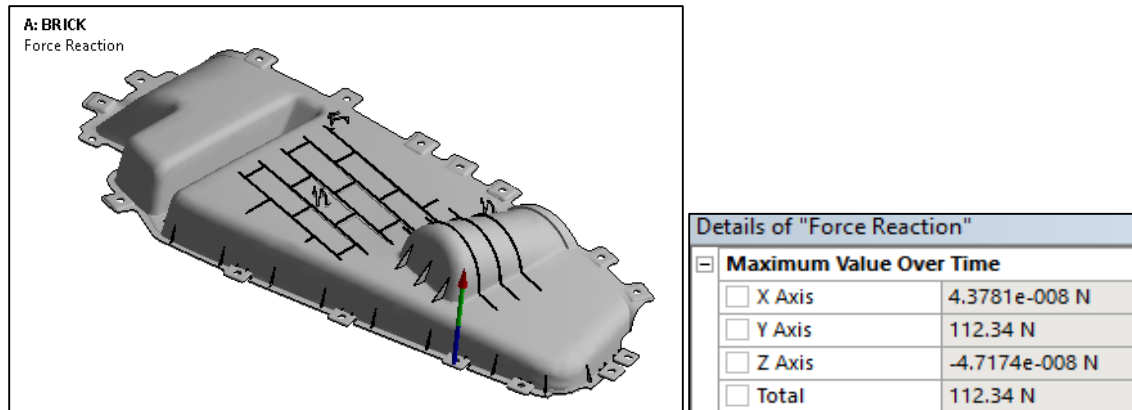
## EQUIVALENT STRESS



**FIGURE 7: Equivalent Stress Of Plastic Pocket Automotive With Brick Stiffeners.**

maximum Equivalent Stress of plastic pocket Automotive With Brick Stiffeners is 39.885 MPa

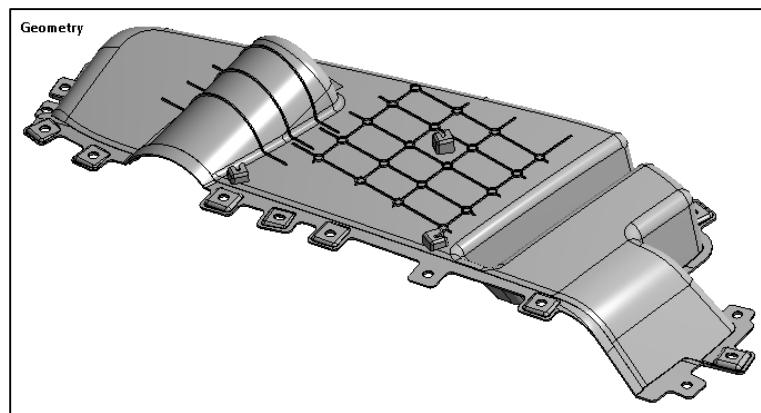
## FORCE REACTION



**FIGURE 8: Force Reaction Of Plastic Pocket Automotive With Brick Stiffeners.**

Force Reaction Of Plastic Pocket Automotive With Brick Stiffeners is 112.34N

## CYLINDRICAL STIFFENERS



**FIGURE 9: Cad Model Of Plastic Pocket Automotive With Cylindrical Stiffeners**

### VI.RESULT

	<b>Total Deformation</b>	<b>Equivalent Stress</b>	<b>Force Reaction</b>
With Brick Stiffeners	5.02mm	39.885MPa	112.34N
With Cylindrical Stiffeners	5.044mm	42.621MPa	105.67N

### VII. CONCLUSION

1. Maximum deformation of plastic pocket Automotive With Brick Stiffeners is 5.02 mm
2. Total Deformation Of Plastic Pocket Automotive With Cylindrical Stiffeners is 5.044mm
3. Reaction force of plastic pocket Automotive With Brick Stiffeners has grater force than Plastic Pocket Automotive With Cylindrical Stiffeners. Hence conclude that strength of Brick Stiffeners better than Cylindrical Stiffeners.
4. Force reaction Of Plastic Pocket Automotive With Cylindrical Stiffeners is 105.67N.

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## Design and Development of Car wash steamer

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**Abstract**—In recent conditions, the system used for washing cars is based on high speed water jet. The cleaning consists of removing dust, mud and dirt particles. This system uses a huge amount of water during cleaning. Prewashing is done using foam which makes the water not reusable. Hence a drainage system is required for removing this wastewater. Hence to overcome this problem car washing using steam is preferred. The Car Washing system using steam uses the force of steam that can clean things up. It has been discovered that steam washing is very convenient and no soapy forms are required that can make the washing much clumsy. The reason behind the use of steam for washing is the reduced waste of water. The development of the steam cleaning system can revolutionize the washing process. Steam does what the commercial washing system cannot do. Steam can easily clean dust and dirt, while for normal cleaning require expensive detergents. So, our main goal is to use steam and do cleaning without affecting or damaging car paint.

**Keywords**— Car wash system, Electric heater, Steam.

### I. INTRODUCTION

In today's modern car wash facilities, be the car wash station, automatic washing stations or self-service stations, the soaps and other cleaning solutions used are designed to loosen and remove dirt and grime. This is in contrast to earlier times, when some operators commonly used hydrofluoric acid, a hazardous chemical, as a detergent in the industry. There has been a strong movement in the industry to move to safer cleaning solutions. The law requires that most car wash facilities treat and/or reuse their water and may be required to maintain wastewater discharge permits, in contrast to unregulated facilities or even street washing, where wastewater can end up in storm drainage and, finally, in waterways, rivers, and lakes.

The main environmental considerations for car washing are:

- a) Use of water and energy resources
- b) Surface water pollution
- c) Pollution of soil and groundwater.

The use of water and energy supply is evident since car washes are users of these resources. The skilled automotive wash business has created vital progress in reducing its environmental footprint, a trend that may still accelerate because of regulation and client demand. Many car washes already use water recovery systems to significantly reduce water consumption and a variety of energy consumption reduction technologies. These systems may be mandatory in the presence of water restrictions. In Europe, Germany leads the way and has very strict rules that make it illegal to wash the car on the road or in the driveway. Surface water pollution can result from the discharge of rinsing in storm drains, which eventually flow into rivers and lakes. The main contaminants in these washing waters include phosphates; Oil and fat; and conduct This is almost exclusively a problem for washing homes/entrances and car-washes. Professional car wash is a "non-point source" of exhaust that has the ability to capture these contaminants, usually in interceptor exhausts, so that contaminants can be removed before the water enters the sanitary systems. (Water and pollutants entering storm drains are not treated and released directly into rivers, lakes, and waterways).

To overcome this problem, we are introducing a system. This system uses steam instead of water. The Car Wash steam cleaning system is truly revolutionary, innovative and environmentally friendly. It is safe and soft enough to be used to clean all car surfaces, car paint, interior, car engine compartment, and other domestic purposes. It gives a perfect external finish without scratches. And when it comes to interiors, they not only clean thoroughly but also disinfect. The steam washing machine is a combination of heat and pressure that quickly removes dirt, bird droppings, oil and spots on the bodywork. The steam cleans without leaving watermarks on the surfaces and keeps the car in good lighting conditions. Steam is also very effective for cleaning rebel strains in fabric seats, carpets, and rugs. Steam cleaning has wide applications in human life, as they are better than cleaning detergents.

Compared to normal washing, steam cleaning has a significant advantage which is the main objective of our project. With the high vapor pressure, you can clean those surfaces where stains and germs are unreachable. From an industrial worker to a housewife, the steam plays a significant role. All household surfaces can be cleaned by the use of steam, but one must always keep in mind that the material he/she is the cleaning and think about how it will react to direct water and heat. Before directly cleaning the surface, the person should take a small area of surface he/she is cleaning.

## II. LITERATURE REVIEW

Sr. No	AUTHOR NAME	TITLE	JOURNAL	YEAR OF PUBLICATION	OUTCOMES FROM THE WORK
1	Zhiyong Liu et.al	A high efficiency electric heater based on dual-helical tube and screw-tape for instant water heating.	Science Direct	2019	By using dual helical tube with screw tape we can get highest heating rate than Single helical tube due to increase in the Surface area. By using this system we can improve 59.6% of efficiency.
2	Krishnamurti M. et.al	Design of multipurpose Cleaning system by using steam	IJLERA	2018	This paper explains a system of method used in multipurpose cleaning and process to determine types of sensor to be use.
3	Dr. E. Subbarao et.al	Design and Thermal Analysis of Steam Boiler (Without & With Baffles)	IJARSET	2018	CFD and Thermal Analysis are done to determine the heat transfer coefficient, heat transfer rate, pressure drop, temperature distribution and heat flux.
4	Abhijeetsinh Makwana et.al	Design of Multi Cleaning System using Steam	IJERA	2016	The steam cleans more efficiently than water. There is no need of any detergent or any chemicals while cleaning.

## III. PROBLEM DEFINITION

### 3.1 Problem Statement

After visiting some car wash garages, it was found that a huge amount of water is getting wasted. In current conditions, the system used for washing cars is based on the high-speed water jet. The cleaning process consists of removing dust, mud and dirt particles. The previous water-based system uses a huge amount of water during cleaning. Prewashing is done using foam which makes the water not reusable. Thus, in order to reduce the wastage of water, the international product named "optima steamer" was processed which is very costly as compared to the normal car wash system. The steam based car washing system in which cleaning car with the minimum amount of water consumption is done. With further moving to this matter, the following causes were identified for a long time.

- Consumed high amount of water during wash.
- Huge amount of water is getting wasted.
- Uses hazardous chemical during water -based cleaning system.

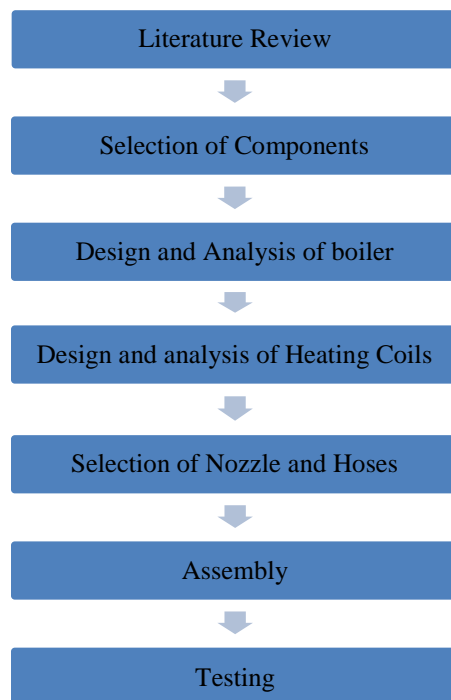
### 3.2 Objectives:

- To reduce water wastage during automobile washing.
- To reduce water pollution by avoiding use of chemicals.
- Manufacturing a cost effective and compact device.
- To use only electrical energy and no fossil fuels.

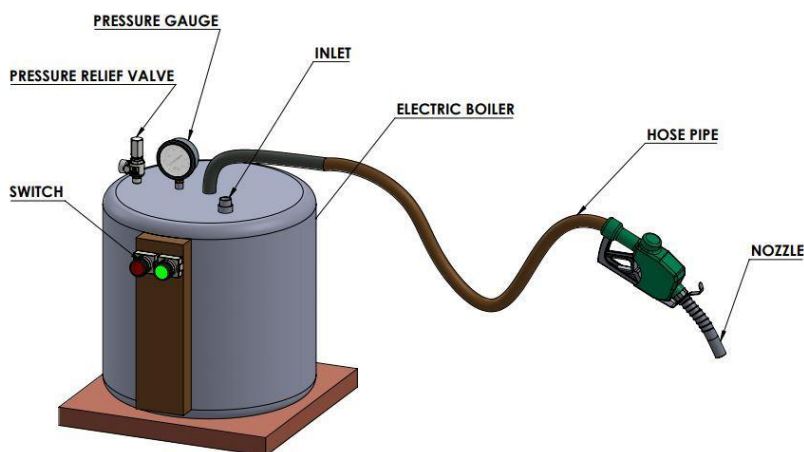
To manufacture a device that reduces the wastage of water, degradation of water quality during automobile washing by chemicals which are harmful for the environment.

#### IV. PROPOSED METHODOLOGY

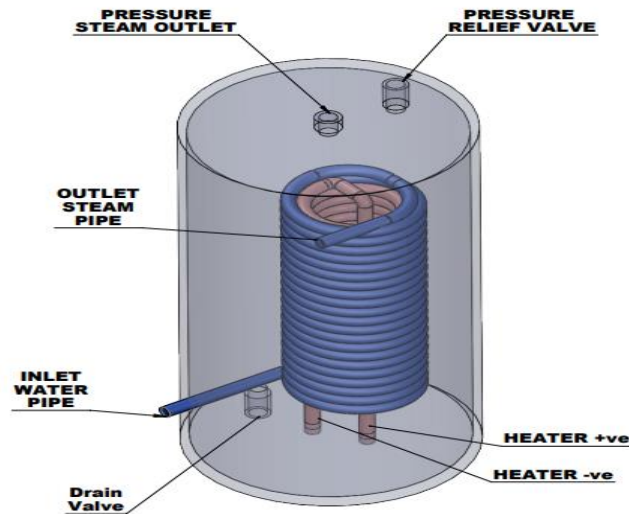
**TABLE 4.1**  
**STEPS OF METHODOLOGY**



#### V. PROJECT CAD MODEL



**FIGURE 1: Car wash steamer**

**FIGURE 5.2: Internal view**

## **VI. RESULT AND DISCUSSION**

The proposed methodology targets at the reduction in water wastage. The following results are expected after implementing Steam Based Cleaning:

- To reduce water wastage during automobile washing.
- To reduce water pollution by avoiding use of chemicals.
- Manufacturing a cost effective and compact device.
- To use only electrical energy and no fossil fuels.

## **VII. CONCLUSION**

Applying the steam-based cleaning system, we can save a large amount of water giving a high return to the environment. Therefore, it is still a very large field to explore and can be a pioneer in saving water and maintaining vehicle, since detergents are not used. Therefore, there will be no water pollution from this car wash steamer. Also, we expect the cost of the project will be minimum compared to original one.

Hence, we are expecting the results while using the steam to wash the cars listed below: -

- Consumes minimum amount of water per hour.
- The process of cleaning the surface without chemicals.
- Minimum amount of water wastage.
- Remove dirt, stains, grease and will require less effort to clean the surface.
- Can be used for cleaning of interior, exterior, compartments and tire.

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# Fabrication of Semi-Automatic Coconut Coir Twinning Machine

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**Abstract**— India has approximately 21 lakh hectares of its land for coconut plantation. On an average, the country produces 10 thousand coconuts per hectare. Coconut is a fruit used on large scale in south parts of India. Growing them is easy but cleaning them requires great efforts. Coconut consists of a fibrous shell and a hard shell, the fibrous part is known as coir or husk. This coir needs to be separated from the coconut to acquire the main product. Basically it's a skin that is needed to be peeled. This coir is a byproduct of coconut and has many different uses which include packaging, mats manufacture, bedding, etc.<sup>[1]</sup>

The objective of this project is to fabricate a machine that could ease the method of peeling a coconut and separate the coconut from its coir. It is a very difficult process and requires a lot of force if done manually by hand. This machine is a semi-automatic coir twinning equipment which also ensures safety of user and easily peels the coconut. According to a normal research it costs a farmer min ₹. 5 to decoir a coconut and its not feasible as the coconut itself is sold at a rate of ₹. 15 – ₹. 20. Thus in order to reduce this unnecessary expense this equipment is designed for coconut farmers which can help them to reduce their expenditure on coir removal and also provide ease for this process<sup>[9]</sup>.

**Keywords** - coconut, dehusking, coir, cost, time.

## I. INTRODUCTION

Coconut (cocosnucifera) is one of the world's most useful and important perennial plants. The coconut fruit is made up of an outer exocarp, a thick fibrous fruit coat known as husk; underneath is the hard protective endocarp or shell. The coconut palm is widely cultivated in the tropics. India is the world's third largest producer of coconuts after the Philippines and Indonesia. Other producers are Thailand, Malaysia, Papua New Guinea and the Pacific Islands. With coconut plantations extending over more than a million hectares, India produces about 5500 million nuts a year. Copra produced in the country is about 0.35 million tons and India accounts for about 50% of the world trade in coir<sup>[4]</sup>.

### 1.1 Project Objective

The objective of this project is to ease the process of coconut coir twinning by designing a machine which would easily remove the coir and also ensure safety of the user. To reduce the labour cost which in turn increases the final cost of the coconut and is a loss for the farmers. This should also reduce the time required for the cleaning process as manually it takes longer time.

## II. PROBLEM DEFINITION

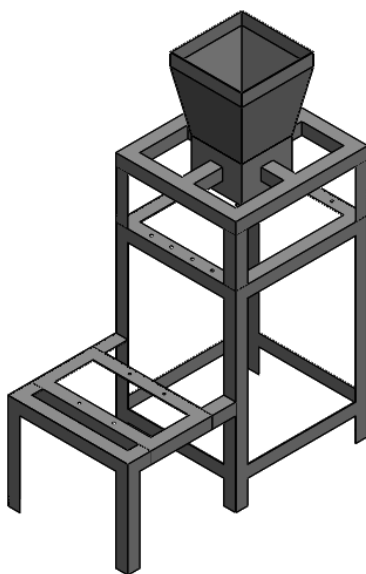
### 2.1 Problem Statement

After research and gathering information we have realized that a coconut is sold at a cost of Rs. 20 on average<sup>[6]</sup>. The farmer has to spend approximately Rs. 5 on cleaning of the coconut. This results in increase market price of the coconut and also the farmer has to spend an unnecessary cost. This also requires large amount of force. Cleaning of the coconut is a difficult task as the shell or coir is fibrous and it does not easily come off the coconut.

### III. PROPOSED METHODOLOGY

#### 3.1 Frame

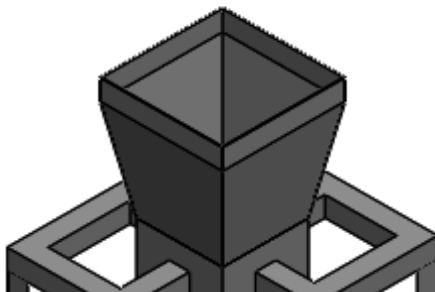
The fabrication of this machine is to manufacture the base frame according to the dimensions. The L- shaped bars are cut into required length and welded at required edges. Dimensions are 500x550x800mm. The small frame welded at bottom part is for the placement of motor. Its dimensions are 400x450x500mm.



**FIGURE 1: Solid model of Frame**

#### 3.2 Hopper

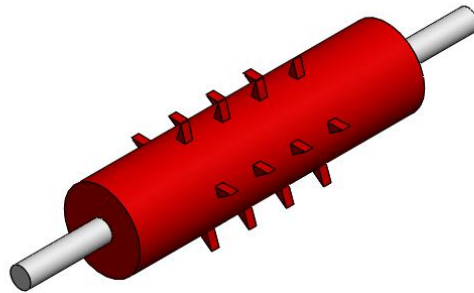
The hopper is made from welding sheet metal of thickness of 2mm. The hopper should be made of the size where an average coconut of diameter 10 to 15cm can easily be passed. The length of the coconut should not exceed 230mm. Also an arrangement with the help of spring and hand lever which would be used to open the hopper to drop the coconut on rollers. Whenever the lever is pulled the coconut should fall down on the rollers to get dehusk.



**FIGURE 2: Solid model of Hopper**

### 3.3 Spiked rollers

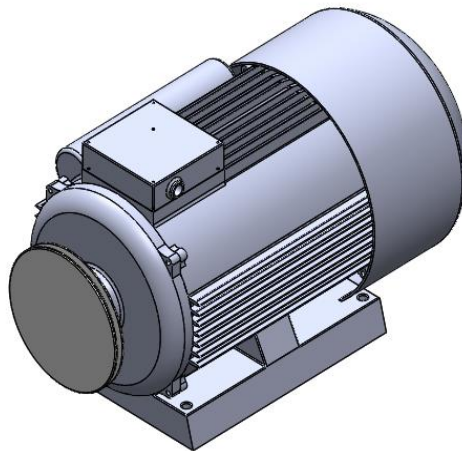
Two cylindrical rollers of diameter 100mm and length 400mm are welded to a 30mm shaft and are closed from both sides. The spikes are welded on the rollers at particular distance and regular intervals. The spikes are cone shaped having 20 mm base dia and a height of 30mm. One cylinder has 5 spikes along the length and second has 4 spikes along the length



**Figure 3: Solid model of Spiked Rollers**

### 3.4 Motor

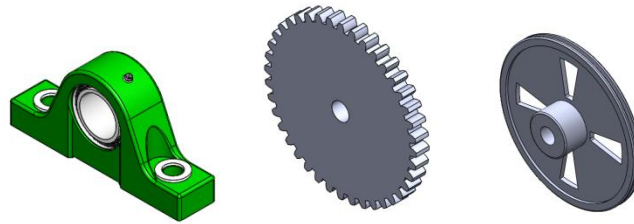
A single phase AC motor of 1hp capacity is required to run this machine. As the machine is going to be used by farmers it cannot be of 3 – phase supply as the supply is not easily available in the rural areas where these machines can be used. A 3 – phase motor can also be used if the application is for industrial use. The motor should have a speed of 80 – 100RPM for both motors<sup>[5]</sup>. We used a geared motor with RPM approximately 100, which was reduces from standard 1440RPM with the help of gear assembly. This was done to increase the Torque Required for dehusking the coconut.



