



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 fourth National Conference on Role of Engineers in Nation Building (NCRENB 2016) in cooperation with International Journal of Computer Application (IJCA) and Indian Institution of Industrial Engineering (IIIE).

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 2012 with various disciplines such as Civil Engineering, Computer Engineering, Electronics & Telecommunication Engineering, Electrical Engineering, Humanities and Sciences and Mechanical Engineering. Since 2014 we have also started with Project Exhibition that will provide the students with an opportunity to exhibit their innovative ideas.

NCRENB 2016 has received total 144 papers in 6 tracks. The selected full length papers will be sent for publication in IJCA and IE 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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GEO-HYDROLOGICAL STUDIES OF LAMKANI VILLAGE IN DHULE- A CASE STUDY

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ABSTRACT— A comprehensive understanding of the ground water regime, the recharge and discharge characteristic of ground water in hard rock areas is a very complex phenomenon and has to be dealt with careful study of local geomorphologic nature & required measure is taken to overcome the drawback. The measures taken are artificial recharge during monsoon include contour trenching on hill slopes, contour Bunding of farms, farm ponds, underground stream bunds & forestation of barren lands with suitable grass, bushes & trees. Artificial recharge in dry season is achieved through construction of percolation tank. With this objective in view a geological study was carried out in Lamkani village. In combination with the applied science studies and on site geological observations, results served as an important tool to understand the groundwater flow in the village of Lamkani located in Dhule district of Maharashtra state.

Keywords— Percolation tank, check dams, continuous contour trench, recharge trenches, basalts.

I. INTRODUCTION

Ground water is a pervasive & vulnerable resource located beneath the earth's surface in soil pore spaces and in the fractures of rock formations. The thrust on ground water is thus increasing exponentially in recent years to support the exploding population for the domestic, irrigation & industrial needs. The declining water levels and yield, land subsidence, intrusion of salt water into fresh water supplies, and ecological damages, such as drying out wet lands are the common problems faced in these days.^[1] Thus hydro-geological investigations must be conducted to enable us to sustain and protect these resources, the ecosystems that they support and to overcome problems of water scarcity. In the past, the village of Lamkani was frequently suffering from drought, drinking water scarcity, unavailability of fodder for cattle, heavy soil erosion and frequent migration of villagers to the urban areas in search of employment. This study aims to characterize the existing ground water environment and to conceptualize ground water flow processes in the catchment of Lamkani village.^[5]

- To establish a geological framework for the area from onsite geological observations.
- To evaluate the water levels of all the dug holes.
- To integrate the data to develop a conceptual geo-hydrological model of the area.

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The project site Lamkani is a small hamlet in Maharashtra state located at Dhule (west). At a distance of 30km from District Headquarters of Dhule, Lamkani village lies in the northern region of Nashik. It is approachable through all-weather roads and accessible through Mumbai-Agra highway NH-3. The total distance up to the village from Nashik is 150 km.

1.1 Percolation tank

Artificial recharge of ground water in dry season is achieved by percolation tanks. In this method the ground water is recharged by reducing the surface runoff and increasing percolation. Water is allowed to percolate in to the ground by constructing a small earthen dam. The height of this dam is less. When rainfall is high and water holding capacity of soil is less, the losses due to percolation are very great. Such losses are very rapid particularly when the soils are sandy and porous e.g., in case of lateritic soil in Konkan region, the soil is quite workable within a few hours even after a heavy rainfall.^[4] Besides rapid percolation of water there is also a heavy loss of plant nutrients viz., Ca, Mg, S, K, etc., resulting in soil becoming acidic. Percolation tanks are the structures for recharging ground water. These are generally constructed across streams and bigger gullies in order to impound a part of the run-off water.^[5] This water, in due course, finds its way into sub soil and recharges the found water. This leads to better recuperation of wells in the downstream areas. Such ponds have become popular in many a place. In Maharashtra there is legislation to cover percolation tanks. The water is not used for surface irrigation.



Fig 1: Percolation tank

1.2 Check dams

A check dam is a small dam which can be either temporary or permanent built across a minor channel or drainage ditch. Similar to drop structure in purpose, they reduce erosion and gulling in the channel and allow sediments to settle. They also

lower the speed of water flow during storm events. It is generally made up of stones or sand bags or wooden boards.^[7]

Applications:

➤ Grade Control Mechanism

Check dams have traditionally been implemented in two main environments one is across channel bottoms and on hilly slopes. Check dams are used primarily to control water velocity, conserve soil, and improve land. Accordingly, they are commonly used in degrading temporary channels, in which permanent stabilization is impractical and infeasible in terms of resource allocation and funding due to the short life period.^[6] Or, they are used when construction delays and weather conditions prevent timely installation of other erosion control practices. This is typically seen during the construction process of large-scale permanent dams or erosion control. As such, check dams serve as temporary grade-control mechanisms along waterways until resolute stabilization is established.^[6]

➤ Water Quality Control Mechanism

Many check dams tend to form stream pools. Under low-flow circumstances, water either infiltrates into the ground, evaporates, or seeps through or under the dam. Under high flow - flood - conditions, water flows over or through the structure. Coarse and medium-grained sediment from runoff tends to be deposited behind check dams, while finer grains flow through.^[3] Extra nutrients, phosphorus, nitrogen, heavy metals, and floating garbage are also trapped by check dams, increasing their effectiveness as water quality control measures.



Fig 2: Check dam

2 Recharge trenches

These are trenches built across the flow of water direction along the hill slopes. During rainy season when water drains from top the hill slope, this water crosses the trenches and starts filling the trenches part by part as the trenches are filled they flow again towards downward direction. In this manner the trenches are filled along the slopes and water is conserved in trenches.^[4]



Fig 3: Recharge trench

II. METHODOLOGY

Table 1: Details of Well Inventory
Φ=Diameter, D= depth, WL= Water Level

WELL NO	Φ (m)	D (m)	GEOLOGICAL STRATA	WL
1	11	13	- Compact basalt - Vesicular amygdaloidal basalt surrounded by giant phenocryst basalt	10.63
2	3.7	8	- well is fed by bore well - there is high column of water standing in well	6.4
3	6.4	15	- compact basalt broadly jointed	11.7
4	5.8 *	16	- compact basalt	12
5	4.5 *	13.9	- water tight amygdaloidal basalt dry during summer	11
6		5	- well on u/s side of nala stone pitting	3
7	8.2	15	- volcanic breccias - jointed compact basalt	12
8		5.5	- unjointed basalt	4.8
9	6.84	6	- volcanic breccias - water tight amygdaloidal	4.5
10	3.65	13	- amygdaloidal basalt - compact basalt	10.1
11	3.7	12.5	- moderately wet - compact basalt - fresh unjointed basalt	10
12	6	14.8	- unjointed amygdaloidal basalt	11
13	7.5	17.3	- compact basalt - murum	14
14	3.04	10.3	- compact basalt broadly jointed	8.5
15	7.5	17.3	- compact basalt murum	14
16	2.75	7.2	- compact basalt	4.8
17		9	- square well lined with stone masonry	7.62
18	6	15	- jointed compact basalt	13

19	6.09	16.2	- murum unjointed compact basalt	12.19
20		10	- broadly jointed compact basalt at base of well	8.5
21	9.14	6	- 3 feet murum	5.2
22	3.5	12.5	- Compact basalt	11
23	5.4	6.3	- Murum compact basalt	5.5
24	8.2	13.9	- Broadly jointed compact basalt	11

To determine the ground water availability in the area under investigation it is necessary to study critically the field and water bearing characters of the sun surface strata. For this purpose, well inventory of 24 wells occurring in scattered manner in the area was carried out. The main five geological configurations noted are:

A. Configuration no 1: Wells located on Amygdaloidal basalt

In this case if the thickness of black cotton soil is more, the portions of the well in black cotton soil are lined in various ways. Out of 24 wells, 7 wells are exposed to Amygdaloidal basalt below the cover of soil up to variable depth. In the weathered Amygdaloidal basalt, sheet jointing and secondary porosity are developed. Due to which, weathered Amygdaloidal basalt has become permeable. Springs have developed through sheet jointing portion of Amygdaloidal basalt. For augmentation of water in the wells these conditions are necessary but the quantity of water and rate of withdraw depend upon the thickness and lateral extent of sheet jointing weathered zone. If the thickness is more than 3m, such well yields good quantity of water for a long period. But if the thickness is up to 1 to 1.5m, springs dwindle away after the rainy season.^[1]

- Small thickness of weathered amygdaloidal basalt
- Weathered amygdaloidal basalt having large thickness underlain by compact basalt
- Weathered amygdaloidal basalt having small thickness underlain by compact basalt
- Occurrence of fresh, un-jointed amygdaloidal basalt in the well section.

B. Configuration no 2: Wells located on Compact basalt

Due to variation in petrology and field characters of compact basalt water occurs in the wells under following two different sub conditions^[1].

1. Wells located on the top portion of the flow
2. Wells located on the middle and lower parts of the flow.

Case No.02- a) wells located on the top portion of the flow

Fresh, unweathered, vesicular upper part of the flow is always un-jointed and occurs as massive, homogeneous, watertight

mass. Only on intermediate stage of weathering, sheet jointing and porosity are developed in it and it becomes highly permeable. Therefore water yielding capacity of the wells taken in vesicular amygdaloidal upper part of the flow depends upon whether Amygdaloidal portion is in weathered condition.^[2]

Case No.02- b) wells located on the middle and lower parts of the flow

The water bearing capacity of the well located in compact basalt depends upon joint spacing and pattern of jointing. If the joints in the wells are closely spaced and inter connected they yield good quantity of water but if the joints are broadly spaced they yield limited quantity of water. Again if the joints are inconsistent and are not interconnected the wells do not yield water even though rock is jointed.^[2]

Configuration no 3: Occurrence of Tachylytic Basaltic band in Dug well

This is a soft material weak and fragile in nature. They occur between two flows and in the form of veins that intrude in the upper and lower flow. Such Tachylytic flow occurs in the form of bands and is very soft in nature. Originally hard tough rock known as red Tachylytic basalt is formed and only after exposure to atmosphere it crumples down. The red Tachylytic basalt is fine-grained rock and found as a separate independent flow in the form of intrusion.^[1]

Configuration no 4: Wells located on the Volcanic Breccias

Explosion breccias formed by embedding explosion fragments in a lava matrix are common in Deccan trap area. The lava matrix is commonly Tachylytic, and it is often turned red by hydrothermal alteration. Volcanic breccias, as far as occurrence of the ground water is concerned, behave just like amygdaloidal basalt.^[2]

III. CONCLUSION

Due to continuous droughts and deforestation, erratic rainfall, the village was facing acute scarcity of water. The deep bore wells taken upto 800ft even were not yielding water. With the help of social forestry of Government the area of 80 hectare, tree plantations of various species were carried out successfully to increase the biodiversity of that area. The critical examinations of the wells show that the ground water recharge depends upon the geological formations beneath as well as the artificial recharge techniques. Well no.23, 21, 19 and 13 show sheet jointed amygdaloidal basalt formation which is best suitable for the percolation of water and thus can be considered as perennial wells. Rest of the wells show different formation and hence can be said to be seasonal wells. Before the implementation of ground water recharge

techniques, the Lamkani village had very low ground water table available on an average depth of 10-11m and thus leading to scarcity of water. After adopting ground water recharge techniques the level of ground water is raised to 8-9m serving the needs of people. The main focus of the water conservation methods in Lamkani village was to opt the following:

1. Construction of the continuous contour trenches along the slope of the hill to arrest the precious soil cover and hence the first step that was taken was the construction of the series of contour trenches along the slopes as per the norms and specifications of the government.
2. Implementation of percolation tanks over an impervious and water sustainable rock.
3. Improving the present percolation tank by filling the pores.
4. The present location of the percolation tank is much more exposed to sun which may again lead to water draining issue, which can be avoided by planting trees around the percolation tank.
5. Check dams constructed should be maintained by clearing the debris from downstream side on quarterly basis.

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Suggestions of traffic system for various places on basis of SATIS project, Thane

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ABSTRACT

With increase in the population and shortfall of infrastructures to cope up with the same there has been traffic congestion in all the major cities in India. This paper gives suggestions for Traffic Improvement in station area for one such major city Sangli based on SATIS (Station Area Traffic Improvement Scheme) Thane.

Keywords

Transportation, SATIS, Infrastructure.

1. Introduction

The term "S.M.A.R.T. Sangli" stands for "System of Multi-Aspect Rapid Transit, Sangli". This paper relates with the decongestion of the traffic in the three main areas of Sangli city, namely ST Stand, Vishrambaug Chowk and College Corner emphasizing on signal less transit system, easy and safe pedestrian movement, hawkers free and encroachment free road.

2. Significance of the work

1. Eliminating of crisscross movement of traffic in station area, grade separation of various modes of traffic and thereby improvement in travel speed.
2. Providing dedicated passage to pedestrian movement to encourage Non-Motorized mode of transport.
3. Providing dedicated passage to Public transport to improve functioning and thereby encouraging use of public transport system.
4. Creating additional space for traffic in Station Area.
5. Avoiding conflicting movements at junctions. Bringing down the pollution levels

3. Experimental Investigation

3.1 Survey at Thane

As an essential part of primary study we decided to visit the Thane site which was required to be surveyed. We observed the whole area of SATIS (Station Area Traffic Improvement Scheme) for further study. Under this observation we studied about the dedicated lanes provided for buses, parking system for various vehicles and FOB provided for the use of pedestrians. The survey was carried for the peak hours of day from 8:00am to 11:00am and from 5:00pm to 8:00pm. Pedestrians using FOB, passengers using middle

deck for the use of bus, buses passing through different dedicated lanes were counted. The width of FOB was also measured.

3.2 Visit to Thane Municipal Corporation

For the collection of detailed information about the SATIS project and to get the idea about the design procedure of the project, we visited Thane Municipal Corporation. We met Project Executive Shri. S. M. Patil. We gave him idea about our project regarding the suggestions for Sangli ST Stand which is based upon SATIS. He gave us the information about SATIS and also gave us data regarding the project.

3.3 Survey at Sangli ST Stand

After the survey and collection of information of SATIS we proceeded with the survey of Sangli Stand. This survey included the counting of buses and counting of other vehicles for different roads. The counting was carried at peak hours from 9:00am to 11:00am and from 5:00pm to 8:00pm. Width of roads approaching bus stand were measured.

3.4 Comparative Study of Survey at Thane and Sangli Stand

To give the suggestions for the provision of easiness for the Sangli Stand, the data collected from Thane and Sangli Stand were studied. From this comparative study of the collection of data, the relative density of traffic volume and the required width of lanes were found out. From this the final required data for the preparation of model were finalized.

4. Design of Traffic Model for Sangli ST Stand Area

4.1. Vehicles from Shivaji Mandai to:

- Civil Hospital Road will pass through LEVEL-ZERO
- ST Stand (Buses) will enter from Zulelal Chowk Gate
- Kolhapur will pass through LEVEL-ZERO towards Patrakar Nagar
- Shivaji Statue (U-turn) will pass through LEVEL-ONE
- Miraj (City Buses) will take U-turn on LEVEL-ONE without entering ST stand

4.2. Vehicles from Civil Hospital Road to

- Kolhapur will pass through LEVEL-ZERO towards Patrakar Nagar
- Shivaji Statue will pass through LEVEL-ONE
- Towards ST stand (Buses) will enter through Zulelal Chowk Gate.

4.3. Vehicles from Kolhapur to:

- Civil Hospital Road & Shivaji Statue will directly pass over the flyover (LEVEL-TWO)
- Haripur Road, Maruti Road and ST stand (buses also) will pass over a small flyover and pass through LEVEL-ZERO

4.4. Suggestions for traffic improvement at vishrambag chowk & college corner.

As like the ST Stand area of Sangli city, the areas which experience heavy traffic congestion are Vishrambag Chowk and College Corner. Vishrambag Chowk is an important junction on Sangli-Miraj Road. The roads for Miraj, Sangli, Kupwad and Dhamani are bifurcated from here. The institutes like Walchand College & Willington College; Police Head Quarters; many hotels and showrooms are situated in the vicinity. College Corner is a junction on Sangli-Madhav Nagar Road. Roads for Madhav Nagar, Timber Area, Apta Police Station, Ganapati Peth are bifurcated from here. KWC College, banks, showrooms, etc. public places are situated in the vicinity. Thus both the junctions are of great public importance and experience severe traffic problems every day. Hence there is a need of traffic improvement in both the areas

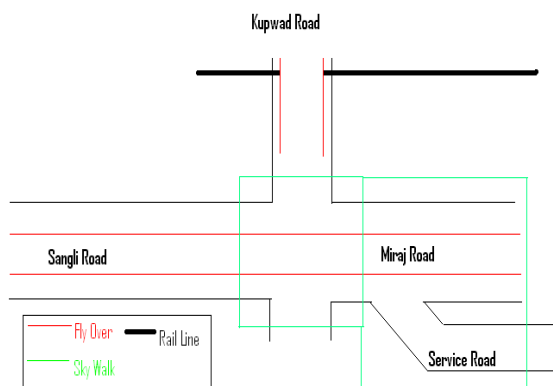


Fig4.4 Proposed System for Vishrambag Chowk.

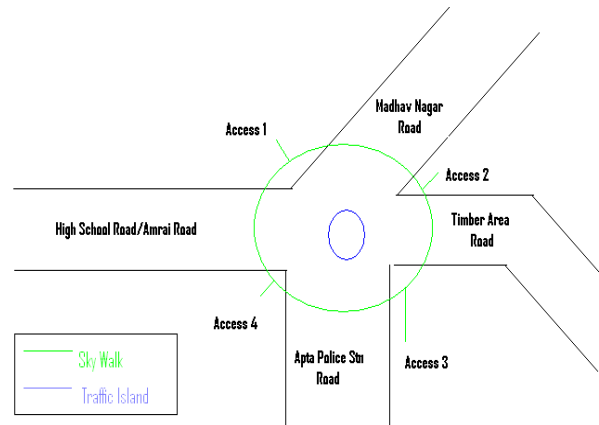


Fig4.4.2. Proposed System for College Corner.

5. Conclusion.

If the proposed model and other suggestions are implemented by Sangli-Miraj-Kupwad Municipal Corporation and Ministry of Public Works(Public Undertakings); a huge positive transformation in traffic system of Sangli city will take place. Though the estimated construction cost seems to be very high, it will impart positive effects in reduction and regulation of peak hour traffic of Sangli city estimated for year 2035. The project when implemented will bring about the following changes:

- Congestion free traffic movement in the area of Sangli ST Stand, Vishrambag Chowk and College Corner
- Signal less transit system in Sangli ST stand area
- Easy pedestrian movement at all the three locations mentioned above
- Specialized lanes for Sangli-Miraj city buses, auto-rickshaw and other vehicles on the proposed "S.M.A.R.T. Sangli" traffic model
- Separate elevated lane for through-vehicles at "S.M.A.R.T. Sangli" traffic model
- Hawkers-free and encroachment free road
- Dome over middle level having solar panels to enable solar street light system on "S.M.A.R.T. Sangli" traffic model

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EXPERIMENTAL INVESTIGATION ON PARTIAL REPLACEMENT OF SAND BY CRUSHED SAND

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ABSTRACT

The need of this project is due to the banned on the excavation of river sand to save the river killing and balance the ecology. Also due to the large construction demand and declining of the river sand in the urban area as well as the rural area and also to search the substitute of the river sand due to the high cost of transportation and availability due to natural sand deposits are being depleted. The Crushed sand is available in huge amount near the city due to making the concrete for the construction from the chips and boulder. Crushed sand offers a viable alternative to the use of natural sand. This project puts forward the applications of Crushed sand as an attempt towards sustainable development.

In this study we are considering the behavior of structural elements made by partially replacing sand with Crushed sand. The purpose of this study is to investigate the effects of Crushed sand on compressive, splitting & flexural behaviors of concrete to compare modes of failure. The properties of fresh concrete is mainly obtained through conducting Slump test and compaction factor test on concrete. Tests on the strength of hardened concrete were conducted. This project also investigates the effects of varying compressive strength, split tensile strength and flexural strength on concrete containing Crushed sand as a replacement for natural sand with percentage of 0%, 20%, 40%, 60%, 80%, 100% by using M20 & M30 grade of concrete.

This report discuss the strength which can be achieved if the 60% of the replacement may be done, due to this upto certain extent the use of natural sand may be reduced and it will be helpful for saving the river beds from excavation in excess.

Keywords

Crushed sand, Replacement, Transportation, flow ability, Strength and Durability.

INTRODUCTION

Concrete is the most widely used construction material because of its flow ability in most complicated form i.e. it is ability to take any shape while wet and its strength development characteristics when it hardens. Concrete requires consumption of virgin materials. It requires cement, water & suitable aggregates. Its production involves a number of operations according to prevailing site conditions. The ingredients of widely varying characteristics can be used to produce concrete of acceptable quality. The strength, durability and other characteristics of concrete depend upon the properties of its ingredients. In concrete fine & coarse aggregate constitute about 75% of the total volume. It is therefore, important to obtain right type and good quality aggregate at site. The aggregates form the main matrix of concrete or mortar.

Fine aggregate (Smaller than 4.75mm) play a very important role in controlling the properties of fresh concrete. They help to improve cohesiveness of fresh concrete, improve workability, and prevent segregation and bleeding of concrete. So, fine aggregate is an essential component of concrete. The most commonly used fine aggregate is natural river or pit sand. The global consumption of natural sand is very high due to extensive use of concrete. In particular, the demand of natural sand is quite high in developing countries owing to rapid infrastructural growth. In this situation developing countries are facing a shortage in supply of natural sand.

Natural sand deposits are being depleted and causing serious threat to environment as well as the society. Increasing extraction of natural sand from river beds is causing many problems losing water-retaining sand, strata, deepening of the river courses and causing bank slides, loss of vegetation on the bank of rivers, exposing the intake well of water supply schemes etc are few examples.

River sand is becoming a very scare material sand mining from our rivers becomes objectionable. It has now reached a stage where it is killing all our rivers of our

country from total depth. Also Dams are constructed on every river hence these resources are erasing very fast. Now days good quality sand is not readily available, So it is a need of the time to find some substitute to natural river sand some alternative materials have already been used as a part of natural sand for example, fly ash slag, and lime stone and siliceous stone powder were used in concrete mixtures as a partial replacement of natural sand. On this basis, the present study has used artificial sand in concrete mixtures as a partial replacement of natural sand.

ABOUT ARTIFICIAL SAND

Artificial sand is popularly known by several names such as crushed sand, Rock sand Green sand, Robo

Sand, Poabs sand, Barmac sand, Pozzolana sand, artificial sand.

Natural sand are weathered and worn out particles of rocks and are of various grades or size depending on the accounting of wearing. The main natural and cheapest resource of sand is river. Dams are constructed on every river hence these resources are erasing very fast. Now a day's good sand is not readily available, it should be transported from long distance. Those resources are also exhausting very rapidly and also in the state of Maharashtra the river sand is banned by the state government. However, natural sand is slowly and consistently becoming scarce. Moreover, since it is an environmental hazard to extract natural sand from riverbeds, even the government has banned it. Thus, a technically superior substitute to natural sand is **ARTIFICIAL SAND**.

cement is partially replaced by artificial sand & two different grades i.e. M20 & M30 are used. Experimental program includes the tests carried out to check properties of fresh concrete like compaction factor test & slump test, and the mechanical properties of hardened concrete like cube compressive strength, split tensile strength and flexural strength.

General Information about Experimental Program

The experimental investigation includes casting and testing of cubes, cylinders, prisms. The cubes are tested for compression at 7 and 28 days of curing. The cylinders and prism specimens are tested for split tensile and flexural strength respectively at 7 & 28 days of curing.

The cubes specimens are casted in six sets, the first set is casted with conventional sand and remaining five sets are casted with replacement of sand by artificial sand with 20%, 40%, 60%, 80% and 100% replacement.

OBJECTIVE OF THE STUDY

To study the effects of percentage replacement of sand by artificial sand on M20 & M30 grade of concrete.

EXPERIMENTAL PROGRAM

OBJECTIVE

To check the compressive strength and other properties of artificial sand, in varying proportions to replace natural sand.

The objective of this experimental investigation is to study the structural performance of concrete in which

Table : Formulation of Cubes

Percentage Of replacement	M20		M30	
	7 days	28 days	7 days	28 days
0 %	3	3	3	3
20 %	3	3	3	3
40%	3	3	3	3
60 %	3	3	3	3
80 %	3	3	3	3
100%	3	3	3	3

The cylinders specimens are casted in six sets, the first set is casted with conventional sand and remaining five sets

are casted with replacement of sand by artificial sand with 20%, 40%, 60%, 80% and 100% replacement.

Table : Formulation of Cylinders

Percentage Of Replacement	M20		M30	
	7 days	28 days	7 days	28 days
0 %	3	3	3	3
20 %	3	3	3	3
40%	3	3	3	3
60%	3	3	3	3
80 %	3	3	3	3
100%	3	3	3	3

The prism specimens are casted in six sets, the first set is casted with conventional sand and remaining five sets are casted with replacement of sand

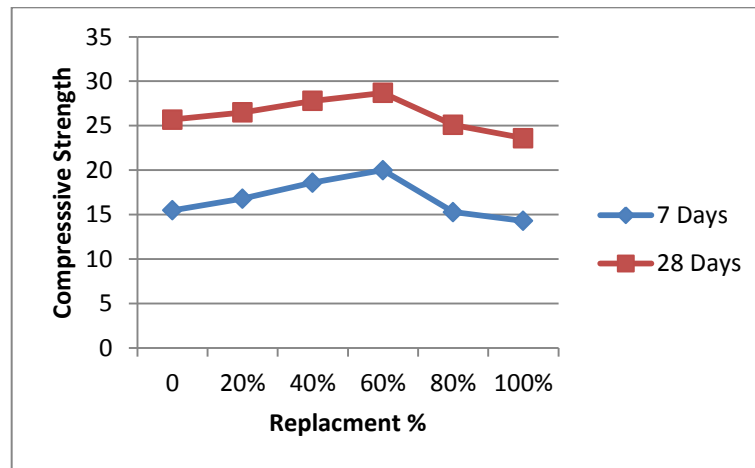
by artificial sand with 20%,40%,60%,80% and 100% replacement.

Table : Formulation of Prisms

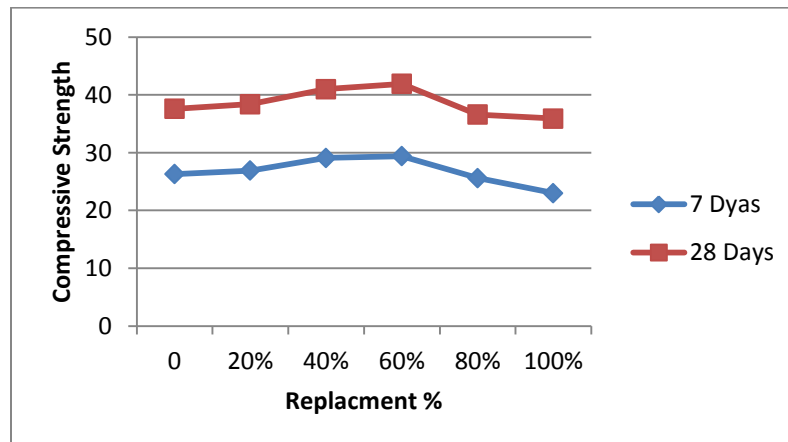
Percentage Of replacement	M20		M30	
	7 days	28 days	7 days	28 days
0 %	3	3	3	3
20%	3	3	3	3
40%	3	3	3	3
60%	3	3	3	3
80 %	3	3	3	3
100%	3	3	3	3

RESULTS & DISCUSSIONS

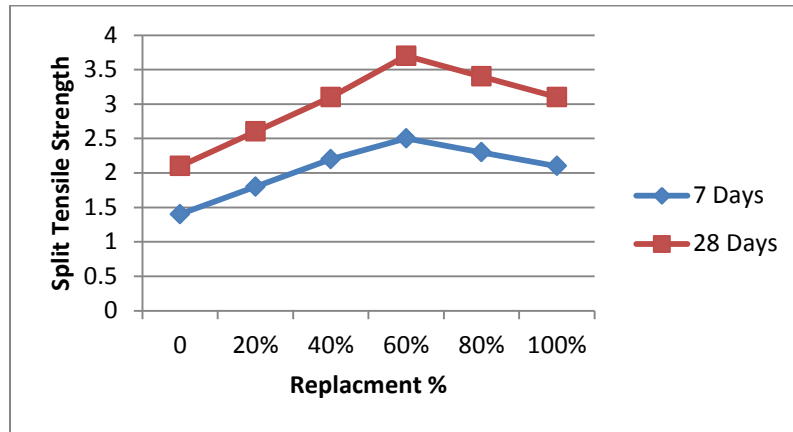
Graph: Compressive Strength values for various mixes of M20 Grade



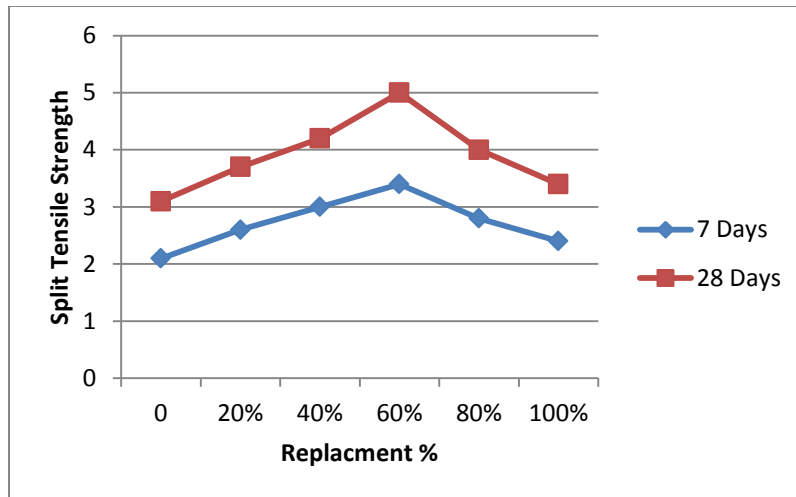
Graph: Compressive Strength values for various mixes of M30 Grade



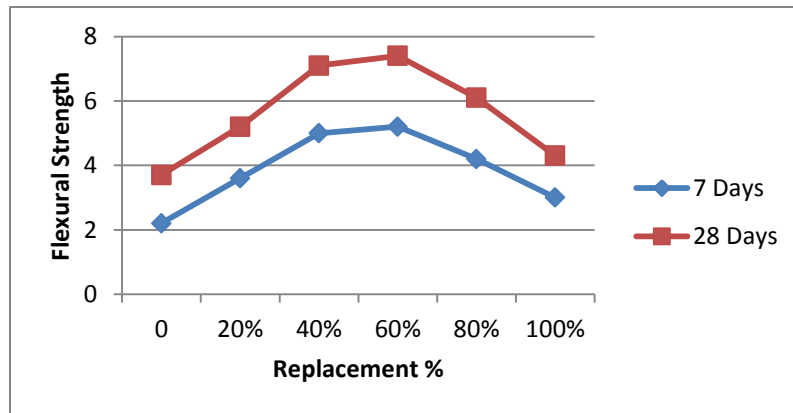
Graph: Split Tensile Strength values for various mixes of M20 Grade



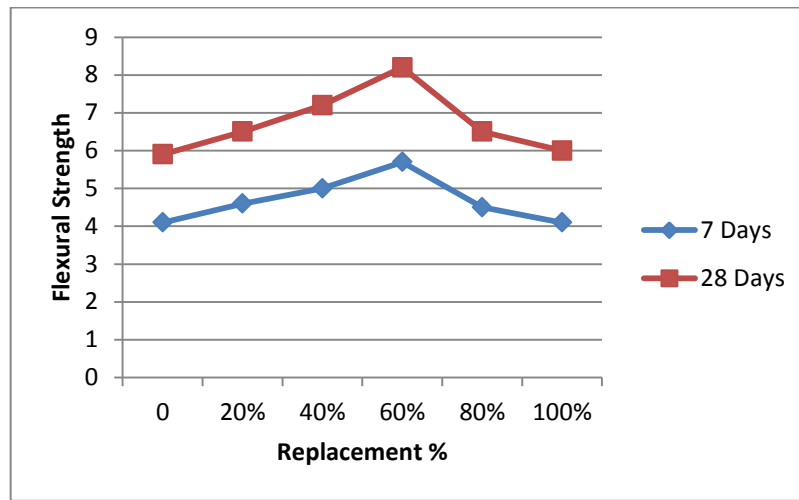
Graph: Split Tensile Strength values for various mixes of M30 Grade



Graph: Flexural Strength values for various mixes of M20 Grade



Graph: Flexural Strength values for various mixes of M30 Grade



CONCLUSION

The following conclusions are drawn from this investigation:

- i) It is observed that the compressive strength and flexure strength of concrete can be improved by partial replacement of sand.
- ii) From the above experimental results it is proved that, artificial sand can be used as partial replacement for the natural sand, and the compressive and flexure strengths are increased as the percentage of artificial sand is increased up to optimum level. The optimum percentage of replacement of natural sand by artificial sand is 60%.
- iii) **Workability:** - Increasing percentage replacement of Artificial sand decreased the workability. As water cement ratio decreases workability decreases. Artificial sand consumes higher amount of water to satisfy the workability.
- iv) It has been observed that the compressive, split tensile and flexural strength of concrete with replacement of natural sand by manufactured sand goes on increasing up to 60% replacement.
- v) This may be due to the fact that 60% replacement of natural sand by manufactured sand may show the optimum reaction with optimum filler capacity.
- vi) It can be concluded that 60% replacement of natural sand by manufactured sand will yield the maximum strengths for concrete.
- vii) In this study we observe that the overall strength of concrete is higher and workability is lower if results are compared with reference mix.
- viii) **Strength:** Concrete mixes revealed an increase of up to 12.61% in compressive strength, 11.44% in split tensile strength and 14.60% in flexural strength as a result of replacement of manufactured sand up to 60%.

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The effect of Just-In-Time on Product development

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ABSTRACT

This paper shows that the principles of just-in-time in manufacturing can be used to improve product development process. new product design and development is crucial for companies to be competitive in a global market. Analysis and comparison of key factors show a high degree of consistency between traditional manufacturing and sequential product development. the comparison of the same factors shows remarkable similarities between Just-In-Time manufacturing and simultaneous engineering. Statistical results indicate that compared with traditional organizations, companies who adopted JIT principles developed new products with maximum percent better quality, with minimum percent less development time, less development cost, and less manufacturing cost. Frequency of new product introduction for JIT organizations is more faster than the traditional companies. Two tests of theory were conducted to test the statistical significance of product development performances before and after JIT implementation.

Key words: Just In Time, Product Development and Design.

1. INTRODUCTION

Just-in-time (JIT) manufacturing, also known as just-in-time production or the Toyota production system (TPS), is a methodology aimed primarily at reducing flow times within production as well as response times from suppliers and to customers. Following its origin and development in Japan, largely in the 1960s and 1970s and particularly at Toyota, JIT migrated to Western industry in the 1980s, where its features were put into effect in many manufacturing companies as is attested to in several books and compendia of case studies and articles from the 1980s. Just-in-time manufacturers as a highly effective methodology for improving operating effectiveness on the shop floor. More and more of us are experiencing first-hand and sharing with others the remarkable benefits of this approach to sustained improvements in productivity, quality and customer responsiveness.

It seems, however, that most practitioners do not recognize

that Just-in-time is an extremely flexible tool that can be applied to many areas beyond manufacturing. Using existing JIT and new product development data since the early 1980s and current data showed that success in JIT has a positive impact on new product development. To understand the relationships between JIT and Product development, one has to examine carefully the two fundamental principles of waste elimination and respect for people in a JIT system. In a JIT system, elimination of waste is achieved by adopting elements such as total quality management, focused factory, reducing setup times, small lot sizes, flexible resources, group technology layout, pull production system and effective use of technology. Respect for people includes elements such as teamwork, fair compensation, worker training, worker participation and new attitude towards vendors.

JIT manufacturers have dominated competition not only in the areas of price, quality and speed but also in the areas of innovation, design and quick new product development experience at small scale company Just-in-time adaptability. I have applied it with good result to everything from reengineering our business processes to developing a strategic information systems vision. And, in the true spirit of continuous improvement, I am always looking for new applications.

Rapid changes in technology, the emergence of global industrial and consumer markets, increasing market fragmentation and product differentiation, and the increasing options for developing and producing products have increased the pressure on all firms to more effectively and efficiently develop new products. In many progressive firms, the design of new products is conducted by a team representing a number of functional areas. Marketing, product planning, design engineering, reliability engineering, manufacturing engineering, quality, and, frequently, carefully selected suppliers and customers are involved, as appropriate. If effectively done, Product development can be a source of competitive advantage for a firm and a competitive strategy for the internal and external partnerships of the supply chain. Just-in-Time professionals and carefully selected suppliers are moving to earlier involvement in the new product development process because of the important contributions they can make in the areas of quality, cost,

and timely market availability. The question of interest in this paper is to investigate if there is a link between successful implementation of JIT in manufacturing and successful management of Product development process.

2. Statement of Objectives

Next, a statement of needs, desires, and objectives is developed. Needs are based on marketing's perception or knowledge of what customers want (or the customer's direct input if the customer is a member of the design team), balanced against the company's objectives and resources. Needs that are potentially compatible with the firm's objectives (profit potential, sales volume, and so on) and resources (personnel, machines, and management) are considered for development. Product objectives, including performance, price, quality, and market availability, are established and become the criteria that guide subsequent design, planning, and decision making.

3. Traditional manufacturing and Design

Close examination of traditional new product development shows that the process contains problems very similar to traditional manufacturing where the system is organised into separate departments with limited communication. To solve problems associated with traditional sequential new product development process, a complete change in design philosophies, similar to the changes in JIT manufacturing, is needed. In other words, total quality management, focused factory, reduced set-ups, employee empowerment, team work, worker training, effective use of technology and other elements of JIT can also be applied to the Product design process. Unlike the traditional approach to new product development, where functional units work sequentially and downstream functions are not involved until late in the process, Product development and design requires early involvement of cross-functional teams. It requires that designers, manufacturers, marketers, suppliers and customers work jointly to design product and process simultaneously. The objective is to integrate product and process design into a common activity.

The new product development process is a series of interdependent and frequently overlapping activities that transform an idea into a prototype and on to a marketable product. The process is much more fluid and flexible than is portrayed in the forthcoming flow diagrams in this chapter. As the original idea progresses through the development process, it is refined and constantly evaluated for technical and commercial feasibility. Trade-offs between the various

objectives (price, cost, performance, market availability, quality, and reliability) are made throughout the process. These days, one hears a great deal about designing for manufacturability. However, invariably, the focus is on the firm's internal manufacturing process. However, when those responsible for design ignore the manufacturing process and technological capabilities of outside suppliers, problems with quality, time-to-market, configuration, control, and cost are inevitable. If optimal design performance is to be achieved, suppliers must be active from the beginning, when they can have a major impact on performance, time, cost, and quality. Selected suppliers should participate in feasibility studies, value engineering, and prototype, failure, and stress analysis, among other product development tasks.

3.1 Product Development Methods

3.1.1 Flow Process chart :

This type of Flow chart is important because small lot size production requires the layout to be compact and efficient to ensure smooth flow of materials. A pull production system requires close communication between work stations. In Product development, overlapping of a large number of activities requires a complete change in layout that facilitates communication and encourages teamwork. Instead of organising by sequential functions. The design team works together in one location, creating a type of process layout. A process layout creates an environment for frequent, two-way communication between team members, which encourages concurrent development of a product and its associated processes.

3.1.2 Set-up Time :

The fundamental goal of contemporary Just-In-Time (JIT) manufacturing is frequent delivery of small lots of material. Setup Time Reduction is the most important of technologies that enable JIT replenishments while raising productivity, lowering inventory, slashing lead time, and improving quality. Quick setups drive smaller lot sizes, make additional capacity available (often at bottleneck resources), reduce scrap and rework, and increase flexibility. World Class performance ultimately relies on many techniques and disciplines working together, but it must all begin with fast setups. Product Development requires continuous flow of small lot sizes of information among team members. With continuous flow of small lot sizes of information, downstream team members can begin working on different phases of the design while final design is evolving.

3.1.3 Employment Feedback :

Another source of insight into ways in which to address customer needs better is the company's own work force. In his writings on JIT, the Japanese concept of continuous improvement, Masaaki (1986) explains that each employee is responsible for both maintaining the status quo and destroying it. This refers to the notion that employees must follow certain standards, but also eliminate waste and contribute to innovation. One way in which employees can contribute is by making frequent suggestions on product and process improvements through a system the Japanese call Teian . Of course, the scope of such an employee suggestion system covers more than just customer needs, but the essence of continuous improvement is meeting customer needs more effectively. In JIT and Product Development suppliers also work closely with the organisation to improve quality, shorten delivery time and offer ideas toward new product design.

3.1.4 Quality :

Intuitively, it's easy to understand that improved product quality reduces the need for inventory, particularly buffer inventory of extra components "just in case" something goes wrong. If you have fewer defective components, after all, you don't need to keep as much safety stock. In Product Development, because of the teamwork and two-way flow of information among team members, quality problems are detected earlier and solved before they have a cumulative impact on the rest of the project.

4.0 Product Development Alternatives :

Development of Alternative ways of satisfying these 88 needs, desires, and objectives should be developed and then evaluated against the criteria established in the preceding step. There is an unfortunate tendency to proceed with the first approach that appears to meet a need even though less obvious alternatives may yield more profitable solutions. Alternative approaches should be evaluated on the basis of suitability, producibility, component availability, economy, and customer acceptability.

1. Suitability refers to technical considerations such as strength, size, power consumption, capability, maintainability, and adaptability. Engineering has primary responsibility for these issues.

2. Reducibility is the ease with which a firm can manufacture an item. In the past, designs needed to be changed to accommodate the firm's or its suppliers' ability to produce the item economically. Problems arose when the needed changes were implemented. Early manufacturing engineering involvement in the design is needed to ensure the produceability of items made internally, and early supplier

involvement helps ensure the producibility of items furnished by suppliers.

3. Customer acceptability is defined as the marketability of an item to potential customers.

4.1.1 Design changes : Design changes during new product development process and early manufacturing phase is used as a measure of development quality.

4.1.2 Development time: Development time is the length of time between initial idea generation until the new product is ready for introduction to the market. Shorter development time and successful early market introduction raise the competitive value of the new product in terms of premium price, larger market share and higher profit margin. Product development time determines how responsive the firm can be to competition and to technology, as well as how quickly the organisation receives financial returns from the sales of the product.

4.1.3 Development cost : Initial Starting cost + Final Product Cost, This is the total cost from the early idea generation until the product is ready for manufacturing.

4.1.4 Manufacturing cost: Manufacturing cost includes initial investment in equipment and tools as well as the incremental cost of manufacturing the product. There is a close relationship between manufacturing cost and the type of decisions made during the early design stage.

4.2 Research and Methodology :

With these similarities between the two and evidence from manufacturing literature, one would expect to see that successful deployment of JIT principles would have a strong impact on the Product Development process. It originally referred to the production of goods to meet customer demand exactly, in time, quality and quantity, whether the 'customer' is the final purchaser of the product or another process further along the production line.

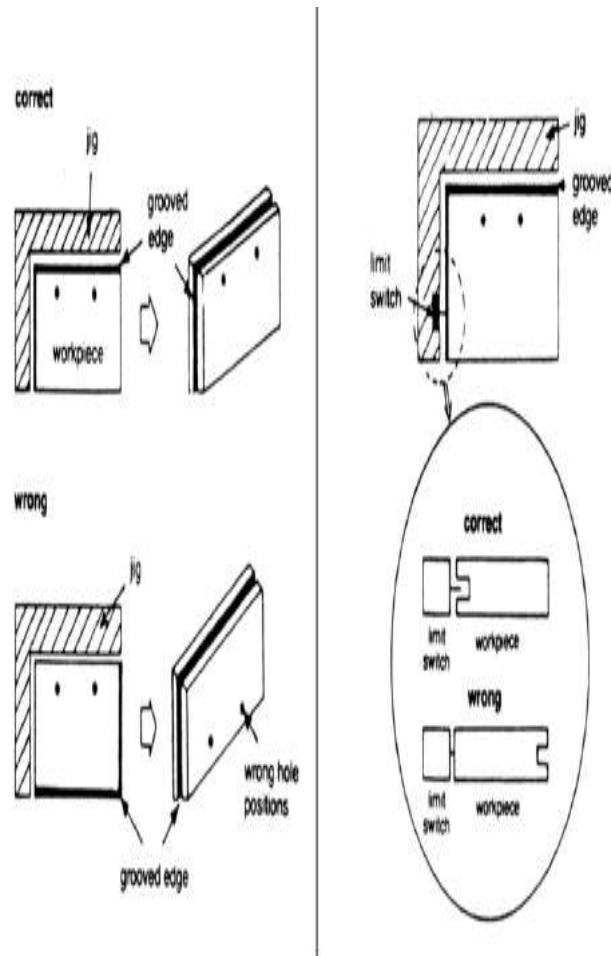
It has now come to mean producing with minimum waste. "Waste" is taken in its most general sense and includes time and resources as well as materials. Elements of JIT include.

For the purpose of this study, the survey instrument contained 4 general managerial and organisational profile items and two product development performance items. For these items, the respondents needed to answer product development performances before and after JIT implementation. The five questionnaire items are shown in Table 1. Since the purpose of the study was to obtain data on product development performance improvement after JIT implementation, the respondents were asked to use a broader view of 'new product', whether it was a complex finished product or a

simple part or component. They were also reminded that in order to answer the questions on product development performance measures before and after JIT, they may need to consult with other colleagues in the small scale company. Out of 9 completed surveys received, 7 surveys were usable resulting in a response rate of 77%. Analysis of survey data indicates that majority of the respondents had various high level managerial positions from organisations with fewer than 20 employees.

5.0 Result : JIT organisations will design new products with fewer design changes, less development time, better competency, less development cost and less manufacturing cost. Statistical results of new product development performances before and after JIT implementation are shown below table 1.

Description of the Process: A workpiece, a side plate, is set into position on a drill press and dowel holes are drilled. The workpiece is essentially symmetrical, and back and front are difficult to distinguish at a glance, although two edges are grooved along their length.



Before Improvement:	After Improvement:
The workers, when setting the workpiece into position, checked to see whether the top and bottom of the plate were in the correct position. They then drilled the dowel holes. Inexperienced workers sometimes confused top for bottom and drilled the holes in the wrong places. Even veteran workers sometimes mounted the part backwards. These defects were discovered only at assembly.	The grooved edges of two sides of the workpieces are used as guides for setting up the plates correctly. A limit switch is mounted on the jig and interlocked with the start switch so it is impossible to start the drill press if the side plate is set in the wrong position. Defects due to defective holes are completely eliminated.