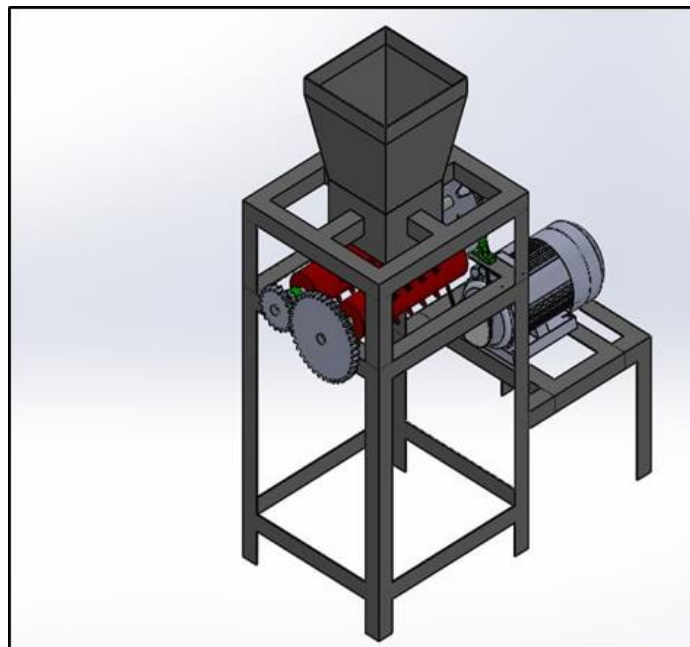
**FIGURE 4: Solid model of Motor**

### 3.5 Gears, Pulleys, Belt and Bearings

For transmission of power, requirement of two spur gears, two pulleys and four pedestal bearings is necessary. The machine runs on the proper arrangement of these parts. A belt of proper length is attached to the pulley of dia 70mm from the motor. The rollers are attached to a 250mm pulley which is connected to the motor with a belt. This provides the drive to the rollers. The gears are in mesh the drive is provided to the large gear and the smaller gear is driven by meshing. Thus a speed difference is created between these two rollers <sup>[3]</sup>. Pedestal bearings are fixed on the frame which supports the shaft that extends from the cylindrical rollers.



**FIGURE 5: Solid model of Bearing, Gear and Pulley.**



**FIGURE 6: Solid model of Coconut coir twinning machine**

## IV. WORKING

The power produced by the prime mover is transmitted to the system through a series of belts and pulleys. The power transmitted into the lower roller was transmitted to the upper roller through a belt drive connection. The fixed rollers has spikes designed to penetrate into the husk and pull it apart. At first the coconut are feeded in the hopper setup. Then the coconut inline drops between the spiked rollers from the hopper. Power produced by prime mover is then used to peel off the coir with the rotating spiked rollers. The rollers keep on removing maximum amount of coir as much as possible. Further operator press the pedal and the finished dry coconut is thrown out and collected in a box while the waste simply drops down in trash bag.

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## V. CONCLUSION

The literature represented in this study describes the need of this product as we have estimated that the coir twinning process is a hectic if done manually with using tradition tools. Although even if automatic machines are considered they are also expensive and cannot be afforded by small scale farmers. In this study, we also anticipated that the user gets injured while using the manual equipments and also it is a tiring process<sup>[2]</sup>. This semi – automatic coir twinner helps to ease the process and also reduces the fatigue on user ensuring his/her safety .The machine is at a low cost initially so can be easily afforded by small scale farmers as well as larger scale coconut cultivators. The machine is simple in design and construction and does not require special planning. Thus carrying out stepwise procedure the machine can be completed successfully<sup>[7],[8]</sup>.

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## Design and Fabrication of sub-aquatic tugger

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**Abstract**— Sub aquatic tugger is a rare vehicle designed to extract metallic objects such as ornaments, coins, etc, from the water reservoir or swimming pool. This vehicle consists of an arrangement of magnets at the base of the vehicle & makes use of pneumatic circuits. It is somewhat difficult to get out materials from the water bodies manually as there is pressure acting upon the body and due to the depth of the water. The metallic objects are pulled out from the water reservoir or swimming pool by using a set of magnets. Mainly the problem faced underwater is to get the location of the object; These problems are solved by using a camera the underwater objects can be visualized by the means of a camera. The camera will help us to navigate as well as it will help us to detect the object which is under the water. The unit consists of a bladder that is attached to the tugger and the inlet side will be connected to the compressor which will help the bladder to blow. The vehicle is controlled by the remote controller; the remote controller gives the command to the thruster to work accordingly to need of the user.

**Keywords**— Tugger, Thruster, Camera, Magnet, Bladder

### I. INTRODUCTION

We find that many objects or valuable things are immersed inside the water bodies which are really very difficult to be spotted (located) Also there are some places where humans cannot reach due to various reasons which can be present inside the water bodies. This unit is not only used for removal of the ferrous material from the water bodies but this unit can be used for navigation So it becomes necessary to be cleaned as it can cause serious problems to our environment.

So we are designing a SUB -AQUATIC TUGGER so that it will be easy to clean the water bodies. And it would help to find the valuable things which are ferrous in nature we can remove them out with the help magnets. The unit (tugger) is a type of vehicle that can be controlled in every direction with the help of the controller. The underwater objects can be visualized by the means of camera. The camera will help us to navigate as well as it will help us to detect the object which is underneath the water. The unit consists of a bladder that is attached to the tugger and the inlet side will be connected to the compressor which will help the bladder to blow. As the metal or ferrous materials are detected the group of magnets will be attracted towards them after the attraction of the metals the compressed air will be passed and the bladder will blow and it will help to bring the metal on the surface.

We are designing the light weight body the reason behind making low weight body is that it will help to move quickly. The Aluminum body is used such that it is very light in weight and it does not corrode. For the movement of the tugger, we are attaching thruster on both the side.

## II. LITERATURE REVIEW

Sr No	AUTHOR NAME	TITLE	JOURNAL	YEAR OF PUBLICATION	OUTCOME FROM THE WORK
1	Huimin Lu; Yin Zhang; Yujie Li; Quan Zhou	Underwater Kinect Camera Using Inpainting and Local Image Mode Filtering	IEEE	2017	By using a camera we can get the exact location of the object immersed in water and steer the Vehicle in the proper manner.
2	Muljowidodok K, Sapto Adi N, Nico Prayogo and Agus Budiyo	Design and Testing of Underwater Thrusters for SHRIMP POV-ITB	IEEE	2009	By using this technique, we can design a thruster that can provide a proper motion to our vehicle and turn the vehicle at the situated object.
3	A. Almasi	Reciprocating Compressor Optimum Design and Manufacture with Respect to Reliability and Cost	IEEE	2009	This paper suggests that we can use a reciprocating compressor instead of using any other compressor. As the reciprocating compressor is more efficient and low in cost. With the help of a compressor, we can uplift the vehicle above the water surface.

## III. PROBLEM DEFINITION

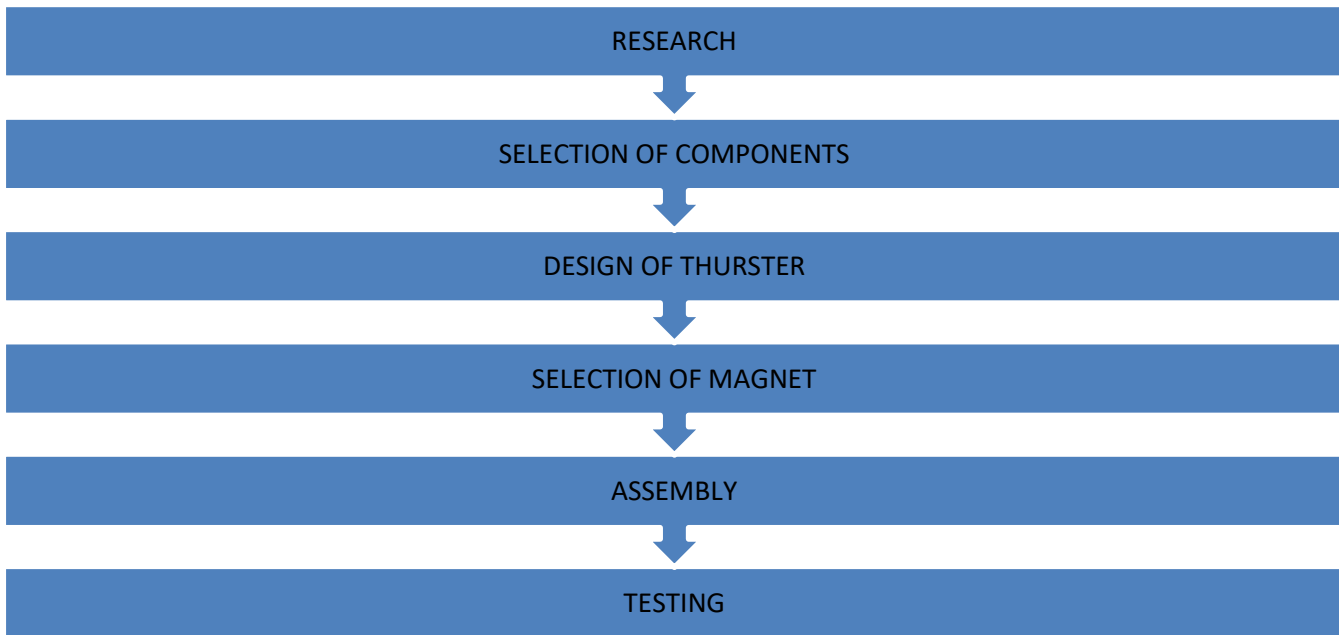
The water bodies get contaminated during festivals as well as the metallic objects fall inside the water. Also many times it happens that while swimming our valuable ornaments falls down in a swimming pool or in ponds and that immersed into the water and we are also not able to navigate in deep water to find the object that is immersed into the water. This vehicle will help to navigate the metallic object also help to remove the object with the use of magnets.

## IV. OBJECTIVE

- To maintain healthy surroundings for aquatic life inside the water reservoir.
- To locate various objects immersed inside the water reservoir as well as swimming pools.
- To remove the precious ornaments and small objects like coins, inside the water bodies
- To clean the water reservoir and swimming pool easily



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**V. PROPOSED METHODOLOGY****I. RESEARCH:**

We researched the components which are required for making this project. We referred the research papers of the previous years. And we got much information related to the components. We also referred to different sites that give us information on the principles which can be used in this project.

**II. FINDING GENUINE MATERIALS:**

After research we found out the types of materials which can be used for the frame of the submersible unit we also found out the ability of the materials which can sustain under the following conditions.

**III. THRUSTERS:**

As the name suggests external thrusters are attached to the frame. Thrusters are a transversal propulsion device built into a ship or a boat. Thrusters make docking easier since they allow the captain to turn the vessel to port or starboard side, without using the main propulsion mechanism which requires some forward motion for turning.

We are using here two thrusters to give direction to all units inside the water. The function of the unit is to lift the metallic (iron) object from the water by using a set of magnets. For that the unit must have to rest in that iron object. When this unit is launched from the floater, then it takes an inclined path in the water. Due to this unit can't reach near the object.

Therefore, by using thrusters we can give the direction to the unit to reach near that object. To make this, thrusters we had used the electric motor of 1000 rpm. The blades of thrusters are made up of mild steel plate. The thrusters are connected at the frame.

**IV. MAGNETS:**

For lifting the ferrous material a set of magnets is used which will attach the metallic object. we have selected the magnet according to the basic application. The magnets are mounted at the base of the body by which metallic objects can easily attach to the magnets.

## **VI. CONCLUSION**

As we have studied the project in detail, we can certify that a Sub-Aquatic Tugger can be used to lift the objects beneath the water surface at greater ease. The controlling of the project can be done over a range of a maximum of 10 feet via remote control. Furthermore, on wider necessities the size of the rubber tube and the entire project can be maximized. Mostly this project has a huge range of applications in a marine field.

As its cost is low industries, as well as a domestic unit can make use of this project to the maximum. It does not make use of external supply. We can conclude this project in working conditions ready for the welfare of human beings.

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# Development of Waterloft to Harvest Potable Water from Atmospheric Air using Peltier Effect

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**Abstract**— Water scarcity is one of the major problems faced by world. Although 70% of earth's surface is covered by water but only 2.5% of it is drinkable. The moisture in atmospheric air can be a good source for drinking water in humid areas like places near sea. This project presents the method to develop the atmospheric water extractor based on Peltier effect. Atmospheric water extractor is device which takes in atmospheric air and cools it below its dew point temperature to condense water from air. This atmospheric water extractor uses the principle of latent heat to convert vapor molecules into water droplets. The formed water from this device is then filtered and can be used for day to day activities. This is not a new concept but is not commonly used in India. This device is portable and can be used in various regions with suitable humidity levels.

**Keywords**— Atmospheric Water Extractor, Peltier Module, Water Filter

## I. INTRODUCTION

According to 2018 report by government -NITI ayog 21 major cities are going to be run out of groundwater in upcoming year and due to uneven rainfall, this problem can get worse. Atmospheric air contains significant amount of water vapor especially in a humid region such as places near sea. India has 7516.6 km of coastline but most amount of water in atmospheric air gets wasted as the technology based on this concept of extraction of water from atmosphere is not very common in India. In such cases atmospheric water extraction can be a good solution.

Atmospheric water extractor is a device which takes in atmospheric air and cools it below its dew point temperature to condense water from ambient air. There are three main methods which can be used to extract water from the atmospheric air, which are

- Vapour Compression Method
- Liquid Desiccant Method
- Thermoelectric Cooling

## II. OBJECTIVES

- To provide an alternative source of clean drinking water.
- To develop a portable and light weight system.
- To extract maximum amount of water from available air
- To manufacture a product which is less harmful to environment
- To manufacture a product which is energy efficient
- To design a cost-effective system.

### **III. PROPOSED METHODOLOGY**

To provide feasible and economical solution for the problem mentioned in the previous chapters, a brief study and research work were carried out by the team and the idea of atmospheric water extractor (water loft) was finalized to fulfill the necessity of potable water.

#### **STEPS IMPLEMENTED:**

- Research
- Problem Identification
- Strategy And Planning
- Methods And Calculations

#### **3.1 Research**

We studied research papers which were published by different researchers to deal with the same problem from the research work we learnt that there are various methods which can be used to resolve difficulty of potable water availability. Out of the research paper we referred, we noticed that thermoelectric cooling method was simple and effective in operation if planned properly than rest of the processes

#### **3.2 Problem Identification**

Research work carried out by the researchers helped us to identify the problems which were faced by them during their experimentation. Some of the obstacles were:

- Less amount of water generation due to improper design specifications.
- Improper selection of thermoelectric module.
- Lower efficiency due to incorrect selection of power sources.
- Unfiltered water generation due to absence of filtration system.

#### **3.3 Strategy And Planning**

As per the problems we identified, we initiated to build up our own strategies for design and development of a water harvesting system working on the same thermoelectric cooling principle with less limitations and drawbacks. Our strategy includes selection of suitable Peltier module and the processes which lead to adequate amount of water generation.

#### **3.4 Methods And Calculations**

##### **3.4.1 Selection Of Thermoelectric Module**

TEM module plays an important role in designing of water harvesting system. Selection of a thermoelectric module is mainly based on a maximum cooling capacity ( $Q_{max}$ ) that is needed to be achieved. Before selecting any efficient TEM device, the important parameters which should be considered are:

- $Q_{max}$  (max cooling capacity)
- Temperature difference ( $\Delta T$ ) between hot and cold surfaces of TEM

**Design specification for condensing chamber:**

- Area = 225sq.cm = 0. 242sq.ft
- Overall heat transfer coefficient (U factor) for wall of chamber = 1.15 BTU (hr. sqft. °F)
- Ambient temp=32°C = 89.6 °F
- Required dew point temp = 15°C = 59 °F
- Watts consumed by fan = 1.8W

As per our required heat load conditions, the TEM having maximum cooling capacity greater than 20 W should be selected.

As long as the availability, economical and efficient selection of TEM is concerned Thermoelectric cooling module **TEC1-12706** with max cooling capacity of 33 W is optimal solution.

**3.4.2 Selection Of Heat Sink For Heat Dissipation**

The thermoelectric cooling modules require proper heat dissipation from its hot surface when power is supplied, so that it can achieve minimum dew point temperature at its cold surface. Heat sink can be classified as:

- Air Cooled heat sink
- water Cooled heat sink



**Fig.1 Peltier Module With Aluminium Heat Sink**

Heat sink made of highly thermal conductivity material works more effectively therefore heat sinks made up of materials like Copper, Aluminium are preferred widely. Since, on comparing thermal conductivities of copper and aluminium it is found that Copper is having higher thermal conductivity but at the same time aluminium is lighter than copper, so we have decided to use the aluminium heat sink to work efficiently.

**3.4.3 Selection Of Power Source**

Power source provides an electric supply to the thermoelectric module so that high and low temperatures are maintained on opposite sides of module. For a system with high efficiency and less size of the device the power should be small in size and give desired output supply.

To make portable water harvesting device the available power source options are:

Power source	Size	Cost	Weight
Li-Ion Battery	Moderate	Moderate	Low
Li-Acid Battery	Large	Low	High
Li-Po Battery	Small	High	Low

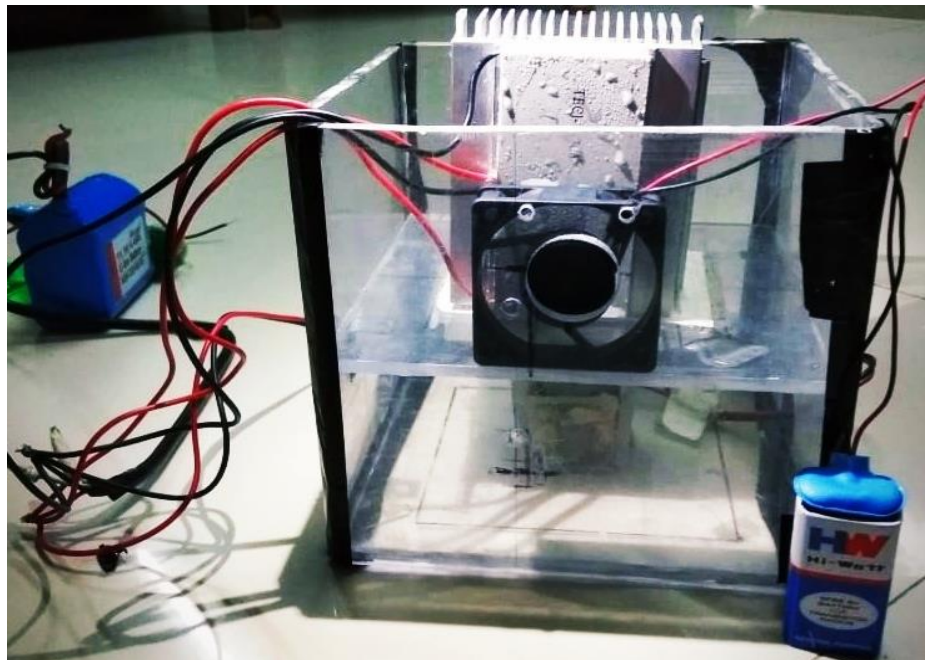
**Table 1. Various Power Sources**

As per the specification of the above options available for the power sources we selected **Li-Ion battery** as it fulfills our requirements of power source. Although the system can also work on ac to dc adapter's power supply but the main drawback is, it can't be portable for use.

#### 3.4.4 Selection Of Filter For Water Purification

Water filtration process makes the condensed water potable. As the water is generated from the air it may contain some impurities which need to be filtered. As the water generated needs to meet the potable drinking water standards set by WHO, we decided to do the process in 3 stages.

- Fiber meshing.
- UV lights.
- Mineral candle.



**FIGURE.2 working model prototype**

#### IV. RESULTS AND DISCUSSION

The analysis of the machine is done on a normal condition where the operating parameters are perfect. As per experimental study as the relative humidity in air increases water productivity increases and power consumption decreases. The machine requires less space as compared to the machines available in the market and can also be carried anywhere. The filtration system used ensures the water formed is potable as per standards.

#### V. CONCLUSION

The literature, research work and ideas represented in this study draw our attention to the crucial topic of drinking water scarcity. This waterloft project is a complete package to avail pure and clean drinking water at low cost. The various problems faced like inadequate water quantity, poor design, insufficient power source etc. were overcome.

As the waterloft incorporates all the required aspects of an optimum product it can be used by anyone, anytime, anywhere. This is a more flexible and handier model as compared to many other products presently available. If proposed methodology is planned well, the remarkable improvements in the water productivity can be achieved. The concept of this project can also be used as a better alternative in refrigeration science against conventional systems.

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## Survey : Development of test rig for estimating fin performance

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**Abstract**—The main purpose of this setup is to give an overview of pin fins of different materials which are used for increasing the heat transfer rate. In past years the concept of fin was not much clear to the people due to which the efficiency of the appliances which generated heat while operating decreased with time. There are many devices which generate heat and thus to increase their thermal efficiency they needed a cooling system. For that purpose we had to increase the heat transfer rate by providing fins (extended surfaces). It was observed that performance of pin fin is better than other fin configurations. In this study we are using circular pin fins of finite length and of different materials namely aluminium and brass with the help of which we can compare their performances and select suitable fin material as per their applications.

**Keywords**— Thermal analysis, Pin-Fin, Heat Transfer, ANSYS, Material Selection

### I. INTRODUCTION

Thermal management is a critical aspect of the design process and, as demand for component density and miniaturization continues to increase, engineers need cooling solutions that fit into small spaces, will not cause project cost overruns, and will provide the best heat transfer possible for today's modern appliances. When the available surface is not capable of transferring the required quantity of heat with available temperature drop and convective heat transfer coefficient, extended surfaces or fins are used. In practice all kinds of shapes and sizes are used but we are focusing on the performance characteristics of pin fins. Pin Fins are designed to meet the requirements of modern electronics cooling with little extra cost added. In particular, the pin fin geometry is designed to provide increased surface area for heat transfer and work in environments where the direction of airflow is ambiguous. As we know there are two types of convections are as follows:

1. Natural convection

2. Forced convection

In this experimental setup we are going to use forced convection for heat transfer through circular fins. Forced convection is heat transfer in which fluid is forced to flow over a surface or in a duct by external means such as blower. Convection heat transfer between a hot surface and the surrounding fluid deals with the Newton's Law of Cooling which states that, "The rate of convection heat transfer is directly proportional to the area of contact or exposure between them. We know that Newton's Law of Cooling is expressed as

$$Q = h A (T_s - T_\infty)$$

Where,

$h$ =convective heat transfer coefficient

$A$ = area of contact

$T_s$ =hot surface temperature

From the above formula we can find a few ways to increase the heat transfer rates.

- i) Increase the convection heat transfer coefficient “h”
- ii) Increase the surface area “A”
- iii) Increase temp difference

But increasing heat transfer coefficient „h” may require the installation of a blower. In natural convection, it is not possible to increase the convective heat transfer coefficient. Sometimes it is not possible and feasible to change the first two options. Then there is only one possible way by increasing the surface area using different types of fins. This is the only economical and feasible way to increase the heat transfer rate.

## II. METHODOLOGY

In recent years, cooling advanced devices such as crucial components of personal computers or internal combustion engines has become a major challenge. Conventional heat sinks are inadequate for advanced devices which generate and dissipate astonishing levels of heat and power. Pin fins are widely used in heat sinks and fan sinks. So for cooling especially electronic components is vital consideration of this study. Thus we have to determine optimum pin fin material. In the experiment different materials such as copper, aluminum, mild steel, brass, and stainless steel are analyzed.

Objectives:

- 1. To calculate the effectiveness and efficiency of pin fin
- 2. To develop experimental setup for educational and research purpose.
- 3. For selecting suitable materials used in various heat transfer applications
- 4. To determine the temperature of a pin fin for forced convection.
- 5. Develop a pin fin apparatus at moderate cost.

Fins are analyzed by taking into consideration uniform heat transfer coefficient on its surface. However, studies by various researchers show that it varies along the fin length. To dissipate the heat of very high heat flux densities, the required fins must often be larger than the device. As a result, the pin fins performance is reduced. In the present research work, actual experiments and analysis of the forced convection heat transfer characteristics of circular pin fin will be carried, by varying the materials. Results will be validated by CFD (Software preferably by ANSYS CFX). The fin is fitted into the duct and air through the blower is forced on the fin. At the base of each fin heating coil is provided for heating. Experiments will be run for different heater inputs and different air flow rates.

The proposed work consists of:

- i) Fabricating and assembling of the experimental setup, fabricating the various types of pin fin required for experimental investigation.
- ii) Conducting the experiment and noting down the steady state readings on various pin fins. i.e, circular pin fins of different materials.
- iii) Plotting performance characteristics of pin fins of various materials from obtained results.
- iv) Comparisons between various pin fins will be carried.
- v) CFD simulation and analysis of two pin fins will be executed and will be validated with the experimental results

### III. ANALYSIS TABLE

Sr. No.	Title Of Paper	Technique Used	Limitations
1	Thermal and parametric analysis of fin	Testing of various parameters of the manufactured fins	Due to manufacturing constraints we can't manufacture circular and hollow pin fin
2	Thermal Analysis Of Perforated Pin Fins Heat Sink Under Forced Convection Condition	Perforated pin fins increase 1-4% thermal efficiency compared to solid pin fins	-----
3	Experimental Investigation of Convective Heat Transfer through Rough and Smooth Surfaced Aluminium 6063 Pin-Fin Apparatus	-----	Surface roughness affects fins efficiency
4	Experimental Investigation Of Heat Transfer By Using Pin Fin Of Different Materials In Forced Convection	Brass material has a higher heat transfer coefficient than others.	As the reynold number increases, the efficiency of pin fin decreases.
5	Experimental Study On Performance Evaluation Of Pin Fins	The results show efficiency of Aluminium is highest followed by Brass and steel respectively.	The results show the efficiency of Aluminium is highest followed by Brass and steel respectively.

6	Experimental Investigation Of Heat Transfer By Pin Fins	efficiency and heat transfer coefficient is greater of aluminium fins than brass fins with dimples	-----
7	Natural Convection Heat Transfer From Square Pin Fin Heat Sinks Subject To The Influence Of Orientation	Upward facing orientation of fins yields highest heat transfer coefficient followed by sideways facing and downward facing orientation .	-----
8	Optimal Pin Fin Arrangement Of Heat Sink Design And Thermal Analysis Of Cpu	Linear arrangement of pin fin that able to give 2.84% and 0.63% better thermal performance compared to the conventional design .	-----
9	Experiment On Heat Transfer Through Fins Having Different Notches	Providing notches to the fins not only results into increase in Heat Transfer Coefficient but also it saves the fin material.	-----
10	Numerical investigation of pin-fin thermal performance for staggered and inline arrays at low Reynolds number	An increment in Nusselt number is observed with increasing Reynolds Number for each of the arrangements and fin geometries	-----

#### IV. CONCLUSION

In this project we are going to develop a test rig for analyzing performance characteristics of pin fins used in various heat transfer applications and based on these analyses we are further going to comment on which material is best to be used as a fin in dynamic conditions. For this project we have studied several research papers and based on the comments and results of the respective authors and also using our academic knowledge we are going to develop this test rig. Once this test rig is developed it will be more convenient to decide which material to be used while manufacturing fins. This test rig can also be used by various engineering institutes and heat transfer research industries for enhancing their knowledge, for better understanding of heat transfer through pin fins and also getting the experience regarding the workability of the fins in actual environmental conditions

and push their interest in the subject of heat transfer. Thus this study aims towards determining the most effective as well as efficient pin fin and developing the test rig considering the performance as well as the economic aspects.

### ACKNOWLEDGEMENTS

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# Analysis on Friction Stir Spot Welding (FSSW) Of HSS Using Explicit Adaptive Meshing Scheme

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**Abstract**— FSSW is an advanced and popular solid state material welding method, which is achieve the different variety of popularity in serve industries and automotive. FSSW method (technique) are used for joining the similar or dissimilar material like aluminium, titanium, magnesium and copper alloys etc. The various factors such as rotational speed, transverse speed and profile of the tool on the joining quality of HSS. The main target of this analysis is to be observed variation of tool profile and welding quality of HSS as the tool speed varies. Two aluminium were lapped and provide support to the bottom of the plate know as back anvil to constrain the motion. Were we analyzed the material flow due to friction of heat generation in weld zone. HSS is one of the most commonly used HSS and it applications where low density and excellent corrosion is applied in a wide range of resistance are necessary such as aerospace industry and bio mechanical, marine, chemical industries, gas turbine, etc.

**Keywords**— Friction stir spot welding(FSSW), AL6082-T6, Tool rotation, Plunge, Dwell, HSS TOOL.

## I. INTRODUCTION

FRICTION STIR SPOT WELDING (FSSW) is a solid state joining process that transforms the metal from solid state into a plastic state and then mechanically stirs the materials together under pressure to form a welded joint. In this process of welding, separate spot are weld by pressing a rotating tool with high force onto the surface of two sheet that overlap with each other. The frictional heat and high pressure laminate the workpiece material. The tool consist of a rotating pin and a shoulder. The pin is a part of tool that penetrate into the material, Tip of the pin plunges into the joint area between the adjacent material at overlap contour. The pin of the tool is plunged into the sheet until the shoulder is in contact with the surface of the sheet. The shoulder applies high pressure which hook-ups the element metallurgically . After a short dwell time, the tool is pulled out of the workpiece.

There are four steps to illustrate the process. First the tool is positioned perpendicular to the work unit and the tool start rotating, after that the tool is pushed against the surface of top sheet due to frictional heat of material tool. The pin enters the weaker metals. Then the pi plunged completely into the work piece . The tool continuously spin and apply pressure for certain period of time or dwell time. After that the material around the pin are stirred together and the lapped plate are metallurgically unite.

## II. PROBLEM DEFINITION

Friction stir spot welding is characterized by a number of process advantages. Any damage to the fabric caused by the acute heat, like that produced by laser or arc welding, won't occur. TIG and MIG is a time-consuming process also this is not suitable for the thick materials. In laser welding ,due to the rapid rate of cooling, cracks may be produced in some metals. Friction stir spot welds have a high strength, in order that they are even suitable for parts that are exposed to particularly high loads. In addition to automotive and rail vehicle construction, the aerospace industry is developing the method e.g. for welding cockpit doors for helicopters. within the electrical industry aluminum and copper are often friction stir spot welded. Other applications are in facade

and furniture manufacture, where the low heat input, especially in anodized sheets, leads to excellent optical properties. . there different materials i.e. Aluminium , Magnesium, Copper and copper alloys , Titanium , Steel and ferrous alloys , Hafnium and zirconium , etc is to be weld by using FSSW . Therefore to analysis the FSSW process by using titanium workpiece material also see the effects on workpiece and tool.

## 2.2 OBJECTIVES

1. To study detail analysis of FSSW and applying the boundary condition as well as mesh And Geometry.
2. To analyze the deformation and temperature distribution of work piece and tool.
3. To analyze the von mises stress distribution along cross section of work piece.
4. Graph of temperature versus radial distance from centre of tool.
5. Graph of von mises stress versus radial distance from centre of tool.

### 1. PROCESS ADVANTAGES

Friction stir spot welding is characterized by variety of process advantages. Any damage to the fabric caused by the acute heat, like that produced by laser or arc welding, won't occur. In particular, within the case of artificially aged aluminum alloys, the strength within the weld seam and therefore the heat-affected zone is far above in conventional welding methods.

### 2. INDUSTRIAL USE:

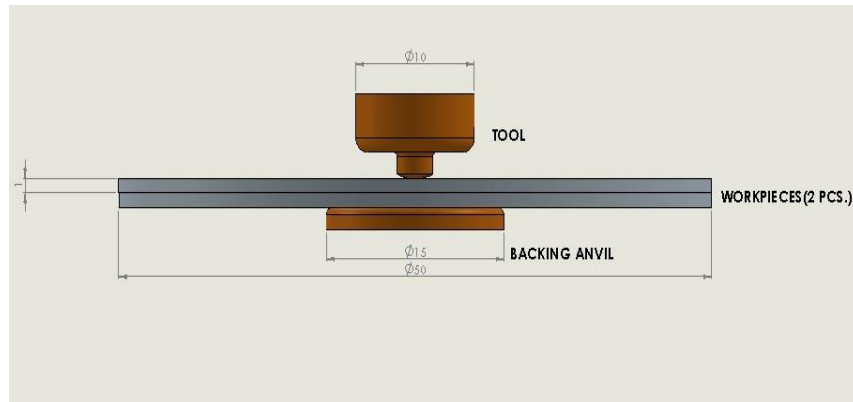
Friction stir spot welds have a high strength, in order that they are even suitable for parts that are exposed to particularly high loads. In addition to automotive and rail vehicle construction, the aerospace industry is developing the method e.g. for welding cockpit doors for helicopters.in the electrical industry aluminum and copper are often friction stir spot welded. Other applications are in façade and furniture manufacture, where the low heat input, especially in anodized sheets, results in excellent optical properties.

## III. MATERIAL AND METHOD

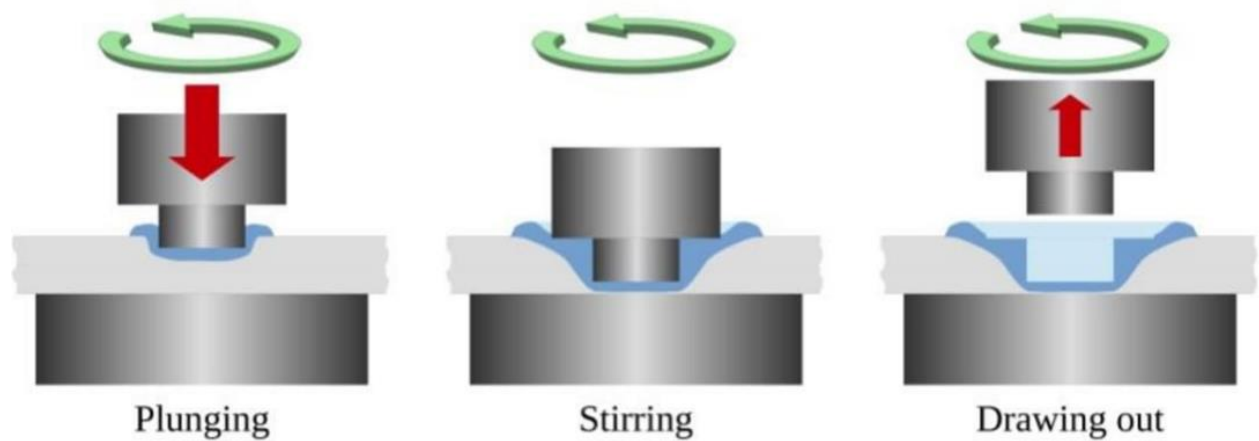
### 3.1 APPROACHED METHODOLOGY







**FIGURE 1: SOLID MODEL OF THE FSSW.**



**FIGURE 2: PROCESS OF WELDING.**

**TABLE 1  
 LITERATURE REVIEW**

Paper name	Content
A comparison of different finite element methods in the thermal analysis of friction stir welding (fsw).	Joining of the similar material or those have minor difference is usually easier in comparison with joining dissimilar material.
Design and experimental study of friction stir welding of aa6061-t6 alloy for optimization of welding parameters by using lathe machine.	While designing tool and tool tip length should be less than thickness of base material.
Effect of pin length on friction stir spot welding (fssw) of dissimilar aluminium-steel joints.	Welding with tools of shoulder pin improves the forging and mixing of the aluminum onto the steel.
Identification of optimum friction stir spot welding process parameter controlling the properties of low carbon automotive steel joints.	Friction stir spot welding can also eliminate the problems associated with other conventional spot welding process.

#### IV. CONCLUSION

The literature represented in the study describes the finite element method has been delineate for simulation and analysis of friction stir spot welding process. which make use of effective meshing and abatement algorithm using an ABAQUS the combination of this features allow the marriage thermo-elasto-plastic response to be obtained which evidently shows the extension of the thermo mechanically affected zone and temperature profile quickly after the operation is completed without the effective meshing and abatement schemes severe elements distortion during the process of welding process would prevent the simulation from converging. While the judged overall deformation shapes are reasonable considering. The assumption made further needed refinement are underway to include the tool tip and anvil as element that absorb and release heat during conducting the operation.

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# Study on Productivity Improvement in Manufacturing Organization

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**Abstract**— In today's era of advancement, one of the major challenges is to improve the productivity of the manufacturing firm by implementing the advanced methods and technology in their systems. A lot of research is going on the way to find out the factors responsible for improving the productivity. Currently there is not a single book or literature that gives in one place, information about various processes, technologies and techniques that can improve productivity. Information is scattered in many literatures and available under various headings. An attempt has been made here to explore various processes, techniques and technologies they can improve the productivity, because of the advancement in the technologies and processes there will be increase in the customer demand. The main aim is to find the areas of improvement and to make an improvement proposal to meet the increment in the demand. This work focuses on the productivity improvement by using the manufacturing modelling concepts. The identification and analyzing the source, reflects the improvement in the productivity of the system.

**Keywords**— Advanced process, Manufacturing techniques, Production process, Productivity improvement, Technologies.

## I. INTRODUCTION

Quality improvement has always been a challenging issue for companies as it usually gives additional costs to producers. In this regard, one of their main concerns is to choose improvement works so that high quality products can be manufactured with substantial cost savings. It has been practically shown that productivity actually increases as quality improves. Humans have always shown keen interest in the possibilities of improving their standard of living. With this interest, it is only natural that from time to time questions about the ability of our industries to deliver the required output remain. Since productivity is the major determinant of competition and profitability, extensive analysis is not needed to reveal that productivity is the backbone of a nation's economic progress. In countries where productivity is high, the standard of living is also high. As international competition continues, there is growing concern about the stagnation in productivity and the long-term impact that it can have on each firm and the ability of each firm to compete in world markets. Therefore, increasing productivity should be the challenge of a corporation, and it tries its best to make all managers achieve their rising levels. Productivity is generally defined as the ratio of total output to total input. It measures the efficiency with which a production activity converts input into output. Obviously, this conversion process involves many inputs and outputs and many complex activities. Most people would agree that a significant increase in productivity over the long term cannot be caused by increasing work efforts alone, especially when the trend in industrialized societies of the world is towards rising labour costs.

Real growth can come through capital investment in new and improved machines, equipment and facilities. It is also being emphasized that improving productivity does not work hard, but is to work in a better way. And productivity should not only apply to physical production processes, but also to all other aspects of human effort. There is a lot of work aimed at determining the principle factors that affect productivity. In order to systematically analyse the complex concept of productivity improvement, this paper turns the issue into an approach to efficiency and effective approach. The former refers to productivity improvement through internal collaboration without consuming additional inputs while the latter requires additional investment in equipment or labour to increase productivity levels.

The growth of a country's economy comes from the growth of its manufacturing industries. Manufacturing firms are currently undergoing very strong competition. Now-a-days industries are using various manufacturing systems, these are dedicated manufacturing systems, cellular manufacturing systems and flexible manufacturing systems. The production of the manufacturing system depends on various factors. These factors include production rate, product quality, and system flexibility. The rate of production depends on the productivity of the system, while quality is related to the conformance of the product produced with the

available quality standards. System flexibility depends on the accountability of the system in relation to changes in product or product specification therefore these factors are considered as performance parameters to measure the overall performance of the manufacturing system. As stated above, productivity is considered an important factor or measure the performance of a manufacturing system.

This study focuses on productivity improvement using the manufacturing modeling concept, improving the productivity ratio will give the manufacturing firm strength and stability in the working environment there. The current problem addressed by industries is lack of productivity (output). Industries need suitable and measurable methods and models with process flows by which productivity ratios will improve. This is the main root cause and affects the entire system of its productivity which leads to an increase in the cost of each floor.

To improve the quality of a product, it needs to reduce its deviation from its nominal value due to noise factors. Offline quality control is one of the main Counters for this purpose which can be implemented in three stages, namely: System Design, Parameter Design and Tolerance Design. Between these steps, tolerance analysis is a valuable tool to reduce manufacturing costs by improving producibility. Tolerance analysis of manufactured parts assemblies is an essential part of successful product development. In the recent decade, several authors have presented various useful methods of selecting design tolerance by employing either the manufacturing cost function or the quality loss function and / or a combination of both.

The goal of this study is to develop the model proposed by Mordinaftchelli et. Al (2015) for an assembled product with M assembly components and suitable alternatives to tolerances, as well as introducing a riskless approach to take improvement actions, resulting in minimal total cost. Here, the term "risk-free" indicates that producers should not incur additional costs by undertaking the improvement works. To overcome the difficulties of simultaneous choices of improved operation and tolerance, a series of algorithms are proposed that help save large amounts of computers by sorting out too many unnecessary evaluations. In quality engineering, parameter design is used to achieve the desired level of quality and economic tolerance design is used to allocate optimal tolerances to components so as to minimize the total cost. However, it is worth thinking about greater productivity during the allocation of tolerances to components by taking some improvement actions. The question could also be generated that "will the standard of some component be improved by this (lower total cost quite earlier cost?)". In this regard, Moradinaftchali et. Al (2015) has introduced a new approach to allocate tolerance to a component, resulting in a minimum total cost by performing improvement work. Through their method, the fixed relationship between the standard deviation and tolerance of the component is first relaxed and then other sources of variability are entered into the total cost model to implement the correction functions. The reason for this is that the manufacturing cost function reflects the cost to the manufacturer by tightening the natural tolerance based on controlling only some sources of variability and not all tangible sources.

Geeta et. al. (2015) have implemented a genetic algorithm to determine the best product sequence of scheduling and to assign tolerance of components based on three elements: manufacturing cost, quality loss and machine idle time cost. However, none of these authors considered the effect of improvement on productivity. Furthermore, all these studies considered a fixed relationship between standard deviation and tolerance, which, in fact, indicates a fixed value for the process capability index. Walter and Wartack (2013) developed an optimization method for tolerance-cost-optimization of a system in motion, which considers two main features of a system in speed during its use. Liu et. al. (2013) used an analytical method in a model involving two types of constraints, namely assembly tolerance constraint and lack of process accuracy to achieve optimal tolerance based on manufacturing cost and quality loss. Rao et. al. (2011) proposed a concurrent approach to determine tolerance at minimum total cost using three evolutionary methods, i.e., genetic algorithms, differential evolution and particle swarm optimization. Chen et al. (2013) constructed an optimal tolerance based on assembly deformation and quality loss with one application in the aircraft industry. Muthu et al. (2009) applied two meta-heuristics techniques, i.e. genetic algorithm and particle swarm, to consider both manufacturing cost and quality loss functions to allocate tolerance to components so as to reduce the total cost. They further conclude that the results obtained by these techniques outperform the results obtained by classical optimization approaches in terms of overall cost reduction for the overall slick clutch assembly problem.

Wu et al. (2009) considered non-explicitly constrained tolerance allocation problems to reduce the ratio between construction costs and risk (the probability of respecting geometric requirements). Peng and others. (2008) used a combined model to balance manufacturing costs and quality losses to achieve synchronously optimal allocation of design and process tolerances to each component for mechanical assemblies involving interrelated amplitude chains. Garth and Hancock (2000) developed a tolerance-based methodology for improving complex, multiple process systems that contain a large number of variables. Fang et al. (2001)

proposed a Stochastic Integer Programming (SIP) for simultaneous tolerance and selection based on suppliers' quality loss function and process capability indices.

Graph Related with Results and Actions (GRAZ) is based on a conceptual reference model that uses two graphical tools and a structural approach. In this conceptual representation model, a construction system is decomposed into three sub-systems: 1) Turning physical system into raw material. 2) managing the decision system and / or controlling the physical system. 3) Supporting informational information system. (Carrie and Mackintosh 1997; Chen, Valspire, Doomints 1997; Dumints 1985).