6.0 Conclusion

The JIT concept is only one part in the value chain that brings the satisfaction to the customers. It means that the JIT concept cannot must solve existing problems in other organization processes. Everything in enterprises is needed to be healthy, through the hierarchy of employees and all workflow processes. Synergy is the only thing that can improve business results. And in the bottom line, the JIT concept is just one link in the whole chain, but very important. In summary, the statistical significance of Product Development performances before and after JIT is a clear evidence of the possible links between successful implementation of JIT in manufacturing and successful management of Product Development. The success of world class organizations in both JIT and Product Development and similarities between a number of critical factors in JIT and Product Development provide other evidence that supports possible links between JIT and Product Development.

4. References

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Performance Evaluation of concrete using near surface mounted Technique

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Abstract— Near surface mounted (NSM) FRP reinforcement has recently emerged as a promising technology for strengthening concrete structures in both flexure and shear. This technique has numerous potential advantages over externally bonded FRP strengthening systems, and is typically able to more fully employ the strength of FRP materials because of superior bond performance. Research to date has focused primarily on overall member behaviour and/or the various parameters that affect the bond performance of available NSM systems. FRP strengthening systems are known to be susceptible to deterioration of mechanical and bond properties. An experimental program was conducted to investigate the shear and flexural performance of NSM FRP beams. This technique consists of placing FRP in a groove cut into the surface of the member being strengthened. The FRP bar may be embedded in an epoxy- or cementitious-based paste, which transfers stresses between the substrate and the bar. The study was carried out up to the failure load.

Index Terms— Glass Fiber Reinforced Polymers, Strengthening, Concrete, Beams, Flexural, Shear, Bond

I. INTRODUCTION

Infrastructure throughout the industrialized world is showing significant and worrying signs of increasing deterioration. With these huge infrastructure deficits, novel approaches for the design, construction and repair of infrastructure must be developed. The experimental work confirms the fact that continuous FRP reinforcement column wrapping increases ultimate displacement and ultimate strength. The use of fiber reinforced polymers (FRPs) in civil engineering applications has emerged over the past 15 years, and FRPs are now providing a number of novel approaches for both new construction, and particularly for repair and strengthening of existing structures. Fibers are typically made of carbon, glass or aramid. However, the use of FRPs in NSM applications is a relatively new idea. Basic characteristic of FRP materials and method of mounting FRP bars within the concrete i.e. near surface mounted techniques is presented. In this newer technique, FRP bars or strips are used as reinforcement with either epoxy or cement-based adhesives. Externally bonded FRP laminates have been successfully used to increase the flexural and/or the shear capacity of reinforced concrete (RC) and masonry members. The use of near-surface-mounted (NSM) FRP bars is an attractive method for increasing flexural and shear strength of deficient RC members. Near-surface mounted (NSM) glass fiber reinforced polymer (GFRP) laminate strips are used to increase the load-carrying capacity of concrete structures by

inserting them into slits made in the concrete cover of the elements to be strengthened and gluing them to the concrete with an epoxy adhesive. This method is often able to utilize a greater proportion of the full strength of the bonded FRP because of superior bond characteristics, which help to prevent premature debonding failures. NSM techniques have become popular due to its specific bond characteristics which can enable more use of FRP. In order to take full advantage of ductility of RC member it is desirable to ensure that flexure rather than shear governs the ultimate strength.

1.1 NSM BACKGROUND

NSM reinforcement for strengthening concrete structures is not a new idea; the basic technique can be found in literature dating as far back as 1948 (De Lorenzis 2000), although these older applications used steel bars or rods as reinforcement and cement mortar as adhesives.

The available literature in this area encompasses two broad testing categories, bond tests and member tests. These two areas have arisen because, in flexural strengthening applications with NSM reinforcement, as is the case with externally-bonded FRP sheets, members can typically be analyzed using the same assumptions that are used for conventional reinforced concrete members.

Bond Tests

Previous researchers have noted that in NSM FRP applications “bond is of primary importance, since it is the means for the transfer of stress between the concrete and the FRP reinforcement in order to develop composite action”.

It can also be found that the larger the groove size the higher the bond strength, except in cases with cement-based adhesive and spirally wound bars, for which pull-out failure at large groove sizes lowered the bond strength because of large amounts of cracking in the adhesive.

Member Tests: Flexural Strengthening Several authors have studied the overall performance of reinforced concrete beams strengthened in flexure with NSM FRP bars. Experiments on four full-scale NSM FRP strengthened reinforced concrete T-beams tested in four point bending were reported. Strength gains between 25.7% and 44.3% were observed when strengthened beams were compared to the unstrengthened control beam.

1.2 STRENGTHENING PROCEDURE

The NSM technique consists of the installation of FRP reinforcing bars in slots grooved in the masonry surface

. The strengthening procedure can be summarized as: (1) grooving of slots having a width of approximately one and a half times the bar diameter and cleaning of surface, (2) application of embedding paste (epoxy-based or

cementitious-based) (3) encapsulation of the bars in the groove and (4) finishing.

There would be an increase in both flexural strength (10%-98%) stiffness and yield

Strength (10%-47%) for all NSM FRP strengthened specimens

Usage of NSM techniques is suitable in the following cases:

1. If the reinforced is susceptible to damage
2. If the concrete has low tensile strength
3. If the surface of concrete is rough

Due to concrete casting conditions, under the tensile longitudinal bars exist a concentration of voids and defects on the microstructure of the material.

2. STRENGTHENING TECHNIQUE

2.1 PRELIMINARY REMARKS

In this research methodology the specimens of beams would be casted and their shear strengthening would be checked when the GFRP are used; the aim is to find out the mechanical and physical properties of GFRP and their interaction with concrete. A detailed analysis related to the compressive strength of concrete when subjected to such fibers will be done in addition to the check of flexural strength of concrete by using near surface mounted techniques.

2.2 DESIGN TECHNIQUES

In this technique's grooves would be cut on the specimen of beams and GFRP would be induced in it. Also the minimum clear cover at which the desired grooves need to be cut should be specified and be used accordingly. The groove filler is a medium of transfer of stresses between GFRP and concrete. The given specimen of beams would be tested under one point loads and two point loads using pull out tests. The mechanism of cover splitting bond failure in NSM system is very much similar to splitting bond failure of steel deformed bars in concrete. Along with GFRP carbon fibers can also be used to increase the strength of concrete. Several fiber materials are available e.g.: glass, aramid, carbon etc. as fibers have linear elastic behavior until failure. The type of filler material used can change the failure mode and the old concrete and filling material could be a weak point.

2.3 ASSUMPTIONS USED TO SIMPLIFY THE CALCULATIONS

(i) Concrete and GFRP behaves elastically and isotropically. (ii) No slip is allowed at the interface of bond. (iii) Bending stiffness of the concrete beam to the strengthened is much greater than the stiffness of composite plate. Here the study of interaction between the flexural-shear cracking and bonded stress is very crucial.

3. MATERIALS PROPERTIES

Glass fiber reinforced polymer (GFRP) rods of 8 mm in diameter were used. The properties of the hardened concrete (compressive strength, tensile strength and instantaneous elastic modulus) were measured at 28 days on concrete cylinders. The specimens were stored for 28 days in a confined room ($T = 250^{\circ}\text{C}$). The tensile strength was obtained from splitting tests. A total of 10 beams, 1.0 m long and of rectangular (230 x 450 cm) cross-section, were cast and tested under a monotonically increasing one point and two point load. Installation of the NSM GFRP began by cutting grooves with specified dimensions into the concrete cover in the longitudinal direction at the tension side of the specimen beam. The grooves were cleaned using airbrushing pressure to remove debris and fine particles so as to ensure proper bonding between the filling material and the concrete.

Cement, fine aggregates, coarse aggregates, water, glass fibers, and conventional skeletal steel used throughout the investigation.

Sr No	Test	Results	Requirement as per IS:1489 (part1)
1	Fineness Specific Surface (m^2/kg)	329	Not less than 300
2	Setting time Initial Final	150 210	Not less than 30 Not less than 150
3	Soundness Le-chatelier Expn Drying shrinkage	1.0 0.004	Not more than 10mm Not more than 0.15%
4	a) Normal Consistency b) Temp. during testing (degree.C)	27.5 27 \pm 2	

4. EXPERIMENTAL PROGRAMME

The experimental programme consists of casting and testing of 11 simply supported beam specimens.

The specimens are classified into two sets of beams. The first group of beam consists of 1 nonfibrous beams and 8 fibrous beams and second group consists of one fibrous and one non fibrous beams having conventional steel reinforcement.

Testing was done using hydraulic jack with single point load (UNIVERSAL TESTING MACHINE....1000KN). Two point loading is used to study flexural behavior of beams corresponding to the depth at loading points.

Shape	Cylindrical(glass fibre)
Fiber length	12mm
Packaging	85gms or as per requirement
Form	Filament(Coated with special Dispersive agent for crack

	prevention)
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Characteristics

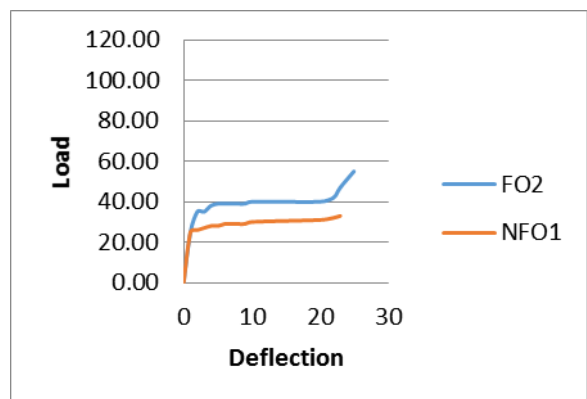
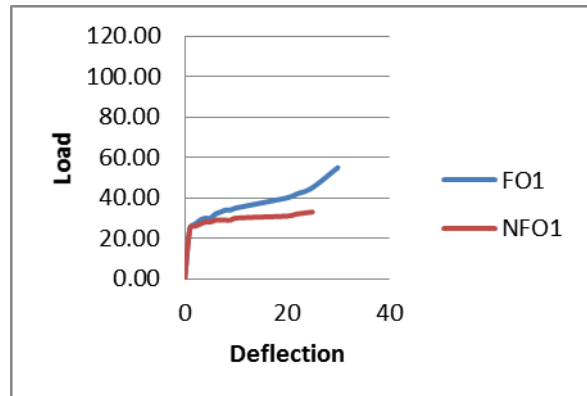
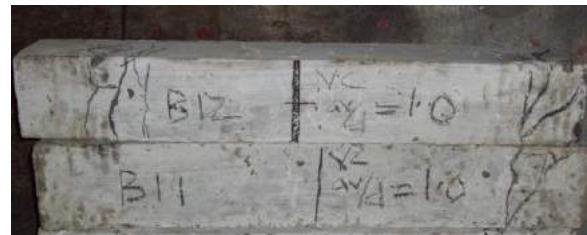
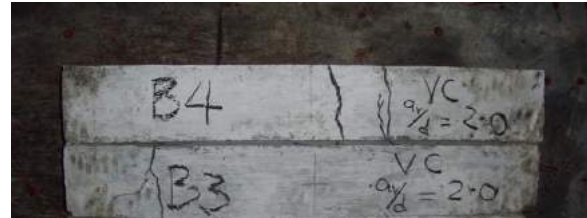
Fiber density	0.0000091 N/mm ³
Specific area	200 m ² /kg
Melting point	160 °C
Water absorption	Less than 0.1%

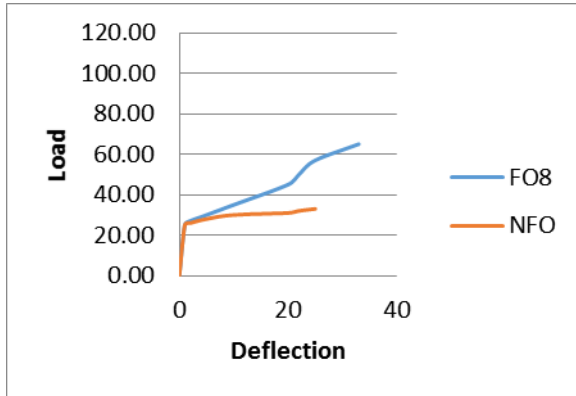
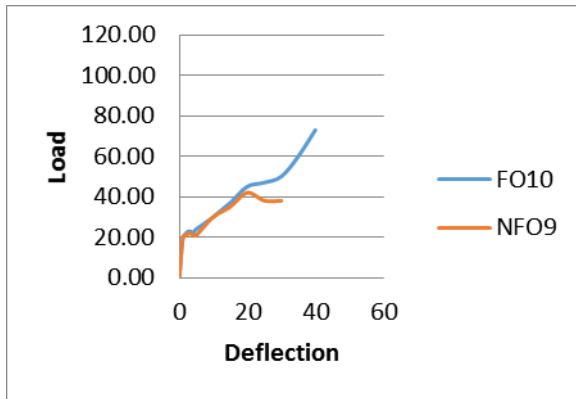
5. TEST RESULTS

SINGLE POINT LOAD TESTING

FO- FIBROUS BEAMS NFO-NON FIBROUS BEAMS
LO -LONGITUDINAL LAYER TR -TRANSVERSE
LAYER (BY making use of NSM techniques). Beam FO1 to
FO 8 failed in shear, whereas NFO9 & FO10 failed in
Flexural

Beam	M_{cr} (kNm)	Shear strength	Midspan deflection	WR APP ING LAY ERS	DISTAN CE FROM NEUTRA L AXIS IN TENSIO N ZONE (mm)
NFO1 230X45 0	20.4	32	25	NO NE	NONE
FO1	29.5	58	30	LO	25
FO2	32.3	55	25	LO & TR	50
FO3	35.2	60	28	LO	100
FO4	36.5	75	35	LO	175
FO5	38.2	60	32	LO	150
FO6	40.6	80	34	LO & TR	100
FO7	34.1	55	37	LO	75
FO8	33.9	65	33	LO	50
NFO9	25.6	39	30	none	None
FO10	34.5	73	40	LO	125





6. CONCLUSION

The NSM technique using GFRP is very effective in enhancing the flexural and shear strength of reinforced concrete beams whatever the filling material (resin or mortar) used (as seen in graphs). The effectiveness of NSM shear strengthening may be influenced by the position of steel stirrups. Results of this parametric study have shown that the strengthening efficiency depends upon the groove depth and the types of fibers being used. A new predictive model originated from the need for rational explanation to the features of above failure mechanisms affecting the behavior shear strengthening of RC beams using NSM GFRP strips has been proposed. In future more extensive research work can be carried out to solve the problems caused by, fatigue damages of concrete and bonding interface of GFRP strengthened concrete structures. The reinforcement with NSM FRP has enhanced the performances of the strengthened beams both in terms of failure load and ductility. In future effect of existing steel transverse reinforcement, span to depth ratio by applying glass or carbon fibers needs to be considered.

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Concerns of Safety at Construction Site in India

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ABSTRACT

Construction is a dangerous and risky sector. About 13 workers per 1lac are being killed in construction, compare to 5 workers per 1lac in the all other sector on average. Construction work also exposes labours/workers to a wide range of health issues and prolonged stress health problems. Safety becomes major concern while participating in civil projects.

When comparing with Indian standard of safety measures, things are much adverse. Fatalities of labours in India are much more than any other nations because of availability of cheap, untrained labours. Labours at construction site in India risk their life because of lack of knowledge, skills and safety gears compare to labours from other part of the world.

Most mishaps can be avoided by following basic measures or by carrying forward proper working measures. This paper will put light on essential issues on safety and health that should be paid attention at construction sites for avoiding misfortunate incidents.

Keywords

Construction, mishaps, fatalities, safety measures, health issues, untrained/unskilled labours.

1. INTRODUCTION

The construction industry adds about 11% of GDP and employs approximately 33 million people in India. Construction industry is second largest sector of the country after agriculture [1]. The Money invested and the job opportunity created by this industry is larger than any other industry in the country.

It is a vital provider to infrastructural developments like: roads, dams, irrigation works, houses, schools and hospitals.

The labor force in the Indian construction industry comprises of 55% unskilled labour, 27% skilled labour, and remaining are technical and supporting staff. About 16% of the nation's working population depends on constructional works for their source of revenue.

The Indian construction labour is 7.5% of the global labour force but it accounts to 16.4% of lethal total occupational accidents [2]. It adds approximately 11% of occupational injuries and 20% of deaths resulting from occupational accidents [1].

The labour in the construction industry is most in danger because employment is generally short-term in nature, employer-employee association is very weak and most of the time short-lived.

There are more than a few factors liable for health troubles and construction site accidents. The Occupational Safety and Health Administration (OSHA) studied the causes of construction accidents, result showed that 33% of fatalities in were because of by falls, 22% were struck by incidents, 18% were caught in/between incidents, 17% were electrocutions, and 10% were caused by other reasons [7].

Larger projects are well thought-out to manage safety aspects. The larger construction firms have leaders responsible for keeping the team members up to date about promising safety problems. Small to medium firms do not have a satisfactory safety program or person to supervise safety criteria. Implementation of the safety management is with project manager.

Safety and quality are vital in the construction industry. The industry needs high quality while ensuring a safe working environment at workplace. In the last decade, need for safety attentiveness among construction companies has significantly increased [5].

Construction safety in India is still in its initial stages because safety laws are not strictly enforced. Efforts should be made to raise the level of responsiveness among the workers and the employers about the importance of health and safety-related issues.

2. ACCIDENTS AT CONSTRUCTION SITE

Accident mitigation requires a wide-ranging knowledge and understanding of construction activities. The identification of major causes of accidents is a difficult task.

Unsafe conditions and unsafe actions are the direct or the primary causes of accidents and it is liability of management as these are because of the failure of management to predict issues like teaching, safeguarding, training and not having safe systems at construction sites [8].

Accidents at construction sites occur due to the lack of knowledge, training, supervision, methods to carry out the task safely, and inaccuracy of judgment or carelessness.

Root causes for the accidents are also because of inadequate construction planning, lack of proper training, deficient enforcement of training, unsafe equipment, unsafe methods or sequencing, unsafe site conditions or not using safety equipment that was provided.

28% of the fatalities results to fractures, 26% accounts for strain or sprain, 23% leads to contusion or abrasion, 7% of the workers affect their internal organs and the rest counts for electric shock, dislocation, concussion etc.

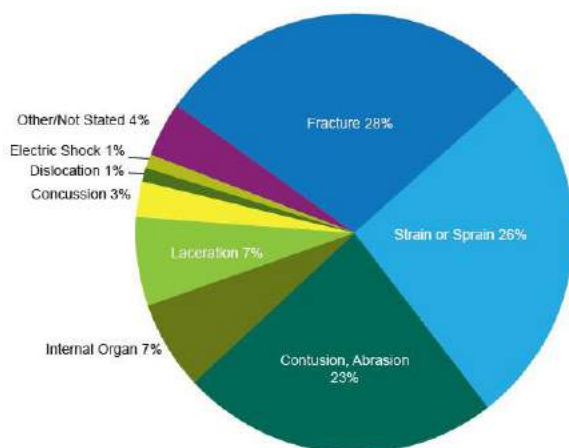


Fig1. Impacts of fatalities

The construction safety factors control a project to larger extent and result in human suffering, delay in project interval, and cost overruns.

It's necessary to develop a safety program in order to keep away from adversities at construction sites. For implementing safety program, the things which should be performed are 'handing over responsibilities to the people concerned in the project', 'identifying hazards and determining solutions to control it', 'teaching and communicating with the people' and 'documenting and enforcing the safety rules at construction site'.

Reason to implement a safety program is because of the benefits achieved by it. Benefits includes reduction in workers' compensation claims, reduction in expenses related to injuries and illnesses, reduction in an insurance cost, reduces the complaints from employees, improves employee morale and satisfaction level and finally productivity at the construction site increases.

Safety managers should be conscious of direct and indirect causes of accidents which will adversely affect safety at sites. In order to calculate when and where risks will reach its

highest peak, analysis should be carried out based up on the data which is available.

Roles and responsibilities of the supervisors at the site is to carry out certain things which include enforcing safety rules and policies, setting up safe work practices, instructing workers about ways to avoid hazards, making count of work-related injuries, illness or near misses, investigating the causes of incidents or near misses and taking the suitable action to prevent it and also ensuring on time medical attention.

Work of safety professional is to develop and put into practice accident prevention programs, advise management on company policies and governmental regulations, evaluate effectiveness of existing safety programs and to train management in safety observation techniques.

3. IMPORTANCE OF GOOD SITE LAYOUT

The process of site layout setting up involves identifying, sizing and allocating necessary temporary/ minimum facilities on a construction site. Temporary facilities range from inventories, ware-houses, fabrication shops, maintenance shops, batch plants and residence facilities [9]. These facilities are needed to maintain construction operations and to provide services for workers on site. Addition of all required temporary facilities and properly positioning them on site can have a huge impact on safety standards [6].

Temporary facilities that have an impact on health and safety include access to roads, warehouses and also welfare amenities which consist of first aid station, toilet, rest area, washing facilities and recreational rooms [10].

Good site layout is important to encourage safe and well-organized operations, to cut down travel time, decrease material handling, and reduce obstruction during movements of materials and equipment [11].

The site layout planning should comprise safety aspects along with the smooth and low-cost flow of resources, labour, and apparatus [12].

Health and safety issues were often overlooked in the earlier studies on site layout planning [6]. Inappropriate site layout causes number of injuries, accidents, and work-related illness and contributes extra cost and delays.

4. CONCERNS FOR CONTINUITY OF CONSTRUCTION INDUSTRY

Safety and the health issues of the labours is very vital for sustainability of the construction industry. The construction industry's insight of sustainability includes construction workers' safety and health also in addition to the safety and health of the facility users.

It is necessary to determine hazards in the jobs so that the precaution can be taken at the early stages. Job Hazard Analysis includes selecting activities with maximum risk, breaking the activity into smaller components, identifying the

possible hazards in each part and developing the procedures to eliminate/reduce hazard.

Rajendran and Gambatese [13] acknowledged safety and health of the workers as part of sustainability initiatives and well thought-out the entire facility life cycle to sustain all resources.

5. CONCLUSIONS

While carrying out sky-scraping quality work within precise time and cost, wellbeing of workers requires a major thoughtfulness. Unsafe acts, unsafe conditions, and failure of supervision to foresee unsafe situations are the main causes of catastrophe.

Responsiveness is a safe way to avoid accidents at workplace. Most mishaps can be avoided by following basic measures or by carrying forward proper working measures. Owners and facility designers play a critical role in the assortment of a safe contractor and eradication of various safety hazards.

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Efficiency of GGBS in concrete

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Abstract

The utilization of supplementary cementitious materials is well accepted because of the several improvements possible in the concrete composites and due to the overall economy. The present paper is an effort to quantify the 28-day cementitious efficiency of ground granulated blast furnace slag (GGBS) in concrete at the various replacement levels. It was observed that this overall strength efficiency of GGBS concretes can also be defined through a procedure adopted earlier for other cementitious materials like fly ash and silica fume. The overall strength efficiency was found to be a combination of general efficiency factor, depending on the age and a percentage efficiency factor, depending upon the percentage of replacement as was the case with a few other cementitious materials like fly ash and silica fume reported earlier. This evaluation makes it possible to design GGBS concretes for a desired strength at any given percentage of replacement.

Keywords: Concrete; Mixture proportioning; Granulated blast furnace slag; Compressive strength; Efficiency

1. Introduction

Blast furnace slag cements are in use for a reasonably long period due to the overall economy in their production as well as their improved performance characteristics in aggressive environments. Also, the use of pozzolanas as additives to cement, and more recently to concrete, is well accepted in practice. Ground granulated blast furnace slag (GGBS) is one such pozzolanic material (termed by a few as a supplementary or complimentary cementitious material) which can be used as a cementitious ingredient in either cements or concrete composites.

Research work to date suggests that these supplementary cementitious materials improve many of the performance characteristics of the concrete, such as strength, workability, durability and corrosion resistance. To assess the effectiveness of GGBS in cementitious composites, some of the parameters like chemical composition, hydraulic reactivity, and fineness have been carefully examined by many earlier. It was seen that among these, the reactive glass content and fineness of GGBS alone will influence the cementitious/ pozzolanic efficiency or its reactivity in concrete composites significantly. Some of the earlier researchers tried to express this reactivity of GGBS in terms of slag activity index (SAI) or hydraulic index, considering its chemical composition.

2. Slag activity index

SAI is defined as the percentage ratio of the average compressive strength of slag cement (50±50%) mortar cubes to the average compressive strength of reference cement mortar cubes at a designated age. Based on this slag was classified into three grades-Grade 80, Grade 100, and Grade 120, depending on the relative compressive strength. Hooton and Emery observed that the properties of GGBS influencing its reactivity to be the glass content, chemical composition, mineralogical composition, fineness of grinding and type of activation provided. Researchers have suggested different compositional moduli to assess the reactivity of GGBS. However, Mantel came to conclusion that hydraulic formulae for GGBS proposed in the literature do not adequately predict the strength performance of slag. He stated that there is no correlation between the chemical composition of a cement or that of a slag and the hydraulic activity of a blend made from that cement and slag.

He also reported that the slag activity depends on the particle size distribution (fineness) of slag and the cement used and showed that this ranges from 62% to 115% at 28 days. He observed that cement with high alkali content has not effected the hydraulicity of the slag. In contrast, Hogan and Rose have said that high alkali cement blends yield an appreciably greater SAI value than the low alkali cement blends. It is to be noted that all the above tests on SAI were conducted on mortar cubes only. Although it is well known that the behavior of mortar is different from that of concrete and, in particular, the reactivity of GGBS in mortar cannot directly be correlated to its performance in concrete, concrete mix proportioning based on the reactivity of slag is not looked into by many. The above discussion shows that there is a need to look at the possibility of proportioning mixes based on the reactivity of GGBS in concrete.

There have been a few attempts of this nature reported in literature. Swamy and Bouikni reported that by a proper mix proportioning GGBS concretes can be produced with strengths comparable to those with ordinary Portland cement from the 3rd day onwards. He also suggested that the total cementitious material has to be increased by 10% for 50% replacement of GGBS and by 20% for 65% replacement to attain strengths comparable to normal concretes. For a general understanding of the reactivity of GGBS, the compressive strength results of Hwang and Lin on GGBS mortars at different ages and at the various replace-ment levels have been replotted (Fig. 1). This shows that

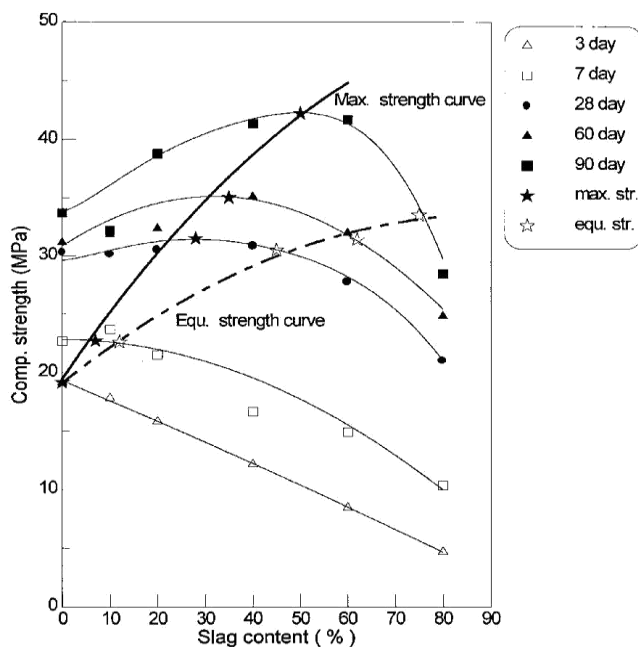


Fig. 1. Effect of slag content on strength development in cement mortars .

there is a maximum percentage for obtaining an equivalent strength (equivalent to the normal mortar at that age) and also, that there is a specific percentage of GGBS at which the maximum strength can be obtained at that age. From this, it can be said that the compressive strength of GGBS concretes depend both on percentage replacement level and on the age. It is felt that the efficiency concept, proposed earlier for fly ash and silica fume, can also be used for understanding the behavior of GGBS in concrete.

3. Evaluation of efficiency

This paper attempts to assess the cementitious efficiency of GGBS in concrete at the various replacement percentages through the efficiency concept by establishing the variation of the strength to water-to-cementitious materials ratio relations of the GGBS concretes from the normal concretes at 28 days. In principle, this was done by using Dw concept, which attempts to bring the water-to-cementitious material ratio $[w/(c + g)]$ nearer to the water-to-cement ratio of the control concrete (w/c_o) by applying the cementitious efficiency factor k of GGBS at any particular strength. However, the first trails to bring the water-to-cementitious materials ratio to strength relations through a single efficiency value (general efficiency factor k_e), at all replacement percentages, did not lead to a good correlation. The remaining difference at this stage was corrected through the "percentage efficiency factor (k_p).". The "overall cementitious efficiency factor (k)" is the sum of the general efficiency factor k_e and the percentage efficiency factor k_p .

A detailed presentation of this method for evolution of efficiency of mineral admixtures in concrete was discussed. Thus, in this method, the water-to-cement ratio (w/c_o) to strength relation of normal concrete will also be valid for the GGBS concretes, by considering the "water-to-effective cementitious materials ratio."

$$w/c_o = \dots c \div kg \div S \div w = \dots c \div k_e g \div k_p g \div S$$

where $k = k_e + k_p$.

For this evaluation of the efficiency, the data available from research efforts in the recent past were collected and summarized in Table 1. It is to be noted that this was to ensure that the results of these investigations are representative of the cements and slags manufactured presently. It was made sure that these will form a fairly representative group governing all the major parameters that influence the behavior of GGBS in concrete and present the complete information required for such an evaluation. During the evaluation, it was seen that some of these mixes do not form a part of normal concretes, due to variations resulting from air entrainment, different curing

conditions and high fineness of slag, etc. and these were not considered

Table 1
Details of the concretes evaluated

				1	0	0.23± 0.83	40± 170	19.7±
				2	10	0.26± 0.38	150	58.5±
				3	30	0.26± 0.55	100±150	49.1±
				4	50	0.30± 0.80	35± 190	21.2±
				5	60	0.26± 0.50	150	43.5±
				6	65	0.46± 0.75	100	23.0±
				7	70	0.41± 0.61	45± 65	32.5±
				8	80	0.5	±	29.5±
Slag no.	Percentage replacement	w/(c + g) Range	Slump range (mm)	28-Day compressive strength range (MPa)		Average efficiency @ 28 days		

for evaluation. Finally, out of the 175 mixes only about 70 concretes made with ordinary Portland cement confirming to grade 53 cement (with fineness in the range of $225 \pm 370 \text{ m}^2/\text{kg}$) and cured under normal conditions were evaluated. The GGBS in these concretes confirm to the minimum characteristics specified by IS 9103-1999 for use as mineral admixture in concrete (with fineness ranging from 350 to $465 \text{ m}^2/\text{kg}$, SiO_2 from 31.1% to 38.59% and CaO from 32.8% to 43.9%). The replacement percentages range from 10% to 80%. Natural river sand was used as fine aggregate and the maximum size of the coarse aggregate ranges from 10 to 20 mm. It is obvious that with replacement levels as high as 80%, some of these concretes had superplasticizers for improving the workability, because of the high fines content in these concretes. In view of this, only concretes up to a maximum superplasticizer percentage of 2% were considered for evaluation. Also, different researchers used specimens of different sizes and shapes and these have been corrected to their equivalent for a cube

of 15-cm size through accepted guidelines . In most cases, the change was the variation from cylinder to cube strength, and was corrected by using a single factor of 0.9 for concretes in the strength range of $55 \pm 70 \text{ MPa}$. The water-to-cementitious materials ratio $[w/(c + g)]$ to compressive strength relations at different percentages of replacement were plotted for all the concretes at 28 days (Fig. 2). It can be seen from this that the 28-day compressive strengths of concretes containing GGBS up to 30% replacement were all slightly above that of normal concretes and at all the other percentages the relationships were below that of normal concretes. It was also observed that the variations due to the different percentages of slag replacement were smaller than the corresponding variations in the case of fly ash. In order to bring the strength values at all replacement levels nearer to that of normal concrete, the water-to-cementitious material ratios were modified by applying the "general efficiency factor (k_e)," replacing the $[w/(c + g)]$ with $[w/(c + k_e g)]$. After several trials with k_e values varying

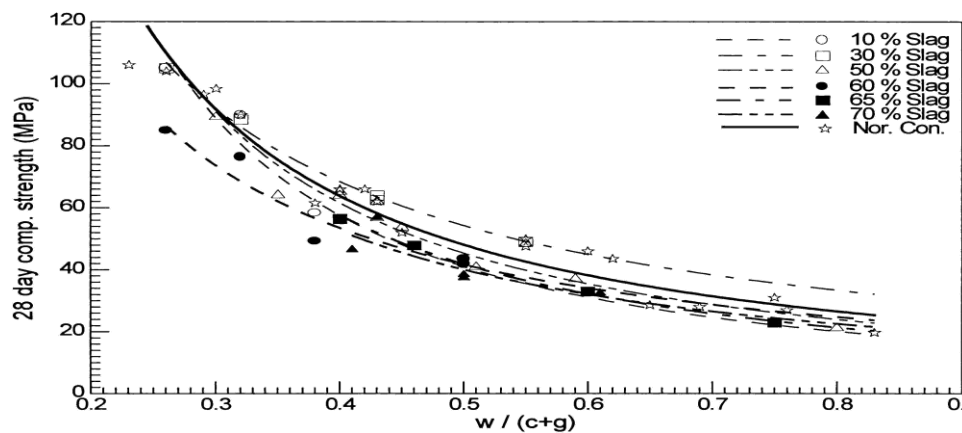


Fig. 2.Compressive strength variation with $[w/(c + g)]$ at 28 days.

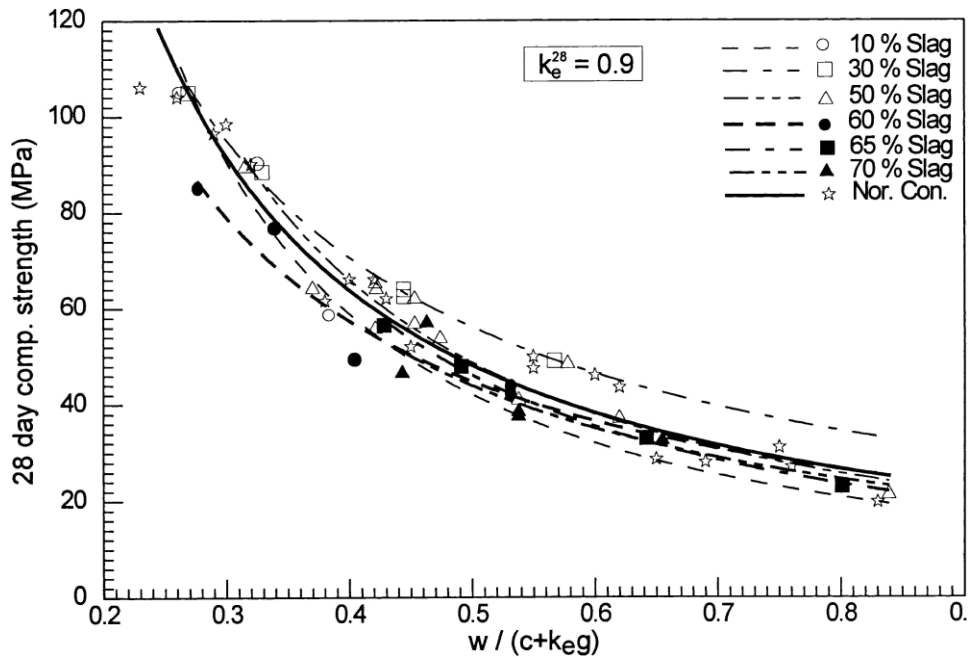


Fig. 3.Compressive strength variation with $[w/(c + k_e g)]$ at 28 days.

from 0.85 to 1.0, the appropriate k_e value was found to be 0.9 for the 28-day strength of these concretes. As already mentioned earlier, it was observed that this general efficiency factor k_e could not bring the $[w/(c + k_e g)]$ to strength relations very close to the water-to-cement ratio of normal concrete (w/c_o) at all percentage replacement levels (Fig. 3). At this stage, the effect of percentage replacement on

efficiency, which can bring the GGBS concrete strength values closer to that of normal concrete was found by evaluating the remaining difference through a "percentage efficiency factor (k_p).". This value was observed to be varying between +0.39 and -0.20 for replacement levels between 10% and 80%. This results in an "overall efficiency factor (k)," the sum of the "general efficiency factor

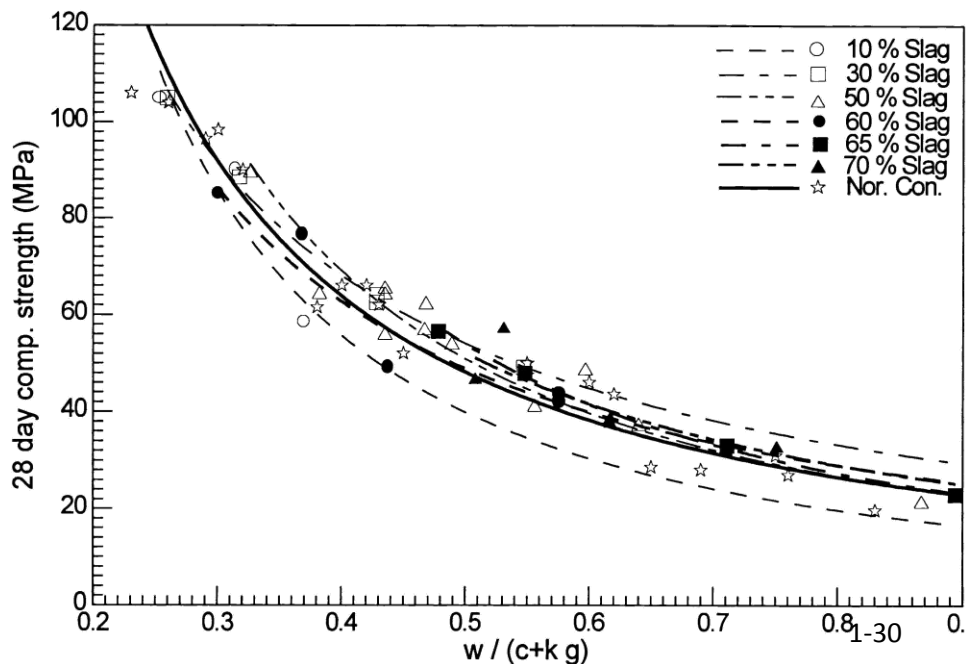


Fig. 4. Compressive strength variation with $[w/(c + k_g)]$ at 28 days.

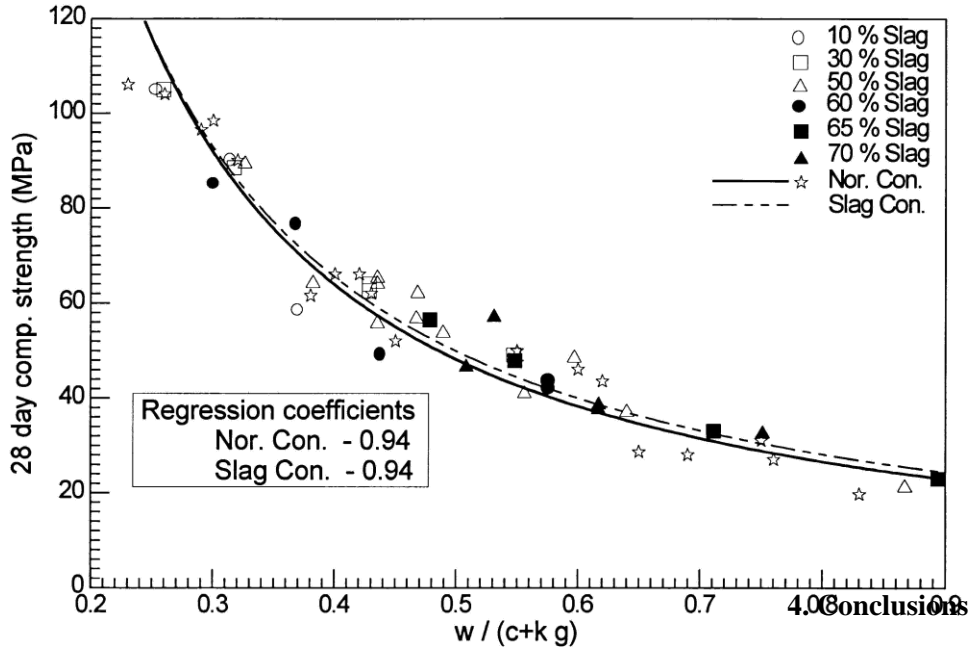


Fig. 5. Assessment of the reliability of the efficiencies evaluated.

(k_e)" and the "percentage efficiency factor (k_p)," varying between 1.29 and 0.70 for the percentage replacements varying from 10% to 80%. The typical variations of strengths with $[w/(c + k_{eg} + k_{pg})]$ at 28 days were presented (Fig. 4). This shows that by adopting the two efficiency factors k_e and k_p , the strength of GGBS concretes at different percentages could be brought close to that of normal concrete. Fig. 5 shows best fit of the corrected water-to-cementitious materials ratio to strength relations of the GGBS concretes in comparison to that of the normal concretes. The regression coefficient for GGBS concretes as well as normal concretes was found to be 0.94 at 28 days. The above evaluation also showed that the slag concretes based on this overall efficiency factor (k), will need an increase of 8.6% for 50% replacement and 19.5% for 65% replacement in the total cementitious materials for achieving strength equivalent to that of normal concrete at 28 days. This agrees well with the observations of Swamy and Bouikni reported earlier.

This study was primarily concerned with the evaluation of the efficiency of GGBS in concretes containing normal Portland cements from the results of the investigations reported in recent years. The replacement levels in the concrete studied varied from 10% to 80% and the strength efficiencies at the 28 days were calculated. The primary conclusions can be listed as follows.

(1) The earlier proposed method for evaluating the efficiency of pozzolanas like fly ash and silica fume was also found to be appropriate for the evaluation of GGBS. This method recognizes that the "overall strength efficiency factor (k)" of the pozzolana is a combination of the two factors-the "general efficiency factor (k_e)" and the "percentage efficiency factor (k_p)."

(2) The evaluation has shown that at 28 days, the "overall strength efficiency factor (k)" varied from 1.29 to 0.70 for percentage replacement levels varying from 10% to 80%.

(3) It was also seen that the "overall strength efficiency factor (k)" was an algebraic sum of a constant "general efficiency factor (k_e)," with a value of 0.9 at 28 days, and a "percentage efficiency factor (k_p)," varying from +0.39 to 0.20, for the cement replacement levels varying from 10% to 80% studied.

(4) Overall, the prediction of the strength of concretes varying from 20 to 100 MPa with GGBS levels varying from 10% to 80% by this method was found to result in a regression coefficient of 0.94, which was also the same for normal concretes.

(5) Finally, it was observed that for obtaining equal strength in concretes at 28 days, by adopting the efficiencies evaluated in the present investigation, it will be required to have an additional 8.5% and 19.5% increase in the total cementitious materials at 50% and 65% cement replacement levels, agreeing well with the values 10% and 20% additional material reported earlier.

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Creep behaviour of Fibre-reinforced Polymer Concrete

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Abstract

Polymer concrete is a kind of concrete where natural aggregates such as silica sand or gravel are binded together with a thermoset resin, such as epoxy. Although polymer concretes are stronger in compression than cementitious concrete, its tension behaviour is still weak. The reinforcement of polymer concrete beams in the tension zone with pultruded profiles made of epoxy resin and glass fibers are a good compromise between stiffness and strength. In this paper it is reported an investigation of the creep behaviour of polymer concrete beams reinforced with fiber-reinforced plastics (pultruded) rebars. Four-point bending creep test were performed. An analytical model was applied to verify the experimental results.

Keywords: Creep; Polymer concrete; Composites; Reinforced concrete

2. Testing set-up

Polymer concrete with 80% (in mass) of foundry sand and 20% epoxy resin was used as the basic material. This formulation corresponds to an optimised result from previous research. Foundry sand has rather uni- form granulometry with a mean diameter of 245 mm. The mechanical properties of this polymer concrete are presented in Table 1 and the mechanical properties of the pultruded rods are presented in Table 2. Beams with dimensions $230 \times 450 \times 1000$ mm were casted, with 4 mm pultruded rods reinforcement, as shown in Fig. 1.

1.Introduction

In polymer concrete a resin binds natural aggregates. Common thermoset resins are polyester and epoxy while natural aggregates can be of various nature, such as silica sand. Like any other type of thermoset resin, catalyst or hardeners are added to the resin prior to mixing and casting of such polymer concrete. In polymer concrete, water is not present at all, unlike cement concrete where water play a major role. Water or moisture can damage the hardening process of the resin. Polyester resin is the most common due to low price and good corrosion properties. However, curing of polyester must be well controlled in order to maintain good workability for a high viscous polymer concrete. Polymer concretes have high compressive strength, good corrosion resistance, low permeability and fast setting times. These characteristics allow the continuous, although slow, increase of polymer concrete in civil construction industries. Polymer concrete have similar mechanical behaviour to cement concrete. Compressive strengths of 100 MPa are common in polymer concrete. However, like cement concrete, its tensile strength is much lower. Therefore some reinforcement is needed in the tensile zone. Several authors have used steel rebars for reinforced concrete and also glass or carbon short fibers to reduce cracking. In this work pultruded rods were used. These rods are manufactured from polyester resin and glass fiber. Polymer concrete is rate-dependent, due to the polymeric nature of its matrix. Creep tests were performed on polymer concrete beams reinforced with composite rods. It is reported the experimental results of such creep tests and conclusions about their performance is discussed.

3.Static testing

Static tests are needed in order to check the ultimate load. In this case we choose a failure by bending. Three point bending tests were performed at a speed of 1 mm/min. In Fig. 2 are illustrated the load-displacement results for three-point static bending tests. The curves obtained (Fig. 3) are rather coincident and it can be checked in Fig. 4 that samples fail in pure bending modes. In Table 3 are presented the mean values of maximum load and maximum stress for three and four point bending tests.

Table 1
Polymer concrete properties

Bending strength	38.7 MPa
Compression strength	82 MPa
Compression modulus of elasticity	11.5 GPa

Table 2
Pultruded rods properties

Tensile strength	1 GPa
Bending strength	1 GPa
Compression strength	450 MPa
Tensile modulus of elasticity	40 GPa
Bending modulus of elasticity	45 GPa
Compression modulus of elasticity	30 GPa

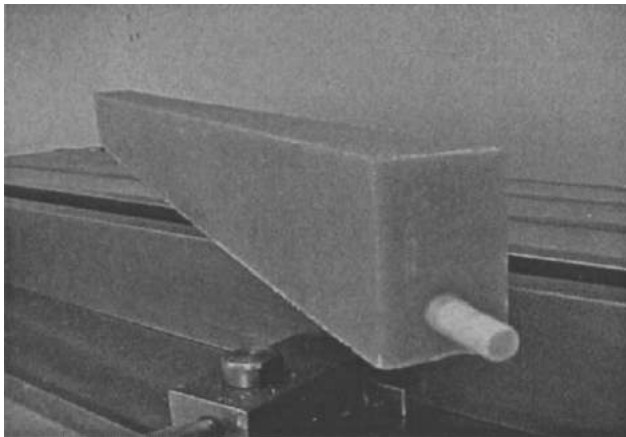


Fig. 1. Polymer concrete beam reinforced with glass fiber pultruded rod.