Integrated Computer-Aided Manufacturing DEFinition (ZDEFO) is a function modeling language that consists of a hierarchy of diagrams, text, and terminology. The diagram is the major component of an IDEFO model. It presents a construction system as boxes that are organized in a hierarchy. These boxes are associated with arrows, which represent data or object interfaces. The position of the attachment between the arrow and the box indicates the four interface types, namely, input, control, output, and mechanism / resource (Platinum) (Cheng-Leong, Feng, Leng 1999; Ang 1999; Colquhoun, Baines, Crossley 1993). Structured Analysis and Design Technique (SADT) uses many graphical tools including diagrams, actigrams, datagrams, node lists, and data dictionaries. Two types of elements, activities and data, are contained in a diagram. An actogram describes a relationship between elements of activities, and a datagram describes a relationship between data elements. (Santarek and Beusif 1998; Zaytoon, Neil, Mille 1994; Downs, Claire, Coe 1988). Structured Systems Analysis and Design Method (SSADM) provides the interface between method processes and techniques. With SSADM, the system can be broken into modules. A module consists of phases of various activities. It has many functions with inputs and outputs at each stage (Toh 1999, Ashworth 1988).

## II. PROBLEM DEFINITION

Products manufactured today, using tools and moulds (stripping, cutting and joining in our case) require excellent accuracy with good surface finish. It depends entirely on the type of machining parameters and the type of machining method used. Thus, precise control of parameters is necessary to optimize quality and improve productivity in manufacturing. Today tool makers manufacture daces and moulds using a wide variety of materials. Thus, machining of various materials in a minimum time and good surface finish is important. Here is where the problem starts i.e. different materials, different parameters and variation in machining time and surface finish.

### **Problem and its effects:**

The current major problem faced by the industry is machining time. Today's industry requires output to maintain product accuracy and surface in minimum time. This is where the problem lies, because of this a huge problem arises. They are as follows:

1. The cost of machining is high.
2. Machining time is longer for the process.
3. Machine working hours are also longer.
4. Since machining hours use more electricity than more.
5. Increasing machining hours increases labour costs.
6. The life of the machine is reduced because it remains in constant use.
7. The efficiency of the machining process is low.
8. High tool wear and tear due to reduction in tool life.
9. Timely delivery cannot occur because machining is slow.
10. It has high heat output due to high equipment contact area.

## III. DATA COLLECTION

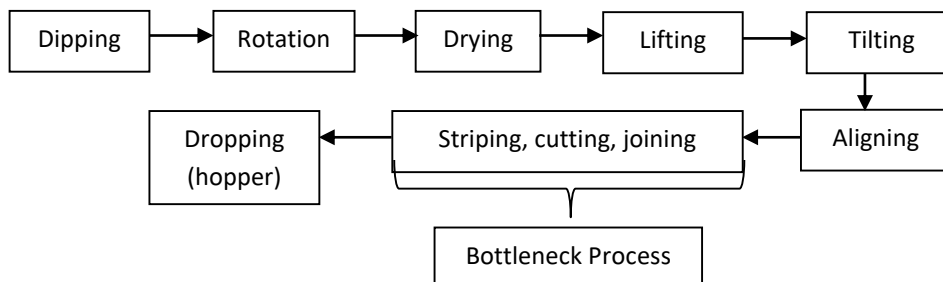
The purpose of data collection is to provide a basis for analysis, in other words, to transform data into information that is decision-making and useful. However, before collecting data, a data collection plan needs to be developed. In the manufacturing plant, data is collected to identify the bottleneck station and analyse them and eliminate them. The collected data is of direct observation in shop floor.

## IV. METHODOLOGY

Productivity improvement techniques are the methodology chosen to increase the production of capsule manufacturing. The work to be done is given as follows.

- From direct continuous observation.
- From the daily entry book of defects.
- Identifying bottleneck process.
- Analyzing bottleneck process.
- Effect on the overall-process and machines.

The following process shows the entire workflow of the machine.



**FIGURE 1: The process flow**

From the above process, we come to know that the striping, cutting and joining is the main bottleneck area which generate the more defects in the final product. To solve this defect, we have fixed and attached some parts of cleaning stuff like oiling on the source and full body oil distribution and oil greaser section in between the dispatching and dipping section.

## V. CASE STUDY

### 5.1. Introduction of the case study.

This case study reflects the productivity improvement of the desired product, by adjusting the parameters of the production area. The assembly point of the product is in the main auto-head section, where the stripping, cutting, and joining processes actually take place, applying methodology to the system will minimize the elimination of the product and improve the productivity ratio of the process. The main motto behind the case study is that reducing the number of defects on the desired product by not changing its characteristics and implementing the following and implemented process will not have any negative impact on the product.

### 5.2. Process Parameters.

**1) Collet/Push-rod Rotation:** The collet/Push-rod rotation is the rotational frequency of the collet of the machine, measured in Revolution Per Minute (RPM). The collet rotation speed depends on the size of the product.

**2) Cutting Speed (Vc):** Cutting speed may be defined as the rate (or speed) at the work-piece surface, irrespective of the machining operation used. The unit used is m/min.

**3) Depth of Cut (ap):** Cutting speed comes with depth of cut to determine the material removal rate, which is the volume of work-piece material (metal, wood, plastic, etc.) that can be removed per time unit. Its unit is mm.

**4) Surface Roughness (Ra):** Surface roughness commonly shortened to roughness, is a measure of the finely spaced surface irregularities. It is known as "surface finish". It is measured in Microns ( $\mu\text{m}$ ).

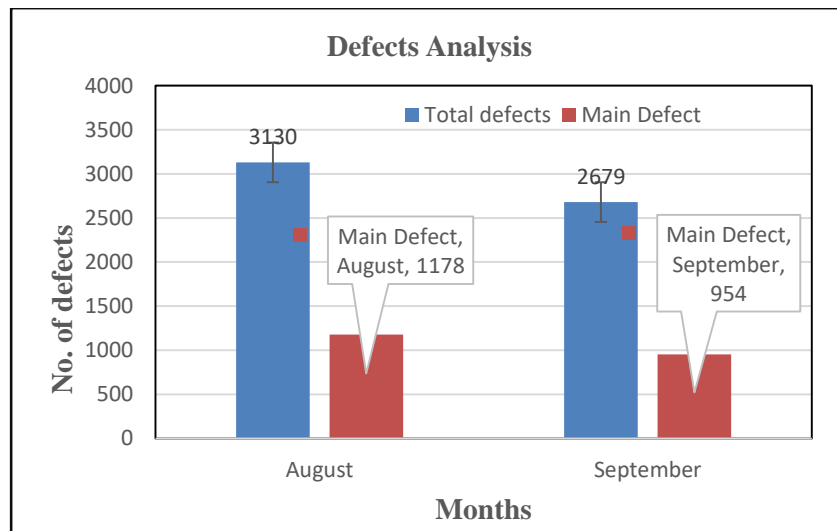
**5) Cotton Felt with Pad:** The cotton felt with the pad attached at the position of the stripping, cutting and joining section which is the bottleneck area of the all process, in which the most chances are arises that the defects comes from this area. The cotton felt provides oil to the lubrication part and pad with greaser distribute it to the whole body of the source.



**TABLE 1: DATA COLLECTION**

Machine Number	Months			
	August		September	
	No. of Defects	No. of C change	No. of Defects	No. of C change
33.	10	11	119	8
34.	83	19	44	18
35.	60	23	187	17
36.	882	21	511	16
37.	143	27	93	13
Total.	1178	101	954	72
Loss in Kgs.	64.24		99.39	
Sorting %	0.037		0.034	
Overall Defects	3130		2679	

The following table for data collection shows the recorded data of defects in the month of august and September, and the graph shows the defects analysis in graph by which one can easily understand the difference between the two.



**FIGURE 2: Defect analysis of August and September months**

## VI. CONCLUSION

From the collected data, it has been identified as that the main defects are generating at the stripping, cutting and joining section. The case study arranged in such a way that it eliminate the defects and meets the requirement of the process. By implementing, it can reduce the counts of defects by which there will not be any kind of wastage and reduction of wastages improve the productivity. By implementing the methodology. we found that there is improvement in the quality of the final product and it reduces scrap and



rework. Manufacturing defects less product will help to meet the demand. The following are the points which reflects the benefits to the organization.

1. The efficiency of the machine increases.
2. Reduction in defects loss.
3. Machining time reduces.
4. Power consumption reduce.
5. Tool wear & tear reduce.
6. Sampling time reduces.
7. No need of detailed observation.
8. Improves quality of the final product.
9. Productivity is high.
10. Machine life stabilize.

### ACKNOWLEDGEMENTS

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# Improving the Productivity by Increasing Availability at Skin Pass Mill by Time Study

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**Abstract**—The aim of this report is to Improving the Productivity by Increasing Availability At Skin pass mill by Time Study. This report gives brief introduction to Skin Pass Mill and its process. The subsequent time study is done on the delays of machine and some delays are reduced. SPM (skin pass mill) is one of the vital processing line of cold rolling mill & the delay at SPM line directly effects next line (finishing lines) production & timely delivery to customers. Annealed coils cannot be held for more than 60 hours in SPM WIP, due to chances of rust formation. So this project is mainly based on the view that there must be eliminate defects like rust & maximum continues running of line. This in terms involves study of various delays occur in line and reducing the ineffective time by time study. The time study is done for the whole machine and the comparison is done for empirically proved standard time duration. This project also involves solving the problem causing unnecessary time loss & operator fatigue. The Project also aims at improving safety by reducing man-machine interface.

**Keywords**—Skin Pass Mill, Time Study, Man Machine Interface, Pay off reel, Entry Bridle, Exit Bridle, Productivity, Availability.

## I. INTRODUCTION

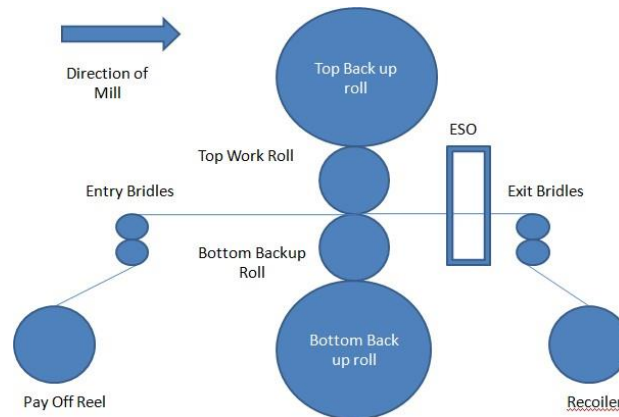
The Skin pass mills are used for a very light cutback to annealed stock. Their secondary uses are to impart a desired finish to the surfaces of the work piece. Electrostatic Oiler machine is designed to apply a uniform coating to a moving substrate, using Electrostatic forces at Spm.

The Classification of Skin Pass Mill are as follows:

- Dry Skin pass Mill
- Wet Skin pass Mill.

**Components of Skin pass mill are:**

1. POR (Pay Off Reel): The payoff reel is provided with four segment expanding/collapsing overhung mandrel, sliding base by means of hydraulic cylinder. Barrel Length: 1450mm, Collapse Diameter: 560mm, Expand Diameter: 630mm, True circle Diameter: 610mm, Motor Rating: 225KW
2. Snubber Roll: Hollow steel roll 200mm dia and 400mm long with polyurethane covering. Roll is driven by hydraulic motor along with chain and sprocket arrangement.
3. Tension Bridle Roll Assembly: The bridle unit is provided at mill entry and delivery side and is provided to deflect the strip, to give strip tension for Skin Passing
4. Cylinders For Work Roll Bending: The up and down cylinders built in the MAE WEST Block operate in co-operation with each other and apply an equal bending force to the upper and lower work rolls together resulting positive bending.
5. Back-Up Roll Balance Cylinder: This cylinder is also contained in the MAE WEST Block and use to press the upper BUR in case of mill operation and also during assembly changing.



**Figure 1: Skin pass mill**

6. No load screw down unit (Passline Adjustment Device): The pass line adjustment device is provided to maintain pass line within specific range. This is an electro-mechanical type screw down and having double worm and worm wheel reduction, AC motors and screw and nut with trapezoidal threads. The electric motors are coupled to each other by means of electromagnetic clutch. For all roll gap adjustment, this clutch is disengaged so that the top BUR can be lifted up by running the electric motor. The screw down arrangement is self locking.
7. Back –Up Roll: This is a special forged steel hardened roll fitted with 4 row tapered roller bearings on the roll neck. The bearings are lubricated with grease. Working Diameter: max diameter 1000mm and min diameter 930mm. Barrel Length: 1380mm without chamfer.
8. Work Roll: This is a special forged steel hardened roll, fitted with four row tapered roller bearing on roll neck. The bearings are lubricated by grease. The ends of work roll have across flat to receive the drive spindle head. Working Dia: max dia 40 mm and min dia 370mm. Barrel Length: 1430mm without chamfer.

## II. PROCESS DESCRIPTION

Main Activities from loading to unloading of the coil

1. Prepare the Coil
2. Unloading Tail End
3. Load the Coil on POR Mandrel
4. Feed the coil up to Mill
5. Feed the coil up to Recoiler
6. Feed the coil on Recoiler
7. Remove the coil from Recoiler
8. Coil Entry & Strapping

## III. TIME STUDY PROCEDURE AND ANALYSIS

### ACTIVITY 1: UNLOADING THE TAIL END

**TABLE 1: Unloading at tail end**

Sr No.	Main Activity	Sequence of Sub-activities	Actual avg Time	Standard Time
1		Line stop & remove tension		

2	1. Unloading the Tail end.	Cut the coil by exit shear	4 Mins	3 Mins
3		Forward the coil & sample cutting		
4		Remove the load		
5		Rewind the tail end on POR		
6		Take the coil car below tail end		
7		Tail end ring fixing		

From The above table it is concluded that this activity can be done in 3 minutes. We can salvage the 1 min duration from this activity.

#### ACTIVITY 2: TAIL END PUSHER TO UNCOILER EXPAND

**TABLE 2: Tail End Pusher to Uncoiler Expand**

Sr No.	Main Activity	Sequence of Sub-activities	Actual Avg Time	Standard Time
1.	2. Tail End Pusher to Uncoiler Expand	Coil Strap cutting and Removing.	3Min s	2Min s
3.		Put the strapping putty in Scrap Box		
4.		Coil Inspection		
5.		Coil Car alignment and Lifting of Coil		
6.		Alignment OF coil with Mandrel		

From The above table it is concluded that this activity can be done in 2 minutes. We can salvage the 1 min duration from this activity.

#### ACTIVITY 3: UNCOILER EXPAND TO EXIT SHEAR

Sr No.	Main Activity	Sequence of Sub-activities	Actual avg Time	Standard Time
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**TABLE 3: Uncoiler Expand to exit Shear**

Is	1.	3. Uncoiler Expand to Exit Shear	Front end bending by Peeler Table	4 Mins	3Mins
	2.		Feeding of Front end through / without Bridle Roller		
	3.		If front end is damaged cut it by Entry Shear		
	4.		Feeding of Coil in Mill		
	5.		Apply Load on Mill		

concluded that this activity can be done in 3 minutes. We can Salvage the 1 min duration from this activity.

#### ACTIVITY 4: EXIT SHEAR TO RECOILER

**TABLE 4: Exit Shear to Recoiled**

Sr No.	Main Activity	Sequence of Sub -activities	Actual avg Time	Standard Time
1.	4. Exit Shear to Recoiler	Feed the coil through exit bridle	5Mins	4Mins
2.		Front end bending		
3.		Feeding in Recoiler Mandrel		
4.		Remove Belt wrapper		
5.		Start the line thread		
6.		Stop line, Measure Sheet size (Thickness & Width )		

above table it is concluded that this activity can be done in 4 minutes. We can salvage the 1 min duration from this activity.

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**CORRECTIVE ACTIONS ON IDENTIFIED PROBLEMS**

**Problem Statement: Coils (HRSPO) are not transferred from pickling time to time resulting into delay in coil loading.**

Reasons for the coil being unloaded:

1. High age coils are to be processed first (To prevent from rusting).
2. According to the Ra requirement thicker gauge coils are to be loaded first (to be loaded as per thickness).
3. To be processed as per urgency of the customer or the next processing lines (Finishing lines).

While making the planning the operator will write R (red), Y (yellow), B (blue) & G (green) in front of the coil no. and will use respective colour cotton cloth for coil marking. Also the white board can be used to give identification to the crane operator by writing just R-Y-B-G.

**Problem Statement: HRSPO coils are not transferred from pickling timely resulting into delays in coil loading at SPM.**

Corrective action taken: One point lesson is been made to communicate with all employees so that by following the method suggested the resulting delay can be reduced.

Reason for abnormality: Not transferring of coils from pickling bay to Mill bay.

Troubleshooting : Timely follow up with pickling and crane department to shift the coils from pickling bay to mill bay.

**Problem Statement: In CRFH coils, front end position lies on top side which restricts the operator to perform coil preparation activity off-line.**

Corrective action taken: One point lesson is been made to communicate with all employees so that by following the method suggested the resulting delay can be reduced.

Reason for abnormality: In CRFH coils the front end lies on top side of the coil.

Troubleshooting: Put the strap cutter in strapping Patti and then load the coil on POR mandrel & cut the strapping Patti only after coil is been loaded on mandrel.

**Problem Statement: In Mode 2 problem while feeding the coil at top entry bridge due to inadequate provision for guiding the strip resulting into more coil feeding time in Mode 2.**

Corrective Actions: Pneumatic cylinder with wheel type rollers and guide bar is provided for guiding the front end of the coil to avoid manual intervention during feeding the coil in Mode 2.

**Problem Statement: At ESO (Electro Static Oiler) teflon guide plates are having less size which was resulting into stuck up of front end while coil feeding through ESO and subsequent delay in coil feeding activity.**

Action Taken:

Guide plate length and width increased for better guiding of strip and to avoid stuck up of coil. Additional guide plate provided at ESO for ease in guiding the strip.

#### **IV. RESULTS AND DISCUSSION**

Total Handling time reduced from 16 Mins to 12.72 Mins.

Achieved Handling Time	12.92	Mins / Coil
Saving	2.77	Mins / Coil
Target Handling Time	2,838	Hrs/Year

## V. CONCLUSION AND FUTURE WORK

Thus we can conclude that after execution of this project the operational delays are reduced up to great extent and thus increasing the efficiency& availability of the system as well as reducing unnecessary labour fatigue also improving the safety and moral of employees. The company will be going to implement many advance techniques for achieving the above purposes such as provision of cameras for inspection purpose, auto control of loading, bending and other parameters and auto entry of coil in the system.

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## Determination of Stress in Propeller Blade through FEA

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**Abstract**— Propeller design aim at achieving high propulsive efficiency at low levels of vibration and noise. As a neighborhood of the analysis static structural testing was conducted by varying material properties in pre-processing stage.. After importing IGES file, further analysis was done using ABAQUS .Achieving the high propulsion efficiency had become quite difficult, since ships are becoming larger and larger. SOLIDWORKS modeling software is used in the generation of BLADE MODEL and For FEA[Finite Element Analysis],ABAQUS software is used. Properties of a certain element is introduced in the software , for the generation of the stress results The propeller model developed in SOLIDWORKS is converted in to IGES file and then imported to mesh for developing fine mesh of the model.

**Keywords**— ABAQUS, FEA, mesh, propeller , SOLIDWORKS

### I. INTRODUCTION

The propeller may be a vital component for the safe operation of ship stumped . it's therefore important to make sure that ship propeller have adequate strength to with stand the forces that influence them. Fiber reinforced plastic composite have high strength to weight and these materials have better corrosion resistance, lower maintenance, nonmagnetic property and it even have stealth property for naval vessels. The forces that act on a propeller blade arise from thrust and torque of the propeller and therefore the force on each blade caused by its revolution round the axis A propeller may be a sort of fan that transmits power by converting motion into thrust. A pressure difference is produced between the forward and rear surfaces of the shaped blade, and air or water is accelerated behind the blade . Propeller dynamics are often modeled by both Bernoulli's principal and law. A propeller is that the commonest propulsion on ships, imparting momentum to a fluid which causes a force to act on the ship. Three, four, or five blades are commonest in marine propellers, although designs which are intended to work at reduced noise will have more blades. The blades are attached to a boss (hub), which should be as small because the needs of strength allow - with fixed pitch propellers the blades and boss are usually one casting.