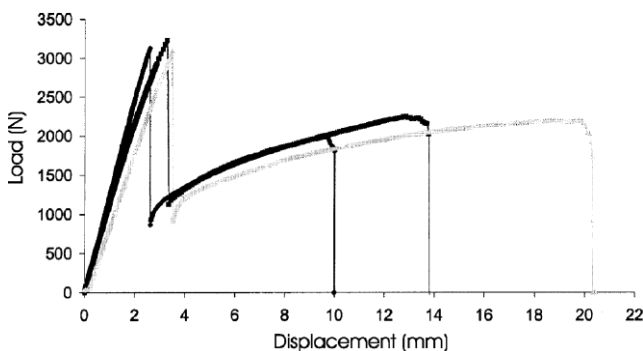


Fig. 2. Load-displacement curve for static three-point bending test.

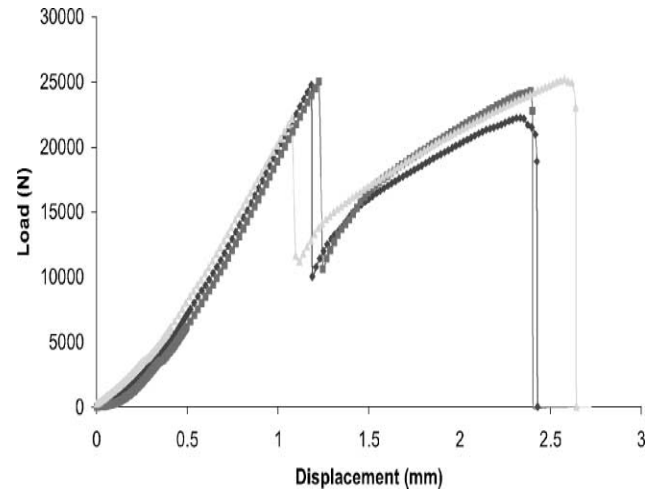


Fig. 3. Load-displacement curve for static four-point bending test.

With the information from these tests the final creep set-up has a span of 160 mm and a 40 mm arm (Fig. 5).

4. Creep tests

The creep testing machine is based on the action of a spring under force control in order to compensate the concrete relaxation. The action of bolted columns allow for a simultaneous bending of the two beams symmetrically placed about the reinforcing rebars. This new set-up was specifically designed and built for these type of beams and has proved to be quite good in overall performance. Extensometers are placed in each beam in the central upper and lower faces, to allow easy reading of compression and tension strains. In Fig. 6 the testing set-up is illustrated. In order to evaluate the effect of load in creep, three load levels were chosen, as a function of the maximum load: 15%, 30% and 45%.

In Figs. 2 and 3 the static results show similar bending stiffness with similar tensile cracking and similar maximum load. Some scale effects are visible as in four point bending tests the first crack stress level is about 17% higher than in corresponding stress level for three-point bending tests. In Figs. 7–9, some variation in creep curves exist. This slight variation can be caused by the material variation and by the testing set-up configuration, which may be improved by a more stiff placement of beams.

For the three creep levels creep compliance was determined as illustrated in Fig. 10. These curves allow to conclude that these beams are insensitive to load level.

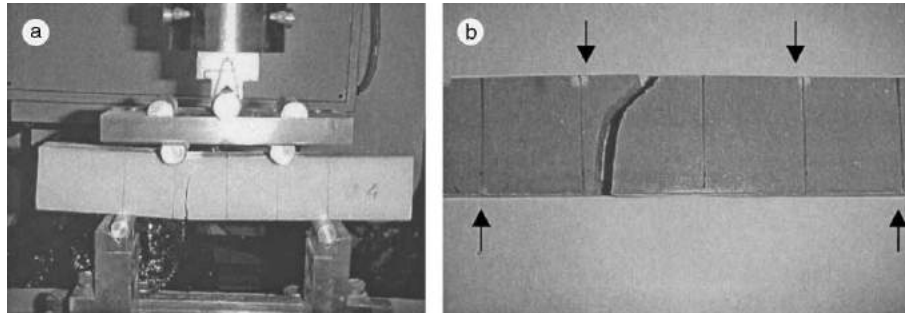


Fig. 4. (a) Four-point bending test and (b) detail of failure.

Table 3
Mean maximum load and stress static results

Test	Maximum load (N)	Maximum stress (MPa)
Three point	3149	32.62
Four point	24,982	38.34

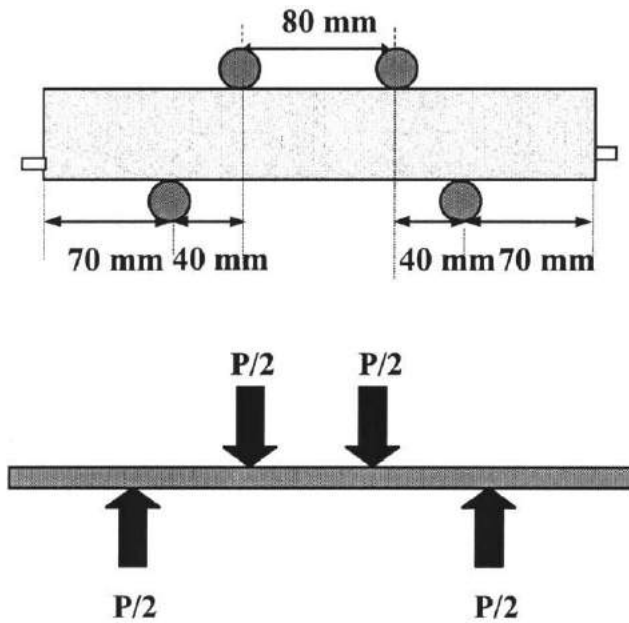


Fig. 5. Schematic representation of creep test.

5. Analysis of experimental results and study of viscoelastic models

In this work it is supposed that the stress distribution do not change along the time. Nevertheless, in this particular case, this assumption is hardly true due to the reinforcement. Even if the polymer concrete behaves like a viscoelastic linear material, a stress distribution should

occur between the polymer concrete and the reinforcing bar. This problem should be considered in a future research. The strain history, under constant load, can be described by the following expression:

$$s(t) = s_0 + \frac{\sigma}{E} \left(1 - e^{-\frac{t}{\tau}} \right)$$

where s_0 represents the instantaneous strain, i.e., the elastic strain.

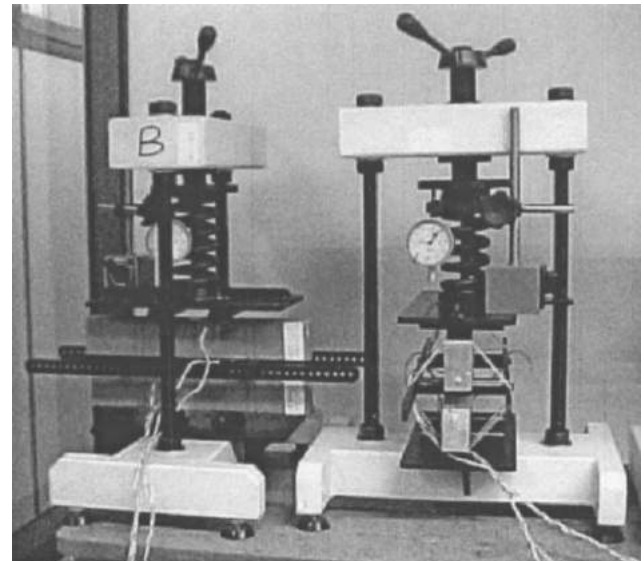


Fig. 6. Creep testing set-up.

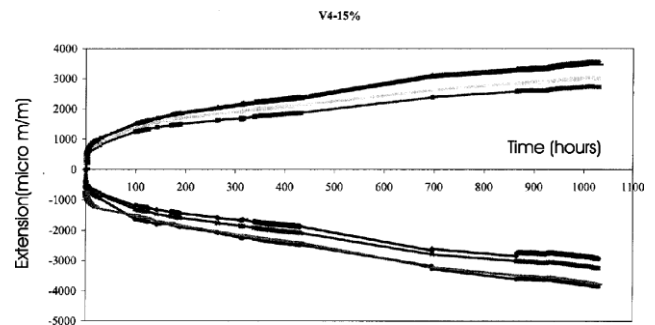


Fig. 7. Creep curve for 15% load level.

overlap but the compression strains show some dispersion, probably indicating a certain degree of non-linearity. Two different models were studied. The first one was the well-known empirical power law, given as

all the normalized strains, i.e. $s_0 P = s_0$, measured at different load levels should collapse into a unique curve. In Fig. 11 the curves obtained for three different load levels, are shown. The normalized tensile strains almost where s_0 is the reference time unity. The power law is one of the most widely use model to describe creep of

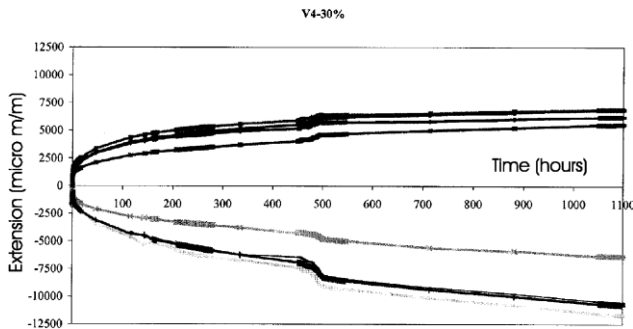


Fig. 8. Creep curve for 30% load level.

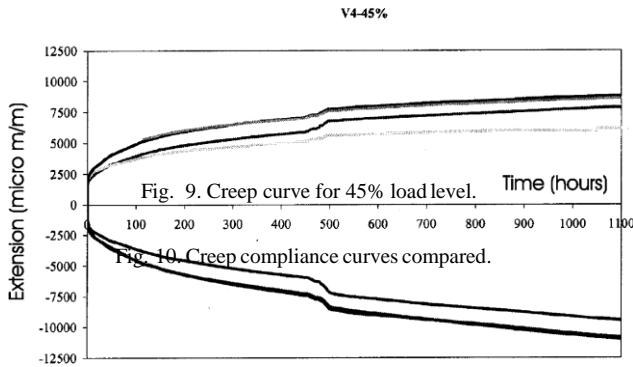
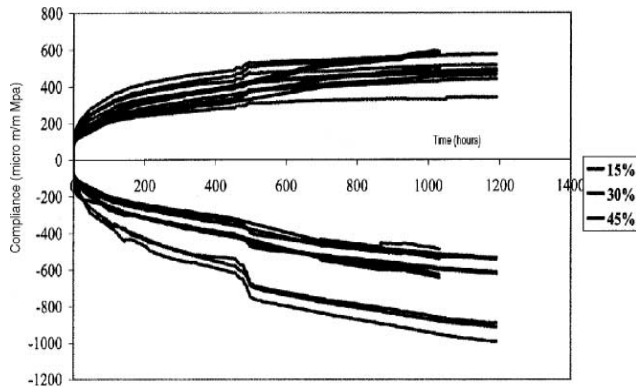


Fig. 9. Creep curve for 45% load level.

Fig. 10. Creep compliance curves compared.



many polymers and fiber-reinforced plastics (FRP). The curve fitting, for the power law model, was studied and the results are shown in Table 4.

The second model was based on a composition of two classical linear viscoelastic models, the Kelvin and the Bruger models, connected in series, as shown in Fig. 12, and designated from now on as the Bruger–Kelvin model.

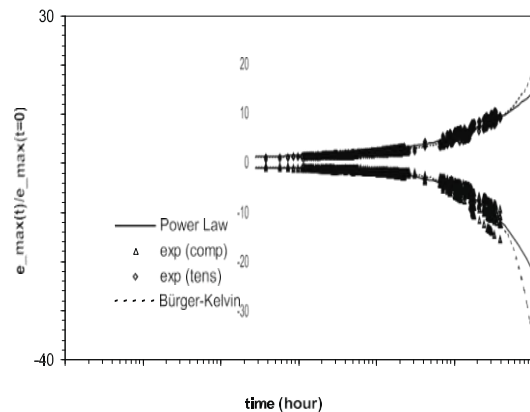
The Bruger model is the simplest viscoelastic linear model that displays all the aspects of the viscoelastic behaviour as recently noted. Bruger model was applied successfully to model the creep behaviour, in bend loading, of sandwich beams incorporating FRP. The curve fitting, for the Bruger–Kelvin model, was studied and the results are shown in the Table 5.

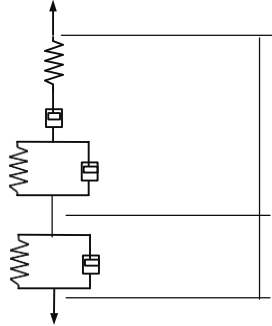
The model curves for the normalized strain, in tension and compression, are plotted in Fig. 11. The differences arise when extrapolating for

03p

Table 4
Power law model parameters

	b	n
Tension	0.9029	0.29
Compression	0.4793	0.41





one decade, i.e. between 2000 and 10,000 h. The Bruger–Kelvin model is more pessimistic due to existence of linear viscous component that can deform continuously, corresponding to a viscous flow directly proportional to time. Although the power law model predicts a continuously increasing of the creep strain, the creep strain increments are decreasing continuously with the time. In this stage of the present research project, it is not possible to say which is the best model to predict the creep behaviour in a long-term analysis. Nevertheless we are strongly convinced, due to the past experience, that a power law type model would be more suitable for that purpose.

Fig. 12. The Bruger–Kelvin model.

Fig. 11. Normalized strain experiment data and curve fitting for two different viscoelastic models.

Table 5
Bruger–Kelvin model parameters

	a_1	a_2	k_2	a_3	k_3
Tension	0.001190	1.318	0.4000	4.424	0.004000
Compression	0.002969	0.9515	0.4000	4.335	0.004000

Morgan-Grampian, 1971

6. Conclusions

A new testing set-up for creep in bending of FRP- reinforced polymer concrete was developed. Creep tests were performed and results reported and discussed. Viscoelastic models were studied and experimental results found to be good.

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PUBLIC PRIVATE PARTNERSHIP

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ABSTRACT

This report majorly focuses on the principles of Public Private Partnership (PPP), its different forms and their suitability as a possible procurement route to be used for the development of road sector in a developing country like India. The report also critically analyse the viability of Private Finance Initiative (PFI) and basic procurement routes for road projects. The report recommends the most suitable types of PPP for the new and maintenance project.

KEYWORDS

Public, Private, Partnership.

1 INTRODUCTION

The country's economic status is dependent on the infrastructure it possess and roads play the major connectivity network. India has road network over 4.1M km & is second largest in the world. In India's transportation sector road transport has been dominating segment with a share of 4.7% in India's gross domestic product (GDP) in 2009-2010 and also over past 5 years number of vehicles on the Indian road has been increasing about an average speed of 10% per annum. Hence the progress of road network is utmost important in the perspective of swiftly growing economy and PPP models can help in achieving the development of the road network (Haldea, 2013).

1.1 SECTOR OVERVIEW (PROPOSED PROJECT)

Country:INDIA

State:Maharashtra

City:Mumbai-NaviMumbai.

Mumbai is the financial capital of India and Navi Mumbai is its satellite city which is developing into business hub with a proposed international airport. This will increase the traffic flow from Mumbai to Navi Mumbai but the route connecting Mumbai to its satellite city is via Vashi which is consumes lots of time. So the new road is proposed which will shorten the time. The road is from Sewri to Chirle. Figure 1 illustrates the proposed route.



Traffic volume analysis	Highest traffic on each toll plaza
Projected traffic growth	5% per annum
Lanes	6 Lanes
Length	25km

Table 1: Assumption for the proposed project

2. PRINCIPLES, MERITS & DEMERITS OF PUBLIC PRIVATE PARTNERSHIP

To understand potential principles of PPP, it is paramount to define the PPP of which there is no generic definition available and hence every government has tailored it to their suitability. According to ministry of finance, Government of India (GOI), PPP can be understood as an arrangement between government entity (GE) and private entity (PE) for provision of public assets and services. The investments and management is done by private sector. Allocation of risks between GE and PE is well defined. PE has to conform to certain performance standards measured by GE and receives payments accordingly (Public Private Partnerships in India, 2011). Several of the crucial principles of PPP includes the following:-

2.1.1 LONG-TERM CONTRACTUAL ARRANGEMENTS

Generally the PPP projects are long termed spanning from 15 to 30 years or more covering the entire economic life of the project to make sure that the private sector considers the same while developing it. The project is then constructed, operated and maintained in view of minimising the whole life costing of the project.

2.1.2 OUTPUT BASED SPECIFICATION

Output specification inspires innovation in PPP projects by characterizing the goals without being prescriptive about the methods for meeting these goals. The public entity lucidly states the services that are expected, while leaving space for the private entity to deliver innovative, economical solutions (Mortledge et al, 2006).

2.1.3 OPTIMAL RISK ALLOCATION

Risks and responsibilities is analysed and allocated to the entity best able to deal with a specific activity along with the associated gains or losses.

2.1.4 PERFORMANCE-BASED PAYMENT MECHANICS

A PPP format can be contractually tailored to include a performance-based payment mechanism, wherewith the public sector only pays when satisfactory services are delivered

by the private sector.

2.2 MERITS

Transference of risks to the private sector protect Public sector against the potential cost overrun. Project will be on time and on budget because the risk of cost & time overrun is contractually allocated to private partner (Lammamet *al*, 2013).

Private partner will consider the whole life costing while constructing road and maintain quality standards as he probably has to operate and maintain that project for a prolonged duration. Payments to private sector are generally performance based, leading to efficiency on the part of private sector.

PPPs funded by the private entities allows the stretching of the project cost for the public sector over a prolonged duration of time, in line with the expected benefits. Public funds are thus released for investments in field where private investment is futile.

2.3 DEMERITS

- Private funding will lead to high rate of interest on the capital amount invested by the private entity leading to high capital cost of the project.
- The contracts of PPP model for the complex project like the proposed one is more complex so the tendering phase will take longer time.
- The project duration will be long-termed of about 30 years, but in India the political mandates last for only 5 years or less. Political instability may cause some uncertainties or roadblocks in the project.

3. SUITABILITY OF VARIOUS FORMATS OF PUBLIC PRIVATE PARTNERSHIPS FOR THE PROPOSED PROJECT

3.1 TYPES OF PPP FORMATS

3.1.1 LEASE AGREEMENTS: As the capital investment of the proposed project is huge and in this structure of PPP capital investment is borne by

public sector it is not a viable option for the new project.

3.1.2 Concessions: The public entity grants the right to construct, operate and maintain an asset for a specific period of time mentioned in a contract to a private entity. Capital investment is generally borne by private entity, while the ownership of the asset is retained by the public sector.

3.1.2 BOT-Toll

In this model the Concessionaire gets his revenue from charging toll from users. This model decreases the financial weight on the public sector while allocating the traffic risk to the private entity.

- This model is widely used for the road projects in India and can be suitable for the new proposed project.

3.1.3 BOT-Annuity

In this model, the Concessionaire is guaranteed of a base profit in the way of annuity payments.

- In this model the traffic risk is allocated to the Government and also it bears the risk pertaining to toll income so, this model is not suitable for the proposed project.

3.1.4 Hybrid PPP (Interest free loan + Toll)

The structure of this model is same as the BOT-Toll except that the loan provided to the private entity is interest free.

3.1.5 Joint venture (JV):

The public entity form a joint venture company with the participating private sector entity with the former having minority shares.

3.1.6 Build Own Operate (BOO):

As mentioned the ownership of the asset lies with the private entity, the government would have minimal control over the asset and also privatization of transportation sector is not viable, so BOO is not a suitable option for proposed project.

3.2 SUITABLE FORMAT OF PPP FOR THE PROPOSED PROJECT

- ❖ **BOT-Toll** is the most suitable format for the proposed project.

Table 2: Illustrates the risks and responsibilities of the project allocated to Public and private sector using BOT-Toll

	Key Parameter	BOT-Toll
Responsibility	Asset ownership	PUBLIC-PRIV
	Capital Investment	PRIVATE with
	Operation & Maintenance	PRIVATE
Risks	Construction	PRIVATE
	Finance	PRIVATE
	Operation & Maintenance	PRIVATE
	Traffic risk	PRIVATE

3.2.1 BENEFITS:

Private partner will bear the cost of designing, construction and the recurring cost of the operation and maintenance. The construction risk as well as traffic risks will be allocated to the private sector. The construction of the road will take less time as the private entities revenue will start once the operation of the toll start.

Table 3 : Proposed Project via BOT-Toll:

Proposed project name	Sewri to NhavaSheva
PPP format	BOT-Toll
Concession duration	35 Years (including construction period of 5 years)
VGF	20%
Toll Collection	Yes (According GOI policy)

Example of successful BOT-Toll project

Project name: Vadodara-Bharuch
Place: Gujarat
Details: 6 laned, 83.3 km length
Project started on Jan 2007 & the estimated completion date was Sep 2009 but was completed on July 2009 so was successfully completed before time.

4. SUITABLE PPP APPROACH FOR MAINTENANCE OF EXISTING PROJECTS

In India roads are in a deplorable condition due to lack of maintenance. New GOI wants to improve the condition of the existing roads, because of its importance to nation's economy, there is a lot of scope for maintenance project and it can be accomplished successfully via operation and maintenance

concessions PPP models. Such a concession transfers the fiscal liability of operation and maintenance to the end user while simultaneously increasing the efficiency of the road's operation and maintenance.

4.1.1 Operate Maintain Transfer (OMT)

Concessions is the suitable PPP model for the operation and maintenance of existing roads in India.

4.1.2 Structure of OMT

- Under the OMT, private partner are allowed to gather tolls on these projects for looking after roadway, providing extra project facilities (like toll booths, bus shelters, service roads) and providing fundamental services such as emergency or safety service (like telephone service, ambulance service etc.)
- The structure of an OMT is similar to BOT-Toll agreement. The principal motive of this concession is to implement a Public Private Partnership in O&M with an underlying condition that construction of the road is already finished and the road is liable to tolling. There may be some slight upgradation work requisite on such roads (Deloitte, 2012).
- In general for OMT the maximum concession period of around 10 years is considered with a perspective to make a project road available for further augmentation post the OMT concession.
- Revenue for private sector is generated by toll collected from the users and private pays public sector a concession fee for awarding of contract.
- OMT projects have financial liabilities, chiefly towards road development agencies.

Risk sharing mechanism under OMT contracts

Type of Risk	Allocation	Details
Traffic Risk	Concessionaire	Entire traffic risk is to be bore by the private concessionaire
Toll Collection Risk	Concessionaire	Entire toll collection risk is to be bore by the private concessionaire
Financing Risk	Concessionaire	-
Political Risk	Government Authority	All direct and indirect risk are allocated to the government authority

Source:CRISIL Research

5. VIABILITY OF PRIVATE FINANCE INITIATIVE (PFI) FOR ROAD PROJECTS

PFI is one of the form of PPP where the construction, operation & maintenance of a project is financed by the private sectors. In PFI schemes private sectors forms a consortium of companies who work in partnership to form a Special Purpose Vehicle (SPV). SPV is then responsible for forming a contracts with the public sector to deliver required services.

PFI schemes are complex in nature it includes contractual agreements between three different types of the organisation:

1. The public sector (Ministry of transport/GOI).
2. The private sector who is responsible to provide the required services.
3. Lenders and investors (Banks, Foreign Direct Investment, equity providers)

5.1.1 FINANCING THE PROJECT VIA PFI

In India the BOT-Annuity model used for financing of the national highways is an example of the PFI model. In this model the private entity will finance the construction of the proposed project. To initiate the construction of the project, Private sector borrows money from finance institutions like banks, FDI, lenders and shareholders. 90% of the money is borrowed from the banks in the form of bonds and 10% is invested by the shareholders in the form of equity. SPV has to repay the debt from the bank and pay the dividend to the stakeholders and repayment can be done only once the revenue starts.

5.1.2 RETURN ON INVESTMENT

After the road is operational the public sector pays an annual fixed amount called unitary charges at regular intervals to the private sector based on performance of the services provided. After the revenue starts private sector starts repaying the debt and paying dividend to the shareholders in SPV and after the loan is repaid the SPV uses the revenue for maintaining and operating the road.

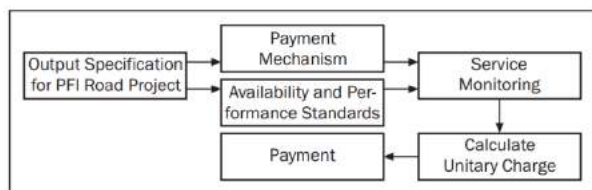


Figure 1 shows performance based payment mechanism

5.1.3 BENEFITS AND DRAWBACKS OF USING PFI SCHEME

As the proposed road project is a high capital value project and procuring it with the prevalent procurement routes is not

desirable for public sector. In PFI scheme the SPV bears the upfront capital cost of the project and the public sector has to repay the project cost annually over the project duration.

The government only pays for the services it gets as the payment is performance based. The project is on time because the private sectors revenue starts after the road is operational.

The limitation of PFI is that the public sector carries the traffic risk. Private company is not affected by low traffic as the public sector continues to pay them annually provided aforementioned service quality is maintained.

BOT-Annuity as a PFI scheme has gained popularity as in India. When the variability of the traffic is more BOT-Annuity is used to attract the private sector as the traffic risk is allocated to public sector in BOT-Annuity.

BOT-Annuity has been successfully implemented in various road projects for instance,

- The road project from *Lakhnadon to MP/MH border*, Madhya Pradesh, India. 4 laned with total length of 40.11 Km was successfully implemented using BOT-Annuity. The project started on March 2007 its estimated completion date was in January 2014 & it was actually completed on September 2009 so it was successfully completed under the estimated time limit of the project.

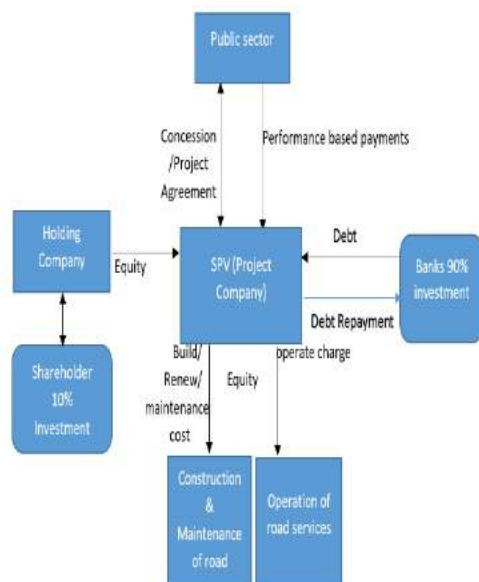
To conclude it can be said that through PFI schemes the government can develop the road sector with the help of finance and innovation of the private sector.

6. VIABILITY OF PREVALENT ROUTES OF PROCUREMENT FOR NEW AND MAINTENANCE PROJECT

To ensure the success of the project, selecting an appropriate procurement route is important. A solid procurement route considers design, construction, operation and maintenance of a project as whole which in turn makes sure that the delivery team work as an integrated team, further increasing the efficiency of the deliverance of the project.

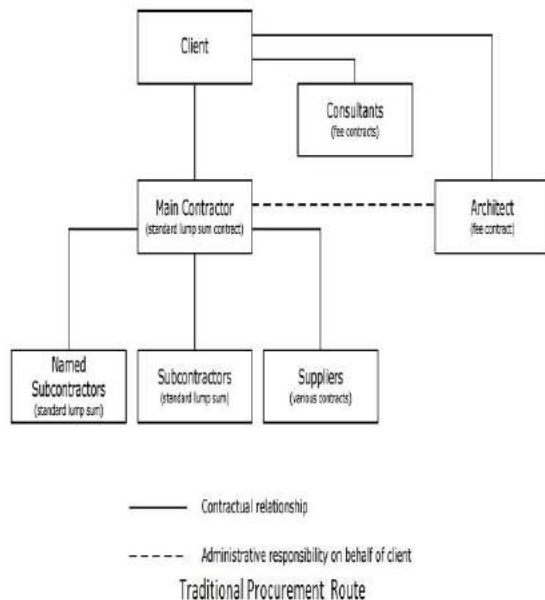
There are four types of basic procurement routes namely:

1. Traditional
2. Design and Build
3. Management contracting
4. Construction management



Structure of PFI

6.1 TRADITIONAL ROUTE



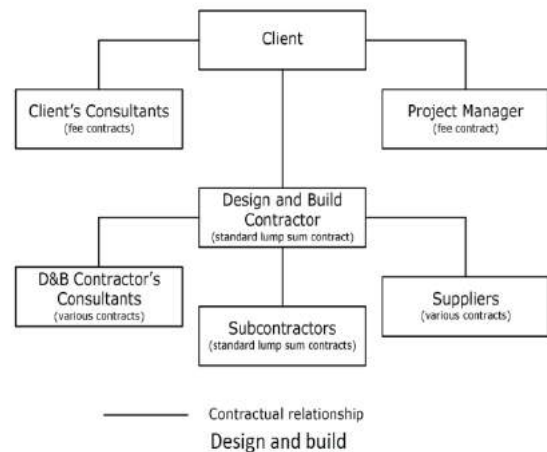
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In this type, the client appoints an architect to do the design work, the contract documents are drafted by the consultants followed by the tender and then the quantity surveyor measures the drawings and the quantity bill is drafted. Then bidding takes place and appropriate contractor is selected. The completion of the project then depends upon the contractor.

6.1.1 VIABILITY OF TRADITIONAL ROUTE

Construction of project starts after designing phase, so time taken is more. The contractor is selected by lowest price tendering, hence quality may be affected. This procurement route is not viable for the publicly funded project as this route leads to disputes between government and private entity, as contractor is not involved in designing phase, quality of the project is not ensured and takes more time for the project to be completed.

6.2 DESIGN AND BUILD (D&B)

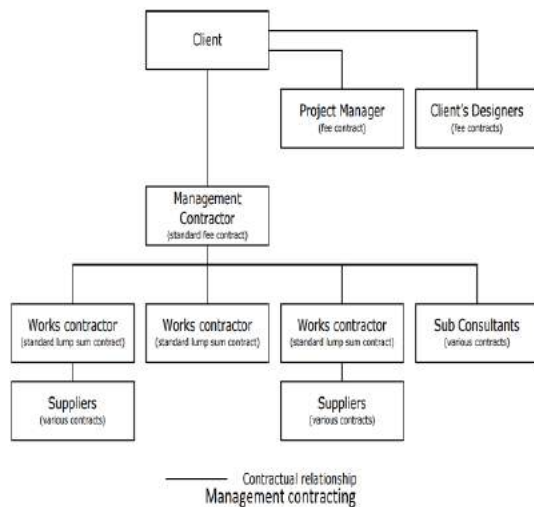


In this type the client appoints the contractor who is responsible for carrying out the design as well as construction work. The contractor then appoints subcontractors to do the design and construction

6.2.1 VIABILITY FOR ROAD PROJECTS

- The D&B type of procurement route has single point of responsibility, so the client has only one party to deal with and the construction of the road can start earlier reducing completion time. The contractor has direct incentive to find an economically innovative design for the proposed project. So the D&B route is viable for the road projects as it ensures the timely and in budget completion of the project by integrating design and construction team and also it transfer the risk of design to the contractor.

6.3 MANAGEMENT CONTRACTING



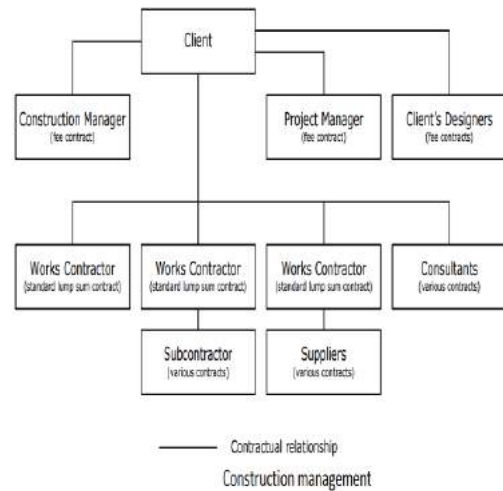
In management contracting the client appoints a management contractor early in the design phase who is responsible for the designing of the project and drafting of the tender.

6.3.1 VIABILITY FOR NEW PROPOSED PROJECT

Time saving potential as the construction of the road can be started parallel to the designing of it. This route provides flexibility, last moment or late changes can be made easily. The budget is not decided prior to starting of the project, hence there is cost uncertainty. Quality brief is required to ensure success of the project. Client is responsible for the project cost and risk.

As the public entity has to carry the overall risk of the project and there is no cost certainty it can be concluded that this route is not viable for the proposed new project.

6.4 CONSTRUCTION MANAGEMENT



In this type the construction manager is appointed by the client to advise him on a fee basis. The client then forms contracts with various specialist contractors instead of the main contractor. In this route the responsibility for the control and coordination of the project is with client hence the risk allocated to the client is greater. If the client is not well informed then this route will fail. The clients have historically run into complications using this route because of increased responsibility of involvement in the project. Use of this route has decreased marginally in the recent years. This type of route is not viable for road projects.

7. CONCLUSION

In this report principle, merits and demerits of PPP were studied and this study was used to find the suitable procurement route for new and maintenance road project in India. It was found that BOT-Toll was the most suitable procurement route for proposed project and OMT was for maintenance project. Study also concluded that PFI scheme is viable for the road projects and viability of prevalent route was also studied.

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STRESS RIBBON BRIDGE

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ABSTRACT

A Stress Ribbon Bridge is a tension structure, which has similar geometry to that of a simple suspension bridge. They are structures formed by a very slender concrete deck with the shape of a catenary. The bearing structure consists of slightly sagging tensioned cables, bedded in a concrete slab that is very thin as compared to the span. They can be designed with one or more spans and are characterized by successive and complementary smooth curves. Extensive research is still being carried and so this type of structure is only being used for pedestrian and cycling traffic.

This paper deals with the literature survey on Stress Ribbon Bridges and aims at compiling data regarding the structural geometry and construction techniques.

Keywords

Stress Ribbon Bridge, literature review, static analysis, dynamic loading tests, preliminary design

1. INTRODUCTION

The cable has always been recognized as a very efficient load-bearing material. In one of its most simple forms, the bearing ropes are used to support cross members allowing the passage of pedestrians across the catenary itself. This primitive idea of using the bearing cables for passage of pedestrians was recovered in the 1960's through the concept of Stress Ribbon Bridges. They can be considered as an improvement over the conventional cable bridges or the simple suspension bridges designed to overcome the short comings.

This paper deals with the overall concept of a Stress Ribbon Bridge. An attempt is been made to study the available literature and compile data for future studies.

2. STRESS RIBBON BRIDGE

This concept was first introduced by German engineer **Ulrich Finsterwalder**. This type of bridge uses the theory of a catenary transmitting loads via tension in the deck to abutments which are anchored to the ground. The first Stress Ribbon bridge was constructed in 1960's in Switzerland.

The construction practice involves embedding the bearing cables in a relatively thin band of concrete and then, through additional prestressing of the cable, setting the so created inverted concrete arch under uplift pressures, which creates a compressive state of stress in the arch. Thus, additional live loads applied later can be taken up without excessive deformation of the cable, thanks to the effective bending rigidity of the arch acquired through the compressive state of stress in the arch.

This type yields slender, aesthetical and almost maintenance

free structures. Such structures are erected independently from existing terrain and thus have a minimum impact on the environment during construction. On the other hand, one of the major drawbacks of this structural system is the existence of large horizontal tension forces that must be resisted by the abutments.

Since its introduction in the 1960's, a number of bridges have been constructed across the world. Few of the outstanding examples include bridges in Republic of Czechoslovakia [1], Sacramento River, United States [2], Vltava River [3]. Though the existing literature on this subject is not very extensive, the most important contributions concerning the analysis and design are those of Prof. Jiri Strasky [4].

2.1 Construction Sequence

1. Construction of abutments and rock anchors.
2. Erection and adjustment of bearing cables.
3. Precast concrete deck segments are hanged on bearing cables.
4. Erection of additional cables through bridge deck for post-tensioning.
5. In-situ concreting bonds bearing cables to precast concrete deck. Wet joint bonds precast plates at the end of the deck to abutment.
6. Post-tensioning of additional cables.
7. Grouting of post-tensioning cables.
8. Installation of fence on bridge deck.

3. REVIEW OF LITERATURE

The presented work is aimed at studying the general idea of a Stress Ribbon Bridge design. This type of design proves to be economic and has minimum impact on the surrounding environment. The literature survey carried out mainly focuses on the design and analysis of Prestressed Concrete Stress Ribbon Bridges.

3.1 Analogy to a Cable

Stráský J. (2006) carried a study on the Static and Dynamic behavior of the stress ribbon bridges. Analysis of the stress ribbon and cable supported structures is studied based on an understanding of the static and dynamic behavior of a single cable. The function of the structures was verified by a series of static and dynamic loading tests and by performance of the bridges. The work explains all the important aspects of the design and proves the correctness of solutions on built structures.

To realize the difference between the behavior of the beam and cable, a stress ribbon and beam structure of spans $L = 33.00, 66.00$ and 99.00 m loaded by uniform load and by vertical deflection of supports were presented. Table 2.1 shows the deflection and bending moment in the beam and

cable for live load of 20.00 kN/m. It is evident that the deflections and bending moments in the stress ribbon are very low as compared to beams.

Table 1 Comparison between beam and Stress ribbon

		Length m		
		33	66	99
M_{sup}	beam [MNm]	-1.815	-7.262	-16.335
$M_{L/2}$	beam [MNm]	0.908	3.631	8.168
$y_{L/2}$	beam [MNm]	0.527	8.433	42.6933
M_{sup}	stress ribbon [MNm]	-0.106	-0.339	-0.594
$M_{L/2}$	stress ribbon [MNm]	0.034	0.039	0.036
$y_{L/2}$	stress ribbon [MNm]	0.0115	0.0726	0.1679

The stress ribbon structures were also subjected to dynamic tests where the agreement of excited natural frequencies with theoretical values was investigated. The pedestrian bridge in Prague-Troja was tested by 38 vehicles weighing between 2.8 and 8.4 tons. During the test only the deformations in the middle of the span and the horizontal displacements of all supports were measured and compared with the values calculated during the design. The results obtained showed excellent agreement between the results.

Table 2 Prague-Troja Bridge - deflections at mid-spans

Loaded Span	Mid-span Deflections	Span 1 (mm)	Span 2 (mm)	Span 3 (mm)
1,2,3	Calculations	40	200	56
	Measurement	40	186	57
1	Calculations	301	-124	-62
	Measurement	272	-92	-48
2	Calculations	-126	312	-78
	Measurement	-95	289	-50
3	Calculations	-38	-76	221
	Measurement	-25	-56	182

3.2 Preliminary Design

Arco D. C. et.al. (2001) presented the structural behavior of prestressed concrete stress ribbon bridge emphasizing the geometrical non linear character of the equations and effects of creep and shrinkage of concrete. Analytical equations are integrated for a particular case of built-in stress ribbon bridge, allowing for the determination of the effects of post

tensioning, evenly distributed live load, and temperature variation. Expressions are given for vibration frequencies. The main emphasis falls on the highly nonlinear geometric behavior and the time-dependent effects caused by shrinkage and creep. A design of an 80-m span built-in stress ribbon bridge is worked out based on the presented formulation. Based on this preliminary design, the final design can be worked out addressing other loading conditions like aerodynamic stability and pedestrian-induced movements.

3.3 Analytical Static Analysis

Aparicio A. C. et.al. (1994) carried out a detailed study of the static behavior of Stress ribbon bridge. The differential equations of equilibrium and compatibility were presented. They were then integrated for a single span bridge accounting for distributed loads, concentrated loads, temperature variations, prestressing, creep etc. Simple formulas useful for first phase of the design were developed. As an example, the first design of 80m single span pedestrian bridge was developed. The values of bending moments, horizontal forces and vertical movements were obtained using the formulas developed. Also the results were obtained using the computer program ANSYS. The results are compiled as below.

Table 3 Comparison between numerical and ANSYS

Results		h KN	M_A KNm	M_C KNm	w_C m
Hyp 1	ANSYS	-15896	1006.9	-116.7	-0.278
	Num.	-15928	0999.2	-115.4	-0.278
Hyp 2	ANSYS	-7787.5	866.4	-79.5	-0.199
	Num.	-7823.7	860.0	-78.6	-0.199

3.4 Monolithic and Hybrid Bridges

Schlaich J. et. al. (1996) presented the concept of a joint less, completely monolithic prestressed concrete stress ribbon bridge, together with some design recommendations. Monolithic connection of the stress ribbon with the abutments or piers is possible when the connections are formed so that bending stresses are small. To add bending stiffness, the slab should be thickened towards the supports. An example of the given theory, Monolithic Stress Ribbon Bridge in Mosbach, Germany is studied. Thus, Monolithic stress ribbon bridges offer pleasing shapes with logical structures, robustness and durability.

One disadvantage of the traditional stress ribbon type bridges is the need to resist very large horizontal forces at the abutments. Also there is a problem of overturning of bridges due to its characteristic slender decks. To overcome this disadvantage, modifications are attempted in the design of the bridges to make it safer.

Strasky J (2006) made an attempt to combine the stress ribbon with a supporting arch. The arch serves as a saddle from which the stress ribbon can rise during post-tensioning and during temperature drop, and where the band can rest during a temperature rise. a structural system formed by a stress ribbon supported by an arch increases the filed of application of stress ribbon structures. Several analyses were under taken to verify this. The structures were checked not only with detailed static and dynamic analysis, but also on

static and full aeroelastic models. The tests verified the design assumptions, behaviour of the structure under wind loading and determined the ultimate capacity of the structural system.

CONCLUSIONS

The review of literature of Stress Ribbon Bridges is carried out. It is observed that Stress Ribbon Bridge is a comparatively new and emerging structure.

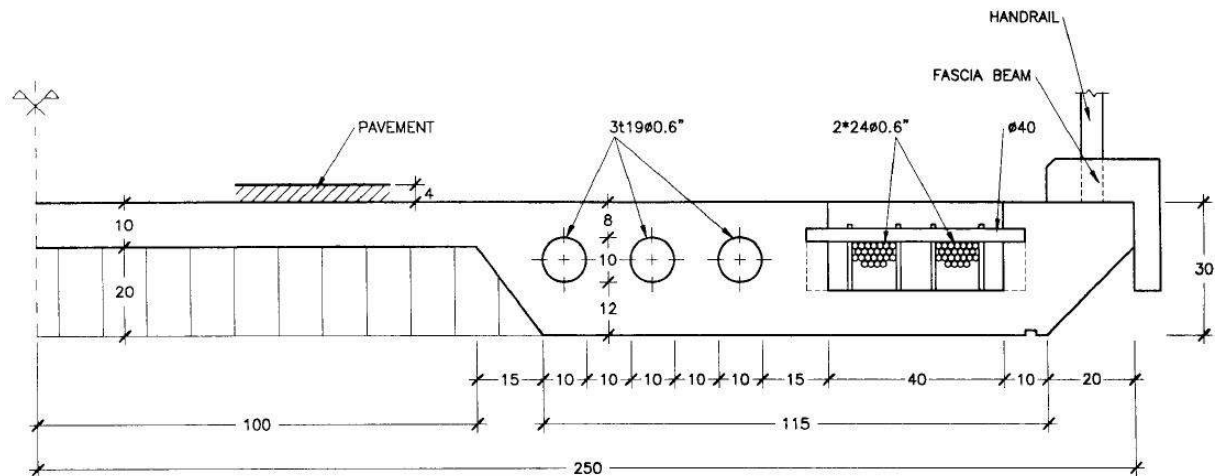


Fig 1 Proposed Transverse section sketch

The experiments carried out by Strasky J. prove that stress ribbon is an efficient load bearing structure and proves to be safer than a beam structure. The deflections induced in the beam structure were way above the safe limit as opposed to stress ribbon bridges. Hence, a stress ribbon structure proves to be safe. Further, the dynamic loading tests carried out on the existing structures show that the behavior of the bridges is according to expectations. Thus, it validates the use of such structures for cycling and pedestrian traffic.

The design techniques adopted by Arco D. C. et. al. prove to be efficient and can be further used for design of structures taking into account the dynamic factors such as aerodynamic stability.

Stress ribbon pedestrian bridges are very economical, aesthetical and almost maintenance free structures. They require minimal quantity of materials and are erected independently from existing terrain. Therefore they have a minimum impact upon the environment during construction. They are quick and convenient to construct if given appropriate conditions, without false work. A stress ribbon bridge allows for long spans with a minimum number of piers and the piers can be shorter than those required for cable stayed or suspension bridges. Post tensioned concrete minimizes cracking and assures durability. Bearings and expansion joints are rarely required minimizing maintenance and inspections. As opposed to suspension bridges, where the cables carry the load, in stress ribbon, by tensioning the cables and the deck between the abutments, the deck shares the axial tension forces.

Thus exhaustive study is carried out in case of stress ribbon bridges addressing the static and dynamic behaviour. Currently these types of structures are only feasible for pedestrian or cycling traffic. Research is still to be carried out for study and utilization of these structures for regular vehicular traffic considering factors such as aerodynamic stability.

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Shear capacity of concrete beams reinforced with fiber reinforced polymers

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ABSTRACT

This paper evaluates the shear capacity of concrete beams and slabs reinforced with different types of fiber reinforced polymer (FRP) bars. The effect of the low modulus of elasticity and the non-yielding characteristics of the FRP bars on the concrete shear strength is discussed. Seven prototype concrete beams reinforced with glass fiber reinforced polymers (GFRP) and carbon fiber reinforced polymers (CFRP) were subjected to four-point loading up to failure. Steel stirrups were used as shear reinforcement in all beams. Measured shear capacities of the tested beams are compared with the values calculated according to the recently published procedures and codes for beams reinforced with FRP. Based on this investigation a simplified expression for the shear capacity of FRP reinforced concrete members is introduced. The proposed analytical method is also substantiated by test results available in the literature from eight concrete slabs and six concrete beams reinforced with conventional steel, GFRP, and CFRP bars. Good agreement was shown between the theoretical and the experimental results.

KEYWORDS: Fiber reinforced polymer; Reinforcement; Shear; Ultimate behaviour

1. INTRODUCTION

In recent years, fiber reinforced polymer (FRP) bars have been adopted as a potential solution to the corrosion problems in concrete structures. In addition to their excellent non-corrosive characteristics, FRP reinforcements have high strength-to-weight ratio, good fatigue properties and electro-magnetic resistance [1–4].

There are fundamental differences between the steel and FRP reinforcements: the latter has a lower modulus of elasticity and linear stress–strain diagram up to rupture with no discernible yield point and different bond strength according to the type of FRP product. These characteristics affect the shear capacity of FRP reinforced concrete members. Test results [5–9] have shown that the shear strength of FRP reinforced concrete members is significantly lower than the shear strength predicted using expressions developed for steel reinforced concrete members.

In this paper the shear behaviour of FRP reinforced concrete beams and slabs is presented and compared to that of members reinforced with conventional steel. In addition, in the light of the experimental results, an attempt is made to assess the contribution of the shear resistance components to the ultimate shear resistance

of the FRP reinforced concrete sections. The applicability of the various methods available for prediction of the shear capacity of steel reinforced concrete members is examined. Based on the experimental program, modifications are introduced to these methods to account for the nature of crack pattern and propagation in FRP reinforced concrete members.