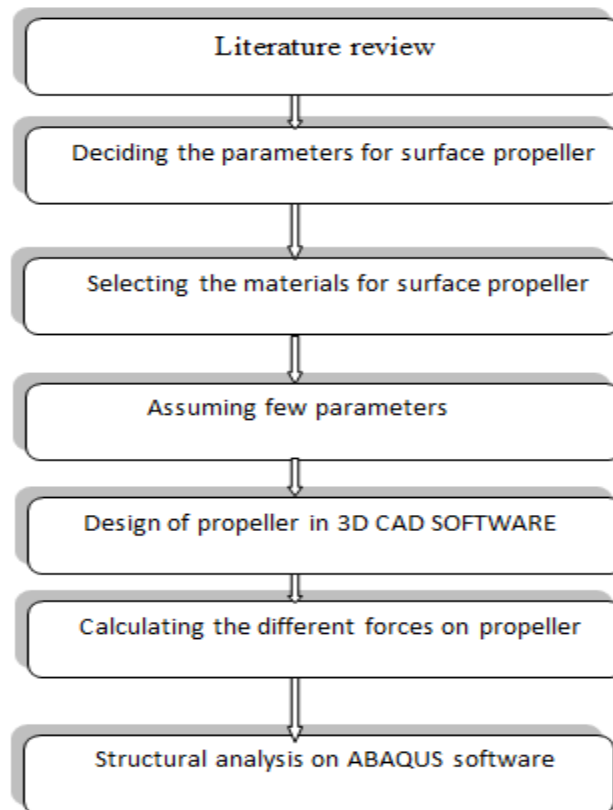
A ship needs system to maneuver in water, so by employing a thrust – producing mechanism the ship moves. There are many thrust-producing devices called propellers like screw propellers, pump jet, water jet etc which producing by high speed crafts, ships, pleasure crafts and torpedoes. The speed of marine vehicle depends on the selection of system . The thrust from the propeller is transmitted to maneuver the ship through a transmission which consists of a rotational motion generated by the most engine crank shaft, intermediate shaft and its bearings, stern tube shaft and its bearing and eventually by the propeller itself .Surface piercing propeller has emerged as an integrated solution for high-speed craft, to beat the issues like cavitations, low draught & shallow water restrictions that's prominent with these crafts. it's also easily adaptable for various operating speeds. These propellers operate in partially submerged condition, mostly in inclined position and draws in bubble along the blade on the rear surface. The air bubbles contract or expand on the surface right along its underwater operation and avoid cavitations and its imp lied problems like vibration, erosion and thrust breakdown. This propeller eliminates the appendage drag thanks to the brackets, shafts including the drag thanks to Magnus effect of the shaft . In is best suitable for little and high - speed crafts and has virtually no limit on size of propeller thanks to draught restrictions. These propellers are freely adoptable for giant range of auto speeds by adjusting the immersion.It is suitable for very high craft to achieve high speeds. Steering requirements can also be met partially by adjustment

of the angles of the shaft. Fiber reinforced plastics are extensively utilized in the manufacturing of varied structures like radomes, wingtips, stabilizer tips, antenna covers, flight controls including the marine propeller. The hydrodynamic aspects of the planning of composite marine propellers have attracted attention because they're important in predicting the deflection and performance of the propeller blade. Reinforced plastic features a high strength-to-weight ratio and is immune to mildew and decay . Because it's easy to fabricate, it's equally suitable for other parts of the marine propeller. Reinforced plastic may be a sandwich-type material. it's made from two outer facings and a middle layer. The facings are made from several layers of glass cloth, bonded along side a liquid resin. The propeller model developed in SOLIDWORKS is converted in to IGES file then imported to HYPERMESH for developing fine mesh of the model. As a neighborhood of the analysis static structural testing was conducted by varying material properties in pre-processing stage. After importing IGES file,further analysis was done using ABAQUS

## II. PROBLEM STATEMENT

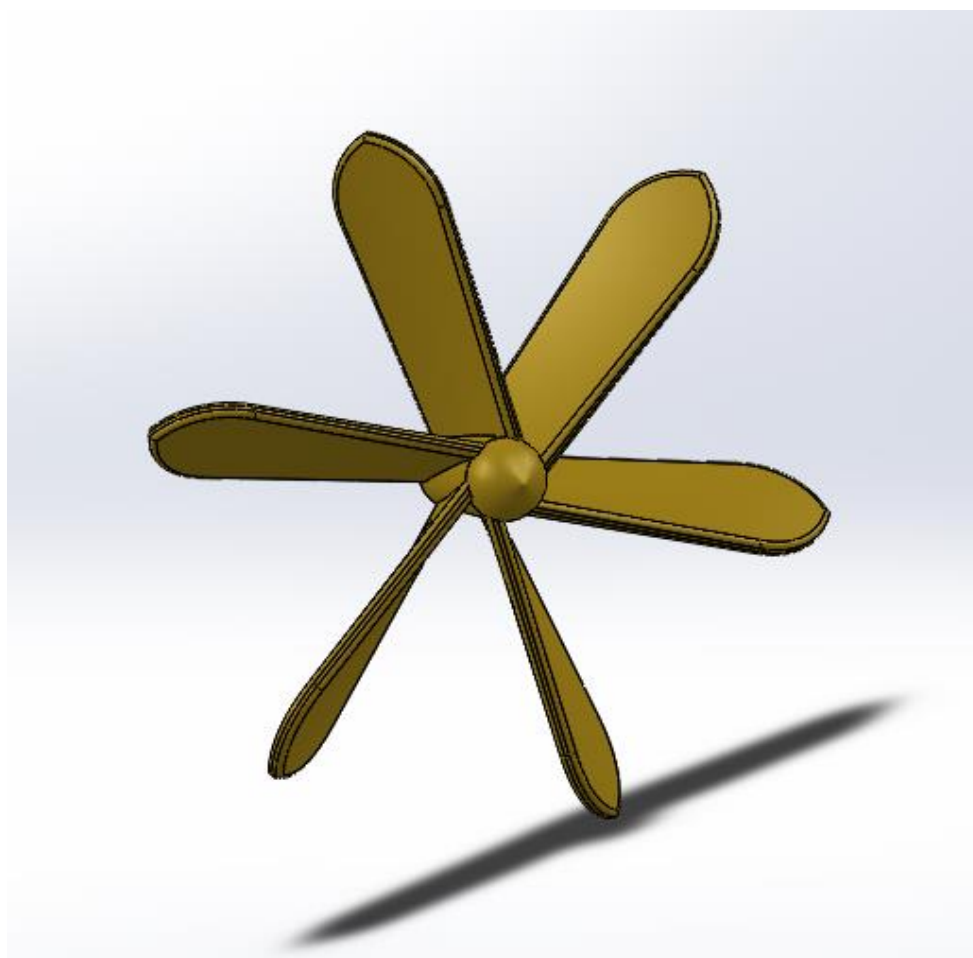
After reading research papers which were proposed for analyzing the stress on propeller blade we come to one sub conclusion that many ships and naval vessels meet with accidents due to propeller failure, which is ultimately caused by improper load distribution on surface propeller blade also, main cause is due to improper analyzing of stress which is going to get applied by varying hydropressure which is caused due to high turbulent flow of waves that are caused in the abyss Selection of material in manufacturing of propeller plays a crucial role for analyzing the stress on it. As there are few materials which comes to the failure over the course of time and due to high turbulent flow of water currents. Hence we can use different types of composite material to conquer this affair.

## III. METHODOLOGY



**Table 3.1: Methodology flow chart**

By referring different research papers which have proposed analysis over a propeller blade, concluding the important points and we proceed to the further process. For the ease of the overall procedure, we consider suitable properties of the material, geometry and dimensions for smoothening its further analysis. Hence it can function suitably. Specific metals or composite materials can only be use for propeller. Selecting improper material may lead to ultimate failure. Hence selection of material plays a crucial role in the functioning of the propeller. We design a 3D propeller model on Solidworks, by giving it approximate dimensions and angles, so that it can mimic the actual propeller. Thereafter, we import it to the desirable FEA software i.e. ABAQUS. Then the model is assigned proper material. In the final step, as per the finite element analysis, we impose the boundary conditions and proper directed pressure. Henceforth, the results are generated.



**Figure 3.1: solidworks design of propeller**

**Table 1**

**Dimensions specifications**

Sr. No.	Entity	Dimension	Sr no.	Entity	Dimension
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01	Hub Diameter	1 meter	06	Blade Width	1.5 meter
02	Hub diameter (inner)	0.8 meter	07	Blade thickness	0.2 meter
03	Hub Length	2 meter	08	Blade fillet corner	0.1 meter
04	No. of Blades	6	09	Blade Area	6 meter <sup>2</sup>
05	Blade Length	4 meter	10	Skew Angle	15 <sup>0</sup>

**Table.2**

**Mechanical properties of materials**

Material	Stress(MPa)	Tensile strength	Modulus of elasticity	Hardness no.	Sp. Gravity
Manganese bronze	200	510	107	145	8.2
Chromium Stainless steel	450	680	200	220	7.8
Low carbon steel	250	450	200	130	7.9
Austenitic cast iron	235	435	105	150	7.1
NAB	295	635	125	208	7.5

Among All above materials NAB (Nickel Aluminium Bronze) is selected for propeller blade owing to its high tensile strength and moderately high modulus of elasticity Propellers being rotating devices need to withstand very high hydrodynamic force centrifugal force , torque and hydrodynamic lift. So NAB is suitable according to the design parameters

**Table 3**

**Some mechanical properties of NAB**

Properties	Values
Shear strength	415 MPa
Proof strength	295 MPa
Specific heat	420 J/kg-K
Thermal conductivity	42W/m-K
Elongation	17%

Modulus of rigidity	49 GPa
Poisson's ratio	0.32
Fatigue limit in water (for $10^7$ cycles)	205-235 MPa
Coefficient of linear expansion	$17.1 \times 10^{-6}$

#### IV. CONCLUSION

After doing overall analysis we will get the stress values on different materials on propeller blade. Henceforth we will be able to filter an optimum stress of the following material to withstand different stresses in ocean. Getting a brief idea for propeller manufacturing and its various performing functions. Finally we have concluded that the main thing about this project is that we can analyze a huge body structure into small scale 3D structures which are affected by many forces under water ultimately leading to high efficiency of expense in ground stage of production of the product, also by selecting the materials of optimum properties and efficiency. Therefore one can reduce the manufacturing cost of the ship propeller.

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## Design and Analysis of Open Type Differential Gear Box

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**Abstract**— The main objective of this project is to perform structural analysis of open type differential gears in gear box. We have taken different aluminum alloy and malleable cast iron materials for conducting the analysis. Presently used materials for gears and gears shafts is Cast Iron, Cast Steel. So, in this paper we are checking as the aluminum alloy can be the other material for the differential gear box for light utility vehicles so, we can reduce the weight. The analysis is to be on Abaqus CAE software. It's a product of Solid works. In the present work all the parts of differential are designed under static condition and modelled. Modelling and assembly are done in SOLIDWORKS.

**Keywords**— ABAQUS, Open type car differential gear box, SOLIDWORKS, Structural analysis

### I. INTRODUCTION

A differential is a device, usually but not necessarily employing gears, capable of transmitting torque and rotation through three shafts, almost always used in one of two ways: in one way, it receives one input and provides two outputs this is found in most automobiles and in the other way, it combines two inputs to create an output that is the sum, difference, or average, of the inputs. In automobiles and other wheeled vehicles, the differential allows each of the driving road wheels to rotate at different speeds, while for most vehicles supplying equal torque to each of them. A vehicle's wheels rotate at different speeds, mainly when turning corners. The differential is designed to drive a pair of wheels with equal torque while allowing them to rotate at different speeds. In vehicles without a differential, such as karts, both driving wheels are forced to rotate at the same speed, usually on a common axle driven by a simple chain drive mechanism. When cornering, the inner wheel needs to travel a shorter distance than the outer wheel, so with no differential, the result is the inner wheel spinning and/or the outer wheel dragging, and this results in difficult and unpredictable handling, damage to tires and roads, and strain on (or possible failure of) the entire drive train<sup>[3]</sup>.

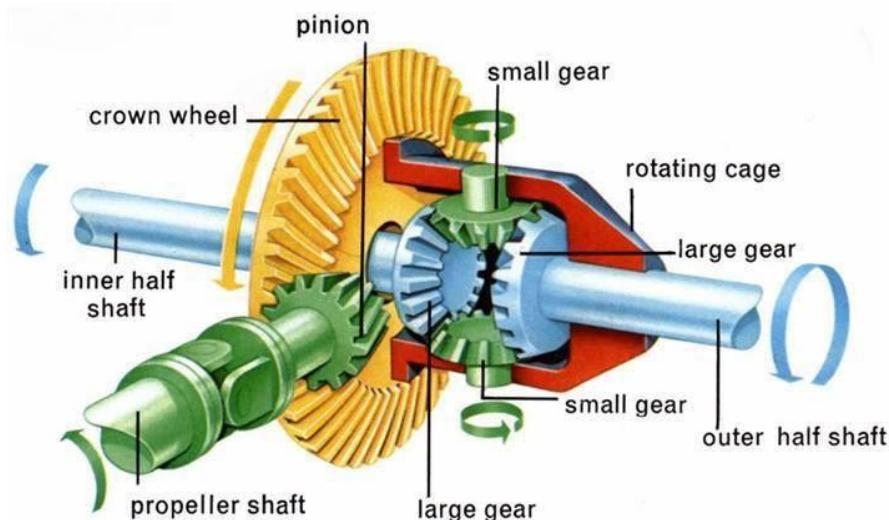


Figure 1: Open type differential

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## II. OBJECTIVES

- Creating the frictional contact between two mating gears.
- Structural analysis on gear box by providing the torque to the sun gear in the differential gear box.
- Calculating total deformation and Von-Misses stresses<sup>[4]</sup>.

## III. ABAQUS

ABAQUS/CAE is a software used for both the modelling and analysis of mechanical components and assemblies and visualizing the finite element analysis result. It provides a complete interactive environment for creating abaqus models, submitting and monitoring analysis jobs and viewing and manipulating simulation results.

Important features of abaqus:

- Creating parts using the feature-based modeler.
- Importing parts into abaqus/ CAE.
- Partitioning parts.
- Meshing.
- Defining analysis attributes.
- Submitting and managing abaqus simulations.
- Viewing the results of the simulations.

Every complete finite element analysis consists of 3 separate stages:

- Pre-processing or modelling: This stage involves creating an input file which contains an engineer's design for a finite element analyzer (also called "solver").
- Processing or finite element analysis: This stage produces an output visual file.
- Post-processing or generating report ,image ,animation, etc. from the output file: This stage is a visual rendering stage<sup>[7]</sup>.

## IV. METHOD

### 4.1 Specifications of differential gear box

The main aim of the project is to verify the best material for the gears in the gear box at higher speeds by analyzing stress, displacement and also by considering weight reduction focus on the mechanical design and contact analysis on assembly of gears in gear box when they transmit power at different speeds at 2400 rpm, 5000 rpm and 6400 rpm. Analysis is also conducted by varying the different composites materials for gears. Differential gear is modeled in SOLIDWORKS. The ABAQUS CAE software were used as the analysis tool for determining the structural behavior of various composites under the given loading conditions<sup>[6]</sup>.

Specifications of used axle:-

Gear profile: - 20-degree full depth involute profile (standard)

Pressure angle ( $\alpha$ ):- 20 degree

Bevel gear arrangement = 90 degree

Pitch cone Angle ( $\phi$ ) = 45 degree

Back cone Angle ( $\beta$ ) = 45 degree



Number of teeth on ring gear =  $Z_g = 60$

Module = 5

#### 4.3 Calculations for sun gear and spider gear

1. Pitch circle diameter (D)

Diameter of sungear =  $D_g = 290\text{mm}$

Considering diameter of pinion =  $D_p = 70\text{mm}$

2. Number of tooth on gear

Number of teeth on gear =  $Z_g = 20$

Number of teeth on pinion =  $Z_p = 20$

$D = D_g + D_p = 360\text{ mm}$

$T = Z_g + Z_p = 40$

3. Module =  $M = D/T = 360/40 = 9$  (according to stds)

4. Velocity Ratio

$V.R = Z_g/Z_p = D_g/D_p = N_p/N_g$

$V.R = D_g/D_p = 290/70 = 4.142$

$V.R = N_p/N_g$

$4.142 = 2400/N_g$

$N_g = 576.43\text{rpm}$

5. Pitch angle

Since the shafts are at right angles therefore pitch angle for the pinion =  $\theta_{p1} = \tan^{-1}(1/v.r)$

$$= \tan^{-1}(1/4.142)$$

$$= 13.57$$

Pitch angle of gear  $\theta_{p2} = 90^\circ - 13.57 = 76.43$

6. Formative Number Of Teeth

For the pinion =  $Z_{ep} = Z_p \sec \theta_{p1} = 20 \sec(13.57) = 37.22$

For the gear =  $Z_{eg} = Z_g \sec \theta_{p2} = 20 \sec(76.43) = 38.963$

7. Pitch Cone Distance (AO):

$$AO = 82.7\text{mm}$$

8. Face Width (b):  $82.7/3 = 27.5 \text{ mm}^{[6]}$

#### 4.4 Material properties

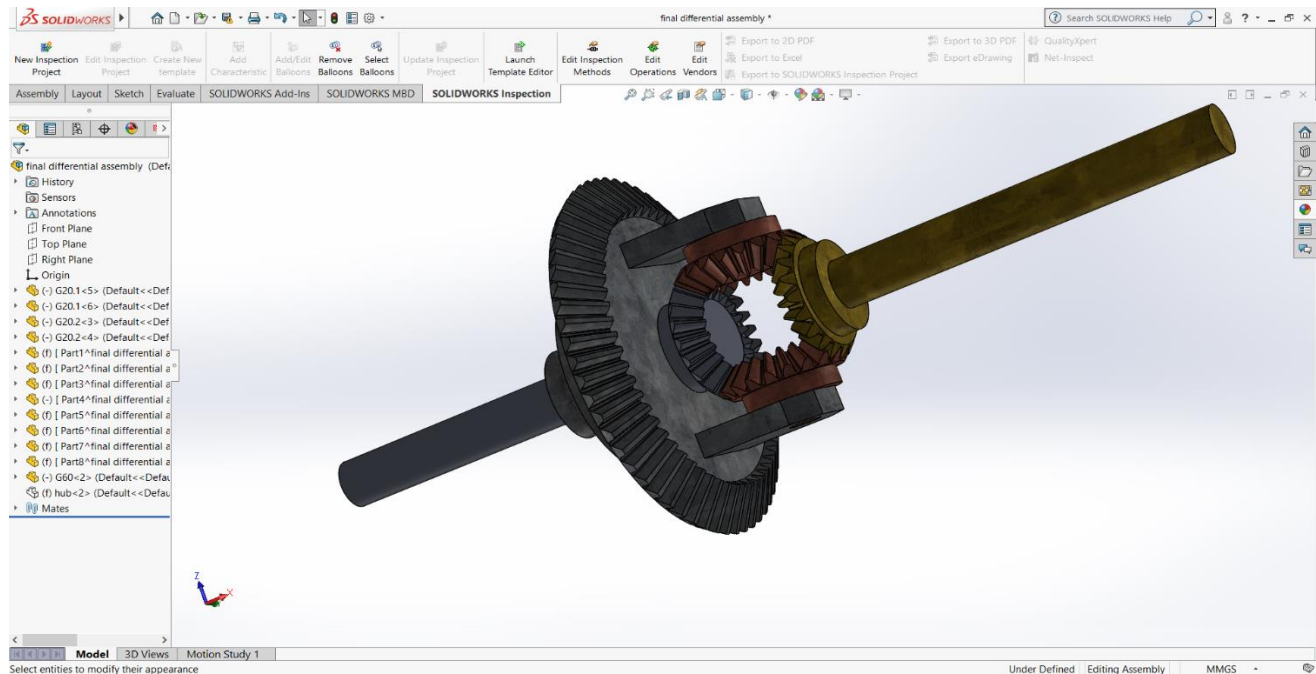
**TABLE 1**  
**PROPERTIES OF MALLEABLE CAST IRON**

Name	Malleable cast iron
Model type	Linear elastic isotropic
Default failure criterion	Max von mises stress
Yield strength	2.75742e+0.008 N/m <sup>2</sup>
Tensile strength	4.13613e+0.008 N/m <sup>2</sup>
Elastic strength	1.9e+011 N/m <sup>2</sup>
Poisson's ratio	0.27
Mass density	7300 kg/m <sup>3</sup>
Shear modulus	8.6e+010 N/m <sup>2</sup>

**TABLE 2**  
**PROPERTIES OF ALUMINUM ALLOY**

Name	Al_alloy7475-1761
Model type	Linear elastic isotropic
Default failure criterion	Max von mises stress
Yield strength	1.65e+0.008 N/m <sup>2</sup>
Tensile strength	3.0e+0.008 N/m <sup>2</sup>
Elastic strength	7e+011 N/m <sup>2</sup>
Poisson's ratio	0.33
Mass density	2600 kg/m <sup>3</sup>
Shear modulus	3.189e+010 N/m <sup>2</sup>

#### 4.5 Solid modelling of differential



**FIGURE 2:Final assembly of Differential Gear box in SOLIDWORKS**

#### 4.6 Structural analysis of on ABAQUS software

The assembly of differential is imported on Abaqus software in .igs or .iges format. Its application used for both the modelling and analysis of mechanical components and assemblies (pre-processing) and visualizing the finite element analysis result.

### V.CONCLUSION

Observing the structural analysis results using Aluminum alloy the stress values are within the permissible stress value. The present work relates to differential gear box as an effective alternative to existing metallic open type differential gearbox. Computer aided engineering software is found to be useful tool for various design stages. Reference model of Differential gear box is selected and SOLIDWORKS is used to develop various parametric models. The torque applied to differential gear box would be 140 ,235 ,320 Nm. Different aluminum alloy material is used for gears and are analyzed using ABAQUS for equivalent (Von-Misses) stress, displacement (total deformation). Comparisons of various stress and strain results with different aluminum alloy and metallic materials (Alloy Steel and Cast Iron) and at different rpm are to be performed<sup>[3]</sup>.

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# Design and Fabrication of Automatic Dustless Chalk making Machine

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**Abstract**— In today's world of automation the traditional chalk making machine is left behind due to lack of automation in this industry. Our project work includes the design and fabrication of automatic dustless chalk making machine. Our main aim is to automate the traditional chalk making machine for ease of manufacturing. The machine consists of traditional machine components such as Hopper, Mould and Ejectors as well as electronic system for the purpose of automation.

The basic working of this machine is to mix the ingredients of chalk in the Hopper with the help of AC motor, this mixture is poured in the mould and dried with the help of heating system. The ejection system ejects the chinks from the mould, the ejected chinks are collected in a tray. All the above processes are automated with the help of Electronic Control Unit (ECU). The automation system consists of speed controller of AC motor, sweeping movement is controlled by servo motor, the sliding movement of the mould and ejection movement is control by stepper motors. The sensors like temperature and humidity, displacement are used to sense various parameters.