2. EXPERIMENTAL PROGRAM

In this research, tests were conducted on simply supported concrete beams reinforced with different types of FRP bars. The beams were tested under four-point loading to investigate their deflection, cracking, and shear capacity. In addition, available experimental results from testing of one-way concrete slabs reinforced with FRP bars were also used for the verification of the proposed analytical model.

2.1. Material characteristics

Fig. 1 shows the material properties of the four types of reinforcement used in this program, including Glass Fiber Reinforced Polymers, GFRP (Isorod) produced by Pultrall Inc., Canada; GFRP (C-Bar) produced by Marshall Industries Composites, Inc., USA; Carbon Fiber Reinforced Polymers, CFRP (Leadline) produced by Mitsubishi Kasei, Japan; and conventional steel. The GFRP (Isorod) bars are manufactured by pultrusion of E-glass continuous fibers and thermosetting polyester resin. To enhance the bond characteristics, the surface is wrapped by helical glass fiber strands and covered by a mixture of a known grain size of sand and polyester resin [13]. The GFRP (C-Bar) rod is manufactured by the hybrid pultrusion process [14]. C-Bar rods are produced using four different fiber types, namely, E-Glass, Carbon, Aramid, and a hybrid of Carbon and E-Glass, designated as Type 1, Type 2, Type 3, and Type 4, respectively. Type 1 reinforcing bars are manufactured in two grades, Grade A and Grade B, according to the surface deformations and characteristics. Type 1-Grade B was used in this study. The CFRP (Leadline) rods are pultruded using linearly oriented coal tar pitch-based continuous fiber epoxy resin [15]. Although GFRP bars possess the lowest tensile strength in comparison to other available FRP reinforcements, they have the

Notation

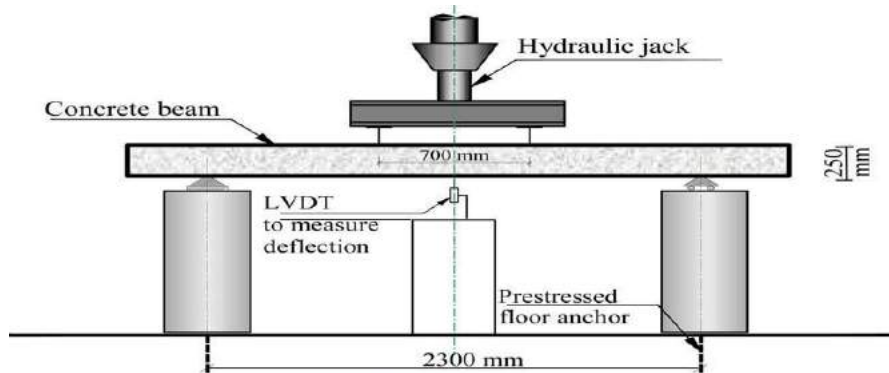
a	shear span	f_c^0	compressive strength of concrete cylinders
A_v	cross-sectional area of vertical stirrups	f_u	rupture stress of the FRP reinforcements
b	width of cross-section	f_y	yield stress of steel reinforcement
b_w	width of web	M_u	ultimate moment capacity
d	depth to centre of reinforcements, measured from the extreme compression fiber of concrete	V_c	concrete contribution of the shear capacity of a reinforced concrete member
E_c	elastic modulus of concrete	V_s	shear strength provided by stirrups
E_f	elastic modulus of FRP reinforcement in tension	b/b_1	ratio of depth of equivalent rectangular stress block to depth of neutral axis
E_s	elastic modulus of steel reinforcement in tension	q	reinforcement ratio (A_f or A_s/bd)
		q_b	balanced reinforcement ratio

advantage of being the least expensive, along with their non-corrosive, magnetically neutral and high strength to weight ratio characteristics. The measured average cylinder compressive strengths of the concrete used for the beams ranged from 30MPa to 35MPa at the time of testing, with a maximum aggregate size of 13mm. The yield stress of the longitudinal reinforcing steel was 435MPa, while the yield stress of the stirrups steel was 350MPa.

The parameters considered were the area and type of reinforcement. The objective of the test program was to investigate the performance of FRP reinforced concrete beams loaded up to

failure. This includes deflection, crack pattern, ultimate Capacity, and mode of failure.

The ratio of reinforcement area was changed to examine an under-reinforced concrete section, a balanced concrete section and an over-reinforced concrete section. The discussion in this paper is limited to the ultimate shear capacities of FRP reinforced concrete beams.



These ratios are based on the properties of the FRP reinforcements provided by the manufacturers [13,15], and the average concrete strength of the tested beams. These values show that the balanced reinforcement ratios for FRP reinforced concrete sections are much lower than those for steel reinforced concrete sections. This is due to the higher tensile strength and the lower modulus of elasticity of the FRP reinforcements relative to the conventional steel. For practical ratios of FRP reinforcements in order to control deflection and cracking, and to avoid the rupture of the FRP bars, FRP reinforced concrete sections are designed as over-reinforced sections. It has to be noted that whether the FRP reinforced concrete section is under-reinforced or over-reinforced, the flexural failure will be a brittle failure. This is due to the fact that the FRP reinforcements do not yield as in the case of steel reinforcement.

The reinforcement details for the tested beams are shown in Table 1. The beams were instrumented to measure the applied load, mid-span deflections, strains in the extreme compression fibers of the concrete, strains in the reinforcement, and crack widths.

2.3. Slab tests

Tests [9–12] were carried out on eight prototype one-way concrete slabs reinforced with FRP and conventional steel

steel reinforcements. The parameters considered were the depth of the slab, and the area and type of reinforcement. Five specimens were reinforced by GFRP (Isorod) bars, two specimens were reinforced by conventional steel bars and one specimen was reinforced with CFRP (Leadline), rods. The three slabs reinforced by CFRP and steel reinforcements are used as control specimens for comparison purposes. The length and width of all the slabs were 3500mm and 1000mm, respectively, with a clear span of 3000mm. The beams were subjected to four-point loading with shear span of 1000mm. The thickness of the test-slabs was 150mm for four of the tested slabs and 200mm for the remaining four slabs. A concrete cover of 38mm was used for the longitudinal reinforcements. The ratio of reinforcement area was changed to examine an under-reinforced concrete section, a balanced concrete section and an over-reinforced concrete section. Details of the eight prototype one-way concrete slabs, reinforced by three different reinforcement materials, described in this program are given in Table 1.

The tested beams and slabs were instrumented to measure the applied load, mid-span deflection, strains in the extreme compression fibers of the concrete, strains in the reinforcements, strains in the concrete at the level of reinforcements, and crack widths within the constant moment zone.

Table 1

Details of tested beams and slabs

Specimen	Reinforcement material	Dimensions (mm)		Reinforcement area (mm ²) ^a		q (%)	q/q _b
		b	h	Bottom	Top		
Beams							
I.4	GFRP (Isorod)	500	250	380	213	0.38	0.78
I.6	GFRP (Isorod)	500	250	633	213	0.63	1.26
II.5	GFRP (Isorod)	500	250	1520	213	1.52	3.00
C.4	GFRP (C-Bar)	500	250	452	100	0.45	1.05
C.8	GFRP (C-Bar)	500	250	883	339	0.88	2.05
L.2	CFRP (Leadline)	500	250	200	100	0.20	0.95
L.4	CFRP (Leadline)	500	250	471	150	0.47	2.24
Slabs [9–12]							
S-150-T	Steel	1000	150	1005	–	0.96	0.23
I-150-A	GFRP (Isorod)	1000	150	507	–	0.49	0.66
I-150-B	GFRP (Isorod)	1000	150	794	–	0.76	0.99
I-150-C	GFRP (Isorod)	1000	150	993	–	0.96	1.25
S-200-T	Steel	1000	200	471	–	0.39	0.09
I-200-A	GFRP (Isorod)	1000	200	354	–	0.23	0.31
I-200-C	GFRP (Isorod)	1000	200	1191	–	0.77	1.01
LL-200-C	CFRP (Leadline)	1000	200	471	–	0.30	0.87
Beams [8]							
1FRP	GFRP	229	286	567	–	1.11	2.10
2FRP	GFRP	178	286	567	–	1.42	2.71
3FRP	GFRP	229	286	850	–	1.66	3.15
4FRP	GFRP	279	286	1134	–	1.81	3.44
5FRP	GFRP	254	286	1140	–	2.05	3.89
6FRP	GFRP	229	286	1140	–	2.27	4.32

^a Beams tested in this research only were provided by steel stirrups of 9.5mm diameter at 400mm spacing.

3. BEHAVIOUR OF FRP REINFORCED CONCRETE BEAMS

During the experimental program, the concrete beams reinforced with glass fiber reinforced polymer or carbon fiber reinforced polymer behaved linearly up to cracking. After cracking, they behaved linearly also but with reduced stiffness, as shown in Fig. 3. Comparing the results for the three beams reinforced with similar reinforcement ratios using Isorod, C-bar, and Leadline, beams reinforced with GFRP exhibit a significant reduction in stiffness after the initiation of the first crack in comparison to the beam reinforced by CFRP. This behaviour is attributed to the low elastic modulus of GFRP bars compared to that of the CFRP bars. The complete deflection behaviour of the tests is de-scribed by Abdalla [17].

A comparison between the experimental strain distributions at the same applied load (80kN) for beam I.4 reinforced with GFRP and beam L.4, reinforced with CFRP, Leadline, is shown in Fig. 4. The theoretical strain of a reference beam reinforced with 0.4% steel ratio is also shown for comparison purposes. The results show that at the same load, the strains and hence the curvatures are higher in the beam reinforced with GFRP than in the beam reinforced with CFRP. Also the neutral axis depth for FRP reinforced concrete sections is very close to the compressive end especially for the beam reinforced with GFRP due to the low modulus of elasticity of GFRP bars. This implies that for GFRP reinforced concrete member, a large amount of the cross-section is subjected to tensile stresses, and the compressive zone is subjected to high strain gradient.

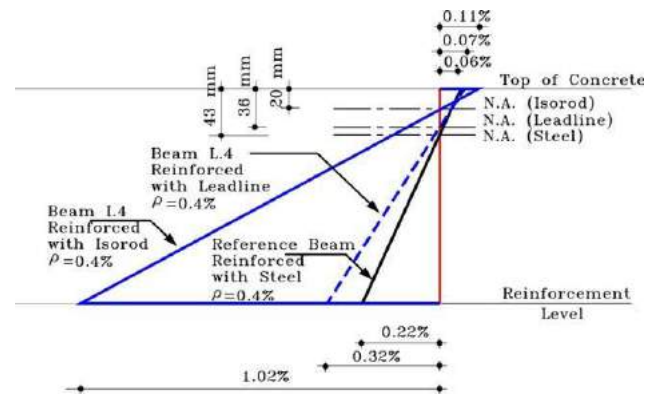


Fig. 4 Strain distribution of beams reinforced with FRP reinforcements (q = 0.4%).

This leads to larger deflections and less shear strength for members reinforced with GFRP. Beam C.4 reinforced with C-bar showed similar results to those of beam I.4, reinforced with Isorod.

Fig. 5 shows the experimental failure loads for the tested beams and slabs. The theoretical flexural strengths are also shown in the figure for comparison purposes. The theoretical flexural strength was estimated according to the ACI-440 design

guidelines [18]. It can be seen in Fig. 5a that in all the tested beams, the experimental failure load was less than the theoretical flexural load except in beam I.4. This is due to the premature shear failure that took place in these beams. Beam I.4, reinforced by GFRP with a reinforcement ratio 0.78 of the balanced ratio, failed due to flexural rupture of the FRP reinforcement. It suffered

wide cracks at the maximum bending moment region before rupture of the FRP bars. This brittle mode of failure in under-sections is not recommended by the ACI design guidelines [18].

The observed shear failure mechanism was similar for the rest of the tested beams. Flexural cracks were initi

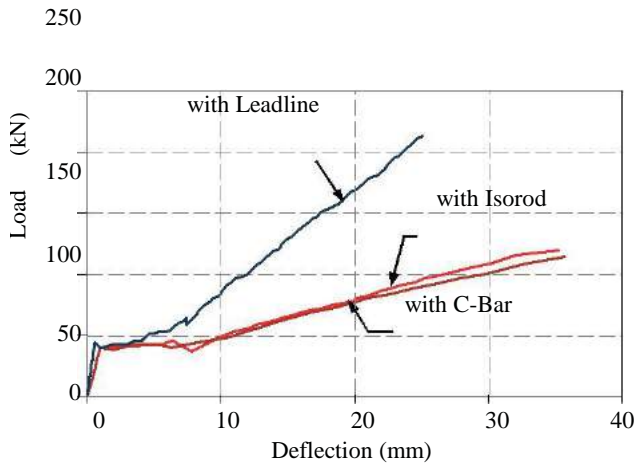


Fig. 3. Deflection of beams reinforced with FRP reinforcements ($q = 0.4\%$). tests.

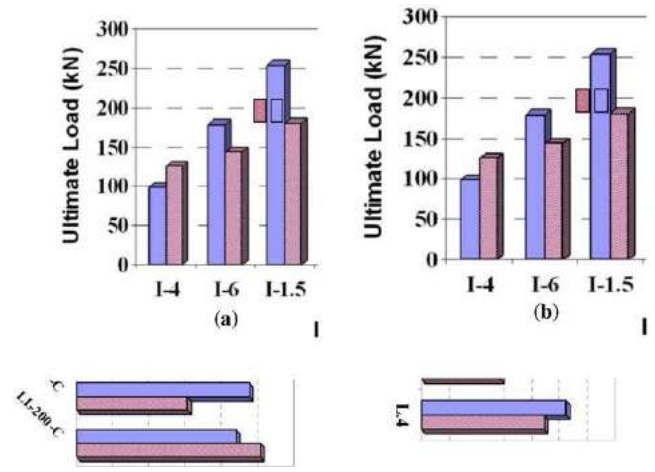


Fig. 5. Load at shear failure for (a) beam tests; and (b) slab

Fig. 6. Shear failure of beam L.2 reinforced with CFRP.

ated in constant moment region. These cracks propagated vertically due to the absence of shear stresses at this region. Increasing the applied load resulted in flexural cracks within the shear span. Due to the presence of shear stresses, wide flexural shear cracks extended towards the point of load application in an inclined direction. Fig. 6 shows the shear cracking causing failure of beam L.2 reinforced with CFRP with reinforcement ratio of 0.95 of the balanced ratio. Fig. 7 shows a close-up of the shear collapse of the same beam where it can be seen that the Leadline bars were still holding the beam together with no reinforcement rupture at the time of failure. A longitudinal hair crack was noticed on the surface of the bars. Fig. 5b shows the

premature shear failure for slabs I-150-C, and I-200-C reported by Michaluk et al. [9].

4. SHEAR ANALYSIS OF FRP REINFORCED CONCRETE BEAMS

The shear behaviour of reinforced concrete members is generally more complicated than the flexural behaviour. Failure in shear takes place under combined stresses resulting from applied shear force and bending moment. The design procedures for shear depend, to a large extent, on empirical equations based on extensive

Table 2

Shear capacities ($V_c + V_s$), of FRP reinforced concrete members (kN)

Specimen	Experiment	ACI-318 Code [16], Eq. (2)	Tottori and Wakui [6], Eq. (4)	ACI-440 [18], Eq. (5)	Proposed method Eq. (7)	Mode of failure
Beams						
I.4	62.9	121.4	71.0	45.1	62.2	Rupture of bars
I.6	71.9	122.4	77.7	45.3	68.4	Shear
II.5	90.4	126.1	96.7	46.1	83.6	Shear
C.4	66.4	121.7	72.9	45.2	64.4	Shear
C.8	84.9	123.5	85.0	45.5	74.4	Shear
L.2	71.4	120.6	80.5	95.3	70.7	Shear
L.4	111.4	121.8	99.7	96.1	86.6	Shear
Slabs [9–12]						
S-150-T	72.5	135.6	NA ^a	NA ^a	NA ^a	Yield of bars
S-200-T	65.0	200.1	NA ^a	NA ^a	NA ^a	Yield of bars
I-150-A	29.5	142.6	62.2	29.9	41.01	Rupture of bars
I-150-B	39.5	145.2	72.2	30.5	48.05	Rupture of bars
I-150-C	37.0	144.9	77.7	30.4	51.87	Shear
I-200-A	23.5	209.2	70.9	43.9	53.14	Rupture of bars
I-200-C	76.5	212.6	104.8	44.7	80.35	Shear
LL-200-C	127.0	202.7	119.4	149.0	86.32	Bond
Beams [8]						
1FRP	38.1	50.1	32.2	10.1	26.6	Shear
2FRP	31.7	38.9	27.2	7.9	22.4	Shear
3FRP	44.5	50.1	36.8	10.1	30.4	Shear
4FRP	45.3	61.0	46.2	12.3	38.1	Shear
5FRP	45.1	55.6	43.8	11.2	36.1	Shear
6FRP	42.2	50.1	40.9	10.1	33.7	Shear

tests and simplifying assumptions rather than on a theoretical analysis. This is due to the large number of parameters that

can be seen from the results that the experimental shear capacities are much less than those estimated from the code equations developed for steel reinforced concrete members. In addition, the shear capacity according to Eq. (2) does not depend on the type of the longitudinal reinforcement of tension reinforcement; V_u = factored shear force at section considered; and M_u = factored moment at section considered.

7. SUMMARY AND CONCLUSIONS

An experimental investigation was conducted on the behaviour of concrete beams reinforced with different FRP bars. Three beams were reinforced by GFRP, Iso-rod, two beams were reinforced by GFRP, C-bar, and two beams were reinforced by CFRP, Leadline. The ultimate behaviour of the seven simply supported FRP reinforced concrete beams was used to evaluate their flexural and shear capacities. Based on the experimental results of this investigation a simplified expression for the shear capacity of FRP reinforced concrete beams is proposed. The analytical proposed method was also substantiated by test results available in the literature for beams reinforced with FRP bars. Good agreement was shown between the theoretical and the experimental results. According to the results from this investigation, the following conclusions can be made:

Concrete beams reinforced with fiber reinforced polymers, FRP, behave linearly up to cracking, and linearly after cracking with reduced stiffness.

Strains and deflections are generally higher in concrete beams reinforced with FRP bars than in concrete beams reinforced with steel.

Due to the reduced compression stress block and due to the nature of cracking in beams reinforced with FRP bars, shear strength of such beams is significantly lower than that of beams reinforced with steel.

The code equations developed for concrete members reinforced with steel significantly over-estimate the shear capacity of the beams reinforced with FRP bars.

The shear strength of FRP reinforced concrete slabs can be estimated according to the ACI-440 design guidelines. The results show that the ACI-440 equation is overly conservative in estimating the shear capacity of the beams reinforced with FRP bars.

The shear strength estimated according to the equation proposed in this paper is in good agreement with the experimental results of this research and with those from published by other researchers.

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Behavior of concrete columns wrapped with fiber reinforced polymer when exposed to high temperature

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ABSTRACT

Fiber-reinforced plastic (FRP) is a composite material made of a polymer matrix reinforced with fibers. The paper presents the validation of results of an experimental program of paper "Behavior of FRP-confined concrete after high temperature exposure" from international journal "Construction and Building Materials" which was presented by Yousuf A. Al-Salloum. The validation of experimental program is done using ANSYS. In that paper it was investigated, the effect of high temperature on the performance of concrete externally confined with FRP sheets. The paper includes the comparative studies of stress behavior of FRP wrapped and unconfined columns. For this purpose analytical study is conducted. In the first phase the cylindrical (100mm X 200mm) and square (100mm X 100mm) concrete cubes are tested for compressive strength after exposing to high temperature of 100^o and 200 ^oC for a period of 1h, 2h and 3h. In the other phase these cubes were wrapped by GFRP and tested for compressive strength using ANSYS. These cubes were wrapped at an angle of 0^o, 15^o, 30^o and 45^o and exposed at different temperatures for period of 1h, 2h and 3h.

1. INTRODUCTION

The application of FRP wraps in buildings, however, has been hindered due to uncertainties regarding their behavior in fire. Most FRPs are susceptible to combustion of their polymer matrix, potentially resulting in increased flame spread and toxic smoke evolution. In addition, commonly used polymer matrices and adhesives rapidly lose strength and stiffness above their glass transition temperature (T_g). The critical T_g threshold, which depends on the specific polymer matrix constituents, among other factors, typically varies from 65 to 82^oC for externally bonded systems. Thus, if left unprotected in fire, FRPs may ignite, supporting flame spread and toxic smoke evolution, and may rapidly lose mechanical and/or bond properties. This may raise concerns as to the fire performance of FRP-strengthened reinforced concrete columns in buildings, where fire is one of the primary design considerations. To date, information in this area is extremely scarce, and a great deal of further work is required to fill all the gaps in knowledge.

2. HISTORY

Fiber reinforced polymer (FRP) composites were first developed during the 1940s, for military and aerospace

applications. Considerable advances have been made since then in the use of this material and applications developed in the construction sector. FRPs have been successfully used in many construction applications including load bearing and infill panels, pressure pipes, tank liners, roofs, and complete structures where FRP units are connected together to form the complete system in which the shape provides the rigidity. In the last decade, polymer composites have found application in the construction sector in areas such as bridge repair, bridge design, mooring cables, structural strengthening and stand-alone components. These composites are materials often referred to as advanced composites and have properties considerably superior to those of earlier composites. The different types of fiber reinforced polymer are: glass fiber, carbon, aramid, ultra high molecular weight polyethylene, polypropylene, polyester and nylon. The change in properties of these fibers is due to the raw materials and the temperature at which the fiber is formed. The paper "Behavior of FRP-confined concrete after high temperature exposure" presented by Yousef A. Al-Sallouma, Hussein M. Elsanadedy^{b,*},1, Aref A. Abadel presents the results of an experimental program to investigate the effect of high temperature on the performance of concrete externally confined with FRP sheets. In the first phase, 42 standard 100 X 200 mm concrete cylinders were prepared. Out of these specimens, 14 cylinders were left unwrapped; 14 specimens were wrapped with one layer of CFRP sheet; and the remaining 14 specimens were wrapped with one layer of GFRP sheet. Some of the unconfined and FRP-confined specimens were exposed to room temperature; whereas, other cylinders were exposed to heating regime of 100 ^oC and 200 ^oC for a period of 1, 2 or 3 h. After high temperature exposure, specimens were tested under uniaxial compression till failure. The test results demonstrated that at

a temperature of 100 °C (a little more than the glass transition temperature (T_g) of the epoxy resin), both CFRP- and GFRP-wrapped specimens experienced small loss in strength resulting from melting of epoxy. This loss of strength was more pronounced when the temperature reached 200 °C

The purpose of this paper is to fill some of the gaps in understanding the performance of the fire endurance of structures strengthened with FRPs. A limited number of studies exist on the behavior of FRP strengthened concrete members under high temperature conditions.

In this project it has been specified different wrapped columns having square and circular shapes. These columns are kept unconfined and analysed in Ansys by maintaining the conditions of 100° and 200°C as per the research papers. This test was designed to expose the column specimens to a standard time– temperature fire curve and to subject the columns to sustained concentric axial load during the fire test.

Test procedure for unconfined circular.

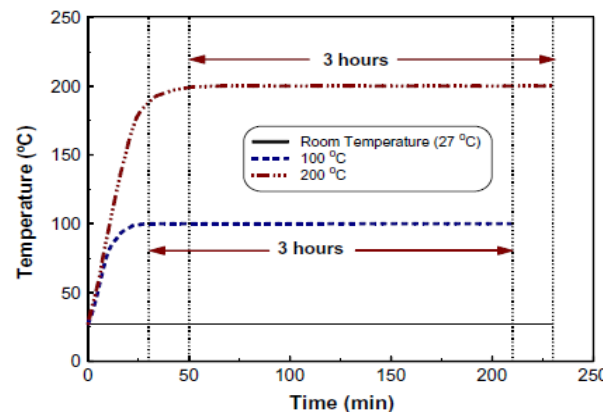
Materials properties of concrete from the paper.

Ingredients	Quantity (for 1 m ³ of concrete mix)
Cement	350 kg/m ³ , Type I
Silica sand	585 kg/m ³
Washed sand	195 kg/m ³
10 mm aggregate (3/8")	315 kg/m ³
20 mm aggregate (3/4")	735 kg/m ³
Free water	175 kg/m ³
Admixture (super plasticizer)	0.67 L

Properties of FRP systems.

Property	CFRP system	GFRP system
Thickness of layer (mm)	1.0	1.3
Ultimate tensile strength (MPa)	846	552
Ultimate tensile strain	1.1%	1.9%
Tensile modulus of elasticity (MPa)	77,280	27,600

The temperature and time graph used in this reference paper.



Time– Temperature curves used in this study.

Results of unconfined specimens.

Average compressive strength (MPa)			
Temperature	Exposure time (h)		
	1 h	2 h	3 h
Room	38.8	38.8	38.8
100 °C	38.2	38.1	37.0
200 °C	36.1	35.3	34.2

Results of GFRP-confined specimens.

Average compressive strength (MPa)			
Temperature	Exposure time (h)		
	1 h	2 h	3 h
Room	69.6	69.6	69.6
100 °C	66.7	65.2	61.7
200 °C	61.1	58.8	58.0

The results from this paper are based on the experimental performance these experimental results are validated by using ANSYS software.

PROCEDURE

Unconfined circular column exposed to 200°C for three hours

1. Specifying the properties of the material in the ANSYS.
2. Generating mesh.
3. Analysis settings
4. Substituting the value of time and temperature from graph (temperature v/s time)
5. Results obtained for temperature.

1. Behaviour of stress and the results obtained from graph and paper.

Results of unconfined specimens.

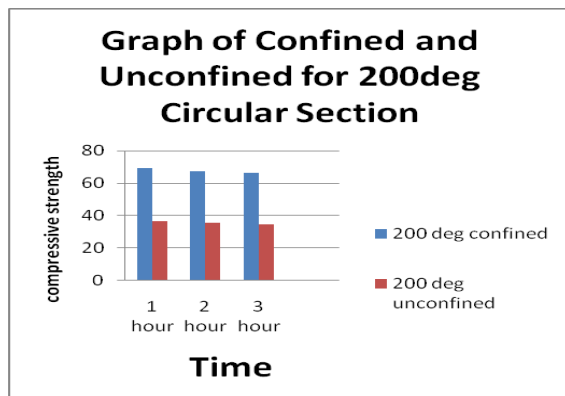
Average compressive strength (MPa)			
Temperature	Exposure time (h)		
	1 h	2 h	3 h
Room	38.8	38.8	38.8
100 °C	38.2	38.1	37.0
200 °C	36.1	35.3	34.2

Results obtained from ANSYS .

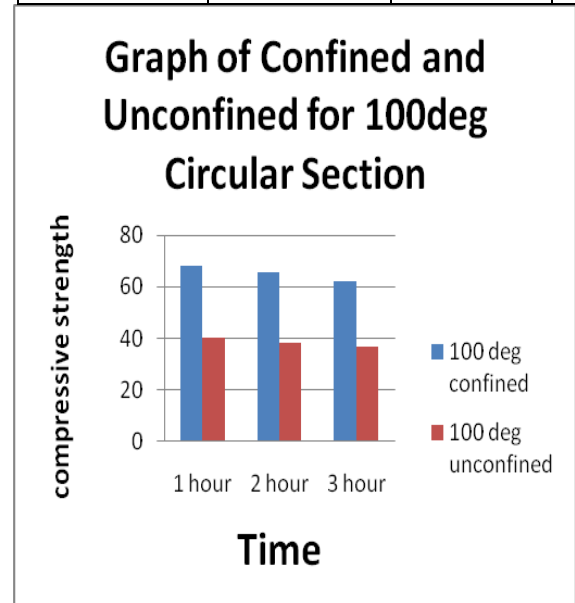
Results of paper and ANSYS have been matched. The analysis setting done for project is validated.

Repeat the same above Procedure for confined circular column exposed to 200°C for three hours. After studying results on circular confined & unconfined section. The following Graphs are obtained.

Comparing confined and unconfined circular columns.



100 deg unconfined	40.28	38.19	37
200 deg unconfined	36.56	35.3	34.4



After studying the graph it can be seen that compressive strength of GFRP wrapped column is more than unconfined circular cubes of column. It is desirable that the columns should be wrapped with GFRP as it is seen from the graph which is obtained from the results the temperature affects GFRP column comparatively less than unconfined concrete cubes.

The experimental results of the paper consisted of confined and unconfined circular column exposed to temperature, but in this thesis research is carried further for different shapes of columns and for different angle of wrapping and exposing the specimen to high temperature using ANSYS

Considering square cubes which are wrapped with GFRP and unconfined and these cubes are exposed to temperature of 100°C and 200° C for one hour and two hours.

Unconfined Square column exposed to 100°C for 1hour

Step1: Selecting the materials and specifying the properties of materials in ANSYS

STEP 2. Creating a geometry of a square cube having size 100 x 100 x 200

STEP 3. Generating the mesh

Step 4. Giving the analysis condition

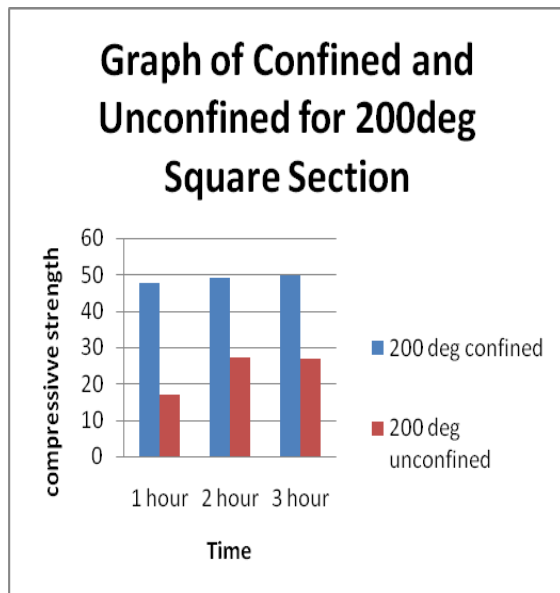
1. Justifying the time and temperature
2. Specifying the convections on the sides of the cube.

Step 5. Checking the temperature

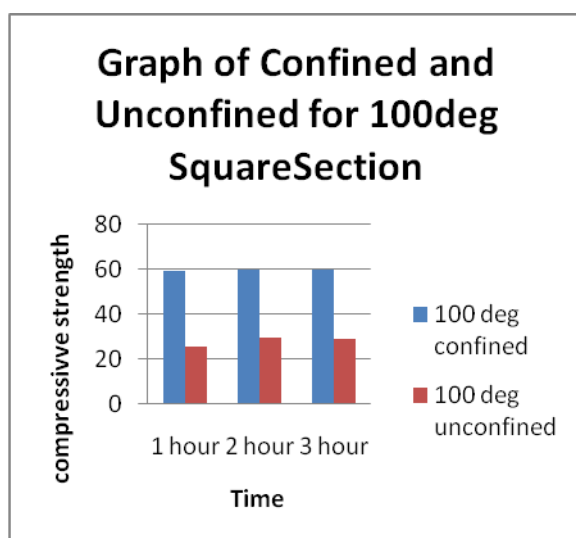
Step 6.Specifying the compressive forces on the faces of cubes.

Results:

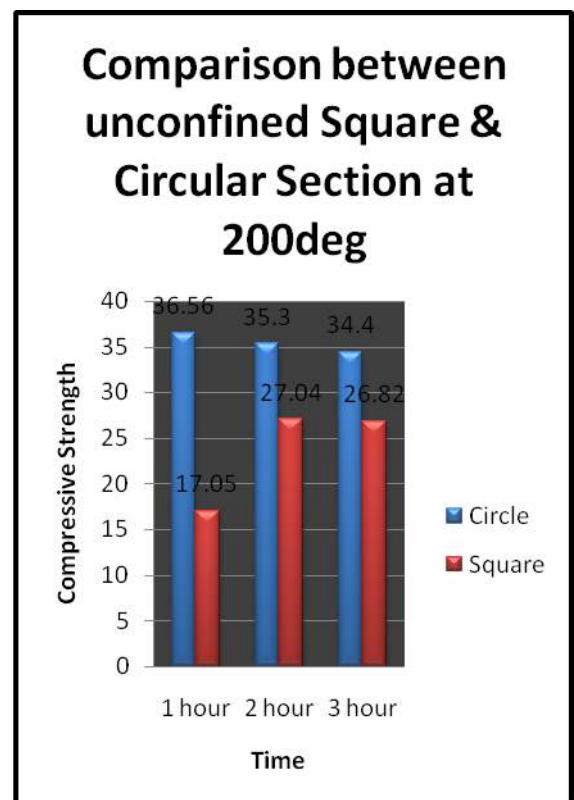
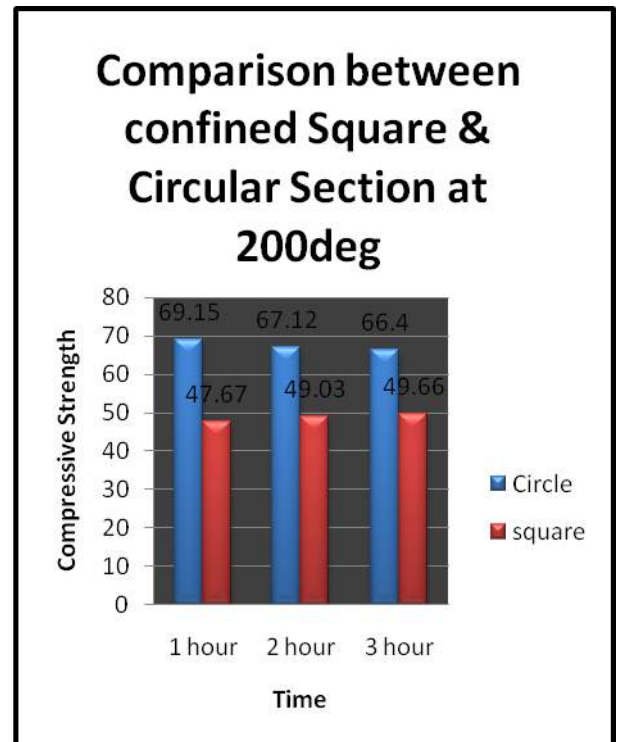
	1 hour	2 hour	3 hour
200 deg confined	47.67	49.03	49.66
200 deg unconfined	17.05	27.04	26.82



	1 hour	2 hour	3 hour
100 deg confined	59.7	59.85	60.15
100 deg unconfined	25.96	29.68	29



After studying results on circular & square confined & unconfined section. The following Graphs are obtained.



Wrapping at different angles: The earlier results are based on only 0° of wrapping, it can be studied whether the

wrapping angle affects the compressive strength of column or not. In this project cube of 100mm x 200mm wrapped at an angle of 15° 30° 45°.

Wrapping procedure in ANSYS :

Step 1. Specifying the materials

Step 2: Generating the geometry of column wrapped at 15°

Step 3: Generating the Mesh

Step 4: Specifying the temperature

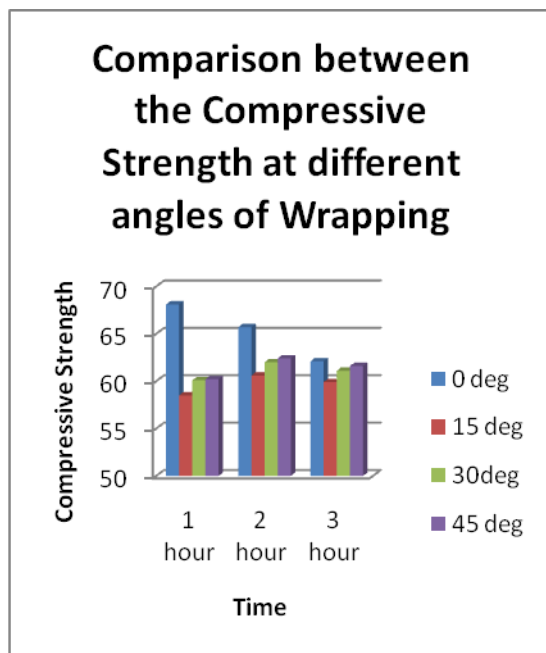
Step 5: specifying convection.

Step 6: Results of temperature

Step 7: Applying force

Step 8: Results

After studying results on circular cube (100mm x 200mm) wrapped at an angle of 15° 30° 45°.The following Graphs are obtained.



	0 deg	15 deg	30deg	45 deg	Temp
1 hour	68.1	58.5	60.1	60.2	

2 hour	65.7	60.6	62	62.4	100deg
3 hour	62.1	59.9	61.1	61.6	

Conclusion

compressive strength of GFRP wrapped column is more than unconfined circular cubes of column. It is desirable that the columns should be wrapped with GFRP as it is seen from the graph which is obtained from the results the temperature affects GFRP column comparatively less than unconfined concrete cubes.

Wrapping angle affects the compressive strength of column. Compressive strength increases with increase in angle of wrapping.

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A REVIEW PAPER ON RAINWATER HARVESTING AND WATER MANAGEMENT IN DROUGHT CONDITIONS

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ABSTRACT

Water is essential for supporting all life forms and used in many different ways. Fresh water scarcity is not limited to the arid climate regions only, but in areas with good supply, the access of safe water is becoming a critical problem. There are no serious efforts to gain water by practices like rainwater harvesting, watersheds and mini-ponds, reuse and recycling of waste water. It is said there is enough freshwater in world, however, it is not always available in the right place or right form. The problem is mainly of access, distribution, and optimum utilization.

This paper aims to investigate the possibility of using harvested rainwater in industrial and drought affected areas and its economic viability.

Keywords

Rainwater harvesting, Storage techniques, Water management

INTRODUCTION

Water is an important natural resource and is the very basis of our life. We use water for drinking, irrigation, industry, transport and for the production of hydro-electricity. The best way to conserve water is its judicious use. A large quantity of water is used for irrigation and there is an urgent need for proper water management in irrigation sector. There is large-scale pollution of water as a result of industrialisation and urbanisation. This trend has got to be checked. Although one-eighth of India is declared as food prone, there are several thousand villages in India which do not have potable drinking water. In India water harvesting means utilizing the erratic monsoon rain for raising good crops in dry tracks and conserve the excess runoff water for drinking and for recharging purposes. When water harvesting techniques are used for runoff farming, the storage reservoir will be soil itself. In India, it is not possible to use the land area only to harvest water and hence water harvesting means use the rain water at the place where it falls to the maximum and the excess water is collected and again reused in the same area. Therefore the meaning of water harvesting is different in different area/ countries. The state of Maharashtra covers an area of 307,713 square km and supports a population of 82 million. Over half of this population is in rural area which faces problems related to water. About 80 to 84% of agriculture in Maharashtra is rain-fed, while 1/3rd of the state falls in the semi-arid climate zone and is dependent on monsoon. Deficient rainfall is reported once in every 5 years and drought conditions occur once in every 8-9 years. Deficient rainfall over the last 3 years has caused drastic drop in ground

water level, acute water shortage and severe loss of crops.

Conventional sources like open well, bore well and piped water supplies have failed due to depleting water tables, poor water quality and high cost involved in operation and maintenance. Rain water harvesting (RWH) can play an important role in solving the water problems. One of the major solutions to meet the ever increasing water demands would be storing the available rainwater through rainwater harvesting techniques. RWH is one of the best methods to solve the serious problem (situation) of catering the increasing water demand.

RAIN WATER HARVESTING

1. What is Rain Water Harvesting?

Rainwater harvesting means the activity of direct collection of rain water which can be recharged in to the ground water to prevent fall of ground water level or storing in surface or underground water tank. It is most suited in today's context due to following reasons:

1. It is the most scientific and cost effective way of recharging the ground water and reviving the water table.
2. It provides naturally soft water and contains almost no dissolved minerals or salts, arsenic and other heavy metals.
3. It can be done at individual as well as in a community level. This way we can be self sufficient in terms of domestic water requirements and not just dependent on the actions initiated by government or any other local body.

2. Objectives of Rain Water Harvesting.

The main objectives of Rain Water Harvesting are as follows:

1. Restore supplies from the aquifers depleted due to over exploitation.
2. Improve supplies from aquifers lacking adequate recharge.
3. Store excess water for use at subsequent times and improve physical and chemical quality of ground water.
4. Reduced storm water run-off and soil erosion and prevent salinity ingress in coastal areas.
5. Rehabilitate the existing traditional water harvesting structure like village ponds, percolation tanks, baolis, tanks, etc.
6. With minor scientific modifications and redesigning, convert the traditional water harvesting structure into ground water recharge facilities.
7. Use the existing defunct wells and borewells after cleaning and also the operational wells as recharge structures.

3. Components of Rain Water Harvesting System:

All rain water harvesting structures will have the following three basic components:

1. Catchment area i.e. the surface area utilized for capturing the rainwater.
2. Collection device, like tanks or cisterns or percolation pits used for collecting or holding the water.
3. Conveyance system i.e. the system of pipes or percolation pits through which water is transported from the catchment area to the collection device.

4. Methods and Techniques of Rain Water Harvesting:

There are different ways by which rain water harvesting is carried out. Some of the important methods are discussed as below:

i) Recharge pit:

A recharge pit is a structure constructed for the purpose of recharging groundwater resources by using rainwater efficiently and effectively. Where there is no well or bore well, total rainwater falling on the open plot can be recharged by making recharge pit. Water flowing out of the plot can be directed to this pit.

This method is suitable in areas having shallow ground water-table/aquifer. This pit may get filled 10 to 15 times in one monsoon and can recharge water effectively. It is filled with crushed gravels and coarse sand to filter out the rainwater, before it infiltrates through the aquifer to join the water table. A wire mesh may be provided on top to prevent the entry of leaves, or other solid debris from entering the pit.

This method is effective in the area where permeability of soil is more. The capacity of the pit is decided depending upon the farm/plot size, the quantity of rain received and the water requirement. The general size of a recharge pit is about 1-2 m wide, and about 3 m in depth.

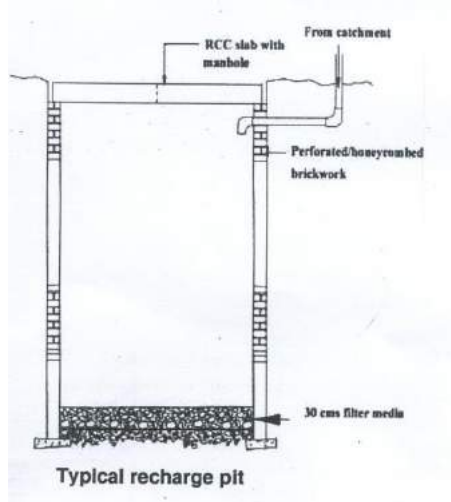


Figure 1: Sectional view of a typical recharge pit

ii) Bore well / Tube well Recharging:

Borewells and Tubewells are vertically drilled wells used for extracting water from an underground aquifer. These are very similar to each other except for the type of casing used, and the type of soil in which they are employed.

Excessive and un-monitored drilling of borewells has not only reduced the groundwater levels at an alarming rate, but have also further aggravated the already serious situation in drought affected areas. However, this borewells and tubewells can be used for recharging the groundwater levels by proper rainwater harvesting techniques.

An entirely new borewell/ tubewell can be drilled for this purpose or an existing one can also be used.

A pit of suitable size is excavated around the well casing. The general size of this pit may be taken as (3x3x3) m. The well casing (PVC in case of borewell, and galvanised iron in case of tubewell) is then provided with tiny slits to allow the rainwater to seep through. A nylon mesh or wire mesh is also wrapped around the casing pipe to prevent the entry of unwanted impurities along with the water. Cement rings of suitable diameter are then placed one over the other around the casing pipe. This creates a ring type structure around the well casing pipe in the excavated pit. The pit is then filled with filter media which includes stones, gravel and sand. Water falling on the pit gets filtered due to the filter media provided and then seeps through the gaps between the cement rings. This water is then further filtered by the mesh provided around the casing pipe. Water then seeps through the slits made in the casing pipe, thus recharging the groundwater levels.

To further increase the catchment area of the pit, a pond of comparatively larger size is dug adjacent to the pit. Water from this pond is then directed to the pit by suitable means such as pipes or trenches. The water thus gets naturally filtered before entering the aquifer and increases the ground water levels.



Figure 2: Recharging of a Bore well

iii) Recharge Trenches:

Recharging through recharge trenches is simpler as compared to recharge through wells. Fewer precautions have to be taken to maintain the quality of the rainfall runoff.

A recharge trench is simply a continuous trench excavated in the ground and refilled with porous media like pebbles, boulders or gravel. A recharge trench can be 0.5 m to 1m wide and 1m to 1.5m deep. The length of the recharge trench is decided as per the amount of runoff expected. The recharge trench should be periodically cleaned off the accumulated

debris to maintain the intake capacity. In terms of recharge rates, recharge trenches are relatively less effective since the soil strata at depth of about 1.5 m is less permeable. To enhance the recharge rate, percolation pits can be provided at the bottom of the trench. In this way the trenches can act as a pathway for water to reach the percolation pit, thus increasing its catchment, while themselves recharging some amount of water. The trenches can be provided with a protective top cover to prevent the entry of leaves or other debris.

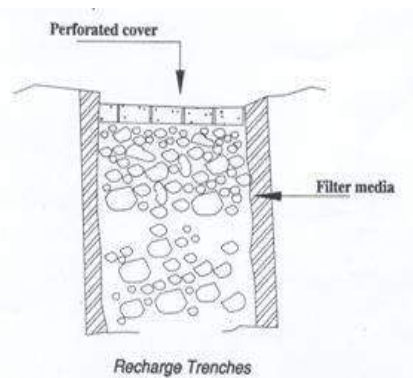


Figure 3: Recharge Trenches

iv) Farm ponds

A farm pond is a large hole dug out in the ground, which harvests rain water and stores it for further use. The farm pond may be square or rectangular in shape. The pond has an inlet to regulate inflow and an outlet to discharge excess water. The size of farm pond depends upon various factors such as the size of the farm, the farmer's water requirement, type of soil and the cost of excavation. The pond is provided with adequate bunds along its banks to prevent erosion. The pond must be located in a corner of a plot of land so that it does not disturb farm operations. For smaller farms, a common farm pond can be constructed at a suitable location. Water from the pond can be conveyed to the field either manually or mechanically using pumps. A farm pond can provide water for farming purposes during dry spells in rainfall and thus prevent losses in crop production. Besides, it also helps in groundwater recharge and permits fish rearing to compensate for the loss of farming land. The water from the pond can also be used for household purpose and off-season farming. Hence, it also increases the income opportunities of a farmer.



Figure 4: Farm pond

v) Percolation tank

A percolation tank is an artificially created surface water body, which submerges under its reservoir a highly permeable land, so that surface runoff is prevented and allowed to percolate and recharge the groundwater. The downward movement of water under the action of gravity is termed as percolation. Percolation tanks are generally constructed across streams to intercept the runoff water. This water then finds its way into the sub-soil and recharges the groundwater. This leads to better recuperation of wells in the downstream area.