**Keywords**— Automatic, Chalk machine, Dustless, Engineering, Mechatronics.

## I. INTRODUCTION

In our project we are designing and fabricating the automatic dustless chalk making machine. Our main purpose of the project is to reduce the manpower and production time. In order to achieve this we have used electronic control unit such as Arduino-Mega for the automation in the traditional chalk making machine and implementing of direct heating of the mould in order to reduce the drying time thus making the process faster .

The ECU controls the various motor viz. stepper motor and servo motor, it also alters its parameters like speed and movements. We use induction heating to heat the water and this heated water is circulated through the mould surface for better heating. For easy ejection of the chalk from the mould the ejectors are used to penetrate through the mould holes pushing the chinks downward in the tray placed below.

The chalk composition used is same as the dustless chalk available in the market. The machine will produce 225 chalk at one pass, we can also produce different color chinks as per requirement.

## **II. PROBLEM DEFINITION**

### **2.1 Problem statement**

After searching for various prototypes of chalk making machines, we found out that the low scale machines are not automatic and loaded manually. The processes take several hours for completion of one batch of chalks. The available automatic machines required skilled labour, more area for installation and their initial cost is high as compared to low scale machines.

The low scale chalk making industry uses old school chalk making machines which are incapable of mass production. The machine used require more efforts and man hours which in leads to high labour cost and eventually reduces the profit. The chalk produce from this type of machine takes more time for drying. Due to more idle time the quality of the chalk manufactured is poor.

### **2.2 Objective**

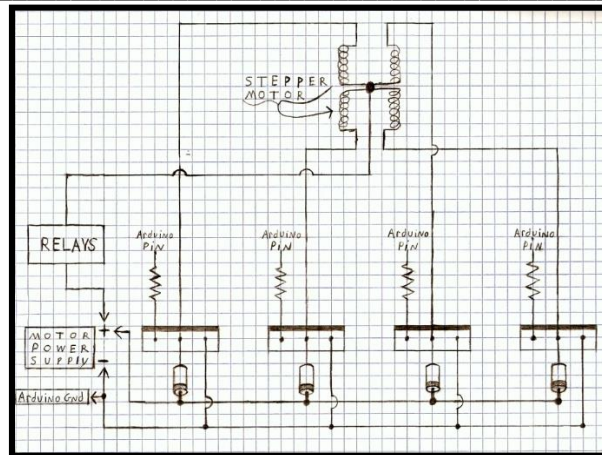
The main objective of the project is to design and fabricate Automatic Dustless Chalk making machine to reduce the manpower, process time, increase the production and quality of chalk and better utilization of traditional chalk making machine.

### **2.3 Advancements**

Following modifications will be made in our machines to overcome the drawbacks of old school machines-

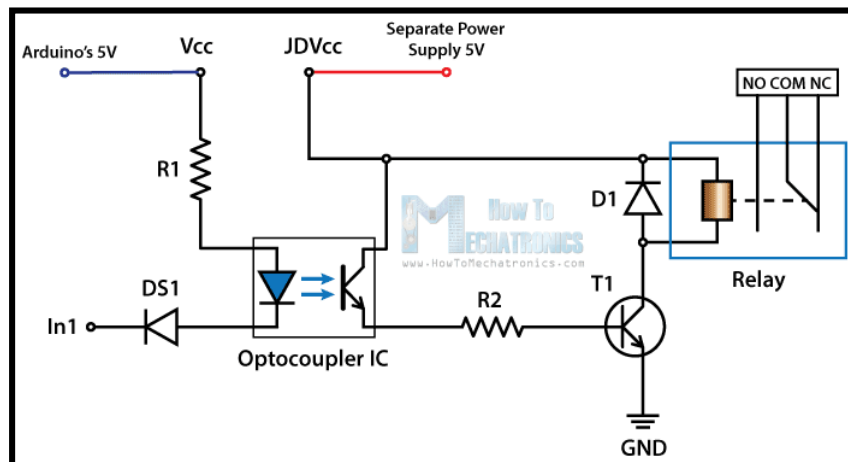
1. In our machine we are using ECU control for automation of machine, which will control the various operation of the machine.
2. For the purpose of reducing the process time of drying we are implementing integrated heating of mould.
3. Our machine can produce 110 numbers of chalk per batch in approx. 2hrs, which eventually reduces production lead time and hence increase in productivity.
4. As the chalk business is quantity type more production of chalks, ultimately increases the profit of manufacturer.
5. As the machine is fully automated the quality of product will be as per desired standard.
6. The efficiency of this machine will be higher than traditional chalk machines.

As the processes are automatic stepper motor are used to move the mould from one section to another and actuation of ejector is also carried out by the stepper motor of high capacity. To control the stepper motors by Arduino Mega relay drivers are used for signaling the direction of rotation of stepper motor. Figure below shows a basic circuit of relay driver.



**FIGURE 1: Relay circuit of one stepper motor**

The Arduino uses DC power source to operate. To control the AC motor by Arduino an AC relay switch is used. HL-52S 2 channel relay is suitable to control AC motor of 240V. Figure below shows circuit diagram of AC motor control relay.



**FIGURE 2: Circuit diagram of AC motor controller switch**

### III. PROPOSED METHODOLOGY

We are designing and fabricating Automatic Dustless Chalk Making Machine by using ECU. The basic structure hopper, electric motor, mould, stepper motor and ECU mounted on the frame. When the chalk mixture pours in the hopper, it is mixes in the hopper with help of blades for the definite time. The mixture is then poured into the mould and excess material is wiped out by slider which is connected to stepper motor. The heated water circulated around the mold and dries the mixture in the mould. The mold slides towards second station with the help of slider. At the second stage the ejection process takes places where ejector pushes the chawks out of mould with the help of stepper motor. All this processes are done automatically and controlled by ECU.

#### 3.1 Steps for design and fabrication of machine

The Design and Fabrication of our Automatic Dustless Chalk making Machine is carried out in following steps –



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**3.1.1 Designing of structure and components**

The first step is to design the frame which is the main structure of machine on which all the other parts are to be mounted. The stresses and vibrations are to be calculated which are going to act on the frame and the vibrations produced needed to be damped so the machine has to be design to absorbs vibrations produced. Some of the components which are not available in the market are to be designed and analysed so that they does not fail during operation.

**3.1.2 Ordering the designed parts**

Second step includes the parts which are needed for the design and fabrication of the machine and are available in the market has to be ordered because of their standard size such as nuts and bolts, electrodes for welding, Arduino Mega, stepper motors, threaded rods, motor coupling, linear bearings, frame material, etc.

**3.1.3 Fabricating the structure**

Third step is to make the actual frame from the material ordered. In this step the material has to be cut according to the sizes required, welded where ever needed and bolted for the maintenance purpose. After the frame is ready it will have to be checked for any failure before installing other parts such as electronic components, mould, ejector and hopper.

**3.1.4 Designing of mould**

The next step is to design a custom mould for 220 charks in one batch of dimensions (180mm×180mm×70mm). And for heating the mould, holes of ½ inch diameter are to be drilled through it and in to the surrounding surface area so that heating effect is achieved for all the charks. The material of the mould is to be of high thermal conductivity so that heat flow rate is maximum.

**3.1.5 Assembling of Parts**

After the frame is setup the next part is to assemble all the other components of machine such as AC motor for mixing, Hopper, Stepper motors, Stepper motor relay, Ejector, Mould and chalk tray for collecting the produced charks.

**3.1.6 Programming the Electrical Control Unit (ECU)**

The sixth step is to program the Arduino Mega for controlling all the electrical components such as stepper motor, AC motor, distance sensors, temperature and humidity sensors, Servo motor as per the requirement of the processes.

**3.1.7 Testing the machine for the objective to be achieved**

After the program is uploaded to the Arduino Mega the next step is to check the working of all the electrical components like direction of stepper motors, temperature sensor reading the room temperature as well as hot water, working of servo for required angle, display screen displaying all the processes currently running on, the ejector ejecting the charks after they are dried.

### 3.1.8 Checking the quality of product produced

The last step is to check the quality of the chalks produced by the machine. The dryness achieved by the heating system.

The length of the chalks are equal so that further processing is not needed like slicing.

## IV. CONCLUSION

We will be designing and fabricating the Automatic Dustless Chalk Making Machine. To do so we went through various research papers which helped us to understand the mechanisms and processes to fabricate the machine. As we get to know the main drawbacks of traditional machines in the market is high lead time and low productivity, we concentrate on reducing manpower, lead time and increasing the productivity. By using the stepper motors and electrical control units for automating the chalk making machine and also a heating system embedded in the project to reduce the drying time of the chalks. We have even designed mould and ejectors on the 3D model software.

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# The Improvement of Manufacturing Process by Using Quality Tools

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**Abstract**— In the era of competitive markets and globalization, quality-related concepts and philosophies have emerged as strategic issues at all institutional levels and across all industries and services. No one can deny the importance of quality in the modern global competitive market, where only those who survive can offer quality products. In 1986, Edward Deming described the "Deming Chain Reaction" in his book *Out of Crisis*. According to him "When quality improves, cost reduction (less rebuilding, fewer mistakes, less delay and better use of the machine, time and materials), cost reduction productivity improves, productivity is happier, they capture the market with better quality and lower prices and therefore they do business They will grow their business The parties cannot deny the importance of quality in such a competitive market where they can offer the same live, good quality product. Seven quality tools were developed independently of each other, but it was first developed by a doctor from the University of Tokyo during the Quality Revolution in Japan. Korunu Ishikawa is popular. Dr. Koru Ishikawa did not invent all of these devices, some of them already in use since 1900, but he took these seven devices and built this set of seven instruments, calling them "the original seven devices of quality." This is why these devices are also called quality Ishikawa equipment. These tools are also known as basic quality tools because they are popular with the public and require less formal training statistics and are used to solve quality-related problems. Come on. Quality tools can be applied in many ways in the process industry, but the PDCA cycle and the DMIC method are well-known and widely used techniques that can be applied in the industrial process through quality.

**Keywords**— PDCA, DMIC, Quality Tool, Productivity.

## I. INTRODUCTION

Quality management can be used as a competitive advantage for an organization. According to ISO 9001:2008, organizations should ensure that customer requirements are determined, to ensure their satisfaction. Thus, organizations need to improve their processes and for that use a set of practices, which include various techniques and tools, including most importantly quality tools. Ishikawa discusses the importance of implementing quality tools, stating that 95% of quality problems can be solved by simple tools such as the basic quality tools. The importance of quality tools is recognized by stating that many businesses do not succeed in implementing Total Quality Management (TQM), since they do not apply appropriate methods of quality management, especially quality tools. According to, quality tools can be used at all stages of the product development and production, with the goal of cost reduction and customer satisfaction. However, it is recommended first to diagnose the different processes to identify those most in need of improvement. This will provide managers with the justification for the selection of one particular process for improvement over others. Once the process has been selected, a definition of the problem must be made and the right tools must be chosen to make the resolution more effective and efficient.

Quality tools can be applied in many ways in the process industry, but the PDCA cycle and the DMIC method are well-known and widely used techniques that can be applied in the industrial process through quality. PDCA is Deming's continuous development cycle. PDCA is a four-step iterative cycle used to improve the process, do, study, and act. The planning phase involves setting quality goals and observing the process, collecting data in the second phase, identifying the problem, the third phase analyzing the problem and finally eliminating the problems and taking steps to achieve the quality goals. The DMAIC methodology is similar to the PDCA cycle but with steps

DMAICs are a little more detailed than PDCA cycles. DMAIC is defining, measuring, analyzing, improving and controlling. The DMAIC method is used to improve the process. DMAIC is a systematic basis for improving the process by defining the problem

and measuring its effectiveness, examining why the problem occurs, and then correcting the process by eliminating the problem and controlling the process without further problems.

Lopez, et al. [1] Demonstrate a study on the use and improvement of quality tools in Portuguese companies. The main results of this study show that Portuguese companies recognize the value and effectiveness of quality equipment, but their use is limited to this recognition. Companies with low levels of maturity in quality processes use certain tools and grow as they reach higher levels of maturity. Jha et al [2]. A case study was conducted to reduce scrap on automotive assembly lines using quality control equipment. Rhys. R et al [3] conducted research in the fan manufacturing industry to address quality issues and improve quality by implementing the basic seven tools of quality. These are important tools used worldwide in manufacturing industries for continuous improvement. Flow charts, check sheets, histograms, cause and effect diagrams, Pareto charts, scatter diagrams, and control charts to define the problem, measure its effectiveness, determine its impact and determine the product. Removals were implemented at various stages of the manufacturing process. In objects that are not deficient. G. Paliska et al [4], this paper deals with a section of extensive research on universalization regularization in the application of seven basic quality tools (7 QC tools). Research has been conducted in various fields, including power plants, process industries, government and health and tourism services. The purpose of the research is to show on practical examples that there is a real possibility for the application of 7QC devices. Nankana, A. N [5], A detailed and systematic study of older 7 QC devices is presented in this paper. The main objective of this paper is to easily introduce and understand the application of the basic 7 QC to improve the quality of any manufacturing process. QC tools include collecting data, analyzing data, identifying root causes and measuring outcomes. These tools are related to numerical data processing. All of these tools together provide great process tracking and analytics, which can greatly contribute to quality improvement. These tools make it easy to see, implement and track quality improvements. Furthermore, it helps to deal with the basic concepts of classic and modern field QC tools and shows how basic quality tools can be used to solve problems and improve quality. William Edwards Demming, 1982 [6], Deming's deep insights stand the test of time. Every leader who cares about quality improvement in the deepest meanings of the word - which improves people's lives - should be well-read in Deming's philosophy and methods. Deming needs to understand how society and the economy operate, not in the name of efficiency, but because of humanity. Ishikawa. K, 1985 [7], Total Quality Management (TQM) is recognized as an effective management philosophy for continuous improvement, customer satisfaction and organizational expertise. Since this concept was initially developed in the field of manufacturing, there is much doubt as to whether this philosophy applies in education. In this regard, the main objective of this study is to examine the compatibility of TQM with education. At the same time, this study seeks to identify important challenges in the implementation of TQM in education. It is hoped that this study will draw a meaningful conclusion about the trade-off of TQM in education and at the same time provide insights into the challenges that create barriers to TQM implementation in education. Wu et al. (2009) [8] consider explicitly constrained tolerance allocation problems to reduce the ratio between construction cost and risk (GRAZ is a conceptual two-graphical context based on contextual use of geometric requirements with results and measures) and a structural approach. In this conceptual representation model, the structural system is decomposed into three sub-systems: 1) the transformation of physical systems into raw materials. 2) Managing the decision system and / or controlling the physical system. 3) Supporting Information Systems. Chen et al. (2013) Walter and Wartock (2013) [9] have developed an optimization method for the tolerance-cost-optimization of a system in motion, which considers two key features in the use of the system in motion. According to Liu et al. Al. (2013) used an analytical method in a model that included two types of constraints, namely the assembly tolerance barrier and the lack of process accuracy to achieve optimal tolerance based on manufacturing costs and quality losses. Rao and. Al. (2011) [10] proposed a singular approach for determining the minimum total cost tolerance using three evolutionary methods, namely genetic algorithms, differential evolution and particle swarm optimization. Muthu et al. (2009) [11] can apply two meta-heuristics techniques, namely genetic algorithms and particle clusters, to consider both manufacturing cost and quality loss functions to allocate tolerance to components to reduce total cost, so that their results can be reduced to the overall optimization clutch assembly problem by these methods Classical Opt Aijesan surpass the results obtained by the procedure. [12] built an appropriate tolerance based on assembly disability and quality loss with an application in the aviation industry. Geeta and. Al. (2015) [09] implemented a genetic algorithm to determine the best production order of scheduling and component tolerance based on three factors: manufacturing cost, quality loss, and machine idle time. However, none of these authors considered the impact of improvement on productivity. Furthermore, all these studies mediate the exact relationship between standard deviation and tolerance, which in fact represents a fixed value for process efficiency index

### **Problem Defination**

There are many quality issues identified during work in the industry. The way to quality is to improve by constantly changing, adding, removing and refining processes. Achieving quality is not a journey and a destination.

Furthermore, the needs and community needs of learners are constantly changing and therefore the products and services provided must be constantly changed to meet these needs. There is always room for improvement in educational institutions. Additionally, choosing who to work with is part of the planning process. There may be improvements in teacher and learner interactions across sectors for improvement in educational institutions; Improve communication between practitioners and the organization; Improving learning by helping learners monitor their work; Performance evaluation and the like.

### **Problem and their effects:**

Defective product is one of the mutual problems shared by all the corporations.

- A defective product in a product that does not meet the criteria set for the cause of the production process and for other reasons usually includes physical changes.
- Disability products may be caused by machinery, humans or environmental factors.
- Product defects can also be a loss of the company such as cost and production time.
- Also, if most defective products are manufactured, it increases the cost of repairs and other costs. Not only this, defective products can also lower the selling price.

To deal with product shortcomings, each company should have a quality control unit that checks for any defects in the product before marketing.

## **II. DATA COLLECTION**

The purpose of data collection is to provide a basis for turning data into information, in other words, to make decisions and be useful. However, before collecting data, a data collection plan must be developed. At the manufacturing plant, data is collected to identify the obstacle station and analyze and eliminate them. The data collected is under direct observation on the shop floor.

## **III. METHODOLOGY**

Basic statistical tools are of great importance because there are seven indispensable tools for quality for any organization to thrive at the peak of excellence. The concept behind the seven basic tools comes from Koru Ishikawa, which states that 95% of quality problems can be solved with these basic tools. The ability to identify the problem, use appropriate means, and communicate the solution quickly to others, depending on the nature of the problem, is the key to successful problem solving. Seven basic quality improvement tools are used to assist in data collection and integration, problem definition and / or resolution, pattern or trend analysis and analysis:

- (i) Check sheet
- (ii) Histogram,
- (iii) Pareto chart
- (iv) Cause and effect/Fishbone diagram
- (v) Scatter diagram
- (vi) Control charts
- (vii) Flow chart/Run chart/Stratification diagram

## IV. CASE STUDY

### 5.1. Introduction of the case study.

The problem investigated in this case study is about the rejection of lath beds, because defects that cause inflammation after the heat treatment process have been used to provide the necessary hardness. Criteria for Acceptance As specified by the design department, a rigid bed is expected to have a certain stiffness and a bed without hardness is rejected. A flame hardening process that satisfies the hardness of the HRC from about 42 (Lower Specification Limit, LSL) to 48 (Upper Specification Limit, USL). 48 HRC rejected in bed maintenance with a hardness greater than 48. HRC is measured with the Rockwell C Scale. Rockwell Scale A hardness scale based on the indentation hardness of a material, and the result is a dimensionless number called HRA, HRB, HRC, where the final letter is the corresponding Rockwell scale.

**Data Collection:** To determine the quality of the lath bed, hardness data were collected on 32 beds and the reading of the hardness inspection is given in Table 1. The run chart of the hardness values is shown in the figure. 2.

**Hardness values (in HRC) of 32 Beds**

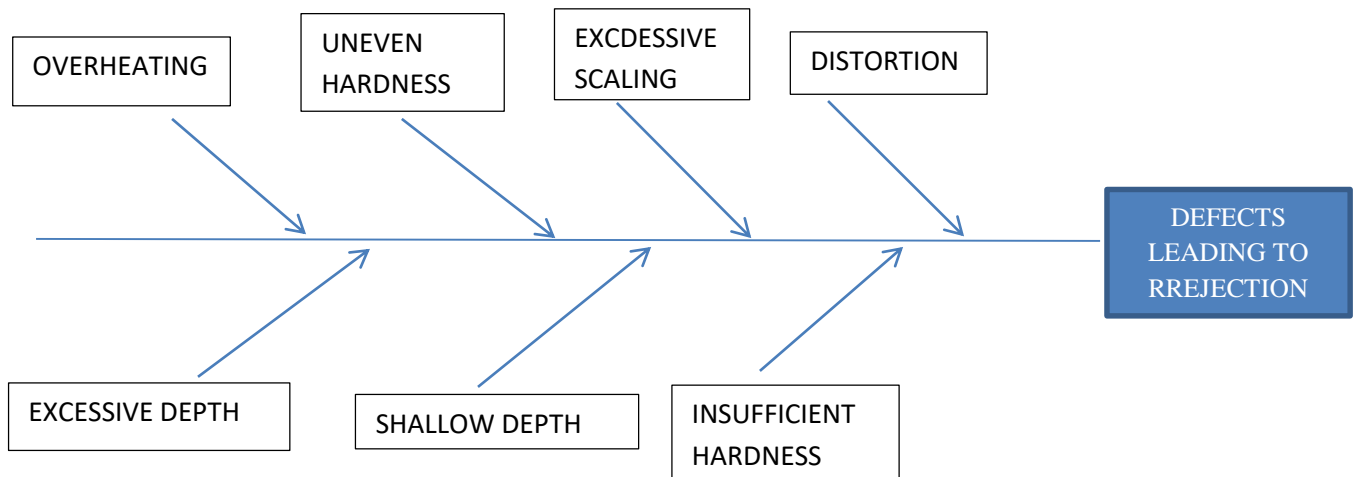
No.	Hardness	No.	Hardness	No.	Hardness	No.	Hardness
1	44	9	45	17	45	25	45
2	50	10	51	18	45	26	47
3	49	11	48	19	47	27	48
4	44	12	45	20	51	28	48
5	47	13	45	21	44	29	43
6	44	14	42	22	50	30	45
7	49	15	45	23	48	31	45
8	45	16	43	24	47	32	43



**FIGURE 1: Run chart of hardness values**

### Cause and Effect Diagram.

A brainstorming session and also conducted some trial runs of the flame hardening process and came out with the reasons behind dis satisfactory results in the hardness values. Based on the data they collected, a cause and effect diagram was constructed as shown in Figure 3. The seven main causes were further explored for the sub-causes and the Table 2 summarizes the causes for each main reason behind the hardness defects.