The size of the percolation tank depends mainly upon the percolation capacity of the under-lying strata. It should accumulate a water body having depth in the range of 3m to 4.5m deep. The percolation tanks are mostly earthen structures with masonry structure only for spillway.

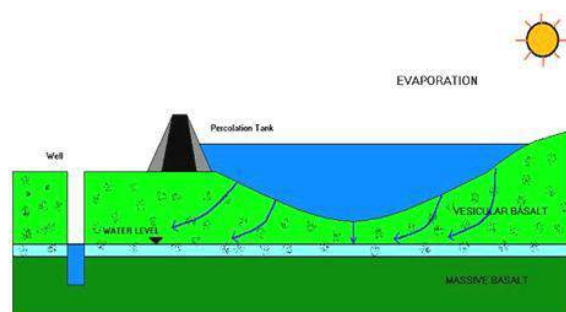


Figure 5: Percolation tank

ESTIMATE FOR A RECHARGE PIT:

The following estimate is done for a particular farm area where there is acute scarcity of water. The average rainfall is assumed to be 600 mm. The farm size is taken as 1 hectare (10,000 sq.m). So it is proposed to harvest the rainwater and allow it to recharge the groundwater through a recharge pit.

Considering catchment area = 700 m²
Average annual rainfall = 600 mm
Coefficient of runoff = 0.8

Quantity of water to be harvested per year = Catchment area x avg. annual rainfall x co-eff. of runoff.
∴ Quantity of water harvested = 700 x 0.6 x 0.8
= 336 m³

Now,

Considering size of recharge pit = 4m x 4m x 3m
∴ Volume of the recharge pit = 48 m³

Cost of excavation = Vol. Of recharge pit x cost per m³
= 48 x 200
= Rs. 9600

Cost of material for filling recharge pit:

a) 75 to 100 mm size aggregate (Rs. 884/m³) = 884 x 16
= Rs. 14144

b) 15 to 25 mm size aggregate (Rs. 884/m³) = 884 x 16
= Rs. 14144

c) Sand (Rs. 1237/m³) = 1237 x 16
= Rs. 19792

d) Labour cost = Rs. 5000

Plumbing cost:

- a) PVC pipe 4" size = Rs. 150 per m
b) Labour cost = Rs.3000

∴ Total Cost = Rs. 65,830/-

The plumbing cost may vary depending upon the length and size of pipe required. Here a 4" pipe of 1 metre length is considered.

ESTIMATE FOR A FARM POND:

The following estimate is done for constructing a farm pond in a particular 1 acre farm. The farm pond size is considered to be 1/10th of the total farm size and its primary objective to supply water for agricultural purposes. The pond is to be covered by a HDPE pond liner to prevent seepage and maintain water quality.

Proposed size of farm pond = 1/10th of 1 acre (4046.856 m²)
= 404.68 m²
≈ 405 m²

Considering the pond is roughly square in shape, having depth of 3 m, the dimensions of the pond are taken as (20.5x20x3) m.

∴ Size of pond = (20.5 x 20 x 3) m

∴ Volume of the pond = 20.5 x 20 x 3
= 1230 m³

Now,

Cost of excavation of pond = Vol. of pond x cost of excavation
per m³
= 1230 x 140
= Rs.1,72,000

Cost for pond liner:

Total surface area of the pond = 405 + 2(61.5) + 2(60)
= 648 m²

Now, cost of liner = Rs. 80 per sq. Metre

∴ Total cost of liner = Sur. Area of pond x cost of liner
= 648 x 80
= Rs. 51,840

∴ Total cost of the proposed farm pond = 172000 + 51840
= Rs. 2,23,840/-

RAINWATER HARVESTING IN INDUSTRIAL AREAS

The acute shortage of water in drought affected areas does not only affect the agricultural prospects of the region, but also the functioning of industries in the area. Industries require water for various purposes. Some use it as a raw material during the production process while some use it as a coolant. Industries generally procure this water from the government at a fixed rate. However, during a drought, when there is scarcity of water, water cuts are introduced for industries. This results in reduced production and thus, huge operating losses.

However, industries in such areas can adopt rainwater harvesting which will not only make them self sustaining in terms of water needs but also help them reduce their expenditure on government supplied water.

Businesses can implement rainwater harvesting systems on an industrial scale if warehouses and factory rooftops can be used. These are ideal rainwater collection surfaces and can result in harvesting of thousands of litres of water which can be stored in rainwater tanks constructed on the industry premises.

RAINWATER HARVESTING SUCCESS STORIES

(1) Ralegan Siddhi village in Maharashtra:

Ralegan siddhi is a drought-prone and rain shadowed area in Maharashtra which receives an annual rainfall of 450-650 mm. In 1975, this was a place of poverty and helplessness. The abuse of their natural resources along with water run-off and soil degradation meant that this village, comprising of mostly farmers, was left un-farmable. The transformation of the village was led by Anna Hazare, a retired armyman. Work began by repairing the faulty percolation tank which would not hold water due to leakages in its embankment walls. Apart from the tank, nalla bunds were built to prevent water run-off. In the first stage, 6 nalla bunds were built and later this number increased to 31 bunds with a storage capacity of 2,82,183 m³. In addition to this, cultivation of water intensive crops such as sugarcane was banned and crops such as oilseeds, pulses and cash crops with low water requirements were grown. Today water is abundant in Ralegan siddhi and agriculture flourishes. The village is self-sufficient and can grow crops year-round.

(2) Hiware bazar village, Ahmednagar:

Hiware bazar lies in the rain shadow region with an annual rainfall of about 400 mm, and hence faced acute water shortage and severe land degradation in the 1970s. In the 1990s, only 12% of the cultivable land could actually be cultivated. However, under the leadership of sarpanch Popatrao Pawar, the village adopted a new development model with water harvesting and conservation as its core. The village was also brought under the Adarsh gaon yojana scheme by the government. During the period of 1995-2005, the village spent all its development money on water conservation, both in recharging groundwater as well as creating surface storages. 414 ha of contour bunding stopped run-off and about 660 rainwater harvesting structures of various types captured rainwater. The area under irrigation has increased from 120 ha to 260 ha. The village is now reaping the economic benefits of its water conservation program.

WATER MANAGEMENT IN DROUGHT CONDITIONS

The integrated water resource management plan can be adopted to tackle scarcity problems in drought prone areas. The traditional approach involves monitoring the available water resources, deciding the drought severity, preparing a relief program, identifying funds and implementing the program.

The integrated water resource management plan, on the other hand, includes the following steps:

- Consultative: Planning of infrastructure by periodic expert consultation and review by relevant stakeholders.
- Multi-sectored: The appointed water council consists of different interest groups such as agricultural, domestic, private sector users.
- Representative and inclusive: Includes state governments, public/civil groups, non-profit organisations, etc.
- Technically informed: Includes specialists such as engineers, hydrologists, hydro-geologists, etc.

The responses to droughts will vary in different regions depending upon the impacted area, the water dependence and the regional development.

CONCLUSION

Rain harvesting is emerging as a viable long term strategy to tackle the increasing pressure on fresh water resources of our country. Over-exploitation of groundwater resources is increasingly being recognized as a major problem. Unless some crucial measures are not taken in time, then by 2025 India will be highly water stressed. Substantial amounts of rainfall in semi-arid areas are lost due to run-off, evaporation and other factors. This water can be used for agricultural production. In view of this rain water-harvesting system is the only alternative, which can provide good quality of water. Harvested rainwater, if recharged in to the ground can effectively solve the problem of depletion of under-ground water resources. Rainwater harvesting has the potential to increase the productivity by increasing yields and reducing risk of crop failure. Most of the harvesting techniques are relatively cheap and a viable alternative where irrigation is unavailable or too costly. It has become very necessary to form certain regulations and laws for the effective utilization of available water sources as well rain water harvesting systems implementations so that our coming future will be secured at least on water front. Financial incentives by the government or other local bodies can be devised to overcome the constraints faced in this direction.

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USE OF DYNAMO IN STREET LIGHTS

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ABSTRACT

Fans are the most used items in India despite the widespread availability of coolers and air conditioners since the initial capital cost of solar system is quite high, when it comes to generate power of domestic use and energy saving and energy generating is a major issue for mankind. This paper present the method of generating power by a ceiling fan .The generated power can be used or stored in a battery for powering street lights and building lights.

Keywords

Dynamo, electromagnetism, fan

1. INTRODUCTION

World is a storehouse of energy. We all know that energy can neither be created nor be destroyed but can be transformed from one form to another. But we are wasting resources that can produce energy as if they are limitless. If we can renew and reuse the energy we waste, it would help in some way to the problem scarcity of energy, which is major threat of present world. by using the concept of wind turbines Wind-generated electricity can be used for battery charging and for connection with the power grid. Beside every fan there is a tube light by mechanism inside the fan motor or a belt that rotates and light up the bulb or store the energy in a battery which could be used to power up street lights.

2. ELECTRICAL GENERATOR

A motor converts electrical energy into mechanical energy of rotation. Some motor can be operated as generators to convert electrical energy into mechanical energy.

Dynamo-a device that makes electrical energy convert into mechanical energy using principle of electromagnetism.

3. ACTUAL CONCEPT

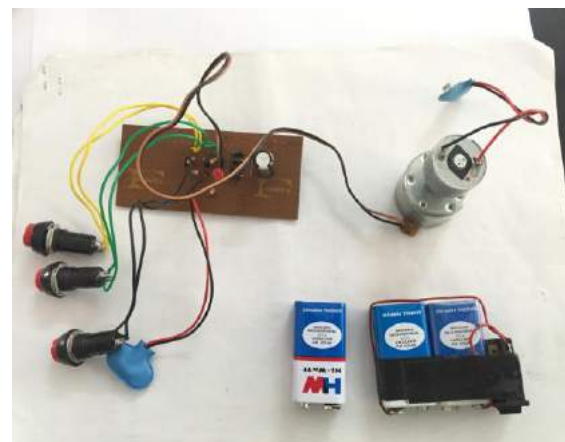
Wind turbine motor is used to generate electricity. Permanent magnet motor can be used as a generator for battery charging. The spinning shaft turns the electromagnets that are surrounded by heavy coil of copper wire inside generators. This creates a magnetic field, which causes the electrons in copper wire to move from atom to atom creating electricity. Voltage produced by generator depends upon number of turns

in its coils, the strength of the magnet and the rate at which magnet turns. More the turns in the coils, more the voltage is produced.

AC dynamo which is used to generate current, it will be interconnected with a ceiling fan through a mechanism in which the rotating ceiling fan motor will rotate dynamo's shaft. It will be connected in such a way that as the number of the rotations of ceiling fan increases the rotation of the shaft of AC dynamo increases, by the mean time the voltage is generated. The voltage generated will be given to charging circuit which will be converted to DC. Then it will give to the 1 volt battery and by using an inverter circuit and a step up transformer this 1 volt may be converted to around 250 volts and used for the street light.

4. CHARGING CIRCUIT

A dynamo attached to a fan's motor for power generation. The dynamo is attached to the fans motor in such a way that it results in the rotational motion of the dynamo's shaft. The motion causes the dynamo to produced electrical energy. The dynamo output is given to the rectifier circuit and then to the voltage regulator and hence the DC regulated output is used



for charging.

5. MERITS AND DEMERITS

5.1. MERITS

- [1] Low initial cost-the initial cost of electrical motor is considerably solar photovoltaic(PV) panels with same output.
- [2] No emission of carbon dioxide(CO₂), mercury(Hg), nitrogen oxide(N₂O), sulphur dioxide(SO₂) or particulate matter into the air, water or soil and helps preserve and protect the environment for generations.

Minimum maintenance cost once generators are constructed, they can operate efficiently without any problems for long period of time. Additionally, one need not have to check them on a regular basis and extra cost of generator maintenance can be avoided.

Reduces the cost to transmit electricity along power lines.

5.2. DEMERIT

- [1] The incorporation of dynamo's mechanism may reduce the speed of the fan.
- [2] The electricity generated by the mechanism will be less than the electricity consumed by the fan.
- [3] Energy losses are high.

6. APPLICATION

- [1] Colleges, hospitals, hostels are equipped with at least 50 fans where this energy generating may be used to light up the tube lights or charge a battery and power up other devices like computers, laptops, etc.
- [2] In order to charge cell phone we need a mobile charging circuit which would give the appropriate voltage and current required for charging the mobile and will be helpful to middle class people to save energy and money.

7. Conclusion

At a time when there is crisis casting its shadows all over the world one has to look into alternate renewable sources. One such alternate way to generate power is presented in this paper. The rotational energy of the dynamo can be used to operate several small powered devices. The various applications where this power can be used are street lights, building lights, etc.

8. ACKNOWLEDGEMENT

We take this opportunity to express our gratitude towards the following people for their encouragement and guidance without which the successful completion of our project work would not have been possible. We are grateful to our project guide Mr. Ashish shetty for his valuable guidance and a suggestion in our project work. It was through his relentless efforts that we have been able to fulfil our project requirement. We would also like to thank Mr. Pratik Mahale for his encouragement and support during the project. We like to further like to extend a warm token of appreciation towards our college for providing a conducive environment for our project. Also we would like to thank our Internet lab for internet facilities which helped us to build our project.

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SUCTION PILE FOUNDATION

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ABSTRACT

Usual Pile foundation used while constructing any infrastructure in sea/river requires a lot of money, man power, specialized workers, time etc. hence here Suction Pile Foundation can help, Suction Pile is like a usual pile foundation but only difference is the load and other factors will be sustain by vacuum present in each pile. The main reason behind researching and developing this type of foundation is reducing the cost, time, man power etc. providing much better life span, strength to the infrastructure.

Keywords

Suction, Vacuum, Pile, Foundation, Structure, Strength, Lifespan, Infrastructure, Cost, Management, Construction, Sea, River.

1. INTRODUCTION

Constructing an bridge or any infrastructure in sea/river is itself is a big problem which requires a lot of MONEY, efforts, TIME etc. and just like construction of any infrastructure on land first of all we need to first lay it on FOUNDATION likewise while constructing any infrastructure in sea we need a solid tough and rigid base/foundation for it to keep that structure stand up in sea. There are many types of foundation/footings but majorly used type is a PILE foundation, pile foundation always prefer to be at those places only where 'hard strata of earth crust is at high depth which cost ton of money to construct in seabed.

In this project we are developing/constructing the pile foundation with "VACCUME" in it rather than concrete or reinforcement, which can sustain more load can cost much less money than usual normal pile foundation can be constructed in much less time than usual pile foundation.

We just only have to fully driven the suction piles in to the seabed at precise depth and further construction can be take place on it, and hence in future with the help of suction pile foundation, construction of any infrastructure in sea or river can be possible

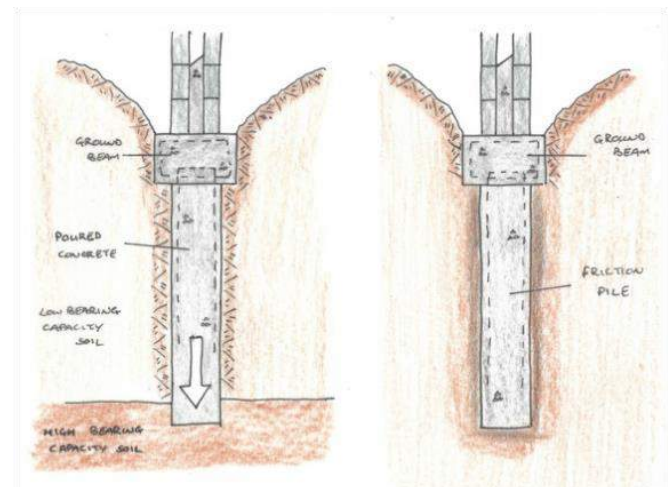
2. PILE FOUNDATION

Substructure in which piles are used to transfer a load from a structure to the soil. A pile foundation consists of piles and a connecting foundation mat. The choice between a pile

foundation and a conventional foundation on a natural base is

governed by economic and technical considerations. These considerations include the engineering and geological conditions at the building site and the features of the planned building or structure. Pile foundations are particularly

appropriate when the building or structure is to be erected on soil that is not stable or is saturated with water. In many cases, such foundations substantially lessen the required earthwork and the expenditure of concrete.

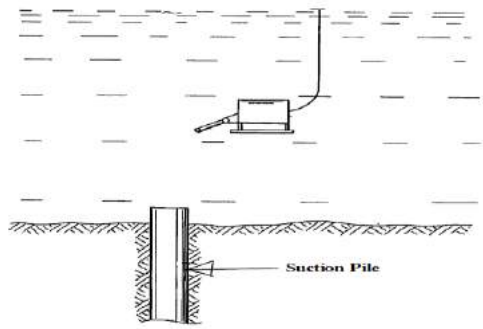


Piles are classified into two categories according to the properties of the soil at the lower end of the pile. End-bearing piles are supported by practically incompressible soil; floating piles are sunk in soil of uniform consistency and transmit their load to the soil both through their lower and lateral surfaces.

3. *SUCTION PILE FOUNDATION*

What is Suction pile?

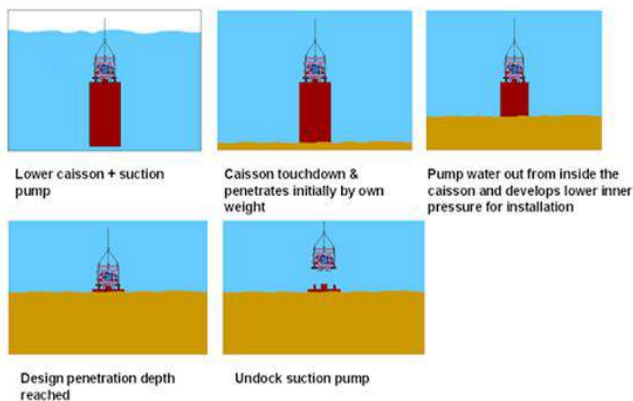
Suction pile foundation is bit similar to usual pile except it has vacuum in it instead of concrete. The vacuum in each pile creates an low air pressure inside and high water pressure outside hence the strength, lifespan, sustainability etc. is more higher than usual pile foundation.



How Suction Pile foundation works?

The Pile foundation can be constructed outside of sea or inside. after construction of piles they are get fully driven into the seabed after driving all piles in seabed the excess of water get pumped out of each pile or we can keep it as it is after all done all piles are set to sustain the load on them.

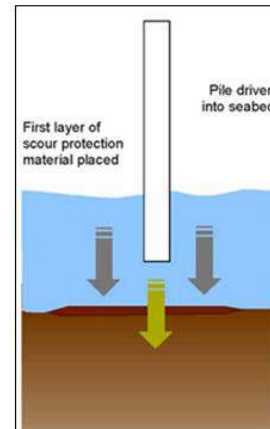
The vacuum inside each pile hold down to seabed and also don't allow the pile to take it off or bent from seabed/surface hence the results we get much better foundation than usual pile foundation.



Why to prefer Suction Pile over usual pile foundation?

1. Suction Pile can be constructed and deliver on the spot of infrastructure in very less time than usual pile foundation.
2. The Cost of construction of suction pile foundation is low than usual pile foundation.
3. Strength, Sustainability, lifespan etc. of suction pile is more than usual pile foundation.
4. Suction pile can be modified as they can retain earthquake of 8.5 richter scale and can hold down in 30m high waves.
5. Not necessary to drive the suction pile up to hard strata like usual pile foundation.

Like wise there are many more reasons to prove that suction pile is much better than usual regular pile foundation.



Difference between Regular Pile and Suction pile.

Here are some difference between both type of piles which clearly states which one is better or which one is poorer in different areas/sectors and here are some major differences which can help.

Table 1. Difference between Regular Pile foundation and suction pile foundation.

Sr. No.	Suction Pile	Regular Pile
1.	More Economical.	More expensive.
2.	Require less time for construction.	Require more time for construction.
3.	Doesn't need to drive this pile up to hard strata of earth crust.	Always need to drive this pile up to hard strata of earth crust.
4.	Require less concrete.	Require more concrete.
5.	Can be constructed out of the sea/river.	Cannot be constructed out of sea/river.
6.	Have more strength than regular pile.*	Have less strength than Suction pile.*
7.	More lifespan.	Probably Less lifespan.
8.	Can sustain more working/dead load than Regular pile foundation.	Can sustain less working/dead load than suction pile foundation.

9.	Suction Pile foundation is hollow.	Regular pile foundation is not hollow.
10.	Suction pile foundation contains nothing but Vacuum inside instead concrete.	Regular pile foundation contains only reinforcements and concrete inside.

4. DISADVANTAGES OF SUCTION PILE FOUNDATION

1. Require more skilled Labor.
2. Require high technical highly complex machinery.
3. Needs to be constructed as one piece. Cannot construct it in different parts or components.
4. Have to construct it outside of shore and then have to be placed at preferred place.
5. Placing of pile in seabed or riverbed needs to be perfect or else sustainability and strength will defer.
6. Cannot use this pile singly, always have to keep more than 4 piles to reach up to precise strength.

Etc.

5. COST ESTIMATION OF STANDARD SUCTION AND REGULAR PILE FOUNDATION.

To estimate the proper costing of both piles let consider a standard size, volume, shape, dimension of both pile and then calculating its costing.

Let us consider.

Depth of pile = 15 meter
 Outer diameter of pile = 5 meter
 Inner diameter of pile = 4 meter (only for suction pile)
 Diameter of steel bar = 40 millimeter
 Total reinforcement required = 7500kg
 Concrete mix = M20
 Concrete strength = 32 Mpa
 Cost of 1m³ concrete premix concrete = Rs.3250/-
 Cost of reinforcement = Rs.40,000/TON. (including vat tax)

COST CALCULATION :-

(ALL COST AND PRICES OF MATERIALS ARE TAKEN FROM REAL TIME MATERIALS RETAILERS EXCEPT LABOUR WORKERS COST.)*

1) REGULAR PILE FOUNDATION COST ESTIMATION.

◆First calculating the volume of pile

$$V = \pi \times r^2 \times h$$

$$V = \pi \times 2.5 \times 15$$

$$V = 294.52 \text{ m}^3$$

Now calculating the area

Hence A1 is gross area, A2 is steel area, A3 is concrete area.

$$A1 = \pi \times r^2$$

$$A1 = 19.634 \text{ m}^2$$

$$A2 = 0.00502 \times 10 = 0.0502$$

$$A3 = A1 - A2 = 19.5838 \text{ m}^2$$

Now calculating total required concrete costing

$$\text{Hence} = 294.52 \text{ m}^3 = 300 \text{ m}^3$$

$$300 \times 3250 = \text{Rs.} 9,75,000/-*$$

i.e. concrete required for single pile costing will be Rs.9,75,000/-* only.

◆For steel reinforcements

As the 5m×5m is round area

With the spacing of approx. 8mm

Hence total required steel bars will be 50 nos.

As for 40mm steel bars weight is 9.86kg/1m.

$$(9.86 \times 15) \times 50 = 7500 \text{ kg}$$

The total required steel will be 7500kg

There for; today's costing of 40mm reinforcement steel is Rs.40,000/ ton.

$$\text{Hence } 40,000 \times 7.5 = \text{Rs.} 3,00,000/-* \text{ only.}$$

◆For reinforcement we need to fasten the reinforcements together then we need 8mm diameter Steel rings and 1mm or less bending wire.

Which approximately cost around Rs.40/Kg

So as for 50 reinforcement bars we will need 8mm diameter approx. 150 rings At the distance of 4 inch between 2 rings from center to center

So for 150 rings as per ring weigh around 2.20kg/1 meter

The total weight will be $150 \times 2.20 = 330 \approx 350 \text{ kg}$

$$\text{Hence now } 350 \times 40 = \text{Rs.} 14,000/-$$

For bending wire which will weighs around 5kg $5 \times 40 = \text{Rs.} 200$

$$\text{Hence total required steel cost will be } \text{Rs.} 3,14,200/-* \text{ only}$$

◆So now for the labor workers cost estimation let consider a specific common amount as of we need a specific no. so let consider the labor and other expenses as Rs.2,50,000/- * only

So the total cost for construction of regular pile foundation will be

Total cost = Steel cost + concrete cost + labor and other expenses cost.

$$\begin{aligned} \text{Total cost} &= 3,14,200 + 2,50,000 + 9,75,000 \\ &= 15,39,200 \end{aligned}$$

So the total cost for construction of regular pile foundation will be Rs.15,39,200/-

2) SUCTION PILE FOUNDATION COST ESTIMATION.

As described the suction pile foundation will be hollow from inside so the required amount of concrete will reduce but the reinforcement we require will be the same as regular pile foundation.

◆Now calculating the total volume of concrete require

Let V1 outer diameter of pile which is 5 meter and V2 be internal diameter which is 4 meter and v3 be final volume, as the thickness of pile will be 1 meter.

$$V1 = 294.52 \text{ m}^3$$

$$V2 = \pi \times r^2 \times h = \pi \times 2 \times 15 = 188.495 \text{ m}^3$$

$$V3 = V1 - V2 = 294.52 - 188.495 = 106.028 \text{ m}^3$$

As 1m³ of concrete cost is Rs.3250/- . so for 106 m³

$$106 \times 3250 = \text{Rs.}3,44,500/-$$

So the total cost for concrete will be Rs.3,44,500/- *only

As the reinforcement cost will be the same as regular pile foundation and it was/in Rs.3,14,200/- * only.

Same as So now for the labor workers cost estimation let consider an specific common amount as of we need a specific no. so let consider the labor and other expenses as Rs.3,50,000/- * only (as suction pile require more skilled labor).

Now the total cost of construction of an single suction pile will be

Total cost = Steel cost + concrete cost + labor and other expenses cost.

$$\begin{aligned} \text{Total cost} &= 3,14,200 + 3,00,000 + 3,44,500 \\ &= 9,58,700 \end{aligned}$$

So the total cost for construction of regular pile foundation will be Rs.9,58,700/- * only.

Hence Construction cost of Regular Pile Foundation is more than Suction Pile Foundation.

Where (*For Considered size and other properties)

Suction Pile Foundation requires = Rs.9,58,700/- *

Regular Pile Foundation requires = Rs.15,39,200/- *

6. FUTURE SCOPE

So all the above work which have done upwards tell us that the suction pile foundation can cost less money than regular pile foundation.

Approximately suction pile can cost 30%-35% less money than to money will required in regular pile while constructing any infrastructure in sea/river.

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8. CONCLUSION

As from this research paper we conclude that the Suction Pile Foundation is a better opinion while constructing any infrastructure in sea or river or than the usual Regular Pile Foundation or any other types of foundation in terms of strength, life span, economy, sustainability's, Transport etc. and for management the Suction Pile foundation can make a huge difference in construction cost by reducing it.

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THE ROTATING BUILDING

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ABSTRACT

Rotating building will give another wonder to the world and the modern civil engineers. Study about the rotating building also includes different sections such as use of material, mechanism of rotation, sustainability, structure, design, and IT technologies. It is one of its own kind of building which rotates. No other construction company around the world have initiated the construction of such an amazing structure.

It will be the best example of civil engineering to the world, which will give the 360° view to people inside the building. It also includes a proper use of sunlight, natural resources, air, and the proper view to the surrounding and the main aim is to give the idea that this building can be used for power generation by its rotation and it can be used for self power generating building. Thus it is also a green building.

This paper on rotating building will give the proper and advance idea to the civil engineering and construction to make world smarter and beautiful.

Keywords

Introduction, Architectural design, Structural design, Energy efficiency, Future of rotating building, Conclusion.

1. INTRODUCTION

The rotating building was just a science fiction object for the world till now, but the advance technology and engineers' knowledge came ahead and make whole world to believe that it can be come into reality. The main object of this project is to give knowledge about the working and mechanism of rotating building. The project will consist of main leading points which will explain the design of the rotating building with architectural view and structural feasibility of the whole structure. The rotating building will also serve as a green building which is new technology to control the energy crisis

and pollution. It will save the energy consume in the construction while building normal construction.

As a civil engineer's view it is important to study such new and innovative structures. The whole world is facing the global warming crisis and unfortunately construction industry is also contributing this crisis, hence building such environment friendly structure we engineers can reduce the global warming and give the best living environment to the whole world. India is a developmental country and infra structures are still to be developed, hence adopting such ideas from developed countries we can make ideal smart cities in India and we can give a best example of environment friendly construction to consumers. Hence, main purpose of the project is to give information about rotating building which helps the environment.



2. REFERENCE PROJECT (CASE STUDY):

2.1 General

2.1.1 Concept

The concept of “Rotating building” is developed by the Italian architect David Fisher. The main idea behind this concept is the building of the future. Mr. Fisher translated this idea into the design of the rotating tower with rotating floors. All the sections of the building would be made of steel structure to stability to the structure. The design should be made in such way that for construction purpose it must be workable hence different designs are made for different load conditions and weather conditions. The building will consist of main core and it will rotate around its own axis with power supplied to it.

The rotating building will generate its own energy to give the power to the different sections of the building and save all construction charges. It will consist of the solar panels, wind turbines etc. which will save lot of fuel and the electrical energy to serve as green building as well. Hence, concept of the rotating building is feasible according to the design.

Table 1. General information

Status	Types	Cost	View
Rotation and Vision	Residential , Office, Shopping mall	High compared to normal buildings	360°

2.1.2 Specifications

Height tower	- 435.3 m
Average storey height	- 5.4 m
Number of floors	- 80 floors
Floor area per storey	- 1142-1826 m ²
Rotation speed	- 1 rot/hr

2.2 Construction

The construction of the rotating building was proposed as the world's first building which rotates. The 90% of the building could be built in a factory and shipped to the construction site. This would allow the entire building to be built more quickly. The core of the tower must be built at the construction site. The modular construction would decrease the project's cost and the number of workers, and that construction will take 30% less time than a normal building of the same size. The majority of the workers would be in factories, working under safer conditions,

kitchen and bathroom fixtures would be pre-installed. The core would serve each floor with a special, patented connection. The entire tower is proposed to be powered from wind turbines and solar panels. The turbines would be located between each of the rotating floors. It could generate up to 1,200,000 kilowatt-hours of energy. The solar panels are expected to cover the roof and the top of each floor.

2.3 Structure

The structure of the Rotating Tower consists of a few main parts: a central core, a steel structure and a foundation.

1. Core

The core dimensions needs to be respected, so the stability structure can be fitted into the architectural design.

2. Steel structure

The steel structure is already designed in an earlier stage. This design will be used as an assumption for the design of the stability structure. When necessary the design of the structural steel can be adapted to the stability structure, since the steel structure is now designed as a free structure hanging from the core.

3. Foundation

No design for the foundation is made yet. A preliminary design will be made for the foundation in such a way that the rotational stiffness of the foundation is sufficient to resist deformation caused by wind loads.

2.4 FIGURES



Fig 1: Dynamic rotating building

3. FUTURE OF ROTATING BUILDING

Use of technology to reduce energy and water, scales up these technologies into border system that work everywhere makes these systems cheaper design with nature to improve our health and well being and build the most cutting edges and reuse what we have in future. Architecture and building automation seem, on first sight, to be two completely separate areas in which, however, big energy saving potential is possible. Against the background of the increasing demand for resource-sparing construction, it is necessary for the investor or developer to find a suitable compromise. Modern, energetic building planning is about finding a compromise between costs, energy efficiency as well as the comfort and convenience aspects for the user. For this not only the energy requirement values determined during the planning are important but also, during the planning phase, it is important to consider how to monitor and minimize the energy costs which will accumulate during the entire lifetime of the building. The running energy costs, such as energy or servicing expenses, contribute up to 80% of the entire lifecycle costs whereas the initially executed planning and construction costs only contribute 20%. From these numbers it can be seen that a contemporary and adapted building automation in addition to energy and building management play a decisive role in the economy and energy efficiency of the building. It is not rare for the values determined for energy consumption during planning to be exceeded by two or three times. Alongside the difficult-to-determine user influence the other reasons are non-optimally regulated installations as well as operating parameters which are not adapted to the utilization. Clarifying these incorrect settings is also one of the responsibilities of building automation. The energy consumption of a building is not of a fixed size but heavily dependent upon user behavior and an optimal installation and building operation. Contemporary atomization techniques are necessary tools for dynamic energy and building management whereby all the necessary data is collected and evaluated. This data guarantees the necessary clarity about all the energy flows by means of appropriate energy data clusters in the building whilst also giving information about the positive as well as the negative influences of the users' behavior. From this, it is possible to introduce prompt and target-oriented economic optimization.

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MODULAR BUILDING

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ABSTRACT

Modular building is the method of off-site construction process known as modular construction. In modular construction all the sides of the building are constructed in remote facility and then they are delivered to their intended site of use. The study about modular building includes different section such as type of material, mechanism, strength and durability of structure. In modular buildings, time required for construction is much lesser then the time required constructing the building by conventional method. Waste generated during the construction process is also reduced; hence modular buildings are eco-friendly.

With the help of our project and this book we will try to give more information about modular buildings which will help civil engineer's community to make the world more beautiful and smarter.

Keywords

Introduction, manufacturing process, material used for construction, typical details, advantages, disadvantages, conclusion.

1. Introduction

There is a growing demand for the construction industry to provide better value by improved quality and performance. With the increasing demand for housing, it is very important for the government to find some alternative and useful way to meet this expanding problem. There are three options to meet this increasing demand. First is the used of indigenous building materials, second is the search for the improvement on the conventional method of construction as well as the design standard and lastly the use of innovative technology. Innovative technology refers to the used of newly discovered construction materials or methodology such as the Modular Building.

Modular house is the culmination of one type of building system. The building process starts with efficient modern factory assembly line techniques. The prefabricated components are brought to the site and erected using building block type construction.

1.1 Definition

Modular buildings are constructed by modular construction method. It is a method of off-site construction. Modular buildings and modular homes are sectional prefabricated buildings or houses that consist of multiple sections called modules. "Modular" is a method of construction differing from other methods. The modules are six sided boxes constructed in a remote facility, then delivered to their intended site of use. Using a crane, the modules are set onto the building's foundation and joined together to make a single building. The modules can be placed side-by-side, end-to-end, or stacked, allowing a wide variety of configurations and styles in the building layout.

2. Modular Building Manufacturing Process

2.1 Factory

Modular manufacturers vary in their production capabilities, technologies and assembly methods. They range from true automated moving production lines that shift the modules thru several different stations where specialized crews perform specific tasks, to static production lines where various crews come to the module and perform their respective tasks. Regardless of production line type, the steps involved are very similar. Today most modular manufacturers employ wood frame construction as opposed to steel or concrete. The very beginning step for most manufacturers in the building phase within the factory is the lumber check



Fig1 Lumber Check in Factory

Lumber must be moisture checked, and pre cut for the floor and ceiling joists shown in fig. 1. This is an integral step that manufacturers tout as evidence of superior product quality.

In design, manufacturers leave a small space between what will become marriage walls (walls where two modules are joined) to allow for a margin of error that will be backfilled with foam when set. Next, several finish components are performed including kitchens, baths, lighting, ducting, windows and occasionally flooring and exterior siding. Doors and windows are assembled with foam around the edges and good quality flashing, weather-stripping and chafing strips, ensuring proper insulation. Once built, the modules must be tested and most manufacturers do this on site.

When combining modular with panelized or site-built construction (to achieve a wide span or a cathedral ceiling) temporary walls or framing is built in to add extra structural support and arched plywood is applied to the tops of the modules where the heavy plastic will be placed to create a bowed frame that rain or snow will readily run off.

2.2 Transportation

Typically it is not feasible to ship modules extremely far due to road size/load restrictions. The average manufacturer typically quotes 250-400 miles as the maximum distance that it is desirable to transport modules. Some companies, like Epoch Homes in New Hampshire, are looking into how to efficiently transport beyond this distance, in special circumstances such as aiding in the reconstruction of New Orleans, but this is atypical. Modular appears to have pushed some fairly interesting boundaries in terms of alternate transport by utilizing both sea barge and helicopter delivery to islands or particularly remote locations. Despite the obvious difficulty inherent in such complicated transport it may often be a more cost effective alternative than utilizing a site built method. Exotic transport aside, most modular deliveries are made over the highway and governed by a somewhat complicated web of international and inter-state regulations. It is not rare for a transporter to have to deal with three or more different government agencies to get through a single state. Opinions vary on the complexity of the approval process. Modular manufacturers are increasingly responding to developer's desire to be provided with more seamless service and are handling the transportation component of the process. Modules less than twelve feet wide are mostly allowed to travel with no restrictions. When the size increases to between

twelve and fifteen feet wide there is an accompanying increase in the restrictions and often a requirement for police escort. Once a module reaches the fifteen to sixteen foot width it is almost universally declared a wide-load that requires police escorts and can often be required to travel overnight as to not impede local traffic.



Fig. 3.1 Transportation of modules by truck

2.3 The Set

It is the developer's responsibility to have the foundation ready and the tie-ins for electric, plumbing, and sewer in place so that the modules can be connected to the necessary infrastructure. Such infrastructure work occurs, weather permitting, concurrently with the manufacturing process so that essentially, once the foundation is set one can ship the modules, connect them and obtain occupancy permits. The modules arrive built with walls, floors, trusses, ceilings, wiring and interior fixtures to the extent the developer wants them. Once on site, the modules are stacked by a crane (usually between an 80 to a 160 ton crane depending on the size of the modules and the distance from the crane that it must travel) at an average pace of approximately four to six modules per crane per day. The modules are bolted together along both the floor and the ceiling joists and the marriage walls are connected with a series of steel fasteners and strapping. They are quickly weather proofed by sealing them with building wrap that blocks moisture and pollutants yet allows the structure to breathe and water vapor to escape. Care needs to be taken to monitor weather conditions around the scheduling of the set. While tarps may be used to protect the unwrapped modules from rain or snow during a set if necessary, this is a less than perfect solution and it is better to schedule around inclement weather if possible. Once set and connected, the structure is then ready for subcontractors to begin the process of performing the interior and exterior finishes and all required utility connections.

2.4 Inspection and Quality Control

One primary difference between site-built and modular methods is inspections. With modular, throughout the manufacturing and installation process, there are multiple parties monitoring the process. While a large multifamily project still requires local architects and engineers to submit stamped permit drawings in their particular state, the physical inspection of the modules as they are built are not handled by

local building inspectors but independent third party inspection companies who are licensed to review the work as it is being performed in the factory to ensure code compliance. As each module is inspected and approved it receives a seal certifying that everything within the module conforms to the plan and the building code. Local building inspectors are only “supposed” to review the additional work that occurs once the module is set such as utility connections and the buttoning up and connections of modules. This is occasionally tested however, by local inspectors who overreach their authority. The third party inspection process applies in most jurisdictions but one must locally verify the applicability. Additionally, the design process involves both a factory architect and an architect employed by the developer and licensed in the state where the development is to occur. This dual design/review process can often eliminate any future change orders or surprises in the field. Quality control is not just code compliance, however, and quality assurance employees and shop foremen inspect the modules throughout the construction process. A major difference between the site-built and the modular process is proximity of quality control personnel to the work being inspected. Quality controls are still subject to human error. Since the factory building method is a fast moving process, many industry insiders recommend the practice of having the manufacturer make two or three modules and then sending the local architect and general contractor to the factory to inspect so that any issues, specifically those pertaining to MEP systems, can be cleared up early on. Some common infractions that do arise either during manufacturing, or once on-site, are minor issues: foil insulation is facing the wrong way inside an interior wall, hairline cracks in the plaster, sixty foot long modules may be slightly off in length.

3. Materials used for construction

The materials used in modular homes are the same as site constructed homes. Wood-frame floors, walls and roof are the most typical. Some modular homes include brick or stone exteriors, granite counters and steeply pitched roofs. All modules are designed to sit on a perimeter foundation or basement. In contrast, mobile homes are constructed with a steel chassis that is integral to the integrity of the floor system. Mobile homes often require special lenders. Most companies have standard plans. However, all modular buildings can be custom built to a client's specifications. Today's designs include multi-story units, multi-family units and entire apartment complexes. The negative stereotype commonly associated with mobile homes has prompted some manufacturers to start using the term "off-site construction.

4. Case study

4.1 General

“SKY CITY” is the name of the upcoming modular building, which is going to be the highest modular building in the world. According to the BROAD, the architectural company, this building will contain 220 floors, which will completely based on modular construction.

4.2 Objectives

Sky City offers a multitude of benefits towards urbanization, sustainable research and the corporate aspirations of BROAD. Boasting a four to one ratio between fiscal savings and environmental protection; Sky City strives for energy, material, water and land conservation.

Based upon practical building methods, our objective is to promote a high quality of life through lively urban design. Sky City will explore the roadmap of Chinese urbanization and improve the quality of citizen life whilst remaining in accordance with Chinese Government policies which govern the building and construction industry. We do not intend to erect a landmark, but to develop and extensively build, a practical building with medium cost and ultra-low energy consumption which will reciprocally shape the future urban life style.

4.3 specification

The building, with 220 floors (838 meters) and a construction area of 1 million square meters, is equipped with approximately 200,000 tons of steel and 104 elevators.

Application	Area	People
Residence	83%	17,400
Hotel	5%	1,000
Educational	3%	4,600
Hospital	3%	1,400
Office Building	3%	2,000
Shop, Restaurant, etc	3%	5,000
Total	100%	31,400

4.4 Environmental Protection

- 1) Energy saving: Unique technologies from Broad offer five times higher energy-saving than that of conventional buildings. Our BROAD unique technologies include a 15 cm thermal insulation, 4-paned windows, fresh air heat recovery, non-electric air conditioning, cooling-heating-power system and more.
- 2) Electricity saving: Electricity consumption is six times less than that of conventional buildings by using technology such as LED lighting and auto power- generated lifts.
- 3) Land saving: 5~10 times less land due to increased building height and decreased traffic.
- 4) Purer air: with BROAD unique fresh air machining this project offers 20 times purer air than outdoor air. BROAD technologies feature a 3-stage air purification, 7 times/h air exchange and 100% fresh air eliminating cross contamination.

5. Advantages of Modular Building

5.1 Design

5.1.1 Structurally sound:

Each wall panel has a ribbed type design on all sides to function as a structural column, resist vertical compression, and a beam type element on top to resist lateral loads. This means that each panel possesses structural properties that make the wall very independent and the use of any concrete column is eliminated.

5.1.2 Architecturally Elegant

Aesthetic expression, size proportion, shape and smooth clean surface texture are designed to easily harmonize with other building materials. Surface imperfections due to plastering and repair of other flaws are eliminated.

5.1.3 Fire resistant

Wooden materials such as window/door jambs are avoided since the main design of window/door jambs are made up of concrete homogeneously poured together as part of the wall and now making the prefabricated wall panel in a pure non-combustible concrete materials.

5.1.4 Durability

The concrete made used is sufficiently resistant against corrosion and cracking. In this walls are properly reinforced by grade 40 temperature bars or welded wire fabrics as reinforcement for temperature shrinkage.

5.2 Construction

5.2.1 Fast wall construction

The wall component of a single detached house unit can be erected in less than 4 hours. This is more hastened by the use of lifting equipment available and thus, placement and erection of the wall on its desired locations will be more accurate. This makes the work more comfortable, easy and offers a very wide margin of time savings and therefore, construction time in subdivision development substantially shorten.

5.2.2 Minimized carpentry work

Production of conventional wooden door and window jambs which is being fit together with the CHB walls is eliminated. Now, with the prefabricated panel, all the jambs can be made in one concrete pouring making the jambs part of the wall.

5.2.3 Assured quality of control

The quality of workmanship for the walls is attained in the production plant where the concrete casting, curing and handling are done. Any problem regarding surface imperfections and other defects are then corrected and avoided. Thus, all the prefabricated walls to be used on site are properly controlled, cured and has reached its correct allowable strength before installing the wall into its final assembly.

5.2.4 Organized Construction Procedure

The resulting construction site is cleaner and more space is available because less false works and formworks are used. In this manner, the placement of the prefabricated wall panel has more room for precision. All other subsequent assembly of trusses and roof system can be implemented section by section without worrying in over lapping of activities. Any

errors and incorrect alignment can be detected because the subsequent assembly cannot proceed if this happens; the highest quality of workmanship is attained.

5.2.5 Maintenance Free Construction Material

The present wall panel is being fabricated with pure reinforced concrete material making it free from any probable voids or surface imperfections. Plastering and finishing works are eliminated. Definitely, the wall panels require no maintenance in a long life term of the structure. Both exterior and interior faces are smooth and will be free from dust collection to stick on the surfaces making it hazard free.

5.3 Economic

5.3.1 Material Cost Saving

Concrete which is measured in terms of cement, sand and gravel and being the material used in the precast concrete wall fabrication is significantly reduced because of lesser volume requirement demanded by this design of walls. Concrete volume requirement for one house unit is reduced by a much five cubic meters compared with conventional CHB construction. Although a slight additional amount of steel reinforcement is necessary. As shown in Table 1 and Table 2, the projected material cost is 5.98 percent and a labor cost is 9.69 percent lesser compared with the conventional CHB construction.

5.3.2 Minimized Concrete Wastage

Significant cost savings are generated during panel production in the plant because concrete pouring can be organized and done by skilled personnel's and mechanical equipment, this proper placing of concrete can be controlled and monitored. The factors affecting the workers inefficiencies in the field which means wastage in manual concrete pouring practice are avoided.

5.3.3 Labor Economy

Definitely lesser labor requirement is demanded since the main bulk of the construction work which is the erection of walls is done by lifting equipment and assisted by new erection personnel only. Labor for concrete plastering, CHB piling are avoided, erecting conventional scaffolding, formworks are cut-off significantly, and labor for jamb assembly is eliminated.

5.3.4 Environment contribution

Tremendous reduction of concrete material consumption and lesser demand of lumber will contribute so much to the preservation of environmental resources of lesser quarrying required and utilization of forest product is substantially reduced.

5.3.5 In Terms of Construction Methodology

Prefabricated building components are easy to assemble and can be finished in 12 to 30 working days depending upon the area of the house to be erected. 8 to 15 manpower is enough to finish the whole structure, work is never delayed because there is no need poor's curing of the materials because before it is installed, it already passed the standard psi required for building houses.

6. Disadvantages of Modular Building

6.1 Volumetric

Transporting the completed modular building sections take up a lot of space.

6.2 Flexibility

Due to transport and sometimes manufacturing restrictions, module size can be limited, affecting room sizes.

6.3 Loses value

Modular homes may lose their value quickly.

6.4 Financial issues

Some financial institutions may be hesitant to offer a loan for a modular home.

7. CONCLUSION

Better houses are the requirement of all living organism. Modular construction is superior to traditional mass construction in most cases. There are a few limits to modular construction but they are usually not encountered in a multi-family building project. Modular building is completed in about half the time it takes using traditional mass construction, meaning the property can be rented faster and added revenue can be created that would not be possible using stick-built construction. Modular construction is also better quality. Because the workers in the factory use lasers to cut the wood and jigs to place the pieces together, the quality is very consistent. The workers are also very efficient because they do the same job repeatedly, which increases their skills and reduces errors. Very little waste is created and no materials are damaged by moisture, which creates a home with very good indoor air quality that is far superior to the average stick-built home.

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RESEARCH ON SELF CURING CONCRETE

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Abstract: Curing of concrete is very important for strength and durability. But sometimes it is not possible to curing the concrete because of site problems and it will affect on strength & durability of concrete. Some interesting research has investigated the feasibility of developing a “self-cure” concrete which would not need any externally applied curing. This concept involves adding water-soluble chemicals to the concrete during mixing to reduce water evaporation as the concrete is exposed to air drying. An ordinary Portland cement concrete with a 28-day design compressive strength of 40 MPa is used. The physical properties measured were compressive strength. Standard compressive strength tests were conducted on concrete cubes.

Keyword : Compressive strength , w/c ratio, Mix design , Admixtures, Internal curing.

I. INTRODUCTION

General : It has long been recognized that adequate curing is essential to obtain the desired structural and durability properties of concrete. A review of the history of the ACI building code reveals little change in curing requirements in the past 50 years. Since the strength development and durability characteristics of high-performance concrete may be different from ordinary concrete, it follows that new curing practices may be needed. Using some available chemicals we can reduce external curing to some extent.

Internal curing purpose: a) A means to provide the water to hydrate all the cement, accomplish what the mixing water alone cannot do. b) Provides water to keep the relative humidity (RH) high, keeping self-desiccation from occurring. c) Largely eliminates autogenous shrinkage. d) Keeps the strength of the mortar and the concrete in the early age (12 to 72 hrs) above the level where

internally induced and externally induced strains can cause cracking. e) Internal curing works & Makes up for some of the deficiencies of external curing, both human related and hydration related.

PROPERTIES OF CEMENT PASTE

Hydration products of Portland cement have been determined to be primarily colloidal. Colloidal particles are generally about 1 nm to 100 nm in diameter and form a rigid network with water adsorbed on the surface of the particles. This colloidal material is the most important constituent of hardened cement paste.

Some of the important characteristics of the hardened paste are its chemical composition, the physical state of the solid phase (hydration products), and the affinity these solids have for water. Pore structure also has a very important relation to the performance of the paste. The moisture content of the paste, which depends on curing, is a primary factor in some of its most important properties, such as strength and volume changes.

Hardened cement paste can have two general types of pores, *capillary* and *gel pores*. Capillary and gel pores will be filled with water if the paste is saturated.

An increase in compressive strength and reduction in permeability of a given concrete is directly related to an increase in the extent of hydration of the cement paste. When cement and water are mixed, the cement particles are separated by water-filled space. As hydration progresses, the solid products of hydration are deposited within the initially water-filled space. There is thus an increase in the *gel-space* ratio.

Absorption—Absorption is the tendency of the cement paste to take on water in the absence of any external hydraulic pressure. This is believed to occur almost completely in the capillary pores outside

the gel. The liquid water is pulled into these pores by surface tension, just as water will rise in a glass capillary. Absorption is the main mechanism whereby dry or partially dry cement paste takes on water. If the water contains deleterious chemicals, these will also penetrate into the paste. *Sorptivity* is the material property used to quantify the resistance to absorption.

BASIC CURING REQUIREMENTS

- 1) Adequate water content : Proper curing involves maintaining suitable moisture content in the paste. This can be accomplished using many different curing methods, or combinations of various methods.
- (2) Maintain adequate temperature Ideally the concrete temperature should be maintained above freezing at a relatively constant value throughout the period of curing.
- (3) Preservation of reasonably uniform temperature throughout the concrete body.
- (4) Adequate protection from damaging mechanical disturbances during the early period of curing.
- (5) Adequate time for sufficient hydration There must be enough time allowed for hydration to progress sufficiently to produce concrete having adequate properties for its intended use. The amount of time needed depends on a number of variables curing temperature, type of cement, and moisture content of the paste.

Basic Curing Period: Concrete surfaces shall be cured for either 3 d at a minimum temperature of 10 °C or for the time necessary to attain 35 % of the specified 28 d compressive strength of the concrete.

Methods of curing: The curing method shall be defined before the commencement of work on site.

The principal methods for curing concrete are:

1. keeping the formwork in place
2. covering with plastic films
3. placing of wet coverings
4. sprinkling with water
5. application of curing compounds which form protective membranes

INTERNAL CURING WATER REQUIREMENTS

Laboratory Techniques to Simulate In-place Curing: Laboratory testing offers the advantage of controlling the factors that affect

curing so that definite conclusions can be reached. When full scale model testing is not feasible, curing simulations need to be developed that will approximate the moisture transport conditions within actual structural members.

Efficiency of moist curing : All methods of curing can be grouped into two main categories: curing practices where water is added, and curing practices that prevent or retard the loss of moisture.

Strength Development Characteristics: Curing criteria have traditionally been based on strength development of the concrete. Codes have made no distinction between the curing required to develop a given strength as opposed to curing required to assure durability.

In-place Assessment of Curing: Current curing requirements in the ACI code are strength based. However, there may be applications where durability is the principal performance requirement. In such cases, curing requirements have to assure that the structure will satisfy its durability requirements.

PROPOSED METHODOLOGY OF WORK:

The proposed methodology of the dissertation work is as follows:

- Characterization of constituting materials: We found out the basic properties of the constituting materials such as cement, coarse aggregate, and fine aggregate. Properties evaluated are specific gravity, unit weight, fineness of cement, initial and final setting time of cement, and grading of coarse and fine aggregates.
- A finer grading of coarse aggregates will be fixed so that more percentage of coarse aggregate will pass through standard sieve of 10 mm and this will remain the same for all the mixes.
- Now quantities of fine aggregates in the mix were increased at the expense of coarse aggregate quantities. Increment was aimed at 2.5 % per trial.
- The replacement of coarse aggregate by fine aggregate was been done until we get the optimum percentage of sand. Such that there was no further segregation and concrete has adequate flow ability.
- Hardened state properties of self-compacting concrete and normal concrete were calculated and compared.

Significance and Importance of Curing : Poor curing practices adversely affect the desirable properties of high-

performance concrete, just as they do any concrete. Proper curing of concrete is essential to obtain maximum durability, especially if the concrete is exposed to severe conditions where the surface will be subjected to excessive wear, aggressive solutions, or severe environmental conditions (such as cyclic freezing and thawing).

Chemical Admixtures: Pharma plast high-range water-reducers (HRWRs), or superplasticizers, are also used. The emergence of HRWRs has facilitated the production of very low water-cement ratio concretes, and good workability can be maintained even at water-cement ratios 0.46. The term “high range” means that the admixture permits at least a 12 % reduction in the water content of a concrete mixture while maintaining the same slump. The main admixture used for self curing is propylene-glycol which reduce 40 to 60 % water, which required for external curing.

Workability: The use of high range water-reducing admixtures has been required with these types of high-performance concretes to provide the fluidity desired. Recent that high range water-reducing admixtures are required to achieve acceptable levels of workability.

CONSTITUENTS OF SELF-CURING CONCRETE

The constituent materials for SCC are the same as those used in traditional vibrated concrete. High range water reducing agent generally employed to enhance the stability of the mix and higher percentage of supplementary cementitious materials and/or VMA used to enhance the workability of the mix.

Cement:

Normally Ordinary Portland cement (OPC) or blended cement is used. Physical and chemical characteristics of cement play a vital role in developing strength and controlling rheology of fresh concrete. Fineness affects water requirement for consistency.

Supplementary Cementitious Materials (SCM):

SCC using cement alone requires high paste volume, which often leads to excessive shrinkage and large evaluation of heat of hydration, beside it becomes uneconomical.

Coarse Aggregates: Aggregates constitute the bulk of total volume of normal concrete. It is not the case with SCC as the main characteristic of SCC are its deformability, and adequate fluidity.

Hence coarse aggregate content in SCC is limited to and below of 50%. The particle size distribution and shape of coarse aggregate directly influence the flow and passing ability of SCC. Maximum size of coarse aggregate is mainly restricted to 20 mm.

Fine Aggregate: The gradation of the fine aggregates affect the water content required for a given workability. Particles finer than 600 micron sieve have a considerable influence on the workability of the mix.

Chemical Admixtures: The requirement of SCC is that concrete should be non-segregating and non-bleeding. To minimize these effect admixtures have been designed, the main function of them is to reduce external curing in order to minimize water migration and segregation effects. Admixtures such as high range water reducer or super plasticizer used to produce. Super plasticizer used to bring about the reduction in water demand and increase internal curing. Propylene glycol is an admixture is used for self and internal curing and used by weight of cement.

MATERIALS USED

1) **Cement :-** Ordinary Portland cement (53 grade.)

Company Name : ultra-tech

2) **Sand :-** Locally available sand (river sand) was used.

3) **Coarse Aggregates :-**

Metal:I – Passing through 12.5 mm & retained on 10 mm. (1.5 seive) (70% by weight)

Metal :II = Passing through 10 mm and retained on 4.75 mm. (I.S. Sieve) (30% by weight)

4) **Super plastisizer :** “ pharma plast”

5) **Admixtures :** Propylene- glycol.

6) **Water :** The water used is tap water as available in the laboratory.

TEST PROCEDURE

Details of mixing : The compression test specimens are casted by using a concrete mix with a proportion of 1 : 2.24 : 4.05 with w/c ratio 0.45 along with a high range water reducing chemical

compound brand name " pharma ", with dosage as 5 % by weight of cement. Also we used admixture "propylene –glycol for self curing of concrete. And that proportion is taken by percentage by weight of cement. The size of the specimens casted is 150x150x150 mm. The fine agg. Percentage as total agg. content is varied from 37 to 67.5 %. The detailed proportions have been tabulated.

Here compaction period taken was 50 to 70 seconds.

Design mix with using chemical (1% propylene glycol by wt. of cement)

Secondly we did mixed design with adding chemical (propylene glycol) from this we casted 12 cubes ,in which

- 1) three cubes are cured by gunny bags ,
- 2) three cubes are cured by water in water tank,
- 3) three cubes are cured by sprinkling two times a day.

In this design design we came to conclusion that compaction period is reduced as compared to normal design.It was observed that time taken was reduced by 20 to 30 seconds which also reduces cost of construction and is economical also workability was increased.

Design mix without using chemical

Firstly we did mixed design without adding chemical (propylene glycol) for this we casted 12 cubes ,in which

- 1) three cubes are cured by gunny bags ,
- 2) three cubes are cured by water in water tank,
- 3) three cubes are cured by sprinkling two times a day.

Design mix with using chemical (1.2% propylene glycol by wt. of cement)

Thirdly we did mixed design with adding chemical (propylene glycol) from this we casted 12 cubes ,in which

- 1) three cubes are cured by gunny bags ,
- 2) three cubes are cured by water in water tank,
- 3) three cubes are cured by sprinkling two times a day.

In this design design we came to conclusion that compaction period is reduced as compared to normal design. It was observed that time taken was reduced by 25 to 40 seconds which also reduces cost of construction and is economical also workability was much higher than normal design.

In this design we came to conclusion that compaction period is reduced from 20 to 40 % as compared to normal design in case of 1% and 1.2% (propylene glycol).

days	Tank curing			Gunney – bag curing			sprinkle curing		
	NORMAL	1 %	1.2 %	NORMAL	1 %	1.2 %	NORMAL	1%	1.2%
3days	17.8	18.0	17.9	18.2	20.4	17.9	23.3	18.8	24.1
	18.0	19.5	18.5	22.0	21.7	20.8	20.4	19.5	20.4
	19.2	20.4	19.8	22.0	21.1	20.5	22.6	18.6	23.5
7 days	27.1	30.4	25.5	28.6	27.5	23.5	22.6	25.7	26.2
	30.0	26.8	25.7	29.3	28.0	25.3	20.0	22.6	20.0
	28.2	29.3	27.1	27.5	28.6	24.8	21.7	24.6	23.5
28 days	31.1	42.2	35.7	34.6	34.6	34.0	29.5	31.3	33.5
	33.3	37.7	35.1	34.2	34.2	30.0	29.7	32.0	32.2
	32.0	39.1	34.4	32.4	34.2	32.0	28.0	32.6	32.0

Description: pharma is a high range water reducing admixture. pharma meets the requirements for ASTM C-494 Types A and F.

Application: pharma is recommended for use by ready-mix and pre-cast concrete producers whenever the manufacture of high strength concrete products requires high plasticity and increased early and ultimate strengths.

Advantages Water Reduction: pharma allows up to 30% water reduction when used as a high range water reducing admixture. pharma delivers high strength concrete with increased early and ultimate compressive and flexural strengths.

High Plasticity: The super plasticizing action of . pharma provides excellent workability and concrete will flow easily at very low water cement ratio's

CONCLUSION

- It is observed that it requires less time for curing of cement concrete.
- To achieve self curing properties of mix (quicker curing of cement concrete.)
- Improve working environment at construction sites by reducing noise pollution.
- SCC can be developed without using any mechanical instrument.
- There was less amount of water required for external curing.
- The best self compacting properties were obtained for a sand content of 65% & a CA content of 35%.
- With regards to cost of materials self-curing concrete is costlier than normal concrete, but the over all cost of the project work comes out to be cheaper in case self-curing concrete work.

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Use of waste plastic in Bituminous Road Construction

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ABSTRACT

Wrappers of betel nuts, chocolates, chips, hand bags, cold drink bottles and all other forms of plastic create significant environmental and economic problem. They consume massive energy and other natural resources, depleting the environment in various ways. In manufacturing firms, construction industries and products delivery services, use of plastic is a priority to handle and pack things comfortably due to its light weight, cost effectiveness and strength. Plastics cannot be banned as it will result in usage of natural resources like paper, wood at a great extent. It is made up of various chemical elements and is regarded as a highly pestilent material which does not easily degrade in the natural environment after its usage. Waste plastics are made up of Polyethylene, Polystyrene and Polypropylene. Temperature varying between 120°C - 160°C gives the softening point of these plastics [5]. They do not produce any toxic gases during heating but the softened plastics have tendency to form a lamination or coating over the aggregate, when it is sprayed over the hot aggregate at 160°C. The main objective of this paper is to discuss the significance of plastic in terms of cost reduction, increase in strength and durability when these plastics are heated and coated upon the aggregates (160°C) to compensate the air voids with plastic and binds with aggregate to provide stability.

KEYWORDS

Municipal Plastic Waste, Aggregates, Shredded Plastic, Stripping, Marshal Stability, Optimum Bitumen Content, Flexible Pavement

1. INTRODUCTION

Plastic roads mainly use plastic-waste i.e., carry-bags, disposable cups and PET bottles that are collected from garbage dumps as an important ingredient of the construction material.

When mixed with hot bitumen, plastics melt to form an oily coat over the aggregate and the mixture is laid on the road surface like a normal tar road.

2. DEFINATION OF PLASTIC

Plastic in different forms is found to be almost 5% in municipal solids waste which is toxic in nature. Due to its biodegradability it creates stagnation of water and associated hygiene problems. In order to contain this problem, experiments have been carried out weather this waste plastic can be reused productively in the construction of roads.

Plastic are durable and degrade very slowly; the chemical bonds that make plastic so durable make it equally resistant to natural process of degradation. They are useful for their durability and strength, and are therefore used primarily in automobiles and construction applications.

A material that contains one or more organic polymers of large molecular weight, solid in its finished state and at some state while manufacturing or processing into finished articles, can be shaped by its flow, is called as 'Plastic'.

3. MATERIALS

The following types of plastics can be used in the construction of rural roads:-

- Films (carry bags, cups) thickness upto 60 microns.
- Hard foams (of any thickness)
- Soft foam (of any thickness)
- Laminated plastic of thickness upto 60 micron, packing materials used for biscuits, chocolates, etc.

3.1 BINDER

Bitumen is the main raw material used in road construction and waterproofing industry

In paving, bitumen acts as a binder of the aggregate (rock material) that ensures the structural strength and texture of the road surface. It gives the road surface elasticity, a characteristic that has led bituminous road surfaces to be known as flexible pavements.



(BITUMEN BINDER)

In the case of waterproofing, bitumen is first modified with products that increase its elasticity and capacity to provide a barrier against the passage of water.

3.2 Aggregates

"Aggregate", is a broad category of coarse particulate material used in construction, including sand, gravel, crushed stone, slag, recycled concrete and geo-synthetic aggregates. Aggregates are the most mined materials in the world. Aggregates are a component of composite materials such as concrete and asphalt concrete; the aggregate serves as reinforcement to add strength to the overall composite material. Aggregates are also used as base material under foundations, roads, and railroads.



(AGGREGATES)

In other words, aggregates are used as a stable foundation or road/rail base with predictable, uniform properties (e.g. to help prevent differential settling under the road or building), or as a low-cost extender that binds with more expensive cement or asphalt to form concrete.

3.3 PLASTIC

Traditionally soil, stone aggregates, sand, bitumen cement etc. are used for road construction. Natural materials being exhaustible in nature, its quantity is declining gradually. Concerned about this, the scientists are looking for alternative materials for highway construction, and plastic wastes product is one such category.



(PLASTIC BINDER)

On heating at 100 - 160°C, plastics such as polyethylene, polypropylene and polystyrene, soften and exhibit good binding properties. Blending of the softened plastic with bitumen results in a mixed that is amenable for road laying. The mixed has been used to lay roads of length up to 1,500 km in the state of Maharashtra. Other states like Tamil Nadu, Karnataka, Pondicherry, Kerala and Andhra Pradesh have also laid test roads. These roads have withstood loads due to heavy traffic, rain and temperature variation.

4. METHODOLOGY

4.1 Various Mix Design Approaches:

There is no unified approach towards bituminous mix design, rather there are a number of approaches, and each has some merits and demerits. Some of the important bituminous mix design approaches are as follows:

- Mix design method
- Recipe method
- Empirical mix design method
- Analytical method
- Volumetric method
- Performance related approach
- Performance based
- Approach

The recent emphasis on bituminous mix design is on performance related and performance based approaches. The requirement of a good mix design has changed from time to time.

4.2 BASIC PROCESS

- Waste plastic is ground and made into powder; 3 to 4 % plastic is mixed with the bitumen. Plastic increases the melting point of the bitumen and makes the road retain its flexibility during winters resulting in its long life. Use of shredded plastic waste acts as a strong “binding agent”.
- By mixing plastic with bitumen the ability of the bitumen to withstand high temperature increases. The plastic waste is melted and mixed with bitumen in a particular ratio. Normally, blending takes place when temperature reaches 45.5°C but when plastic is mixed, it remains stable even at 55°C.



(POWDERED PLASTIC)

Step I: Plastics waste (bags, cups, etc.) made out of PE, PP, and PS cut into a size between 1.18 mm and 4.36mm using shredding machine, (PVC waste should be eliminated)

Step II a: The aggregate mix is heated to 1650c and transferred to mixing chamber.

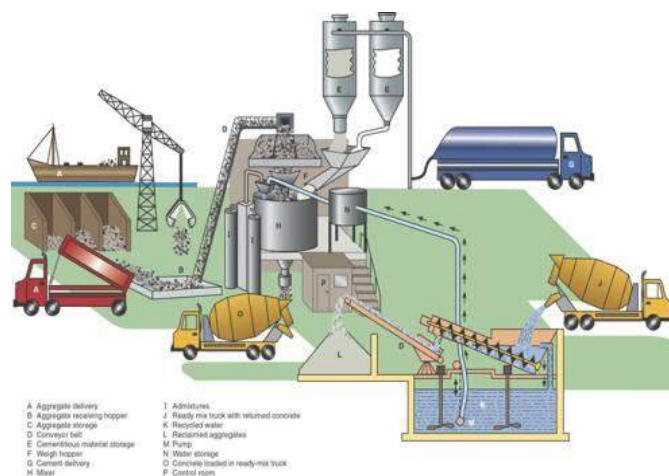
Step II b: Similarly the bitumen is to be heated up to a maximum of 1600 c to have good binding and to prevent weak bonding. (Monitoring the temperature is very important)

Step III: At the mixing chamber, the shredded plastics waste is to be added over the hot aggregate. It gets coated uniformly over the aggregate within 30 to 45 seconds, giving a look of oily coated aggregate.

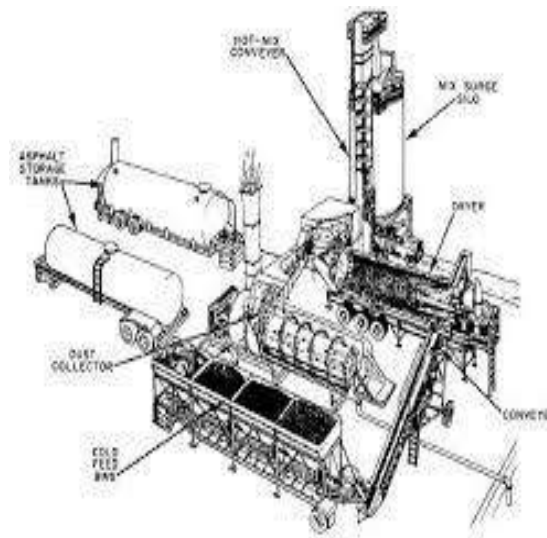
Step IV: The plastics waste coated aggregate is mixed with hot bitumen and the resulted mix is used for road construction. The road laying temperature is between 1100 c to 1200 c. The roller used is 8-ton capacity.

4.3 Central Mixing Plant:

The modified process can also be carried out using central mixing plant. The shredded plastics are added along the aggregate in the conveyor belt. A special mechanical device is developed which will spray the plastics inside the chamber to coat the plastics effectively. This also can be used as an alternative method CMP helps to have better control of temperature and better mixing of this material thus helping to have a uniform coating.



4.3.(a) (CENTRAL MIXING PLANT)



4.3.(b) (HOT MIX PLANT)

5. ADVANTAGES OF PLASTIC ROADS

Plastic Roads have been tried and tested and have proved to be an eco-friendly, efficient way of road construction. A well-constructed Plastic Road will result in the following advantages:-

- Longevity upto 3 times that of the current methods of road construction.
- No cracking or potholes.
- Resistance to water.
- Reduced cost of maintenance.
- Reduced stress on bitumen which is not an unlimited resource either.
- Best use of plastic waste. This thin plastic is not recyclable and the only ways of disposing them are incineration or landfilling.
- Completely eco-friendly.

- Inculcation of waste segregation culture. If every other country can do it, nothing should be stopping India from making a start somewhere.

6. CASE STUDY

Finding an ecological solution to reuse polythene and plastic waste, the Brihanmumbai Municipal Corporation laid a 100-metre stretch of road at Dadar using plastic and asphalt. This stretch on Prof V S Agashe Road near the Kohinoor Technical Institute in Dadar was laid by the civic body's Road department with the help of the Indian Centre for Plastics in the Environment (ICPE).

Place: V.S Agashe road, Dadar, Mumbai.

Road Laying Authority: Brihanmumbai Municipal Corporation.

Date of Laying: 8th August, 2009.

Road length: 100m length x 7m width.

Plant: Hot mix plant.

Source of waste: Municipal waste plastics/Industrial plastic Waste.

Temperature: 28 C

Rain fall: 110mm

7. CONCLUSION

Plastics will increase the melting point of the bitumen. The use of the innovative technology not only strengthened the road construction but also increased the road life as well as will help to improve the environment and also creating a source of income. The road strength is twice stronger than normal road. Less bleeding during summer and the compressive strength is >100Mpa and flexural strength is >450kg/cm with respect to binding property. Plastic roads would be a boon for India's hot and extremely humid climate, where temperatures frequently cross 50°C and torrential rains create havoc, leaving most of the roads with big potholes. It is hoped that in near future we will have strong, durable and eco-friendly roads which will relieve the earth from all type of plastic-waste.

8. ACKNOWLEDGEMENT

We are really thankful to our project guide Mrs. Gargi Das for her invaluable guidance and assistance, without which the accomplishment of the task would have never been possible. In our present project, we have chosen the topic "**Plastic Roads**" and a case study of the same is done.

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Wi-Fi Walkie - Talkie: A Cheapest And Modern Technique For Communication

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ABSTRACT

It would be amazing and fantastic to experience communicating between other devices in a secure mode without any access point or internet services or Cyberspace . A fantastic experiences and very practical needs to communicate with other other peers in a secured manner with different devices without any AP. The direct communicating like this doesn't rely on any infrastructures and its very cheap to install. It requires very low cost for developing such app for communication. This direct Peer -to- Peer wireless communication is needed in many cases and condition in today's world. For example, in the battlefield, a scout group of soldier is executing a secret military mission that is to destroy the enemy's radio communication station, then how to address the communication issue among the soldiers of this troop is very critical issue? The calling charges and internet charges payment is a large amount of budget or cost. Now-a-24-hour interval usage of Mobile headphone and its respective bills has risen suddenly. How to reduce it is a big issue. So to give solution to all this needs an android based mobile app of Walkie-Talkie is proposed to be developed. This app will be used for wireless direct communication between different devices using Wi-Fi Direct i.e without any access point or internet connection. This direct communication with Walkie-Talkie allows two or more peers to talk to other ones directly by using Mobile devices .The proposed app will provide low latency direct mobile communication. This means that this app will give quick response to communication. This direct communication will provide high bandwidth i.e. there will be no congestion and audio recording frequency will be very smooth. The proposed system have summarized these design finish to be ad-hoc, wireless and real -time communication . It will also be providing audio recording and sending proficiency to the walkie-talkie android based mobile app. Wi-Fi Direct will be used for communication. The proposed system will have an extended range than present app has.

Keywords

Wide range, low signal, natural calamities communication, Wireless communication, less cost communication. walkie talkie, free communication, easy communication.

1. INTRODUCTION

The proposed scheme of rules is communicating based App that will provide various daily facilities in cheaper cost and in network deprived region. This proposed system will help citizenry to communicate with each other even in the absence of a communication network. It is much cheaper than any other connector -oriented communication. It will provide secured communication between different peers. The developing app will provide user friendly UI as well as GUI. Not only to currently using Walkie Talkie App users will find it easy to use but also it will be easy for new user to understand. The already developed Walkie Talkie App users may switch to the proposed Walkie Talkie App as it provides larger range with more feature of speech.

Formal Introduction To Proposed System

Thinking about the ever-growing communication network and exhaustive use of Internet, uttermost of human population is highly dependent on connection-oriented (i.e full of signals) communication media. Due to this, even for forming communication for approximately shorter space , people pay comparatively large amount of money of money on such communication media. And when the connection-oriented communication media collapses due to any natural calamity or due to certain technical issues, that sentence people become helpless because of unavailability of any communication sources[1]. Walkie Talkie using Wi-Fi Direct is a proposed system which is exception over connection-oriented network as it does not use any signal to communicate. And hence no issues of getting isolated from other people arise in this proposed system. Secondly, this proposed system can be used during university conferences where communication needs to be formed among pupil for shorter

distances. Also the same proposed system can be helpful in corporate offices where usually employees have to communicate with one another and for that sake they tend to spend ample amount of money over phone calls. Hence the basic intent of the proposed system is to provide a communication channel in signal-less environment.

2. SYSTEM DESCRIPTION

The developing proposed arrangement is providing a customized android based app as such any Mobile having the android feature will support. Less monetary value, easy to install, and a best alternative to calling system with no expense. The proposed system is providing an port for communicating with respect to frequency Wise statistical distribution. It will provide Transmittal audio data file (.mp3) in real-time. Proposed system will be providing a list of available equal. Grouping proficiency will be provided in the App i.e. Clients with same frequency id can communicate with each other and with the Host too. Updating frequency automatically with respect to surrounding. Provides easy-to-communicate and searchable interface. The proposed system is to share audio files, record audio, communicate in emergencies without external internet resource or any access point.

Wireless fidelity Walkie Talkie Features

- 1) Wi-Fi Walkie-Talkie will be no more dependent on any access points.
- 2) The system will be using wireless communication feature.
- 3) The app based on android will be highly responsive to the users.
- 4) The backbone of the walkie talkie app is that it's implementation is totally based on concept of Wi-Fi Direct.

System Architecture

Figure 1 represents the system architecture of the proposed system. As the name itself says, Wi-Fi Walkie-Talkie works on the principle of Wi-Fi Direct which setups connection in between the Android handsets which are present in frequency area of about 60-80 meters. In order to implement the Wi-Fi Walkie-Talkie, the architecture is divided in three layers as shown in Figure 1.

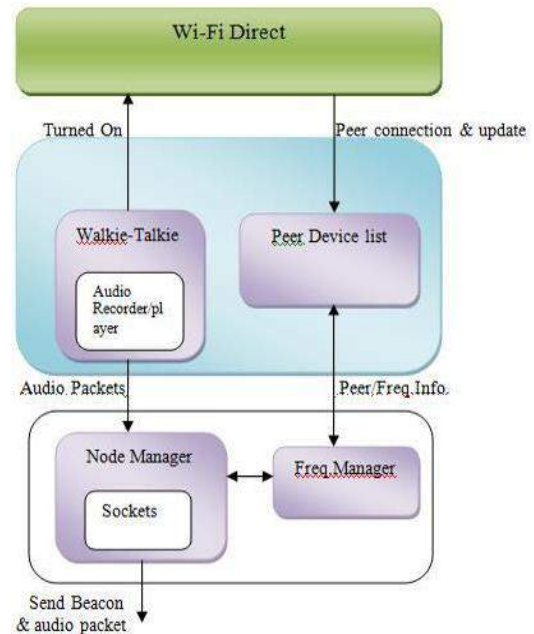


Figure 1. System Architecture of walkie talkie app

Wi-Fi Direct layer -Wi-Fi Direct layer mainly handles the direct communication between peers. It is involved in discovering and connecting peers and also for maintaining the peer status. This layer consists of Wi-Fi Broadcast Receiver Object. This object encounters changes taking place in events and inform about it to the Wi-Fi Direct Layer.

Walkie-Talkie Function layer -Walkie-Talkie Function layer maintains the Walkie-Talkie Interface and also handles audio communication between peers. Once the Wi-Fi Walkie-Talkie application is enabled (started), the Walkie-Talkie Function layer sends a signal to the Wi-Fi Direct layer and then the Wi-Fi Direct layer discovers the peers and connect with them. It also contains Peer Device List Object which acts like a database that stores the peer list information available in that frequency area.[5]

Manager layer -Manager Layer consists of Node manager and Frequency manager. The Node Manager helps in sending/receiving audio files by creating sockets. The Frequency Manager helps in encountering all the possible frequencies in the given area with which connection can be built. The Wi-Fi Walkie-Talkie using Wi-Fi Direct is built on the major rule that the peers can form a connection if and only if they belong to the same frequency area. This is implemented by creating a virtual frequency group. So the peers belonging to that virtual frequency group can only communicate with one another. From the Figure 2, peers A, C and peer D belong to same virtual frequency group and hence they can communicate with each other. Here peer B belong to another frequency group and hence peer B cannot form communication with peer A, C and peer D.

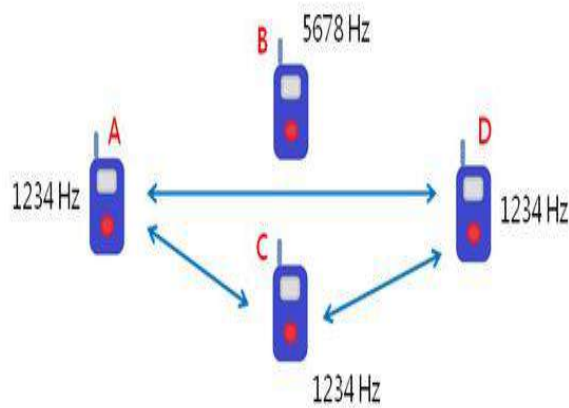


Figure 2. Frequency based communication

3. LITERATURE REVIEW

Following are some of the contents which we have reviewed for the proposed system.

- 1) Faouzi Derbe et al. 2003 [2] proposed in the paper, how the Reliable wireless communication for fire detection systems is important in commercial and residential areas. The author explained how the Wi-Fi Direct works, what are different issues to be referred and what are the different solutions over such problems.
- 2) Rabiner et al. 1978 [6] proposed the speech signal in communication channel is efficiently first processed and then delivered to the receiving end.
- 3) G. Foschini et al. 1998 [1] proposed the limitations of using multiple antennas over wireless communication in signal fading environment.
- 4) M. Wenk et al. 2006 [5] proposed the actual implementation of multiple input multiple output algorithm. Also explained the overall behavior of peers in MIMO environment.
- 5) [11] "Zello Demo - New Walkie-Talkie/CB Radio App for Smart phones and PC", last accessed on Sep 29,2015.

4. IMPLEMENTATION

Considering the requirements and feasibility of the system, the system will be implemented with following facts:

Work flow of Wi-Fi Walkie-Talkie

Flowchart of Wi-Fi Walkie-Talkie Figure 3 shows the systematic working of the Walkie-Talkie app. Initially click on the icon of Walkie-Talkie application, we are directed to Home Page. After coming on home page, set the Wi-fi Walkie-Talkie button On or Off, then the Wi-Fi Direct layer will get activated and it will display all the nodes that are available in that frequency region. In such way, connection is formed with peers. After that, objects of Node manager, Frequency Manager and Audio Players is constructed. Here, the Talker Button is used which is set on in order to talk to another peer device.

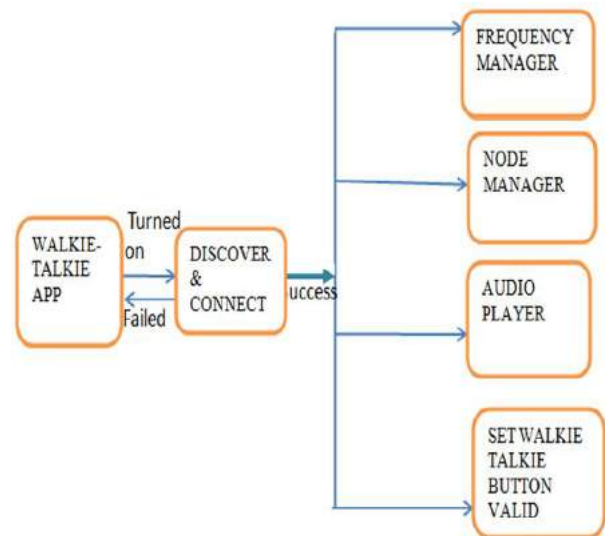


Figure 3. Proper Flow Diagram of proposed system

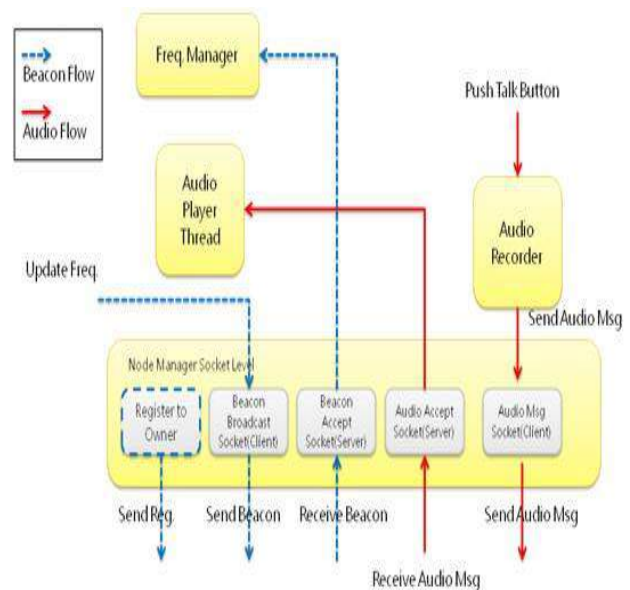


Figure 4. Walkie-Talkie app Audio sending process.

Figure 4 represents Transferring real meter audio files. The

proposed system consists of two independent major flows which are namely Beacon Flow for controlling message and Sound recording Flow for sending audio messages. These two flows are used for handling data interchange between peers, data to be exchanged will be audio or images.

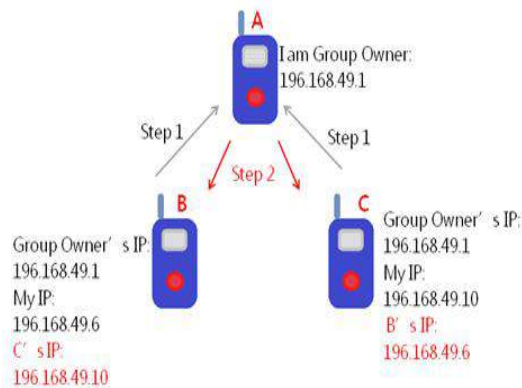


Figure 5. Connection orientation of multiple devices

Figure 5 represents, Initially, when Wi-Fi-Direct group is created, because of the property of Wi-Fi-Direct, it results into each Wi-Fi Group having a Group Owner & rest other as Group Members. The nodes which are available in the group only know Group Owners IP address. This indicates that at start they are able to send data to group owner only. Hence, there will be two steps registration process to handle this problem. Each client (device) in a group must register its IP address to their group owner. Once this is done, the group owner may help to disseminate members address to other devices. The Figure 3.6 shows that once the Wi-Fi direct is created and formed, A is the group owner and rest B and C are the group members[6].

In first step, peer B or peer C needs to register themselves to peer A so that peer A can obtain the IP address of peer B or peer C. In second step, peer A will produce a control message and send it to peer B or peer C client or group member to guide peer B or peer C member gain Group Owners IP address.

Walkie-Talkie Registration Steps

Figure 6 shows, In the case of Beacon Flow, the Beacon Broadcast Socket (Client) will keep on broadcasting the control message which includes the IP address and the virtual frequency. If the user updates the virtual frequency, the broadcast socket will help to send new beacon message to peers immediately. The Beacon Accept Socket (Server) helps to receive beacon messages, also extract the information of frequency and inform about the received frequency to upper layer. The bellow Figure shows that the frequency of peer A or peer C or peer D is 1234Hz and the frequency of peer B is 5678Hz. After the beacon exchanging is done, every device will receive the control message from one another. Hence, the Frequency Manager will produce a table to maintain peers frequency[3].

The another flow is Audio Flow which looks after the audio communication messages. When the Walkie-Talkie is switched on,

the Audio-Player Thread gets created and runs in the background. After receiving audio message, the Audio Accept Socket will send the audio message to the Audio-Player Thread. Therefore, the user is able to hear the voice played by the Audio-Player Thread. If the user pushes the talk button, the Audio Recorder object will get created to record voice and send audio message to down layer. The down layer Audio Message Socket will generate sockets and send out the audio message to those devices in the same frequency group.

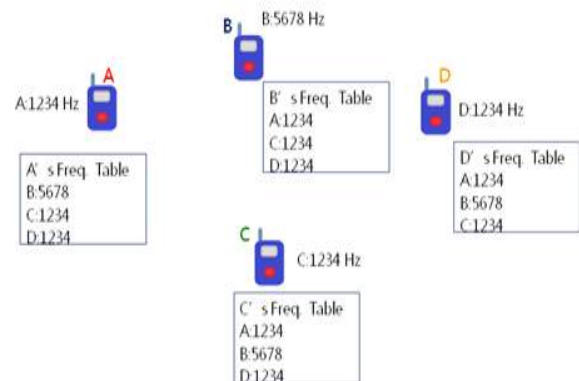


Figure 6. Frequency table for Peers communication.

5. EXPERIMENTAL RESULTS AND ANALYSIS

Following are few analysis which are done on the proposed system.

In the era of advance communication, it is a basic need of humans to have signal-less (without internet connection) but highly secured peer to peer communication media[2]. Such direct communication among mobile phones require low cost as well as do not need any well-built infrastructure and works with high speed. There are many circumstances where individual may require such signal-less peer to peer communication media. These circumstances are explained below.

Battlefield

Battlefield is a location where the soldiers have to secretly perform their actions in order to accomplish the mission. Soldiers usually face communication problems in such cases. These problems can be overcome by such peer to peer communication.

Mountaineering Expedition

The people in Mountaineering Expeditions require such connectionless peer to peer communication as there does not exist any communication media and they need to communicate among themselves as they are separated in areas for their work.

Natural Calamities

Natural Disaster is the situation where communication is collapsed and people are deprived from communication with one another. Hence such connection-less channel is essential[1].

Company & Campus

Scenarios where company employees and students in campuses can make most benefits with such signal-less communication. In companies where employees have to communicate with one another over projects or corporate issues which unknowingly costs huge bills to their phones. Campuses where, with the help of such communication channel students can stay connected during various conferences and seminars etc.

Experimental results of System

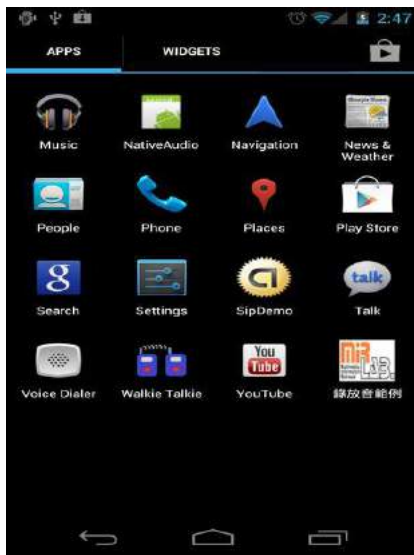


Figure 7. Walkie –talkie app shown after installing

Figure 7 shows , how the app's icon will appear on the mobile screen with other installed apps once, it is installed safely and correctly[11].

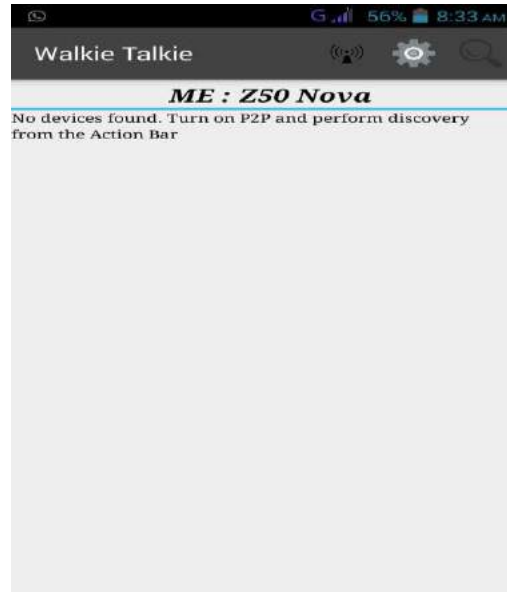


Figure 8. No peer is available for connection.

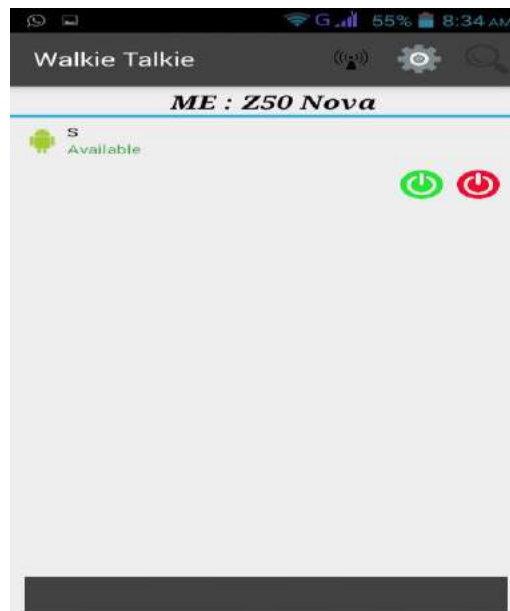


Figure 9. Peer is found for connection.

Figure 8 represents, a simple UI after starting up the app, when no peers are available before searching for the peers as no Wi-Fi direct is not enabled yet. A message has been displayed on the screen to make our device discover so that peers can be found.

Figure 9 Shows 'S' peer available to communicate once the Wi-Fi Direct feature of mobile has been enabled. The Green and Red colored button in GUI is for starting and ending the communication respectively with peers.



Figure 10. Connection formed with peer.



Figure 11. Setting peers frequency.

Figure 10 shows peer 'S' which was available has been connected successfully. Once the green coloured button from figure 9 has been clicked, a virtual green coloured walkie talkie appears. Hold that shape to communicate with connected peers. The audio is been transmitted within a specific range.

Figure 11 shows, the concept of frequency. Frequency can be set. It also works as an identifier of a group.

6. CONCLUSION

Drawbacks of previously developed app has been overcome in our proposed mobile app. The range of the app has been increased from 10 meters to 38 meters now and soon it will be implemented for approximately 100 meters. This app provides secured association between peer and thus a secured communication is possible within a range. Audio frequency recording, audio sending, trope capturing and sending is at present possible. This Walkie-Talkie system achieves the goal of communicating among peers in an ad-hoc wireless network. The sound reflection echo issue is an issue in our real time Walkie-Talkie application.

7. ACKNOWLEDGMENTS

We would like to express a deep sense of gratitude towards my guide Ms. Ashwini Save and Co-guide Ms. Nikita Patil Department of Computer Engineering for their constant encouragement and valuable suggestions. The work that we have been able to present is possible because of their timely guidance.

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INTELLIGENT COMPANY SALES PREDICTION

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ABSTRACT

Nowadays data mining techniques are best suited for classification of big data. Also classifications and patterns for customer transaction data is very important for decision making and for a good business support. The objective of this paper is to give an advanced decision making for improving sales and services. An approach is made for mining data to predict various factors affect in sales of product according to a business point of view. In this paper mining patterns of huge stock of data. In first stage, we divide the data in three different clusters on the basis of product categories like seasons, genders, colors, etc and sold quantities. This approach is develop for to reduce the paper work, waste storage files, and to make the advance decision by system itself to improve productivity and it will be use as business intelligence system. The improved data clustering is designed using the concept of k-means algorithm.

Keyword

Decision making, frequent pattern, inventory sales prediction, business intelligence, clustering.

1.INTRODUCTION

Initially, with the appearance of PCs and means for mass computerized stockpiling, we began gathering and putting away a wide range of information, depending on the force of PCs to deal with this amalgam of data. Shockingly, these enormous accumulations of information put away on dissimilar structures quickly got to be overpowering. This introductory disarray has prompted the formation of organized databases and database administration frameworks (DBMS). The productive database administration frameworks have been critical resources for administration of an extensive corpus of information and particularly for compelling and proficient recovery of specific data from a huge gathering at whatever point required. Data recovery is basically insufficient any longer for choice making. Faced with enormous accumulations of data [1]. Deals information arrangement has distinctive business sector patterns. The data delivered is exceptionally valuable for choice making. Just through the information mining systems it is conceivable to remove valuable examples and affiliation. Information mining comprises of valuable systems, for example, grouping and affiliation runs, these procedures can be utilized to anticipate the future patterns in view of the thing sets [4].

Project Description

In order to achieve our goals, we have to completely abuse this information by separating all the helpful data from it. Shockingly, the size and many-sided quality of the information is such that it is unreasonable to physically investigate, disregarded, and the potential advantages of expanded computational and information gathering abilities are just halfway figured it out. In this paper clustering concept is implemented as it is used to generate groups of related patterns. Decision can take place on the basis classification of Dead-Stock (DS), Slow- Moving (SM) and Fast Moving (FM) of the sale. Segment by segment sales forecasting can produce very useful information [6]. In the research it is understood that k-means algorithm which is used in this system is better algorithm than some other algorithms in clustering. The performance of k-means algorithm is better than Self-Organization Map or Expectation Maximization (EM) algorithms. In a general conclusion, partitioning algorithms like k-means and EM are recommended for huge data sets and also random datasets. The quality of these algorithms becomes very good when using this datasets. The problem of finding out the selling power of the products in the market. Thus on the basis of this scenario it can be predicted the reason of dead-stock, slow moving and fast moving items. Data mining techniques are best suited for the analysis of such type of classification, useful patterns extraction and predictions [4].