**FIGURE 2: Cause and effect diagram for the rejection of lathe Beds**

## V. CONCLUSION

These devices are helpful in every phase of defect removal. From the case study it has been concluded that the basic seven instruments of quality are very useful and effective in identifying and removing defects from the manufacturing process. This case study quality guru Dr. Reinforces Ishikawa's famous statement that "95% of quality-related industrial problems can be solved by applying the seven-basic means of quality".

## ACKNOWLEDGEMENTS

After completion of this work, I would like to give my sincere thanks to all those who helped me reach my goal. It is a moment of great pleasure and immense satisfaction for me to express my deepest gratitude to my mentor and head of department, Prof. Niyati Raut, whose continued encouragement enabled me to work enthusiastically. His continued motivation, patience and outstanding expertise in discussion during the progress of the project work has benefitted us to an extent that is beyond expression. Last but not the least, I would also like to thank all the staff of VIVA Institute of Technology (Mechanical Department).



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## Static and Dynamic Analysis of an all-Terrain Vehicle

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**Abstract**— Single unit of all-terrain vehicle (ATV) has been analyzed and developed by 4<sup>th</sup> year Mechanical Engineering students of Faculty of Mechanical Engineering, (VIVA Institute of Technology). The aim of this project is to do the static and dynamic analysis of the designed ATV on ANSYS software. The students have to organize themselves to design and build the ATVs within budget constraint. This project emphasizes on the practical and engineering applications of the subjects like Vehicle Dynamics and Automotive Technology which are taken by the students within the same semester. The students have all the freedom in deciding the specifications of the ATV.

**Keywords**— ANSYS, ATV, VEHICLE DYNAMICS

### I. INTRODUCTION

The objective of the study is to design a safest vehicle for driver. The roll cage is designed strictly according to the safety standards given to us. Line model of the roll cage & 3D Assembly of whole vehicle is modeled in SOLIDWORKS 2018. Finite element analysis (FEA) is carried out on line model of roll cage in cases of front collision, rear collision, rolling; dynamic, front bump & Rear bump analysis in ANSYS. FEA of suspension arms was carried out in ANSYS. Based on the result obtained from above tests the design is modified accordingly. The Centre of Gravity was tried to keep in middle of the vehicle & closest to the ground for optimum stability. The length of the vehicle was kept small so as to reduce weight and maintain a desired center of gravity, while the width of the vehicle was keeping the most to maintain stability in turns.

## II. PROBLEM STATEMENT

All-Terrain vehicle or an ATV is basically a Land based automobile capable of reaching remote areas where normal vehicles like cars/bikes cannot reach. ATVs have a wide range of applications nowadays like in Military, Forest departments, Farming, etc. The project is to analyze an ATV by calculating all the required parameters, analyzing CAD model of each component and making the complete assembly of an All-terrain vehicle on Solid works CAD software.

## III. METHODOLOGY

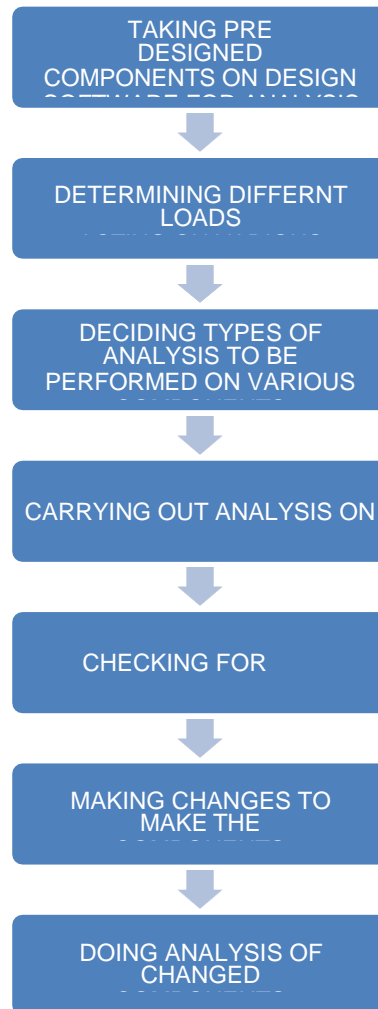


Fig. : The Process Represented

As a Flowchart

#### IV. CONCLUSION

The chosen design was the safest and the most reliable car for any long terrain. All the parameters like safety, cost, performance, reliability, durability, aesthetics, standard dimensions and material were also taken in consideration on the same time. Where ever possible finite element analysis was done on the regularly loaded parts and modifications were done accordingly to avoid any type of design failure. In case of rolling front and rear curved members Behind the driver's seat) take the side load equally not like in other designs where only the rear curved members were made to bear the side rolling loads.

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## Design and modelling of an all terrain vehicle

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**Abstract**— The aim of this study is to do all the design considerations, make necessary calculations involved in the design of an ATV. The focus has been laid on the simplicity of design and its high performance. The design and development comprise of material selection, chassis and frame design, design of various components of powertrain, suspension and wheel assembly, braking system and steering system. During the entire design process, innovative ideas was always the primary goal. Most of the OEM (original equipment manufacturer) components have been chosen keeping in mind the easy availability and reliability and also according to the proposed design calculations. Keeping all parameters in mind we are going to design a vehicle which is ergonomic, aerodynamic, highly engineered and easily manufactured. Hence it makes the vehicle more efficient. Our vehicle can easily navigate through almost all terrain, which ultimately is the objective behind the making of any all-terrain vehicles.

**Keywords**— ATV, BRAKING SYSTEM, CHASSIS, POWERTRAIN, STEERING, SUSPENSION

### I. INTRODUCTION

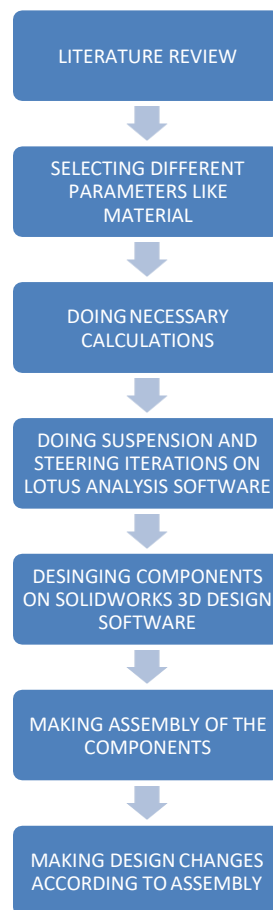
The objective of the study is to design a safest vehicle for driver. The roll cage is being strictly designed in accordance with SAE BAJA 2014 rule book. 3D Assembly of whole vehicle & Line model of the roll cage is modeled in SOLIDWORKS 2018. Finite element analysis (FEA) is carried out on line model of roll cage in cases of front collision, rear collision, rolling; front bump & Rear bump analysis in ANSYS. FEA of suspension arms was carried out in ANSYS. Based on the result obtained from above tests the design is modified accordingly. The Centre of Gravity was tried to keep in middle of the vehicle & closest to the ground for optimum stability. The length of the vehicle was

kept small so as to reduce weight and maintain a desired center of gravity, while the width of the vehicle was kept the most to maintain stability in turns.

## II. PROBLEM STATEMENT

All-Terrain vehicle or in short called as an ATV is basically a Land based automobile capable of reaching remote areas where normal cars/bikes cannot reach. ATV have a wide range of applications nowadays like in Military, Forest departments, Farming, etc. The project is to design an ATV by calculating all the required parameters, designing CAD model of each component and making the complete assembly of an All-terrain vehicle on Solid works CAD software.

## III. METHODOLOGY



**FIGURE 1:**Flowchart of Methodology

The material used for roll cage is AISI 4130 (chrome-moly steel) i.e. chromium molybdenum alloy steel. This was selected on a comparative study on parameters like Availability, Cost, Weight and Strength. The primary objective of the roll cage is to provide the driver safe driving conditions. Great emphasis was put on the safety of the driver as well as on Driver Ergonomics while designing the chassis.

The transmission system must be able to deliver maximum torque from the engine to the wheel. Hence, continuously variable transmission (CVT) is used to gain maximum torque. The vehicle is powered by a 10HP OHV Briggs and Stratton engine with maximum torque of 19Nm at 2600 RPM and it is governed to the maximum RPM of 3800. CVTech CVT is used which has an overall ratio of 3.5:1 to 0.45:1. In addition to CVT it contains two stage reduction gearbox which is made up of Aluminum for a light weight housing of gears. The first reduction ratio is of 2.33 and second reduction ratio of 3.6 which provides the required velocity. The drive shaft is customized for required dimension with proper design. Both the end of half shaft contains CV joint. One end is connected with spool and another end is connected with wheel drive. The design aim of the steering team was to ensure smooth maneuvering of vehicle during Corners. In order to achieve this ratio of vehicle wheelbase to track width is kept close to 1:1. Steering system hard points were first fixed by considering the clearance and ergonomics. Later within the given range, iterations were made on the lotus analysis software for verification of the hard points and better dynamic behavior of steering system. Special attention was given to toe change during bump condition to ensure that the vehicle motion is in driver's control. Customized rack and pinion were opted to achieve a steering ratio of 3:1 that ensures vehicle lock to lock steer travel of 100mm with steering wheel rotation of 180 degrees while inner wheel angle at 43.67 degree and outer wheel angle at 29.21 degree i.e. an Ackerman percentage of 84.3% at static. Steering wheel diameter of 7 inch was designed considering driver input force of 60N to enable steering of vehicle without causing fatigue to driver during the endurance. Steering effort of 14 Nm is required to steer the vehicle.

Fox Float 3 Evol R series shocks were used as they are light in weight and incorporate variable stiffness Parameters. They provide a travel of 5 inches and have an extended length of 18 inches. In front, unequal double wishbone type suspension is incorporated which provides flexibility in design for required roll center height, camber gain, for efficient cornering and low unsprung weight. In rear H-arm and camber link is used. The use of an H-type lower arm and a single lateral upper link is a special case where the H-arm is being asked to perform the function of four links instead of just three.

The objective behind the braking system is to lock all the four wheels statistically and dynamically and to increase the safety of the driver and maneuverability of the vehicle. Tandem master cylinder with four outlets is used to generate hydraulic pressure which will induce a clamping force between brake rotor and friction pads of brake caliper. Dual piston caliper is used to generate more clamping force and it also results in compact wheel assembly with less unsprung mass. Brake rotors are custom manufactured to achieve the required output and to achieve design requirement for reduction of weight. Brake lights are activated by hydraulic pressure transducer which actuates at required pressure resulting in increased safety. Brake fluid of DOT 3 grade is used. Brake lines in the circuit are OEM product having maximum working pressure of 135 bars against the actual working pressure of 83.9 bars.

#### IV. CONCLUSION

The chosen design was the safest and the most reliable car for any long terrain. All the parameters like safety, cost, performance, reliability, durability, aesthetics, standard dimensions and material were also taken in consideration on the same time.



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- [12] Harsh Raghuvanshi[1], N.S. Ramnaveen[2], Puneet Malhotra[3], Rakshit, Anurag Khatri[4]: International Journal of Engineering and Advanced Technology (IJEAT) Innovative Design of an All-Terrain Vehicle (ATV)

# MANUFACTURING AND TESTING OF AN ALL TERRAIN VEHICLE

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**Abstract**— Single unit of all-terrain vehicle (ATV) have been fabricated by 4<sup>th</sup> year Mechanical Engineering students of Mechanical Engineering, (VIVA Institute of Technology). The purposes of this project are to manufacture ATVs at low cost. The students have to organize themselves to build the ATVs within budget constraint. This project emphasizes on detailed practical and engineering applications of the topics of Vehicle Dynamics and Automotive Technology which are taken by the students within the same semester. The students have all the freedom in deciding the specifications of the ATVs.

**Keywords**—ATV, Manufacture, Vehicle Dynamics

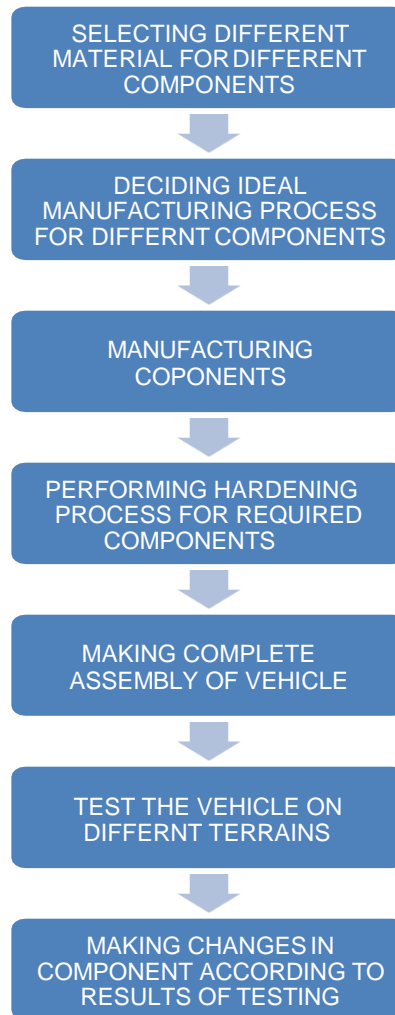
## I. INTRODUCTION

The objective of the study is to fabricate safest vehicle for driver. The roll cage is being strictly fabricated in accordance with SAE BAJA rule book. 3D Assembly of whole vehicle & Line model of the roll cage is modeled in SOLIDWORKS 2018. Different processes are used to manufacture different components with a view to reduce cost and achieve proper tolerances at same time. Different validation techniques are used to validate safety standards and attain required performance of vehicle. The Centre of Gravity was kept in middle of the vehicle & closest to the ground for maximum vehicle stability.

## II. PROBLEM STATEMENT

An all-terrain vehicle (ATV), also known as off-road buggy consists of a quad, quad bike, three-wheeler, four-wheeler as defined by the American National Standards Institute (ANSI) is a vehicle that travels on low-pressure tires, with a seat that is straddled by the operator, along with handles for steering and cornering control. As the name implies, the ATV is designed to handle a wider variety of terrain than most other vehicles. Although it is a street-legal vehicle in some countries, it is not legal within most states and provinces of Australia, the United States or Canada.

### III. METHODOLOGY



### IV. CONCLUSION

The chosen design was the safest and the most reliable car for any long terrain. All the parameters like safety, cost, performance, aesthetics, reliability, durability, standard dimensions and material were also taken in consideration on the same time. Where ever possible finite element analysis was done on the regularly loaded parts and modifications were done to avoid any type of failure. In case of rolling front and rear curved members behind the driver's seat take the side load equally, not like in other designs where only the rear curved members were made to bear the side rolling loads.

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## A Review on Stress Analysis of Alloy Wheel

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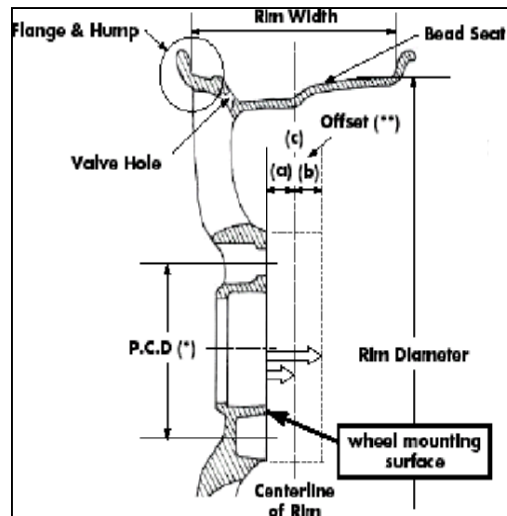
**Abstract** -The research paper focuses on to review the determination of best suitable wheel rim material by performing FEA analysis on them. Wheel is the main mechanical part of the vehicle suspension system that has to withstand various loads encountered during vehicle action. The alloy wheel rim should be strong enough to withstand these loads. The material used for alloy wheel should be selected very carefully to withstand different stresses and deformations. Accordingly, materials like aluminium, magnesium and zinc alloy are studied by applying loads. The model is designed on Solidworks software and then the analysis is done using Abaqus software. The static condition is used for the analysis of the alloy wheel. At last the results of total deformation and equivalent stresses are obtained for different wheel rim materials and compared with each other. Thus, the best material can be selected for the manufacturing of the alloy wheel.

**Keywords**— FEA, Alloy wheel, ABAQUS

### I. INTRODUCTION

The significance of wheel and tires in the vehicle cannot be challenged. Without engine, the car may pull, but without the wheels, it is not possible. The wheel thru tires takes complete load and decreases friction, and delivers cushioning effect to the passenger by absorbing vibration due to road surface unevenness and support in steering control. The wheel is a device that enables efficient movement of an object across a surface. Early wheels were simple wooden discs with a hole for the axle which further seemed to be inefficient. The spoke wheel was invented more recently, and allowed the construction of lighter and swifter vehicles. Alloy wheels are automobile wheels which are made from alloys like aluminium and magnesium. Alloy wheels are better heat conductors than steel wheels and also lighter in weight than them. Automotive manufacturers have been developing safe, fuel efficient and lightweight vehicular components to meet government regulations. In the real service conditions, the determination of mechanical behaviour of the wheel is important, but the testing and the inspection of the wheels during their development process is actually time consuming and costly. For economic reasons, it is important to reduce the time spent during the development and testing phase of a new wheel. Since it is difficult to estimate the stresses by 3-D stress analysis using elementary mechanical approximations, Finite Element Analysis(FEA) is used for the purpose.

- 1) Wheel: Wheel is generally composed of rim and disc.
- 2) Rim: This is a part where the tire is installed.
- 3) Disc: This is a part of the rim where it is fixed to the axle hub.
- 4) Offset: This is a distance between wheel mounting surface where it is bolted to hub and the centerline of rim.
- 5) Flange: The flange is a part of rim, which holds the both beads of the tire.
- 6) Bead Seat: Bead seat comes in contact with the bead face and is a part of rim, which holds the tire in a radial direction.
- 7) Hump: It is bump what was put on the bead seat for the bead to prevent the tire from sliding off the rim while the vehicle is moving.



**FIGURE 1: Wheel Rim**

**Nomenclature**

## II. OBJECTIVE

- 1.. To optimize the design of alloy wheel .
2. To determine the stresses on the alloy wheel under operational loading.
3. To achieve reduction of time by reducing the number of product development cycle.
4. To reduce cost by simulating the testing of model on computer instead of expensive test.

## III. LITERATURE REVIEW

Karthik A.S. et. al, 2016 [1] used Finite Element Techniques to find out stress and displacement distribution in vehicle wheels subjected to increase pressure and radial load. The model was made using “CATIA V5” and the analysis was done through “ANSYS Workbench”. Jaspreet Singh et. al, 2015 [2] considered an wheel for the analysis. During the part of thesis project aluminium alloy was carried out for the FEA analysis. The static condition was chosen for the analysis and software used was ANSYS 15.0 .The pressure was applied on the outer rim of the aluminium alloy wheel. P. Meghashyam et. al, 2013 [3] created a model of the wheel rim with the help of CATIA software. Later this CATIA model was imported to ANSYS for the analysis work. With the help of ANSYS software, the different forces, pressure acting on the component were analysed. ANSYS static analysis was done by taking into consideration two different materials aluminium and forged steel. N. Satyanarayana et. al, 2012 [4] performed a static analysis on aluminium alloy wheel A356 by using FEA package. The 3D model was designed by using CATIA and imported into ANSYS using iegs format. The analysis was performed in a static condition. The pressure was applied on the rim. FEA was carried out by simulating the test conditions to analyze stress distribution, fatigue life, safety and damage of alloy wheel. Kalpesh R. S. et. al, 2017 [5] analysed stress and displacement distribution in automobile wheels subjected to increased pressure and radial load , and took essential efforts to discover the Finite element techniques. Alloy wheel was designed using Creo software and static structural analysis was done with different materials , load and boundary conditions using Ansys software. The

maximum total deformation and equivalent stresses obtained were lowest for ZA21. Hence it is the best suitable material for alloy wheel rim.

#### IV. MATERIAL

**TABLE 1**  
**MATERIAL USED (5)**

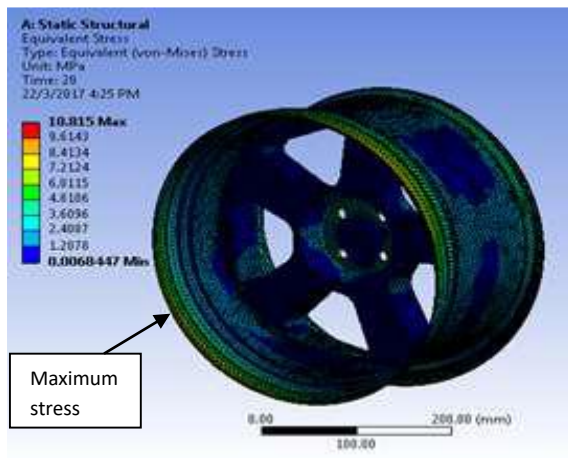
Properties	Aluminium 6061	Magnesium AZ91D	Titanium 6A-4V
Density(g/cm <sup>3</sup> )	2.70	1.8	4.6
Young's Modulus(GPa)	71	45	96
Poisson's Ratio	0.33	0.35	0.36

#### V. METHODOLOGY

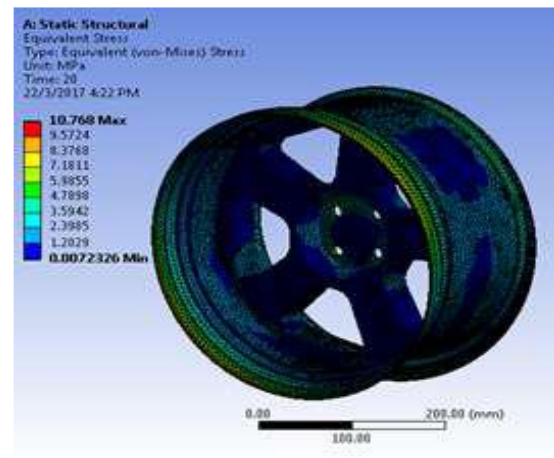
In this paper reviewed the concept of radial fatigue testing for estimating the fatigue life of aluminium alloy wheel by conducting the manual testing and comparing the same with finite element analysis using ANSYS software. Fatigue life prediction using the stress approach is mostly based on local stress. In radial fatigue test the recommended minimum external diameter is 1.2m for wheels with rolling radius of less than 0.5m and 2.4m for larger wheels. The finite element analysis method is an effective approach for predicting the failure mode of an automotive component of wheel during wheel design stage [6]. FEA simulation of the wheel can significantly reduce time cost required to finalize the wheel design. As in the case of an automobile wheel maximum load is applied on the alloy wheel. Among aluminium, magnesium and titanium, maximum deformation noted was for Magnesium and Titanium has less equivalent stress and deformation but it is costly as compared to other [1]. The CATIA file was imported into ANSYS15.0. After application of boundary conditions and loads it was found that maximum deformation for aluminium alloy was at the circumference of the wheel and minimum at the bolt portion [2]. ANSYS static analysis is carried out using two different materials namely aluminium and forged steel and found that aluminium wheel rim is subjected to more stress compared to forged steel [3]. The analysis was executed in a standing state on aluminium alloy wheel A356.2 using FEA package. After applying pressure on the rim, using ANSYS found that the total deformation of wheel maximum is 0.2833 and minimum is 0.031478 [4]. A static FEA was performed on the alloy wheel to determine their critical areas. The mesh size in the analysis should be considered because it will affect the accuracy of the result. The accuracy of result increased with the decrease in the number of element size. The analysis indicated that the most critical part of an automobile alloy wheel is located at the circumferential area of the rim. In particular, titanium alloy is the most suitable material but is very expensive [5]



## VI RESULTS



**FIGURE 2: Stress distribution (Aluminium) [5]**



**FIGURE 3: Stress distribution (Magnesium) [5]**

## VII CONCLUSION

A wide literature survey is carried out in the research area of wheel rim materials to study the performance of the alloy wheel rim using established experimental methods . Commonly used materials are AL alloy, Mg alloy, etc. The analysis indicated that the most critical part of an alloy wheel is located at the circumferential area of the rim for all materials. Also from the analysis, it was found that stresses are more at the bolt holes than the remaining area of the wheel which agreed from the literature review. The simulation for the three types revealed that titanium alloy demonstrates the highest fatigue life and to be the most suitable material but is more expensive. Further the work can be extended by the dynamic analysis.

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# **A Study of Green Supply Chain Management in Pulp & Paper Industries**

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**Abstract**—With the increasing competition to do good business, companies have already created many environmental issues. The stress on the environment is increasing as the level of energy and material intake is also increasing with increasing pollution from various sources, resulting in inadequacy of resources and dilapidation of the environment.

The purpose of this thesis is to create an agenda that can be used by supply chains, particularly in the supply chains from the pulp and paper industry, to develop inner strengths and faintness and external openings and threats to develop environmental policies to recognize. To identify what questions to use in the framework of the environmental approach, we first identified the environmental picture, which the pulp and paper industry is facing. We then used this and the principle of green supply chain management to explore how a non-integrated supply chain firm could become greener, and compared it to an integrated green supply chain firm. Our conclusions suggest that the industry is focusing on reducing greenhouse gas emissions, but there is still much effort that needs to be done. Hence as a case study the supply chain management of THERMAL PAPER MANUFACTURER ASSOCIATION INDIA is reviewed.

Finally, we therefore present an environmental deliberate framework to explain what strategic options are in this particular supply chain that can make them greener. The general environmental outline presented can be used as a strategic tool to identify environmental strategic options for the supply chain.

**Keywords**— agenda, dilapidation, faintness, inadequacy, non-integrated,

## **I. INTRODUCTION**

In 2018 the world's greenhouse gas emissions was the highest ever in history. The implications this will have is still unknown, but research done leaves no doubt that the climate changes we are facing today is a consequence of the increased amounts of gases that circulates in our atmosphere due to increased human activity following the industrialization. If the amount of emissions continues to increase, the middle-temperature of the earth will be higher than what is sustainable. Researchers are saying that if the global middle-temperature rises with more than 2 degrees Celsius until 2100 there is a large potential for "dangerous climate change".

Clearly there is a need for action to be made. First in 1972 the environment and sustainability became a topic on the international policy arena, as the United Nations Environmental Programme (UNEP) was established. Since then it has inspired and encouraged governments and private organizations to become more environmentally conscious. Several initiatives have been started, environmental organizations established and new technology invented in the continuous work to improve the world's environment.

The pulp and paper industry are of particular interest when it comes to tackling climate change, as its main raw material is a natural resource that have proven to be a vital piece in the world's climate puzzle. Just small shares of extra gas in the atmosphere disrupt the natural balance. The forest industry is a large, energy consuming industry, and depending on trees as a raw material. The production process itself, due to intensive energy consumption, leads to 10 high levels of greenhouse gas emissions. In addition, deforestation releases large amounts of carbon dioxide in the atmosphere. Thus, this paper will address the question of how this non-integrated supply chain system is becoming greener, compared with an integrated supply chain and best practices in the industry. Our intention is to provide a general framework for a supply chain system that can be used to find which strengths and weaknesses they have internally and which opportunities and threats it faces externally in terms of the environment.

## II. PROBLEM DEFINITION

Green supply-chain management (GSCM) is gaining increasing interest among researchers and practitioners of operations and provide chain management. The growing importance of GSCM is driven mainly by the escalating deterioration of the environment, e.g. diminishing staple resources, overflowing waste sites and increasing levels of pollution. However, it's not almost being environment friendly; it's about good business sense and better profits. In fact, it's a business value driver and not a price center.

Greening the availability chain has numerous benefits to a corporation, starting from cost reduction, to integrating suppliers during a participative decision-making process that promotes environmental innovation. A growing number of corporations are developing company-wide environmental programs and green products sourced from markets round the world.

Many progressive companies, like ITC LIMITED(PSPD) have capitalized on the opportunities of green supply chain management and are therefore very concerned with the environmental burden of their supply chain processes. Throughout the availability chain, customers and thus firms designing and operating supply chains are particularly sensitive to reducing their carbon emissions. Operationally, this might involve carbon control of assets and infrastructure, the utilization of energy-efficient vehicles, waste reduction through process optimization, and recycling. Hospitality industry in India may be a global business and thus there's need for players within the industry to profile the service offering to evolve to global green supply chain best practices so as to stay competitive within the market. It's important for the hospitality industry players to conserve their key raw materials which is energy and water to enable them to understand sustainability within the availability chains. This is further curtailed by the ever-increasing costs of energy and inputs have forced business to seek out new ways to scale back energy use so as to scale back costs.

### Research Objectives:

The general objective of the study was to spotlight the green supply chain best practices within the hospitality industry in India.  
Specific Objectives:

To guide this study, the following four specific objectives were used:

- 1) To describe how green procurement is implemented as a green supply chain best practice in the Indian industry.
- 2) To describe how green design is implemented as a green supply chain best practice in Indian industry.
- 3) To describe how green operations and reverse logistics is implemented as a green supply chain best practice in Indian industry.
- 4) To describe how green manufacturing is implemented as a green supply chain best practice in the Indian industry.
- 5) To describe how waste management is implemented as a green supply chain best practice in the hospitality industry in India.

## III. MATERIAL AND METHOD

### Paper is made through the following processes:

**Raw Materials Making:** The wood obtained in the pulp mill comes in various forms. It depends on the pulling process and the source of the raw material. The bark is attached in the form of round-wood bolts and can be obtained in the form of chips, about half a dollar in size, from round wood produced from area.

If round timber is used, it is first dabbled, and wash water is usually applied by tumbling into large steel drums. If the pulping process calls for chemical digestion, paste those wooden bolts into the chipper. The chips are shaped, cleaned, and stored temporarily for further processing.

**Fiber separation:** During the fiber partition phase, many pulling techniques are deviated. The chips are placed in a large pressure cooker (digester), which contains a chemical suitable for craft chemical pulping.

The chips are then digested by steam at different temperatures to separate the fibers and partially dissolve the lignin and other essences. Some digesters work continuously with a continuous feed of chips and the alcohol is intermittently charged and treated one batch at a time.

After the digestion process, the ripe pulp is released into a pressure vessel. Here the vapors and volatiles are closed. After that, this ripe pulp returns to the chemical recovery cycle. Fiber separation is less dramatic in mechanical pulp.

The process of masonry-floor timber forces the removed logs against rolling the stone wheels. Refiners are made by pulp and thermo-mechanical pulp chips. These chips are grounded by turning rapidly in two processes.

In the second step after cleaning, the pulp is scrubbed, rinsed, and most processed water is removed in preparation for making the paper.

#### **Bleaching process:**

The lignin and other discoloration in raw mash is so high that it needs to be bleached to produce a light-colored or white paper that is preferred for most products. The fibers are further transported by dissolving excess lignin from the cellulose through chlorination and oxidation. These include chlorine dioxide, chlorine gas, sodium hypochlorite, hydrogen dioxide and oxygen.

Strong alkaline sodium hydroxide is used to remove dissolved lignin from the surface of the fibers. Bleaching agents and the order in which they are used depend on a number of factors, including the relative cost of the bleaching chemicals, the type and condition of the pulp.

Mechanical pulp bleaching is different from chemical pulp bleaching. Bleaching of mechanical pulp is designed to remove lignin, which reduces fiber yield.

Chemicals used for chemical bleaching choose paint impurities, but include sodium bisulfite, sodium or zinc hydrosulfite (not used in the United States), calcium or sodium hypochlorite, hydrogen or sodium peroxide, and sulfur dioxide-boroalkine lignin and cellulin. Process (variation of the SO dime hydrosulfite method).

#### **Paper Manufacturing Process:**

Bleaching or uncooked pulp can be further refined to cut the fibers and the surface of the fibers will be thickened to increase the formation and bonding of the fibers as the fibers enter the paper machine.

Water is usually added to the pulp solution to form a thin mixture with less than 1% fiber. The dilute solution is cleaned in a storm cleaner and placed on the centrifugal screen before being fed into the 'wet end' of the papermaking machine. The thin stack passes through the head-box, which is uniformly distributed over the width of the sheet of paper forming the fiber solution.

### **IV. CASE STUDY**

By studying this non-integrated supply chain, we have noticed that Thermal Paper Manufacturing Association is trying to make India greener, but using different methods. One common point is that they set certain environmental goals that they want to achieve, but they use different measures to reach them and are part of different activities with a different focus.

**Green Design:** Thinking green when designing can make a big difference to a company's product and environmental profile. Green design also does not appear to be a major focus for industry participants. They use "e-wheels" to understand and assess the environmental impact of their products. This cycle is divided into five stages: raw materials, manufacturing, distribution, use and end of life.

**Green packaging:** It is not easy to estimate how much packaging is required for paper, but it is reasonable to assume that they are covered with something before shipping. Packaging is a big part of the operational life cycle, and because of this there are many ways to change the packaging process that makes up the supply chain. A greenhouse solution can be developed by using environmentally friendly materials for packaging

**Green procurement:** Green collection consists mainly of forest management and production facilities. To verify a product, the entire supply chain from the jungle to the mills and the final product must be verified. Forest managers have systems for Sustainable Forest Management (SFM), and forest product traders rely on chain verification to find out the origin of the products.

**Green Production:** Thermal manufacturers are constantly working with improvements in their production process, which is environmentally friendly. He introduced his own e-index to more easily follow the company's environmental reforms. They set annual targets for 48 different parameters of the e-index and calculate the total e-index score for the entire company. His e-index score in 2016 was 1.14, which is below his 2015 target of 1.09. An index value of 1.0 or less indicates that the mill has an environmental standard that satisfies the performance achieved by the best technology or best practice available to the mill.

**Energy:** Paper production is a very energy efficient process, and most of the greenhouse gas emissions come from the energy they buy and produce to operate their mills. They use energy for two purposes: implementing production processes that separate fiber and water, and provide process heat and dry paper. They are trying to reduce various methods of energy reduction such as solar and wind to meet environmental standards.

**Water:** Water is used to grow fibers through the system in the process of pulp and paper production. 92 percent of the water comes from thermal producer surface water, and is used to cool machinery and equipment. Eighty percent of the water comes from groundwater, and only a small part comes from municipal water, which enters the production process through purchased raw materials as water is present in fiber-based raw materials. Thermal manufacturers have stated in their annual reports that the water they use is not overused, and that the water cycle is reused after treatment and treatment, permitting the use of water according to local regulations. When released, water undergoes therapeutic processes that remove solid particles and dissolve organic matter before it returns to nature. Water is usually used several times before treatment and returns to the water cycle

**Waste:** Reducing the waste to landfill has been the main challenge for the industry, as the production process generates large amounts of waste. New innovations of technology have made it possible to make use of the waste though, and the paper producers are therefore continuously trying to reuse or recycle most of their waste. Especially the usage of waste for biofuel is something other paper producers are doing. However, Thermal manufactures does not seem to be successful when trying to reduce waste to landfill as the numbers has increased over the last few years. It is especially the production process with recycled paper that creates a lot of waste, because of the deinking process. It seems therefore somewhat strange that they sold their Chinese mill that used only recycled paper, and still the amount of waste to landfill is increasing. Unlike for water, the waste handling is not the same in different regions of the world.

## V. CONCLUSION

We have examined various aspects of green supply chain management to improve environmental sustainability in the pulp and paper industry. After studying the non-integrated and integrated supply chain in this particular industry, we have developed a general framework that can be used as a strategic tool for identifying environmental strategies for supply chains in the pulp and paper industry. This framework is well suited to the pulp and paper industry, but it can also be applied to other industries with some adjustments.

Green Supply Chain Management is a new field and we thought it would be difficult to find good theoretical literature that addresses this issue. The literature we find focuses on very general or concrete topics, which companies have told or told stories about. We therefore provide a working environment framework for our entire supply chain system, looking at case studies from a specific non-comprehensive chain. Our research is challenging and somewhat confusing. Our research is challenging and somewhat confusing. An interesting finding is that many companies are very good at demonstrating the green actions they are taking, but neglect to mention what they cannot. In addition, there are many international programs, organizations and reporting systems, each with their own way of measuring and recommending goals.

## ACKNOWLEDGEMENTS

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Last but not the least I would also like to thank all the staffs of VIVA Institute of technology (Mechanical Dept.) and also the staffs and associates of the Thermal manufacturers for their valuable guidance with their interest and valuable suggestion brightened me.

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# Impact of Total Quality Management with focus on enhancing customer satisfaction

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**Abstract**— Today's modern era, Total Quality Management is a participative, systematic approach to planning and implementing a constant organizational improvement process. It's a continuous effort by management to upgrade and improve the processes and systems to ensure superior quality products. The principles of TQM are Produce quality work the first time, Focus on the customer, Have a strategic approach to improvement, Improve continuously, Encourage mutual respect and teamwork. Nowadays, Total Quality Management is also used within the e-business sector and it perceives quality management entirely from the point of view of the customer. The objective of TQM is doing right things that saves the organization time that is needed to correct failed product of the company and service implementations. There search aim to enhance rate of relationship between TQM executions towards rate of empowering.

**Keywords**— Continuous improvement ,Customer satisfaction, empowerment job satisfaction, leadership, total quality management.

## I. INTRODUCTION

Today's TQM is one of the business expressions in management and having scientific value and cooperation of staffs and manager of that company. Implementation of TQM becomes a top management agenda in many manufacturing companies that deal with. Today, quality improvement is an essential manner that is notified primarily as an essence in industry manufacturing. Other word total integration is being noticed and it will follow up common responsibility between managers and staffs to respond to good quality. TQM is a management system- a philosophy, set of tools, and organizational models. It is known by names other than Total Quality Management, including: the Deming Management Method; in the United States Total Quality Improvement and Total Quality Commitment; in Japan- Total Quality Control, Company- Wide Quality Control, and kaizen, which in Japanese means gradual, unending improvement, doing little things better, setting and achieving ever higher standards.

## II. TQM BASIC CONCEPTS

**1. Continuous Improvement of Quality.** Fundamental to all TQM systems is improving the quality of the products and services provided by an organization. Such quality improvement results in greater productivity and enhances the ability of an organization to remain vital, employ people, and serve customers. A focus on continuous quality improvement helps an organization do things right.

**2. Central Focus on the Customer.** Also central to all TQM is a focus on the customer, the internal and external recipients of an organization's products. Their needs and desires define quality for the producer whose job it is to meet or exceed the customer's needs and expectations. A focus on customers helps an organization to do the right things.

**3. Systematic Improvement of Operations.** All work occurs in processes that begin and end somewhere. These work processes account for 80- 85 percent of the quality of work and productivity of employees. Management is responsible for systems within an organization; therefore, managers, not employees, must shoulder blame when something goes wrong with the system.



TQM calls for studying work processes quantitatively, using individuals or teams, to find places that breakdowns or unnecessary complexities occur in processes, and then to identify solutions that prevent them in the future. Study of work processes helps to reduce costs while ensuring that quality is built into a service or product since quality cannot be inspected into it at the end of the processes.

**4. Open Work Environments.** Continuous quality improvement requires an atmosphere for innovation where suggestions for improvement are solicited and respected and where supervisors and managers are open to disagreement, conflict, and challenge. Activities for the improvement of work processes, especially when teams are involved, help to break down barriers that occur between departments or between supervisors and those supervised.

**5. Long- Term Thinking.** TQM is also characterized by long- term thinking which helps mold the future by understanding the consequences of current actions. Such thinking requires decision making that is based on data, both hard and soft, and related to real problems, not symptoms. It requires time. It shies away from quick fixes arrived at by discussion and intuition. Long- term thinking works best in organizations where managers plan to stay, and thus have a stake in the consequences of their decisions.

**6. Development of Human Resources.** Organizations that follow TQM principles are organized to help people do their jobs; they are seriously committed to employee learning and development. Such development begins with a thorough orientation to the organization, including its mission, values, and information about where the job fits into the organization. It involves educating people to perform to the quality standards of a specific job before requiring them to work independently.

TQM expects managers to respect the ability of well trained employees to know the work they do better than anyone, and therefore, to be the best at improving it. Human resource development includes providing the training to learn the communication, quantitative, and team- participation skills required in an open, quality improvement work environment. Development programs provide extensive education to help individuals keep up- to- date on their jobs and to prepare themselves for new responsibilities.

**7. Management Responsibility for TQM Leadership.** Managers need to lead the transformation of the organization to the new culture of continuous quality improvement. They must accept personal responsibility for continuous quality improvement and be dedicated to empowering others in the organization to accept personal responsibility for it, too. This approach taps the collective genius of the organization to identify and solve problems. The leader's focus is on policy, structure, and systems to sustain continuous quality improvement. Within this context, quality is the first among equals of the organization's functions. Quality is at the top of the agenda for every meeting, every communication. The leader's goal is to help people, things, and machines do a better job; the leader's role is that of facilitator, catalyst, and coach.

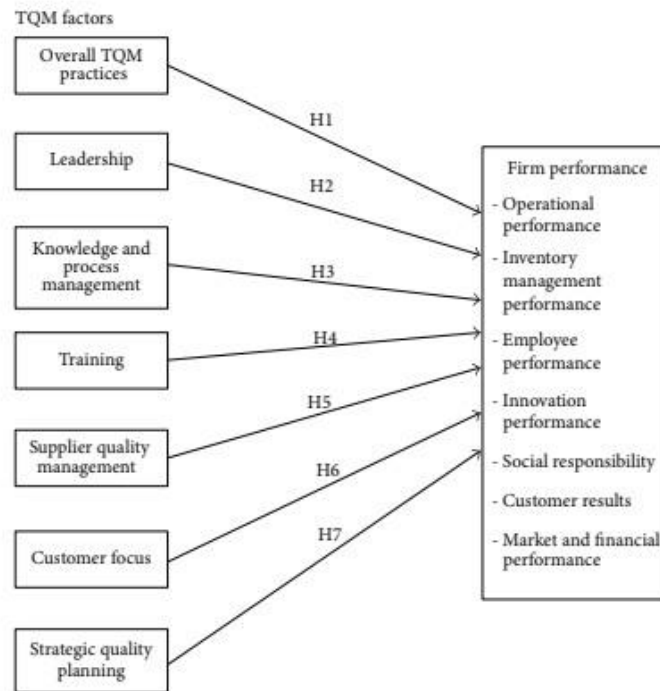


FIGURE 1: The proposed research model of the relationship between TQM practices and performance measures.



Figure 2: TQM Construct

### Staffs Empowerment

Staff Empowerment means conferment of authority in organizational roles that the authority must be dedicated to individual or organizational roles. Empowerment means individual enthuse to admit responsibility of an entry that firstly was officially

interpreted into respond meaning . When quality principles were mentioned by Japanese in 60s, western countries were keen on it in 80s. The principles expressed empowering and training personals and staffs. By TQM, nurse roles regarding to quality control were allocated to staff, and empowering and training of them will be accepted. Therefore, staffs learn quality management techniques and broadly it is focused on staffs and matrons training.

A. Hypothesis I: There Is a Meaningful Relationship between TQM and Empowerment of Staffs

Regarding given results in Table I, correlation coefficient between TQM and empowerment is given 0.401. Accordingly meaningfulness of correlation coefficient in 0.001 level, it can be concluded that quality management has positive and meaningful relationship with empowerment. Thus, researched evidences approve hypothesis 1.

### **III. CONCLUSION**

TQM program was characterized by customer focus, full participation, process improvement and process management and planning. TQM implementation process was a very long-term procedure. Empowerment of staffs, in the research, is resulted from TQM making.

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