2.LITERATURE REVIEW

M.cheng Lo, 2007 [8], proposed a decision support system for the integrated inventory model with general distribution demand. M.C.Lo considered a model for inventory decision support system [IDSS] in which ordering quantity, ordering cost, safety factor, lead time and back over discounts are decision variable, the algorithm is applied to find the optimal solution. Jo Ting et al. 2006 [10], demonstrated mining of stock data inter and inter-stock pattern association classification.

J.Ting proposed the technique based trading data mining approach for extra stock mining which usually performed concentrates on finding most appearing items for the stock time series data and inter trading mining which used to discover the different strong relationship among the several stocks.

L.K Soon, et al. 2007 [6], proposed an imperial study of similarity search in stock data. L.K soon compared the execution performance of numerical and symbolic representation of using data in terms of similar search he generated a list of stock which are influential to

kualalumpur composite index(KLCI) and then produce classification rules. Which he denotes the interrelationship among the stock in terms of that trading performance.

DattatrayP.Gandhal et al. 2011[3], proposed an optimized approach to analyze stock market using data mining technique, Dattatray Gandhal gave the solution to pattern discovery which provide maximum profit to investors. This experimental result is applicable for the investors to invest their money in share market in proper manner.

Vivek Ware, 2014[1], proposed a decision support system for inventory management using data mining techniques. The problem of pattern discovery from stock data mining is addressed in this project. Hybrid clustering association mining approach is implemented to classify stock data and find compact form of associated patterns of sale.

Osama Abu Abbas, 2008[2], compared between data clustering algorithms, this comparison resulted that SOM algorithms performance gets lower when k becomes greater. The quality of Expectation maximization and k-means algorithms becomes very good when using huge dataset. Hierarchical clustering and Self-organization map algorithm goes good when using small dataset.

3.PROPOSED SYSTEM

In this system an algorithm for mining patterns of huge stock data to analyze affected sale of products. At first In the principal stage, we partition the stock information in three unique bunches concurring on the premise of sold amounts i.e. Dead-Stock (DS), Slow-Moving (SM) and Fast-Moving (FM) utilizing K-implies bunching calculation. In the second stage we proposed Most Frequent Pattern (MFP) calculation for discover frequencies and example of property estimations of the relating things. Calculation gives continuous examples of thing qualities in every class of items. Economic specialists use group investigation to parcel the general populationof purchasers into business sector division, intra and bury stock examples and to see better relationship between them[3].

System Architecture

In the study we approached a two phased model. To start with we produce bunches utilizing K-Mean calculation, and afterward most continuous example is intended for tallying frequencies of things under their predetermined properties. The square chart of the entire procedure is given in figure.In phase-1 the first step is to collect sample data from real store soldout data. We have process the data to remove the noise first, so the incomplete, missing and irrelevant data are removed and formatted according to the required format.

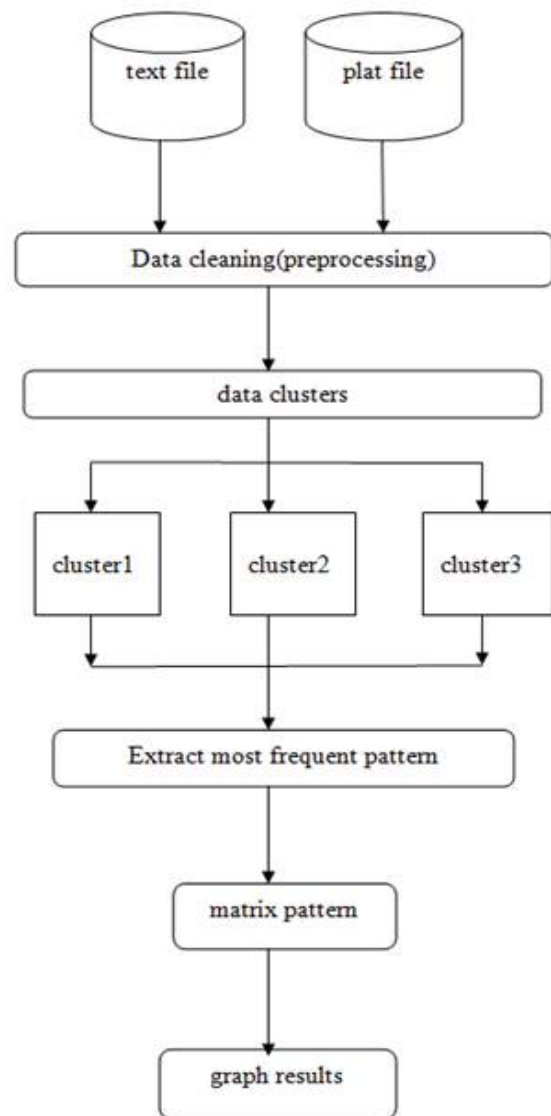


figure 1: system architecture

Above figure 1 shows the architecture of the system. The text files or flat files which are selected goes through preprocessing in which cleaning of data is done. Then the cleaned data is further clustered.

The clustering gives three different clusters by using the k-means algorithm and then the data again goes through the MFP algorithm to obtain most frequent pattern. Once this is done output matrix are formed. Different graph are obtained to given parameters.

4.IMPLEMENTATION

In the existed system, for the huge set of data preprocessing is done and data cleaning is performed. Further the selected set of data is then clustered in three different parts by using k-means algorithm and then the clustered data goes through MFP algorithm to obtain the output matrix according to given parameters.

Data Pre-processing

Information in its unique arrangement never affirm to the required shape for information mining. It should be changed, incorporated and amassed so that the mining procedure can viably perform on it. There is a need to handle the information before it utilized as a part of the learning revelation database (KDD) process. Being information quality a key issue with information mining as half to 80% of mining specialists regularly invest their energy in information quality, the pre-handling in information mining have a key significance. For this situation the gathered information was cleaned by utilizing SQL Server Data Transformation Services, and after that expelled clamor from the changed information.

K-means

This algorithm having great accuracy quality results than other clustering algorithm (i.e Expectation maximization and self organization map algorithm)[2].

General k-means formula given below:

$$J(v) = \sum_{i=1}^C \sum_{j=1}^{C_i} (|X_i - V_j|)^2$$

Where, ' $|X_i - V_j|$ ' is the Euclidean distance between X_i and V_j .
' C_i ' is the number of data points in the cluster.
' C ' is the number of cluster centers.

Algorithmic steps for k-means clustering

Let $X_i = \{x_1, x_2, x_3, \dots, x_n\}$ be the set of data points and $V_i = \{v_1, v_2, \dots, v_c\}$ be the set of centers.

Most Frequent Pattern (MFP)

Association standard mining is a standout amongst the most vital and well characterizes strategy for concentrate relationships, continuous examples, affiliations or causal structures among sets of things in the exchange databases or different vaults. Affiliation principles are generally utilized as a part of different territories, for example, hazard administration, telecomm, market examination, stock control, and stock information. Apriori calculation for solid relationship among the examples is profoundly suggested. In this work we proposed another calculation MFP that is all the more proficiently creates continuous examples.

Input: data Set D, minimum support (minsup)

Output: frequent item sets L pseudo code for Most Frequent pattern-apriori algorithm:

- (1) $L_1 = \text{find_frequent_1_itemsets}(D)$;
- (2) For ($k=2$; $L_{k-1} \neq \emptyset$; $k++$)
- (3) {
- (4) $C_k = \text{Apriori_gen}(L_{k-1}, \text{minsup})$;
- (5) For each transaction $t \in D$
- (6) {

- (7) $C_t = \text{subset}(C_k, t)$;
- (8) For each candidate $c \in C_t$
- (9) $c.\text{count}++$;
- (10) }
- (11) $L_k = \{c \in C_k \mid c.\text{count} > \text{minsup}\}$;
- (12) }
- (13) Return $L = \{L_1 \cup L_2 \cup L_3 \cup \dots \cup L_n\}$;

The above mentioned algorithm has issues related to the execution time to scan the database. This drawback is being removed using the (Apriori) algorithm. The advantages of above mentioned algorithms will be hybrid and implemented in the project for better performance[2].

5.EXPERIMENTAL RESULTS

cluster 1: Dead moving stock in Rainy season

Cluster Id	Product Name	Color	Gender	Season	Qty Sold	month
1	T-shirt	Red	Male	Rainy	22	September
2	Coat	Blue	Female	Rainy	22	October
3	Jeans	Blue	Female	Rainy	21	October
4	T-shirt	Black	Male	Rainy	14	July
5	Shoes	Red	Female	Rainy	14	July
6	Shoes	Black	Male	Rainy	14	October
7	Shirt	Red	Male	Rainy	13	July
8	Shirt	Black	Female	Rainy	13	September
9	T-shirt	White	Male	Rainy	12	September
10	Shoes	Blue	Male	Rainy	11	August
12						

figure 2: dead stock in rainy season

In above result describes the cluster of data in N clusters. cluster will be according to seasons and it will organized data in different tables .The table contain Id, pr_name, pr_color, pr_quantity, month,season, etc. table shows only 10 product information at a time. In dead moving stock it display only that product information whose quantity is less than 25.Email will be send to the particular branch for improve the productivity.

cluster 2: Fast moving stock in Winter season

Cluster Id	Product Name	Color	Gender	Season	Qty Sold	month
1	Sweater	Blue	Female	Winter	65	December
2	Coat	Black	Male	Winter	56	December
3	Shirt	Blue	Female	Winter	52	December
4	Shoes	White	Male	Winter	52	December
5	Sweater	White	Female	Winter	50	December
6	Shoes	Black	Male	Winter	44	December

figure 3: Fast stock in Winter season

In above result describe the fast moving stock which cluster according to winter season. The table contain Id, pr_name, pr_color, pr_quantity, month, season, etc. table shows only 10 product information at a time. In fast moving stock it display only that product information whose quantity is greater than 40. That is for example in above table sweater is only product having high sales in winter season.

cluster 3: Slow moving stock in Summer season

Cluster Id	Product Name	Color	Gender	Season	Qty Sold	month
1	Shoes	White	Male	Summer	39	April
2	T-shirt	Yellow	Female	Summer	37	June
3	T-shirt	White	Male	Summer	34	May
4	T-shirt	Green	Male	Summer	30	April
5	T-shirt	White	Female	Summer	30	May
6	Jeans	Blue	Female	Summer	30	April
7	Jeans	Blue	Male	Summer	27	April
8	Shoes	White	Female	Summer	24	April
9	Shirt	White	Male	Summer	23	June

figure 4: Slow stock in Summer season

In above result describe the slow moving stock that is sales between dead stock and fast moving which cluster according to summer season. The table contain Id, pr_name, pr_color, pr_quantity, month, season, etc. table shows only 10 product information at a time. In fast moving stock it display only that product information whose quantity is greater than 25 and less than equal to 40.

6.CONCLUSION

In existing system sales data decision making using clustering techniques gives the idea of product placed in market for selling and the rate of which the product is been sold It gives the overview of the total sale done of a particular product according to their type, size, range and season. In this paper the problem of pattern discovery for stock data mining is addressed. The system is independent enough to take useful and more accurate decision for the better sales of the variety of products. The output matrix is obtained and further the system will rate the product according to their maximum sales. Hence an automated E-mail system will be send to the branches of the company for more efficient offers to give increase in the sales of dead stock or slow moving. In future we will extend our work to implement in sentimental analysis process and decision customer reviews and blogs.

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A SURVEY ON AUTOMATED SYSTEM FOR QUERY EVALUATION

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ABSTRACT

The human species use of technology began with the conversion of natural resources into simple tools. As a technology has undergone massive advancement over years hence it had made possible for a generation to use mobile like a personal computer. Because of which smart phones are increasing day by day, it has been used by every age group from young children to old age people. According to 2011 survey, it has been observed that 41% of the population in India speak Hindi language and therefore they are unfamiliar with English mode of language which has been used in every sector including the government sector as a result of which they find inconvenient to get desired information accordingly.

Keywords

Automated System, Language barrier, Audio Input-Output, Data Retrieval

1. INTRODUCTION

Audio applications are being increasingly used to support project working across distributed project teams. This paper purpose is to give a brief description of audio tools which can be used to support such collaborative work within our institutions and to summarize the main challenges to be faced in various sectors.

Android is probably the most popular operating system being used by millions of smart phones and tablets today and is growing by leaps and bounds. This is one of the most sophisticated and user friendly platform. Thus android can be used as a platform to develop a system that provides a solution for the people who are unable to read or speak a particular language either because of illiteracy or not sharing a common language, or for other reasons.

Mobile computing is technology which takes computer and all necessary data, files and the system. Nowadays, smartphones are more common than computers and the most popular OS is android. The Android applications are creeping into every aspect of student life. We are living in a fast paced world where everything is done instantly. Many students are using android phones to ease the time and burden just on a 'click of finger'.

2. LITERATURE REVIEW

Related work in this field includes text to text, text to speech or vice versa translation in different languages. They are as follows:

2.1 Proposal Paper on Sanskrit Voice Engine": Convert Text-to-Audio in Sanskrit/Hindi [1]:

System has used two major modules under its consideration i.e. "Teaching" & "Evaluation". System utilizes the similarities of the two languages & add on to the Sanskrit learning environments. System accepts various Sanskrit texts, their Hindi interpretation and read it out using the module comprising speech synthesis. This system is related to speech recognition, text-to-text and natural language processing. This system converts Sanskrit text to Hindi audio. It is based on pattern matching technique. The tool used in this system is consortium Part of Speech. [1]

2.2 Neutral Network based Approach for English to Hindi Machine Translation [2]:

This system is able to translate English language's simple sentences into Hindi. This system has been implemented with the help of feed-forward back-propagation artificial neural network. ANN model does the selection of translation rules for grammar structure and Hindi words/tokens (such as verb, noun/pronoun etc.). Neural network has been used as the knowledge base and for mapping process from bilingual dictionary and linguistic rules. [2]

2.3 Novel method for Speech to Text Conversion [3]:

extra add-on feature which nourishes the user's communication skills by text to speech conversion. This software allows one to learn, judge and recognize their potential in English language. It also facilitates extra add-on feature which nourishes the user's communication skills by text to speech conversion. Enhancing the existing algorithm of speech to text conversion to improve the quality of the output is under consideration. [3]

2.4 English Text to Multilingual Speech Translator Using Android [4]:

This Android application was developed for text to speech conversion to help the translation of English language text into speech output in different languages. Various few civilizations had been made which further advance this system to include more target peoples so as to make it more beneficial and useful. The proposed English Text to Multilingual Speech Translator using Android (T2MSTA) aims at providing convince to the people lacking the power of speech onion-resident speakers like people who do not share a common language. [4]

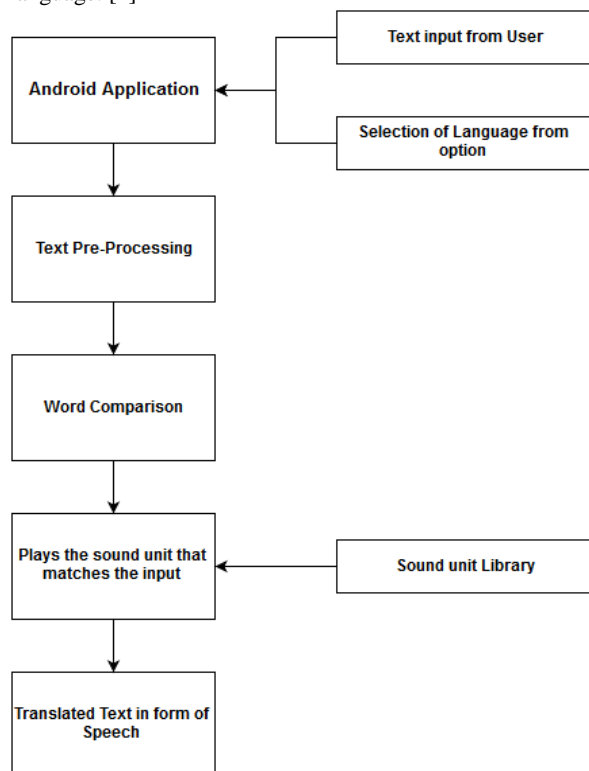


Fig. 2.4.1: System Architecture of T2MSTA

The Fig 2.4.1 describes the system architecture of the given paper that is English text to multilingual Speech translator using android*

3. CONCLUSION

This paper represent various text to text, speech to text and text to speech based system available in various languages. After reviving above mentioned system it can be concluded that there is no such system that provides audio to audio query solutions in certain languages like Hindi. Systems can be effectively developed in android apps as a future scope.

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A SURVEY ON QUESTION PAPER GENERATION SYSTEM

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ABSTRACT

The effort needed for creating question paper is reduced because of the advanced system. Firstly people require to spend time on generating paper by referring syllabus and references book etc, which was time consuming. Because of the advanced system there is no need for human to think and spend time which can be used on some more important tasks instead of creating question paper. The system fully automates the process of question paper generation. The advanced system generates question paper based on database such that all types of questions such as (MCQS, Numerical type, Theory based etc) are stored in database. The system randomly selects questions from database and generates a question paper such that it covers entire syllabus.

General Terms-

Artificial Intelligence, Security, Algorithms.

Keywords- CSV file, PDF file, Question paper format, pattern composer, question aggregator.

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1. INTRODUCTION

Previously question papers were generated manually, which time was consuming. To overcome this problem new

System is generated that uses keywords from syllabus and EBook to generate question considering the rules and

Restriction, paper is generated very effectively and efficiently. The question paper generation system that currently exists is totally based on database. It just randomly selects the questions from database and generates question paper. In proposed system instead of adding each question into database for question paper generation, CSV files are used to generate question paper based on keywords that are extracted from that CSV file.

For generating CSV file that is imported into database for keyword extraction, system will use simple PDF file of syllabus given by university is used and further process of selecting number of question and type of question generated on each module takes place with help of CSV file.

So proposed new question paper generation system is very much efficient and time saving than the other ones that currently exist.

Comma-separated values (CSV) file stores the tabular data (i.e. numbers and text) in plain text. Each line of the file is like a data record and each record consists of one or more fields, separated by commas. The use of comma as a

field separator or delimiter is the source of the name for this file format. An official standard for the CSV file format does not exist, but RFC 4180 provides a de facto standard for many aspects of it. In popular usage, the term CSV may denote some closely related delimiter-separated formats, which may use a variety of different field delimiters. These formats include tab-separated values and space-separated values, both of which are popular. Such files are often even given a .CSV extension, despite the use of a different field separator than the comma. This loose terminology creates problems for data exchange [8].

2. LITERATURE REVIEW

2.1 Generation of Paper from Question Bank[1]

The structure of question database, paper database and template database are discussed. First question type is designed including subjective and objective questions. The test database contains variety of question with difficulty levels. Using the system user can choose paper setting manual.

Functions

Through user interface user can access following functions:

- 1) **Test question database maintenance:** The question can added, deleted and modified from database.
- 2) **Manual paper combination:** In proposed system user can select the required question and add it into paper.
- 3) **Intelligent paper combination:** In proposed system question are selected randomly according to specific requirement and conditions.
- 4) **Test paper generation:** It is the combination of manual and intelligent paper combination.
- 5) **Other function:** Other function like setting, system exit, library open etc [1].

System Structure and Composition

- 1) **Structure of test question database:** Most important database containing different question like sums, theory question etc.
- 2) **Structure of paper database:** Used to Store Generated paper.
- 3) **Structure of template database:** Used to apply intelligent paper combination to generate a paper, it also stores how many questions and difficulty level etc.

- 4) **System implementation:** Using intelligent function system will generate a paper as per as specific requirement. After selecting the question, number of question and difficulty level the percentage of marks should be calculated by Score Distribution Algorithm.

2.2 Question Paper Manipulation[2]

The development of proposed system follows prototype model of software development life cycle, which help us to create a product in short time. The system has several test engines with randomization of question that can create different sets of question.

System Structure and Design

Overall aim is to generate question automatically, first select number of question set, secondly the number of questions in each set. Then user needs to select examination question from test bank, if user satisfy then he can continue with further process else select different question from test bank. Lastly user should select output file i.e. in (PDF or text file) [2].

2.3 Keyword Extraction [3]

Fang Yuan in year 2005 has proposed a method for extracting information from PDF files. The rule set is constructed for manually or from learned training data for information extraction and modified later. There are many Information Extraction (IE) approached can be used e.g. STALKER, CCWRAP. Main task of IE algorithm to find out symbol of left and right side of each attribute. But these methods cannot be applied directly to PDF files.

The process of Information extraction consists of following modules.

- 1) Construction of PDF files parser.
PDF document consist of various information such as text, images and table information. PDF file parser parses this information.
- 2) Construction of tag injector.
In PDF files information is organized in the form of co-ordinates, so for extracting information just inject user defined tags for example font size, font type, empty row etc...
- 3) The process of tag preprocessor.
It process the user defined tags [3].

2.4 Question Paper Template Generation[4]

Vaibhav M. Kale in year 2013 has proposed the framework for creating question paper. The quality of question paper depends upon various constraints like question paper format, coverage of syllabus, coverage of difficulty levels, coverage of cognitive levels. The algorithm provided in the proposed system solves the problem by dividing the task into two subtasks namely question paper template generation and question paper generation.

Constraints

- 1) Unit wise distribution of marks
- 2) Difficulty level wise distribution of marks.
- 3) Distribution across cognitive level of Blooms Taxonomy.
- 4) Question paper format [4].

Algorithm Working

- 1) Round 1: Algorithm takes two constraints input question [], unit [] and stores the output in Question temp[] and Unit No[]
- 2) Round 2: Same algorithm takes two input Cognitive_Level [], Question [] and stores the output in Question temp [] and CoglevNo []
- 3) Round 3: algorithm takes two inputs Difficulty Level [] and Question []
And final output will be stirred in Question_temp [] and DiffLevNo[] [4].

2.5 Intelligent Test Paper Generation [5]

Jing Mei Li in year 2009 has proposed two strategies for intelligent paper generating.

- 1) Random selection.
- 2) Backtrack .

Constraints

Test paper generation algorithm has following constraints:

- 1) Score in total test paper.
- 2) Required proportion of each module.
- 3) Difficulty in total test paper.
- 4) Required proportion of question type.

Algorithm

- 1) Judge whether the input control parameters is legal, if not, jump to 11), otherwise, system acquire question types parameter and chapter

parameter and initialize the difficulty factor, then go to next step.

- 2) Sort order based on the percentage difference between required question types and current question types, select question type which can minish the percentage difference most, then go to next step.
- 3) Judge whether the percentage of current question type can meet the need, if yes, go to next step, otherwise, jump to 5).
- 4) Judge whether the percentage of all current question types can meet the need, if yes, jump to 11), otherwise, continual.
- 5) Sort order based on the percentage difference between required chapters and current chapters select chapter which can minish the percentage difference most, and then go to next step.
- 6) Judge whether the percentage of current chapter can meet the need, if not, go to next step, otherwise, jump to 5).
- 7) Look up difficulty partition table (M) according to the difficult grade in the whole test paper. Compare the percentage of each area between exam question that existed in current test paper and required. Select area that have most different and judge whether there is any exam question existed in selected area. If yes, jump to 9), otherwise, go to next step.
- 8) Judge whether all of areas has been searched. If not, jump to 5), otherwise, jump to 7).
- 9) Judge whether there is any exam question that can match the selected question type, chapter and area constraint existed. If not, jump to 7), otherwise, go to next step.
- 10) Sort all of exam questions that existed in database based on selected frequency. Select exam question with low frequency and put it into test paper, then jump to 2).
- 11) Test paper generation process complete [5].

2.6 Extract Table Information from PDF[6]

Burcu Yildiz in year 2014 has proposed a way to decompose table and store extracted data in structured data format (XML) for easy reuse. Table often contains high density information. PDF file is taken as an input. Table Extraction is process of decomposing table information in document. In this process author made use of PDFtohtmltool. For each text chunk in PDF file it returns text in XML with following attributes.

Attributes

Attributes are the properties related to the text

- 1) Top=vertical distance from the top of page
- 2) Left=horizontal distance from the left border of page
- 3) Width=width of text part
- 4) Height=height of text part
- 5) Font= this attribute describe the size, family and color of text part.

Heuristics

Here author has studied and explored different types of table and their structure and given some heuristics. The heuristics used can be grouped in two categories

- 1) Heuristics intended to recognize table.
- 2) Heuristics intended to decompose table.

2.7 Framework of Question Paper Generation System [7]

Ashok Immanuel in 2015 proposed a system, which is trying to tell how to generate an efficient paper by using set of keywords of syllabus particular course subject. There are seven main components to generate the paper; they are Question Bank Engine – Framework, Bank Interface, Syllabus Engine, Pattern Composer, Question Aggregator, Bank Management, and Question Paper Generation.

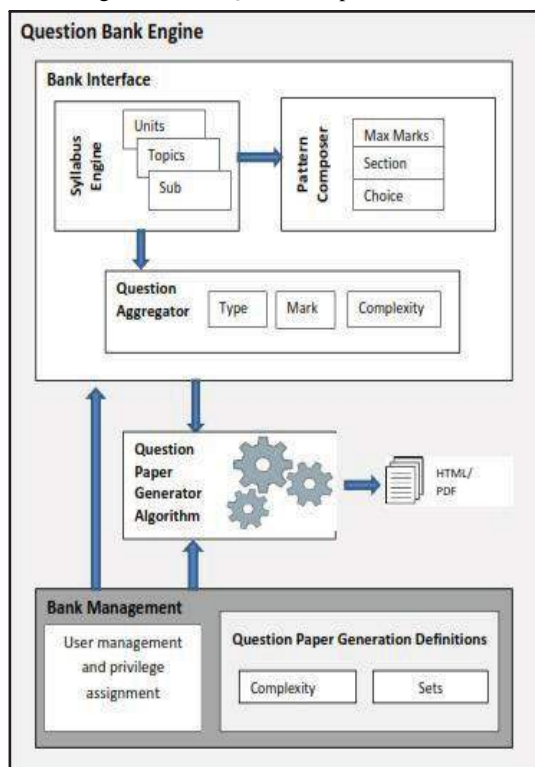


Fig 2.1: Framework Diagram[7]

Above figure 2.1 represents framework diagram syllabus engine consist of units, topics and subtopics which is input to pattern composer and question aggregator .pattern composer consist marks ,section, choice .question aggregator consist of type mark and complexity of question which will be input to the question paper generation algorithm and after that the PDF of question paper is generated[7].

3. CONCLUSION

This paper presents various systems to create effective question and automate the complete procedure of question paper generation. Some system uses searching algorithm and questions can be generated that are relevant to syllabus and generate a question paper according to weight age of each chapter. Thus system simplifies the whole process of question paper generation. And further security can be added in future to system.

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Education Station

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ABSTRACT

Education is what you need if you want an answer to your 'whats', 'hows' and 'wheres'. It helps you understand the world you live in. Subjects like history, geography, science etc. Helps us to know more about your surrounding as well as whole world. This system enables teachers, college graduates and young professors who like to volunteer teaching to children in rural areas, and kids under the care of various NGOs. This system makes it easy for volunteers to find the student or NGOs who are looking for teachers. The students can post requirements based on their subject and location and as same student can find volunteers by simply posting their requirement online. This will be a turnkey content management system which can be used by government or NGOs dealing with education with ease. This system will have a complete administrator dashboard so that operating personnel can manage the front end easily. The overall goal of this system will be to bring together volunteers and students to promote education in India.

General Terms

Education system

Keywords

Database, Data mining, Education system.

1. INTRODUCTION

This chapter gives us information about the problems faced by students in India to find relevant teachers. This system is dedicated to bringing socio-economic Betterment in India by giving more important on basic education, in the belief that education is a important and necessary for socio-economic change. Home tutoring is an effective tool for overcoming problems that constrain the ability of a society's educational system to cover and reach unprivileged students whom are living in suburban, poor or distant areas.

2. RELATED WORK

All the previous innovations done in the method of bringing students and teachers together were either offline or not optimized to reach the masses.

The technology used in the proposed system is K-means clustering which makes the job of providing relevant users with relevant information.

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There have been many research and development work done on the implementation of K-means algorithm. One of such research has been done by R. Thiagarajan, et al.[1] who proposed The Web Recommendation Systems which is implemented by using Collaborative filtering approach. It is an important type of information filtering system that emphasize to predict the user browsing activity and then recommend web pages items to the user that are likely to be of his interest.

The proposed of new recommendation system in this paper by using the concept of Weighted K-Means clustering approach is to predict the user's navigational behavior. The proposed recommendation system is based on Weighted K-Means clustering that performs well when compared to K-Means algorithm. The experimental results gives performance of the comparative analysis. Web Usage Mining (WUM) mines user access patterns from usage some patterns that may be the input to the recommendation systems which is gives the ability to predict the next visited page for a given user.[2]

To improve the web site usability by knowing the interest of the users is the main goal of the recommendation system. The offline and online this two components web recommendation process consists with respect to web server activity To builds the offline components it analyzing historical data, such as se log file which are captured from the server.[3] Then these web logs are used in the online component for capturing the intuition list of the user comes online for the next time and also recommend page views to the user.[4]

Considering all pages equally in K-Means clustering, but some of the pages have been visited by more number of users. [6] We are giving more importance for that page at the time of clustering, which are visited by more number of user Hence, proposed Weighted K-Means algorithm in this paper and web page recommendation have been done accordingly by using Weighted K-Means algorithm .[7]

3. PROPOSED SYSTEM

The proposed system enables teachers, college graduates and young professionals who wish to volunteer teaching to children in rural areas, and kids under the care of various NGOs. This system makes it easy for volunteers to find the student or NGOs who are looking for teachers. The students can post requirements based on their subject and location and as same student can find volunteers by simply posting their requirement online. The existing system that provides such solution is completely managed manually and is inefficient; the proposed system removes all the hassle of manual management and does it completely automated using web technology. The main goal for creating this application is to

make it simpler to find relevant students or teachers. The proposed system is made to work in all conditions. The application will be primarily used by Education related organizations. With the use of our application it will be extremely easy for students whom are living in rural, poor or distant areas to connect with teachers

4. METHODOLOGY

To implement the mentioned scenario, we can use K-means clustering approach. The figure below shows the activity diagram which describes the behavior of the system.

Basically, activity is started by guest who logs in to the system and system will perform operation in backend mentioned in the diagram and will give appropriate solution to the user.

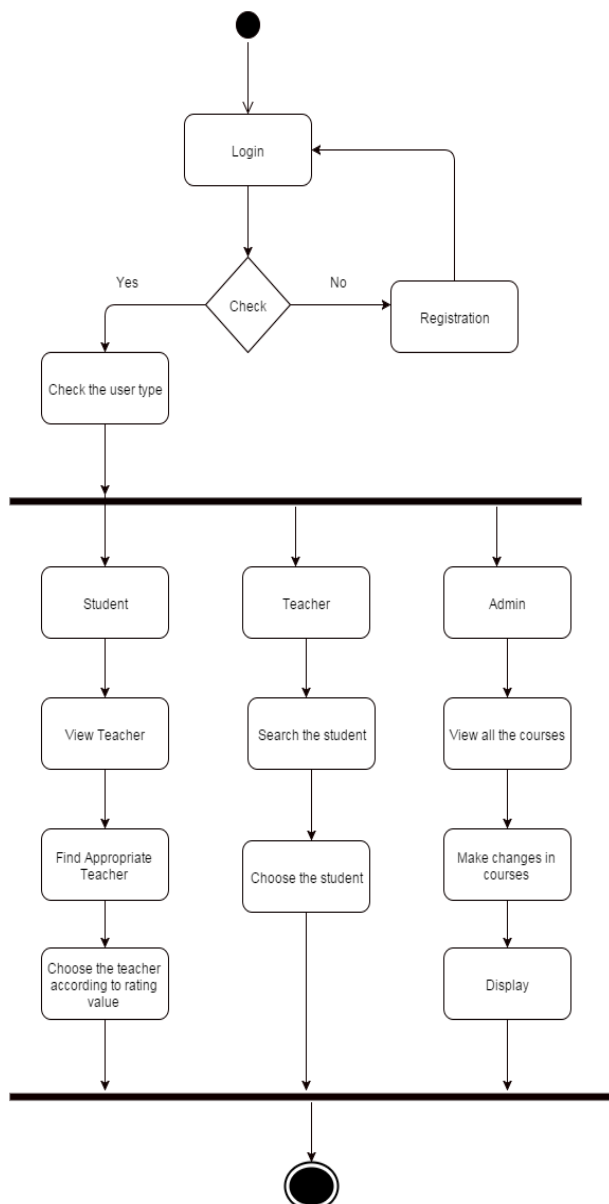


Figure 4.1: Flow of proposed system

4.1 STEP-WISE PROCEDURE:

Step wise procedure of this system by using various algorithms is shown:

1. First the guest can register on the website as student or Teacher. In this step the user enters his credentials and upon clicking Submit, the user's details get stored in MySQL database.

2. Cluster students and teachers by similarities using K-means. In this step k-means clustering is applied to cluster the students and teachers based on similarities like subject, location and recommendation. The cluster for students includes subject, location and time while the cluster for teachers includes subject, location and rating.

3. Extract details and display best results on website, based on reviews. Based on the various factors like subject, location and rating the student is shown the best results when he searches for teacher. Teachers also see the best result based on the factors like subject, location and time.

4. Reviews left by students filtered using Naïve Bayes Classification. When students leave reviews Naïve Bayes Classification is applied to filter out offensive words, if any, in the review.[7] The Naïve Bayes classification categorizes a word into either neutral or offensive. The neutral words classified by the Naïve Bayes algorithm are left as it is in the reviews. Reviews left by students are also mined for positive words to determine the teacher rating value that is used to display the best results.[8]

5. Automatic removal of offensive reviews. Based on the offensive words classified using Naïve Bayes Classification the system automatically removes offensive reviews left by students. Only reviews containing the words classified as offensive by the Naïve Bayes classifier are removed, reviews containing words classified as neutral are left in the review and not removed. These reviews are displayed to the students while browsing the review section.

5. BENEFITS

1. Turn key content management system which can be used by government or NGOs dealing with education with ease.
2. This system will have a complete administrator dashboard so that operating personnel can manage the front end easily.
3. The end user just needs to have access to a computer with an internet connection to access the system.
4. The proposed system will also have an interface for easier communication between teachers and students.
5. The system also includes search feature with customizable filters for easier navigation
6. Clustering of students and teachers by similarities using K-means. This makes it easier to get relevant search results

6. EXPECTED RESULT

The visual representation of the User interface is shown below. With the help of a clean User interface and detailed steps the end user can easily get started using the system.

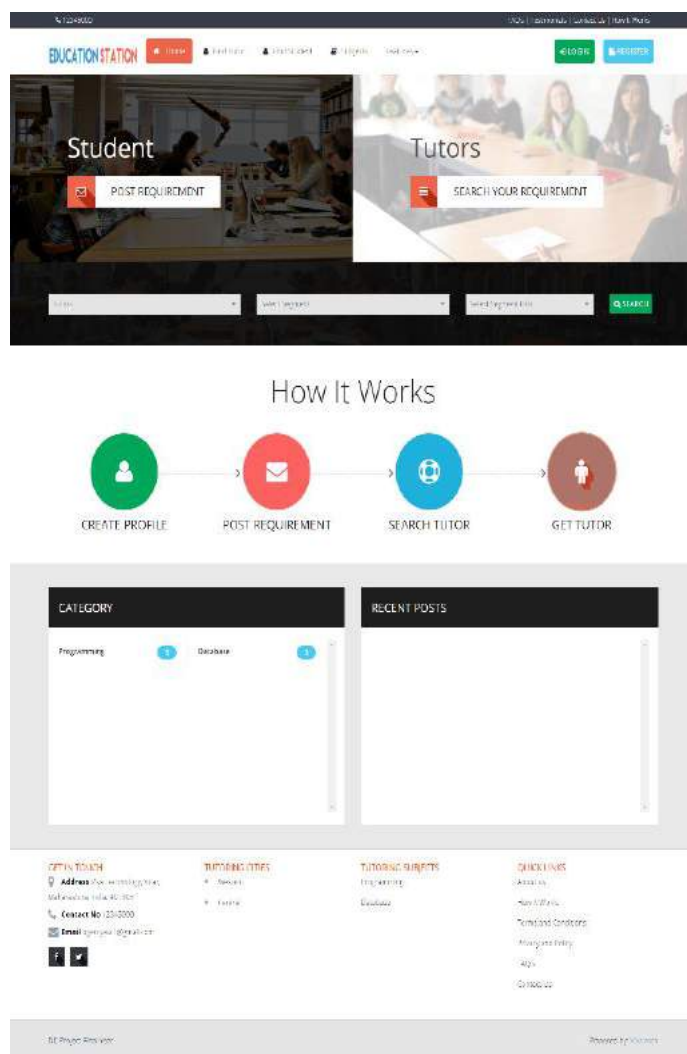


Figure 6.1: User interface of system

7. CONCLUSION

With this system the aim is to achieve complete digitalization of student and teacher finding procedure. The project is being well made to tackle the security issues and user interface makes user handle the system easier and provides good communication between user and the system.

The primary focus of this system is to make it simpler to find relevant students or teachers.

The secondary aim is to promote education in India bringing underprivileged students and volunteer teachers together.

Future improvements in the system will be automatic delivery of notification to a student's mobile through SMS if a teacher has accepted to teach the student. Other improvements will include making the system more robust to handle large database and traffic if it has a huge influx of visitors.

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Intelligent Diet Food Suggester Based On Nourishment

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ABSTRACT

Food is an important part of human life, which provides energy to live. So, today we see lots of processed food products in markets, therefore for a healthy diet need to be very careful about its choice of food products. The main goal of the proposed system is to compare the food products for consumers in terms of its nutrients such as, energy value, fats, recommended daily allowance etc. User will select products which they want to compare their nutrients and price will be compared and best result will be declared accordingly. While comparing the products modified knapsack algorithm is used which compares the products selected by user in an efficient manner.

Generally users have a goal of price or quality in mind before they buy any product the proposed system is designed in such a way that users will be shown multiple options of a product so that they are eventually satisfied with their selection.

Keywords

Web, Database, OCR, HCI- Human Computer Interaction.

1. INTRODUCTION

The consumers are getting smart day by day with respect to the food which they are consuming. The consumers are getting more aware of their choices to maintain their health, but these efforts are often time consuming and frustrating, as they have to take professionals advice every time to analyze their decision by doctors/dietitians. [1] Due to ever increasing number of food products in markets, consumers often get confuse which product to choose from.

Smart Diet Food Suggester is a state of art complaint management system tuned for resolving a very critical problem of consumers which face problem in searching best product for them. It is a single point web based database management system listing and searching all products in the database that could make searching efficient. [2] And useful to the user.

This system will benefit thousands of user and consumers who consume a large number of products. The system will also help to optimize their shopping list in which they are interested in buying .And help them to get the best result in terms of nutrients and money. User can search its needful product in the system and system will provide a better result to the user. The user can compare different products under same categories and select best for them. [5]

The Proposed system aim to reduce the efforts taken by the consumer to reduce its time in searching for which is the best food product for him/her. And also to reduce its dependencies on professional help of doctors/dietitians, save the time and money in manually finding best suited product. It should also help users during medication to recover fast.

2. RELATED WORK

With rise in the industrial age has boomed various sectors of industries. Food processing and manufacturing has also arise, which has resulted in large manufacturing plants. This rise is a boon because it has satisfied its hunger needs, and curse because it has degraded the quality and the healthy quotient of the food. Even now there are several cases of adulteration in the products. And there is no centralized system for the consumer. The users have to manually search and analyse which is best suited product for them. [1] There is no such system available which will provide a classification according to personal needs of the user. Also if consumer have any query about the product they have to consult dietitian / doctor where they have to take appointment for consultancies which consumes a lot of time / and money.[2]

The different modules in our proposed system are as follows:

2.1 Web

Web is most popular and user friendly service System nowadays. Around 75% users worldwide have used web application in their personal computer. This is the reason of preferring web system for creating our application . User will have web portal where they can search for different consumable products. User can upload an image with the request to update. User can also use this application to gather more information about any particular company or a product. This application provides a user friendly UI interface for personal guidance from the system

2.2 Database

Today database management system is being used in almost in every field to optimize their storing, searching and updating the knowledge base for better understanding of data . A database administration framework (DBMS) is a product bundle with PC programs that control the creation, support, and utilization of a database. It permits associations to advantageously create databases for different applications by database chairmen (DBAs) and different pros. A database is a coordinated accumulation of information records, documents, and different articles which will help in storing the information related to different products such as company name, nutritive value, daily value percentage, proteins, fat, carbohydrate, value of product. [6]

2.3 OCR

The basic concepts of Optical Character Recognition techniques will be used for retrieving of text from the images of product. It will be implemented for automatic update of the system. [3] [10] [11]

3. EXISTING AND PROPOSED SYSTEM

The drawback in previous system is there is no centralized system for the consumer. The users have to manually search and analyses which is best suited product for them. There is no such system available which will provide a classification according to personal needs of the user. Also if consumer have any query about the product they have to consult dietitian / doctor where they have to take appointment for consultancies which consumes a lot of time / and money. [8]

The proposed system consist of three main parts which are as follows:

3.1 Client side Development

It contains Web App development for users / peoples to compare different products. This website will give user to compare different information of products based on nutrients and price a user can compare at the most two to three products at a time.

3.2 Server side Development

It contains server side Database which contains all incoming images of products. It uses ocr for updating in the database of different values of the products. It will have all information of the products. Which will be used for comparison .This website will give admin to upload any images of the products to take picture of it and upload it for updating in database.

3.2 Middleware

After developing both server and server side, it is very essential to make connectivity. This is very essential part.

Only after connectivity user can search in database get comparison between two products.

4. FLOW OF THE PROPOSED SYSTEM

The complete activity of proposed system is shown in fig.1 The GUI activity page will be opened when we run the proposed system The GUI activity page will consist of the name of proposed system and a keyword with marquee having text dairy food products. Click on dairy food products, it will take you to another page having a search tool for searching different products and list of dairy milk products.

The list of product by different manufacturer will appear when user search the product. When user will click on any item, another window will appear consisting the name of companies manufacturing that particular product. Choose two, three manufacturing companies the same product, then comparison will be done on the basis of nutrients and price.

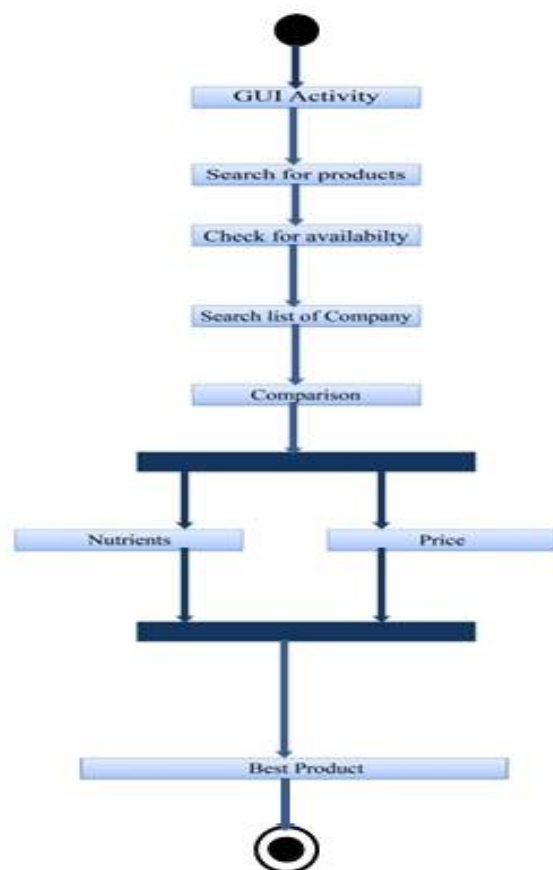


Fig 1: flow diagram

5. EXPERIMENTAL RESULTS AND ANALYSIS

In this way, it is expected that the system is the intelligent system that assist the users while shopping by suggesting appropriate products related to their diets. Also it keeps the

track of nutritional intakes. This system is user friendly which uses web browser for navigation and minimizes difficulties in accessing them. The updating of database is simpler and also gives the details of the in-stock products. The proposed system only focuses on dairy products.

- i. **Speed:** Proposed system is much faster than other similar systems present online. Because of the knapsack algorithm the results are displayed much faster and efficiently. Database of the system is update frequently so the results are always accurate and correct.
- ii. **Performance:** The application performs equally on various ranges of devices such as mobile phones and tablets. Since it is light in terms of processing the results are displayed seamlessly
- iii. **Functionality:** Functionality provided by our system is more than the functional requirements. Proposed system provides comparison of cost and nutrients. More suggested products are also displayed with the comparison result.

The fig 2 shows that a user is selecting a product from the list, fig 3 shows selection of second product from the remaining fig 4 shows the final result where both the products are compared and final product is displayed to user. And if user want to compare another companies with the best result then, they can compare it.

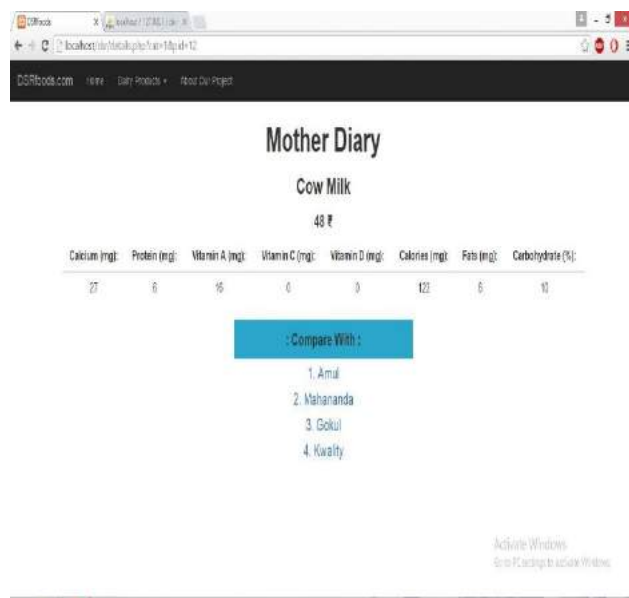


Fig 2: Selecting Product

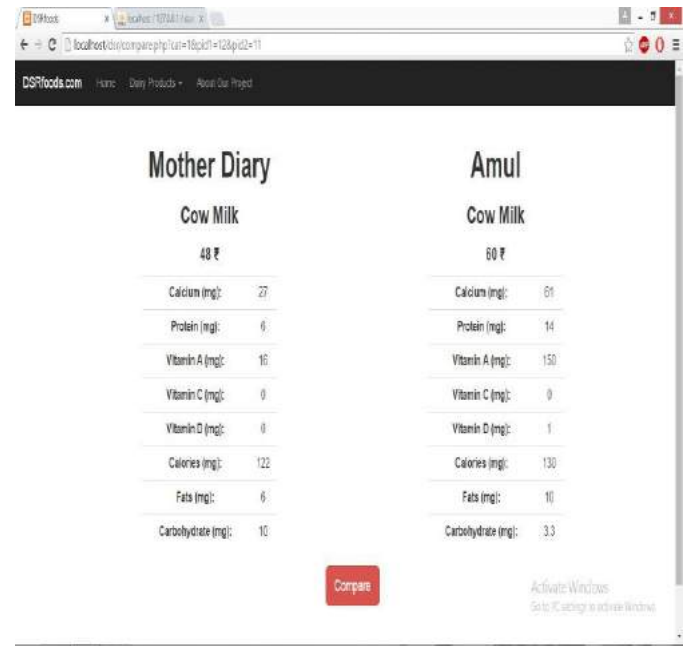


Fig 3: selection of second product.



Fig 4 : final result.

6. CONCLUSION

The proposed system will have a large database of food items. This will give all the detailed list of the food product. Previously was not present and now customers can access them in more user friendly way. The result of diet will be displayed in the list format which will consists of tables of nutrients, fats, proteins and price. They will also be displayed food products depending on diseases and lifestyle. In the proposed system user can compares the nutritive value of two products giving consumer the best result. The proposed system saves time and money saving tricks and individual customization.

The proposed system will be implemented in a website friendly manner which users are already used to in their day to day life so they will use the proposed system which is our final aim.

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Student Mentor System

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ABSTRACT

Mentors in colleges and schools guide's students to a correct path in academics they make sure that the student is not alone in dealing with day-to-day challenges. Mentoring can be helpful in exchange of information between student and teacher.

However mentoring can be done with less paper work and more efficiency by use of different technology's interaction of mentor and student can be more fluid and transparent. Viva-Technology Mentor System focuses on keeping the essence of conventional mentoring method and combining it with web technology. Viva-Technology Mentor System will have 4key actors (users) Student, Mentor, Mentor head, Administrator each of them will have their roles and different login access in the web application. Students will create a profile (register) into the Mentor System, they can interact with mentor by sending message and if mentor is online it will reply to it immediately or later. Mentors will reply to student's message by means of chat service in web application they can also announce meetings which will be then displayed in student interface. The main task of mentor is to assign mentors to a group of students in the Mentor System Web Application they will be doing this by an automated assignment of mentors to group of students roll number wise. Mentor head can also manually assign mentors if they wants to do it in some custom manner. Administrator will have highest priority rights to change something in system which cannot be done by other actors like assignment of mentor head.

Keywords

Bootstrap, Mentor, Mentor Head, Students, Administrator,

1. INTRODUCTION

In today's technological world, entering any detail on a sheet of paper and storing it in a file is very **un-happening** thing. This process could lead to loss of information, if the file is misplaced or damaged. So, to prevent such accidental loss of information a system should be developed. Our system is a website that will store details of a student in a database and hence the information can be prevented from accidental loss.

The system is a manual system at present, forms of marks, attendance, profile and co-curricular activities are filled by students and then it is submitted to respective mentors.

Proposed system is focused towards improving the quality of mentoring process followed at present by doing it with the help of online website. Students can fill their forms online and share the Google drive link of their scanned documents, mentors would not have to maintain a separate file the records of students will be online. Announcements of meetings can be done online which will be displayed on students view interface in website.

Current method of mentoring is manual and takes a lot of time in simplest of process like document submission by students. Can it be improved was a question there are already software's available but they are focused towards corporate sectors rather than schools and colleges. Teachers had to carry a lot of documents with them which in itself is messy, it is age of technology and we can surely improve it this was the main motivation in choosing this proposed system and to improve it. The proposed system will solve the problem of mentoring which is generally faced by mentors and students. Proposed system will have interfaces for Students, Mentors, Mentor Head and Administrator. Submission of documents will be done online by students teachers will inform students about meetings by use of the proposed system. The proposed system will not cover scanning of documents by OCR.

2. RELATED WORK

There are mentoring websites and applications which provides information about mentoring but they are all focused toward providing mentoring to corporate and business sector and there is no focus provided to the mentoring done in schools and colleges which is very important. The mentoring websites are focused on profit of the company rather than focusing on physical and mental development of individuals which is a necessary part.

The proposed system overcomes all these drawbacks and focus on main essence of mentoring that is development of students. The system can be accessed on multiple devices and browsers which is an advantage.

3. EXISTING AND PROPOSED SYSTEM

The whole system is implemented using HTML, MYSQL, PHP and bootstrap. The whole system will be available online and it decreases the burden of maintaining the documents of students and maintaining a file for the same.

For a new student to login in the system, student must first register on the system. The username and password will be mailed on the student's mail id. Students can easily login in the system using the credentials.

The administrator of the system will manage everything of system such as assigning mentor head to mentor's and many more things. The administrator will have all access and rights related to system.

Mentor will be able to add and delete students from particular list. A mentor can arrange a meeting with the student's guardian also will be having a clear report of student's academic detail's and documents. The mentor head will be assigning mentor's to a particular group of student.

Student will initially register for the system, then with the credentials individual will login in the system and able to contact the mentor and check the messages. The Mentor will be able to verify and maintain the student's document. Mentor head will be able to add and delete mentor.

3.1 Front End

In Mentor system web application the front end will be designed according to the different views of the users in the system. Technology used in front end is HTML, CSS, JAVASCRIPT and BOOTSTRAP.

Student will login to the system and the login page is implemented using the technology mentioned above. Now because of bootstrap, mentor system website can be viewed from mobile [4] devices comfortably. Student will also upload their documents on google drive and then update the link in mentor website [5].

Mentor can add a student to an existing database, it will give the notices of meeting and discussions to the students. One part of mentor's job is to check if students have uploaded the documents properly and have provided the correct information in the website.

Mentor head assigns students to mentors. In mentor system it will be done by using simple form. Where mentor head can select the students form check boxes and then select the name of teacher to which these students are assigned

Administrator is the one who have all the rights and change anything in the website. The main reason behind this is teachers may leave the job of a college then their login access in such a case should be revoked given to other teachers

3.2 Back End

Backend consists MySQL queries for management of data. We will simply translate the user's request into a normal

MySQL query and the same will be provided as output by the database output will be displayed on the user's screen with some addition of CSS and HTML

3.3 PHP Connection

The connection between the client-side and the database is being done by using PHP always executes on the server, which means that it has nothing to do with your computer while you're doing any other thing on your computer.

4. FLOW OF PROPOSED SYSTEM

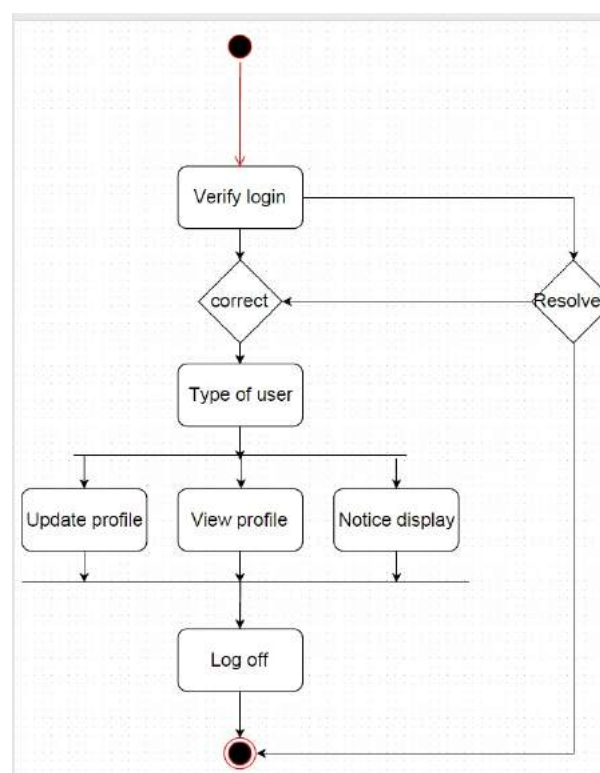


Fig 1: Mentor system flow

The above figure 2 shows that mentors and students will login from the web interface students will do the tasks which they are supposed to do such as update profile, view notices and logout. Similarly mentor will also login to the system and perform activity such as contacting student and display notices and finally all the actors will logout of the system.

5. EXPECTED RESULTS

Proposed system is reduces the amount of work done manually and different document related paper work done be college and schools in mentoring. Students will be able to contact their mentors in a proper way because records of meeting will be automatically kept online whenever a meeting

is conducted. The users which are using the system as mentors will be able to login to their particular interface and inform about meetings and submission of documents. Students will receive this message in their notice board as well as student interface.

The system will provide md5 [2] encryption to the passwords to the users which are mentors, students, mentor head and administrator. Md5 is a type of encryption technique which can only do encryption in one way so it is not possible to reverse the algorithm to get the password of the users one again developers of the application will also be not aware of the passwords of the users.

Users will be automatically logged out of the system if there is no activity for a longer period of hence it gives additional protection [3]. Logging out of users will be prompted by a redirection of the page were message of logged of system because of inactivity will be displayed to the users.

Security from the attacks such as SQL injection will be incorporated so the internal data base of the system should not be accessed by doing certain changes in the URL of the web page while using the website and hence the internal database structure will remain hidden from the attacker there by providing additional security.



Fig 2: Home page of proposed system



Fig 3: Hsc details web page

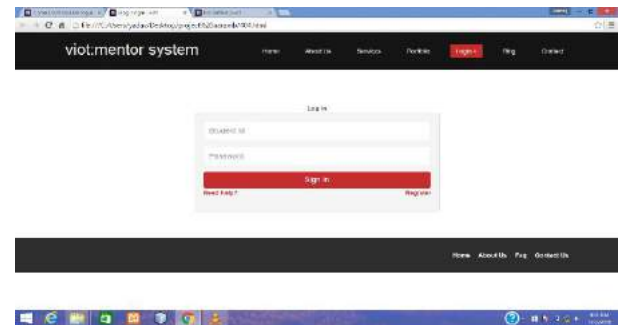


Fig 4: Login page

6. CONCLUSION

The systems which are similar to the proposed system aim mainly towards corporate mentoring and hence they cannot be used in schools and colleges for mentoring students. In educational institutions mentoring is done manually, hence efficiency and transparency is not maintained. Submission of documents by students to mentors will lead to paper work which then has to be maintained by mentors. Time of meets are announced in classroom or displayed on notice board either way students which are not present will not get the information.

Proposed system will is developed considering the needs of mentor, mentor heads, and teachers so it will be focused towards educational institutions for mentoring of students. The proposed system is a web application and hence problems faced due to manual processes will be eliminated. Teachers will not have to maintain documents of students and meetings can be announced via interface in website. Complete profile of student will be maintained online and if the data is required for other similar purposes in college it can be used. The proposed system will have a lot of atomization.

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Automatic Form Filling System

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ABSTRACT

Generally keyboard is use to enter the inputs to the computers. Different inputs can be enter using keyboard but entering redundant data again and again could be a time consuming task. OCR basically stands for optical character recognition technique which is use to extract the character from the scanned images.

In proposed system user need not to take efforts for filling up the same information twice or thrice. In proposed system documents such as Aadhar card, Pan Card etc. manually scanned, then this scanned documents will converted into PDF format, from this available documents, information of user is extracted using OCR. This information will be stored in the user database. So when user need to fill same information in a different forms of a particular organization, then user information will be retrieved from database and form automatically gets fill up.

GENERAL TERMS

OCR (Optical Character Recognition)

KEYWORDS

PDF, database, Aadhar card, pan card, character extraction, Redundancy Elimination, Electronic conversion, Reducing time efforts

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1.INTRODUCTION

Proposed system tries to eliminate the human efforts of filling redundant information in forms of an organization. Optical character recognition technique is used in proposed system. It introduces many advantages over an existing system. Earlier

versions used to work only for some limited number of fonts. The main aim of proposed system is to give accuracy and compatibility for more number of fonts.

Flow of proposed system

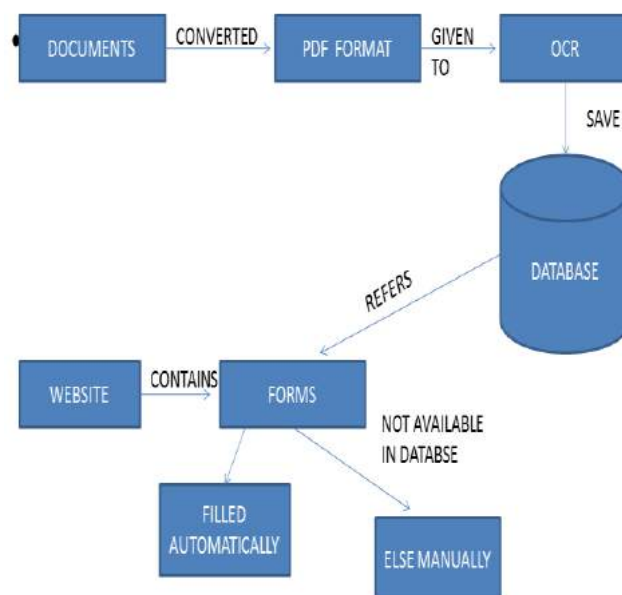


Fig 1. Basic flow of system

2. RELATED WORK

A. Framework to fill the web forms

BipinUpadyaya in year 2012 has proposed the framework to help users to save their valuable time. With the help of framework user can fill any web forms on any websites. Same information no need to fill again and again. Framework shares and reuses user's previous information while filling the web forms. In this author address the problem of auto form filling by exploring the relationship between user information or user's input.

B. Character recognition

Prof. Gandhali s. Gurjar in year 2014 has proposed the system which is mainly used for offline character recognition. The proposed system starts scanning from the upper edge of character which is having scalability property. Basically the proposed system is only works for selective fonts. First step of proposed system is pre-processing of an image. After that feature extraction will be done. This work is mainly done by OCR.

C. Online intelligent form filling system

NingQiu in year 2009 has proposed the system which works on the principle of an excel template through which user can upload a document and then it will be distributed to the different users. The proposed system use less time and less space and also extract relevant information from old information intelligently. Therefore it reduces the workload of form filling. Main technology also adopted by the proposed system and author also explain the design and development process of the proposed system.

D. Feature extraction

Pritamsingh and sumitbuddhiraja in year 2014 has proposed the system which was very advance and also capable of producing high degree of recognition. The proposed system also gives the accuracy for most of the fonts. In proposed system author introduced so many types of fonts which is first recognized. Then this recognized fonts

compared with predefined standard fonts or with library fonts. After that those fonts stored into the database. The proposed system can also recognize handwritten character.

3. IMPLEMENTATION

3.1 Stepwise procedure

1. document scanning and converting in PDF

documents like Aadhar card, pan card etc. will be scanned manually and scanned documents are converted in PDF format.

2. Character extraction using OCR

Optical character recognition technique is used to extract the characters from scanned documents. OCR converts the document in black and white format and using appropriate algorithms it extracts the characters.

3. Storing, referring database & automatic data generation

The information which is extracted by OCR will be stored inside the database. While filling up the form of an organizations information of user which is present in database will be linked with the fields of forms and the information of an user will be automatically get fill up in form.

3.2 Algorithms

1. determining character lines algorithm

In proposed system, basically this algorithm is used to find out the characters. OCR converts characters in black color and background in white colour. Colour documents are not understood by OCR. This algorithm checks for the black surface. It creates lines above and below the characters once the characters are detected.

2. determining individual character line algorithm

In proposed system, this algorithm is used to detect individual symbol or characters. On an single line there is a set of characters are present. To detect individual characters line top and line bottom lines

are created. Line top indicates the top part of complete characters and line bottom indicates the bottom part of complete characters as well as it also creates character top and character bottom lines which indicates the upper and lower part of individual characters.

3. Optional confirmation algorithm

In proposed system, this algorithm is used to detect individual character height. each line consist of different characters having different height so as to adjust the height of each character this algorithm is used.

4. RESULT AND ANALYSIS

Existing system

Demerits of existing system are as follows,

- i. User used to fill up redundant information
- ii. OCR is working only for some limited fonts

Proposed system

Basically proposed system is the combination of three parts that is scanning documents of user manually and converting in PDF, information of user is extracted using OCR technology and storing information in database, fields of form is linked with the information present in database so that similar fields get automatically fill up.

Merits of proposed system are as follows,

- i. It saves the human effort of filling similar information
- ii. It saves the time
- iii. OCR works with high accuracy

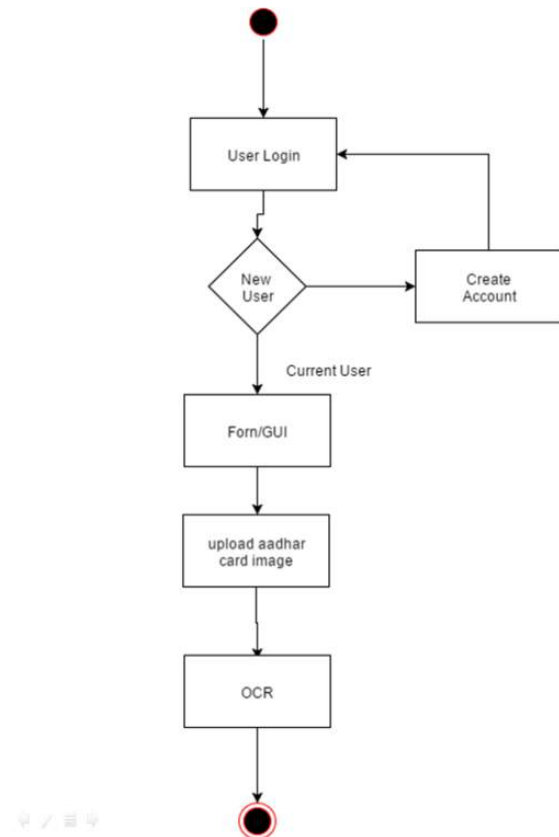


Fig. 2 activity diagram of user

Partial Result of proposed system

Internal working of proposed system



Fig.3: upload image

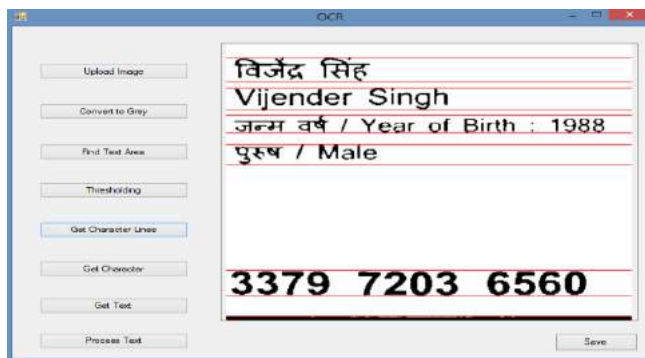


Fig.4: character extraction

GUI



Fig.5: GUI

5.CONCLUSION

To avoid filling up the same information again and again in form the concept of advance automatic form filling is introduced. Proposed system uses optical character recognition technology to grasp the information from documents such as Aadhar Card, pan card etc. this information is stored inside the database so when user tries to fill up same fields in different forms, the information which is stored in database will be automatically generated in form so the efforts of user can be reduced.

FUTURE SCOPE

Future scope of proposed system is to develop OCR mobile application. OCR application can be used to recognition of signature and other symbols. It can also be used for translating one language to another so that it will be helpful for user from different countries.

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E-RTO SYSTEM

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ABSTRACT

Due to the increasing availability and use of smart handsets in our day to day daily life, the mobile phone will soon become a simple way to access many of the sophisticated applications and services in a very convenient as well as secure manner. The new technology i.e. Near Field Communication (NFC), provides the phone with an interface which allows it to act as a smart card reader. The proposed system is based in developing an Enhanced Driving License (EDL) which proves the identity of a person and also helps to access the details about the license holder's records. The system consists of three modules. The first module consists of a Web application for user from which he/she can register or apply for a new license attached with the NFC tag. The second module is the Admin module from which the admin can login into the system and verify the documents and issue a new license to the user. All the details will be stored in the Motor Vehicle Department (MVD) database. The third module consists of a handheld device which is carried by the officer through which the NFC tag.

Keywords

Near Field Communication, Enhanced Driving License, Motor Vehicle Department.

1. INTRODUCTION

E-RTO system is an Automation of Road Transport Department through Cellular Network and our E-RTO is a step in the Mobile computing by using NFC which will make it easy for RTO professionals to manage and administrate internal office data and also access it on field during enquiry via Mobile application. The manual RTO system in nature is modified in this method and we introduce a new technology i.e. NFC. The complete NFC system consists of a tag (transponder), reader/writer and a computer host. The tag which is the microchip has memory to store data and also receives and sends back the data to the reader. The power is given by the electromagnetic signal which is received from the reader development in the technologies.

Trade and transactions can not only be done using only real money but also the virtual one. The NFC based devices are powered through the radio frequency. The process of shopping has been supported by the existing NFC technology device. The NFC tag (EDL) gives a unique identity to every user account. When a vehicle driver has been caught by the traffic policeman for violating the traffic rules and regulations, its driver is supposed to scan his EDL. If the identity of the driver is matched with the stored data in the system, the corresponding data is fetched on the handset. If the driver violates the rules, the policeman can also file a new complaint about him and the fine amount will be deducted virtually from his account. After this procedure, the vehicle will get immediate access to drive through. This system also has some additional features. The new user can register himself/herself through the web application by feeding all the necessary information. The user can login and view all his previous records if there are any.

2. THEORY

Near Field Communication

NFC is a wireless communication technology, which is a short-range technology that enables exchange of data between devices over about a distance of 10 cm. Near Field Communication is an upgrade of the existing proximity card standard (RFID) which combines the interface of a smartcard and a reader into a single device. The significant advantage of NFC over the Bluetooth is the shorter set-up time. The connection between two NFC devices is established at once. The NFC provides a higher degree of security than Bluetooth due to its shorter range and makes it suitable for crowded areas where correlating a signal with its transmitting physical device (and by extension, its user) might otherwise prove impossible. It can also work when one of the two devices is not powered by a battery. It requires a separation of 10cm or less. NFC operates at 13.56 MHz on ISO/IEC 18000-3 air interface and rates that are ranging from 106 kbit/s to 424 kbit/s. NFC Forum defines the four types of tags, which provide capabilities and speeds in communication in terms of configurability, memory,

security, data retention and write endurance. These tags offer a memory between 96 and 4096 bytes. There are three modes in which each full NFC devices can work:

1. NFC card emulation—enables NFC-enabled devices such as smartphones to act like smart cards, allowing users to perform transactions such as payment or ticketing.
2. NFC reader/writer—enables NFC-enabled devices to read information stored on inexpensive NFC tags embedded in labels or smart posters.
3. NFC peer-to-peer—enables two NFC-enabled devices to communicate with each other to exchange information in an adhoc fashion.

Working of NFC architecture

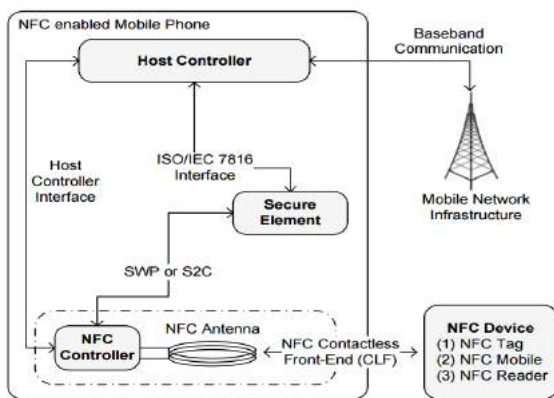


Figure 1: NFC architecture

In the above figure 1, it shows that NFC technology integrated (NFC enabled) mobile devices are typically composed of secure element (SE) for performing secure transactions using NFC devices as well as storing sensitive data in a secure environment and an NFC communication interface. NFC interface is composed of a contactless, analogue/digital front-end called as NFC Contactless Front-end (NFC CLF), an integrated circuit called as NFC controller to enable NFC transactions, and an NFC antenna. Secure element provides a dynamic and secure environment for both programs and data. It enables storage of valuable, sensitive, and private data such as credit card information of the user, and secure storage and .execution of NFC enabled services. The host controller sets the operating modes of the NFC controller through HCI, processes data that is sent and received, and establishes the connection between the NFC controller and the secure element.

3. PROPOSED SYSTEM

Many of the new smart phones, tablets and other devices consist of an integrated scanner which can read the NFC chips. The only simple thing that a person needs to do is to attach a single low-cost NFC chip to the driver's license. Unique combination of numbers is stored in the NFC chip. This unique combination of numbers is the ID which is read by the smartphone with the NFC technology that associates with the driver's data already

stored in the web database of MVD. The drivers are able to perform the automated checks using the NFC to the web application. They just have to hold their driver's license up to their smartphones. The smartphone scans the NFC chip and reads the unique number ID from the chip from which it can fetch the driver's entire data. The connection required to fetch the data can either be through a mobile data connection or via Local wireless network.

4. IMPLEMENTATION

Modules of the project

The proposed system consists of three modules which work simultaneously which are as follows:

A. Admin module:

1. The admin can only login the application.
2. The admin can check the documents of the new user who wants to register and if the documents are legal then he will make a new account for the user into the web application and provide EDL to the user.
3. After a new user account is created, the user will get the username and password by mail.

B. Traffic Policeman module:

1. The traffic policeman can login to the android app.
2. If any user is caught by the policeman for violating the traffic rules, then the traffic police will get his driving license and tap it using the android phone.
3. After tapping, the police can place a new complaint as well as view all the previous records of the user.
4. After the new complaint is filed, the fine amount will gradually be deducted from the total balance of the user.

C. User module:

1. The user can login into the system using his username and password provided by the admin.
2. He can view all the previous complaints which were placed against him.

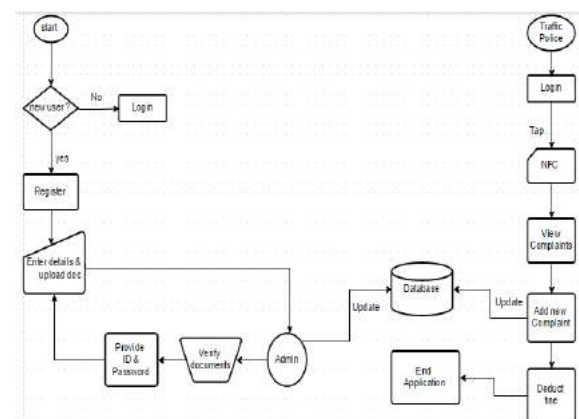


Figure 2: flow of the project

Step 1: If the user is new than user register for license or if the user already have account then user will login to system.

Step 2: After registration user send all the scan documents to the RTO office i.e. admin.

Step 3: Admin manually verify all the documents.

Step 4: If all the documents are valid then admin provide a unique ID & password to user. So user can login to system using this ID & password.

Step 5: After getting ID & password user can login to system and can see his complaints, uploaded documents & also apply for updating new information.

Step 6: After according to users requirements of updating information admin can update in the database.

Step 7: If traffic police caught the user then traffic police login using android phone and tap the NFC embedded license to phone.

Step 8: After tapping the license the traffic police can see the information and previous complaints.

Step 9: If traffic police wants to register a new complaint, than he can write the new complaint and that is stored in the database.

Step 10: After registering complaints the fine for that complaint is directly deduce from account.

5. RESULTS

Till date, some of the modules that have been designed are shown below as follows:

A. About the website

When a new user visits to the website for the first time, it will show the information about the corresponding RTO system as shown below

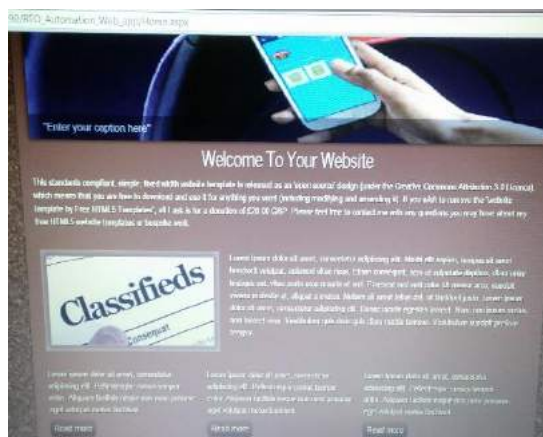


Figure 3: Homepage

B. Login

Whenever an admin wants to create a new account for the user, the admin will login the website by entering the valid ID and password as shown below:



Figure 4: Login

C. Add new User

To add a new user in the system, the user has to fill up the required appropriate details in the given blank spaces along with their proper photograph so that a new license can be issued to the new user with proper details.

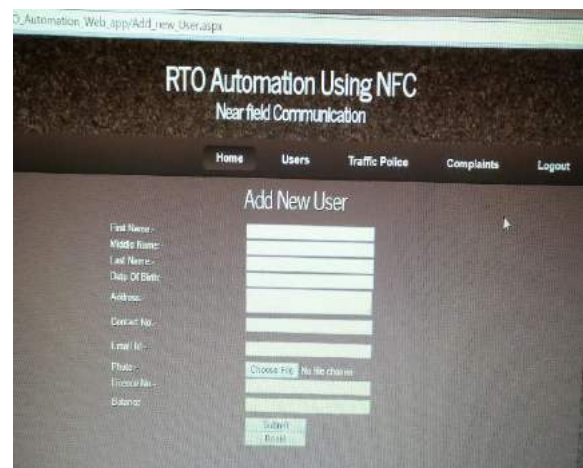


Figure 5: Add new user

D. Add new Traffic Police

A new traffic policeman details can be entered into the system along with its designation assigned.

Figure 6: Add new Traffic Police

6. CONCLUSION

The technologies that are used in this system is an android for the mobile application and a website for the user and the RTO admin. This is an effort to automate the current system in RTO which will help us in billing and lodging complaints and bring more transparency and make work easier. It will make the work of RTO digital and automatic and reduce the manual work and make the easy and fast implementation of the process.

FUTURE SCOPE

The technology can also be used for various applications in the future as mentioned below:

- Toll systems
- Mini wallet
- Various licencing systems
- Automated ticketing

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“Seckey Paste”: The secure way to share between wired and wireless device

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ABSTRACT

In today's digital life security is a major concern. Every user wants their data to be private and secure. There are many Android applications available for secure sharing of messages, images, and videos. But most of them require registration to their service and have other hurdles as well. Every user needs applications which are secure and easy to operate (without login, signup, and captcha). Along with these requirements, users also want to share their data from mobile to PC and vice versa. Conventionally, they need to register and login into their accounts and set up a connection between mobile and PC. To avoid these tedious tasks, we present an Android and web application

"Seckey Paste". This application provides a secure way to transfer data without any registration. The key feature of this application is cross platform data sharing. The application uses secure keys to encrypt and decrypt the data.

Keywords

Pastebin, Seckey Paste, Volley, Exponential Backoff Algorithm, cross platform, decoding, encoding, WhatsApp, Facebook, Gmail, Yahoo, Skype, graphical user interface.

1. INTRODUCTION

Data sharing is a very important activity in today's life. Everyone sends text messages or images to someone every other day. There are many options available for this purpose in today's technological environment like email, WhatsApp, Facebook, etc. But it is not easy to switch between different hardware platforms like desktops and mobile devices. It is more difficult to easily transfer data or links between different software platforms like Windows and Linux, and between Windows and Android. This gives rise to the need to easily and efficiently share information between the diverse systems that is used in daily life. The existing applications do their job but are also time-consuming and require a lot of effort (typing long messages, logging in to the system, remembering password and id, etc.) Sometime many people want to share data from mobile to computer or vice versa. There is only one option left – email. But it is inconvenient for users with slow internet. There are also many people who, on principle, do not use social applications like WhatsApp and Hike. These applications are also huge in size and computing requirements. All these drawbacks can be overcome by

Seckey Paste.

A major advantage of this application is security. This application not only simplifies your sharing but also secures your data. Seckey Paste is instantly usable on any device, whether your own or a friend's or a shared device, because registration (mobile number, user name, password, etc.) is not required. The simplicity of this application is exemplified by the fact that in spite of having no user authentication, all data sharing is highly secure. This is because messages are stored as key-value pairs i.e. each message is assigned a unique key. The message can be viewed only by using this unique key either via the Seckey ('Security Key') Paste Android application or its website. It is also light on both memory and processing resources.

2. RELATED WORK

There already exist applications and websites for quick link sharing between individuals and also between groups. We can also leverage existing applications to share data between different devices. Let's see a few examples below.

E-mail services like Gmail and Yahoo! Mail can be used in the following way. Data to be shared is stored in a common repository, the inbox. The data can then be accessed by the user anywhere in the world with an internet connection. This approach is secure and reliable; however, it is also lengthy and inconvenient. The user must follow a tedious sequence of steps both while uploading the data and while downloading it.

The second way of transferring data is via social and chat applications like Facebook, Skype, and WhatsApp. This approach also suffers from tediousness. Facebook is not designed for instant sharing of data; moreover, controlling access to the data will be an issue. (The two main ways of posting on Facebook - via messaging and via 'wall posts' - do not encourage tight control of viewer access). Skype also suffers from sharing problems – instant messaging is individual-oriented and not group-oriented. Of the three, WhatsApp is perhaps the fastest at data sharing; it also provides 'broadcasts' for group sharing. However, WhatsApp has a major drawback: messages cannot be accessed without mobile devices. This is fatal for PC-mobile communication.

A close relative of the proposed application is the concept of the pastebin. Web pastebins exist online, but they usually target specific platforms. The proposed application aims to

work as a universal pastebin for mobile-mobile, PC-mobile and PC-PC communication.

3. PROPOSED SYSTEM

The proposed application, Seckey Paste, is based on the everyday need of the average person to share data more efficiently with minimal struggle. This application seeks to fill the cracks created by our diverging mobile and desktop experiences. Millions of people today own both PCs and smartphones, and use both devices at different time for differing purposes. This introduces asynchronicity between user experiences on both types of devices; there is a need to view data created on one device, on another device as well. Another aim of this application is to enable quick sharing of data – to make it possible for users to share quickly, easily and efficiently. This application not only fulfils this need but also provides a secure way to transfer data between different platforms with much fewer steps involved.

3.1 Actual Working

The essence of Seckey Paste is quick and easy sharing of data. Data sent through the application should be available anywhere, anytime. To do this we use a typical client-server architecture for our application. Data is uploaded and downloaded through client device (PCs or Mobiles). This data is assigned a unique key which is randomly generated. The client device then sends both the key and data to the server where it is stored and retrievable globally. The database on hosted server is connected through PHP (Hypertext Preprocessor) with various functions provided by android library known as volley. This android library (Volley) uses algorithm known as ‘Exponential Backoff Algorithm’ to send and retrieve data from PHP file, hosted on the server. When a user on a different client device wishes to access that data, he/she simply enters the key for that data. This key is sent to the server, which compares it to the list of existing keys. If a match is found the server sends the relevant data to the client device; if no match is found, an error message is sent and the user is asked to re-enter the key. Refer Fig. 1 for better understanding.

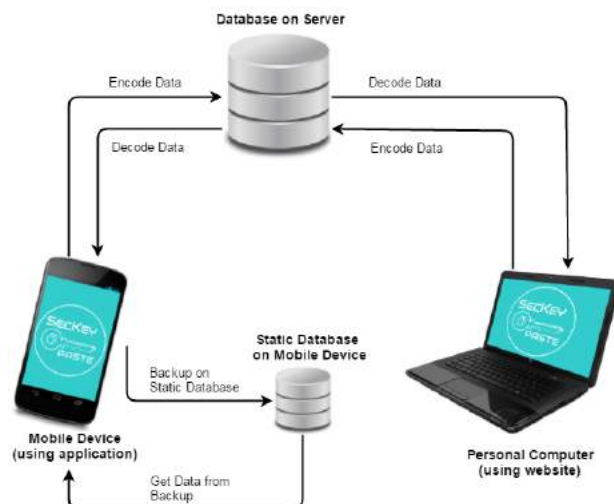


Fig. 1: Working of Seckey Paste application.

Client devices also store a local copy of all data sent and received via the application. This service is currently available

only for the Android application, since the website version does not require registration. This history is stored in a static database in phone memory/SD card. A backup facility is also provided for one touch history transfer and to enable the user to track their previous usage.

3.2 Services offered by application

There are many services offered by this application. Some of them are listed as follows:

- Send texts/images/videos.
- Get texts/images/videos.
- Backup data on mobile device.
- Feedback.
- History of usage.

3.3 Activity flow

There are two major functionalities provided by the application. The first is encoding of data (text, image, or video) and the generation of a corresponding key at the sender's end. The other is decoding and receiving the data using the unique key at the receiver's end. The key generated by the application will be unique for each data element and will serve the purpose of data security.

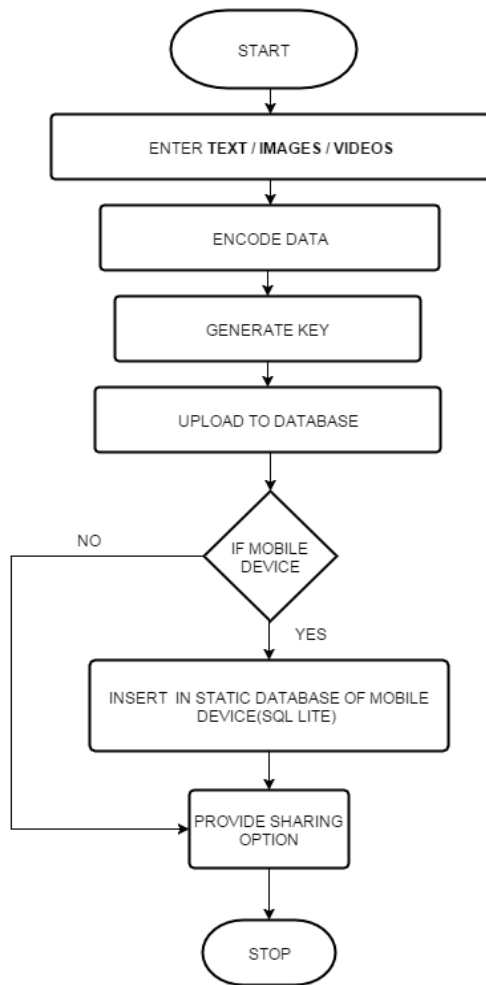


Fig. 2: Flowchart for sending data.

The procedure for sending data through the Seckey Paste Android application is as follows. The user opens the application and clicks on “Send Text” (refer Fig.4 for the UI layout). The user then types the data or attaches an image or video, and clicks on the Send button. The application then generates a random numeric key (using the Java XYZ function) and checks that this random key is unique i.e. has not been used previously. . Then the key and data are updated in a row of a SQL table by the PHP file on the hosted server, where they are available globally. Refer Fig. 2 for the flow chart.

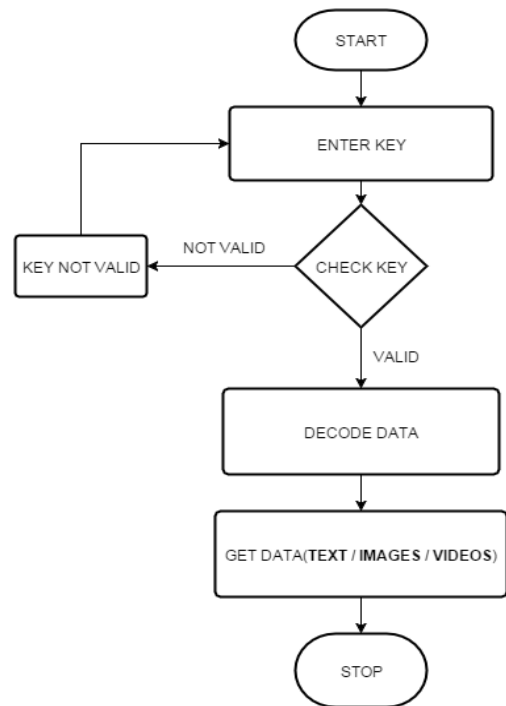


Fig. 3: Flowchart for receiving data.

Now let's see the procedure to retrieve data from the application. To download and view data, the user opens the application and clicks on “Get Text”; next, a new screen is displayed and the user is asked to enter the key for the desired data. The user may type the key manually or copy and paste it. The e server database is queried to see if a corresponding data item exists (for this purpose all the entries in the first column of the SQL table are compared with entered key); if it does, the data is downloaded; otherwise, the user is asked to enter a valid key. Refer Fig. 3 to understand the flow of activity.

4. RESULT AND ANALYSIS

The biggest advantage of the proposed system is its ease of use. The application has been designed from the ground up to facilitate quick data transfer between devices. Its design is inherently focused on providing the best and fastest user experience via its clear and simplified user interface. Effort has been taken to ensure that data can be shared while using the fewest number of clicks, and thus the least amount of effort and tedium. Refer Fig. 4 and Fig.5 for the graphical user interfaces of the Android and web applications respectively.



Fig. 4: Graphical User Interface of Android application.

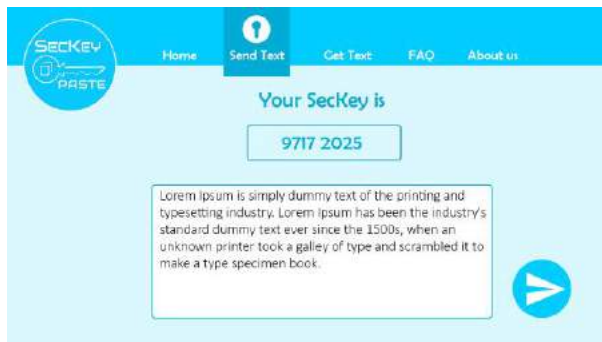


Fig. 5: Graphical User Interface of web application.

SecKey Paste aims to function as a universal pastebin - It should be possible to send data quickly and efficiently irrespective of platform, (Windows, Linux, and Android etc.), web browser, or device (PC, tablet, or mobile). The application can work on any platform, because it has a website that has both desktop and mobile versions.

5. CONCLUSION

The proposed application introduces an efficient way to transfer data with fewer levels of bureaucratic delay. The application uses efficient algorithms to encrypt and decrypt the data at the sender and receiver ends, respectively. The graphical user interface (GUI) of the application is very user-friendly and responsive, providing a simplified and elegant experience to the user. The key features of this application are secure data sharing, cross platform support, low memory consumption and easy access of data. Many new features will be added to the existing application in future iterations.

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Advance Cryptography Using Color Code Based Substitution with multi-language Support

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ABSTRACT

The threats to information security have been incrementing at an astounding rate. The most influential approach used for countering such threats is encryption. Various encryption techniques are classified into substitution and transposition techniques. In all conventional substitution techniques; the numbers, characters and special symbols are substituted with other numbers, characters and special symbols. An unprecedented cryptographic substitution method is proposed to generate a stronger cipher than the existing substitution algorithms. This algorithm of substitution is based on Play Color Cipher. Furthermore, asymmetric RSA algorithm is used to make the PCC key more secure and robust. The proposed system will prove that the cipher is strong. A translator is used to enable multiple language input as plain text.

KEYWORDS

Language translator, Play color cipher (PCC), Color substitution, color block, RSA algorithm.

1. INTRODUCTION

Security is the main concern regarding data transfer. Integrity of the data is an important factor for both the sender as well as the receiver. In today's times, many techniques are used to ensure the same; one of those techniques is cryptography. In the substitution techniques frequently used till date; numbers, characters and special symbols are substituted with other numbers, characters and special symbols. Like an alphabet would be substituted with another alphabet itself, or a number would be substituted with a number itself. In this system, an unprecedented cryptographic substitution method is proposed to generate a stronger cipher than the existing substitution algorithms. This system emphasizes on the substitution of characters, numbers and special symbols with color blocks. Color code substitution will be used in the project for encryption and decryption of the data using the algorithm play color cipher. This is known as color code substitution. The cryptanalysis done will prove that the cipher is strong.

2. PROBLEM DEFINITION

Sending data over a shared medium using symmetric key is vulnerable for attack. In Symmetric-key ciphers, the sender sends the plaintext which is encrypted using a shared secret key. The Asymmetric key cryptography system is based on personal secrecy. Unlike symmetric key cryptography, this has distinctive keys: a public key and a private key. Public key of the receiver is used for encryption while the private key of sender is used for decryption. In existing system, play color code technique is only applicable for single language. The data accepted can only be in the English language. This puts restrictions on the data that can be encrypted using play color cipher. Thus, limiting the play code substitution cryptography. The block size which forms a major part in the color code cipher is fixed, that is the block size is pre-defined. This is another vulnerability to the existing systems being used.

On a basic level, Translator performs simple substitution of words in one language for words in another, improving output by limiting the scope of allowable substitutions. This technique is particularly effective in domains where formal language is used the process of language translation in the proposed system which takes the source text and convert it into required language if needed. Analysis is done on the source text to obtain the Interlingua language which is then used to generate the target text.

3. LITERATURE REVIEW

Cryptography based on Color Substitution for plain text was done for English Language. In Symmetric-key ciphers, the sender sends the plain text which is encrypted using a shared secret key. The receiver decrypts it using the same shared key. These ciphers consist of Substitution and Transposition ciphers.

DevyaniPatil et al [1], has proposed that the symmetric key for cryptography in play color cipher was carried out on the ASCII values of the plain text. This was done for single Language for English. In Symmetric-key ciphers, the sender sends the plaintext which is encrypted using a shared secret key. The receiver decrypts it using the same

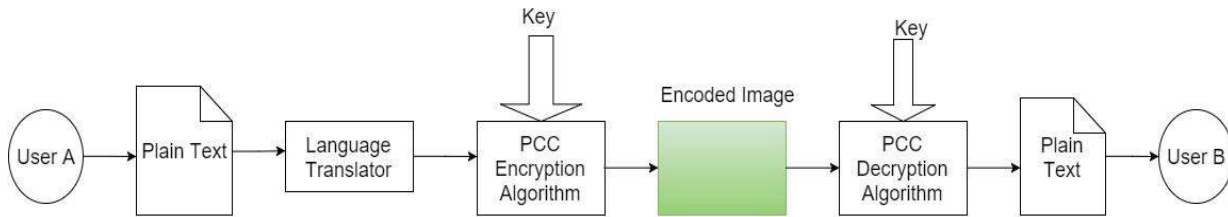


Fig 1: Proposed system

shared key. A Substitution cipher replaces one symbol with another. This formed the basis for color code cryptography. PrasannaRaghaw Mishra et al [2], has explained that the input text given in Hindi language will be converted to English and Cryptanalysis will be performed using translator.

4. PROPOSED SYSTEM

4.1 Diagrammatic Representation

System has proposed advance cryptographic technique with multilanguage support which consist of various techniques that are clubbed together to develop the system as depicted in figure1. The system proposed uses play color cipher to encrypt and decrypt the plain text. The key which is the backbone of any cryptographic technique is symmetric for PCC. In order to make this more robust, the key is encrypted using RSA algorithm which is an asymmetric cryptography technique. The google translator is used to ensure Multilanguage support. The translator is used to convert Hindi language into English language when the input is in Hindi rather than English. Figure1 shows the pictorial representation of proposed system.

4.2 Advantages of proposed system

In order to increase the security of the data and making it more robust, asymmetric encryption technique is used on the data for multiple language.

The character or letter is substituted with a color and then passed through the asymmetric algorithm to obtain the cipher text.

For language support, a translator is used. This way instead of just taking data which is in English language as an input, we can take Hindi as the input text, translate it into English using the translator then accept that translated data for the play color cipher. The cipher is also stronger being an asymmetric key.

To make the system more robust the block size used is made variable. This makes the key used for decryption more secure. Variable block size gives a better chance of security to the system.

After decryption the plain text obtained is again passed through the translator to obtain the original language if the input text was in Hindi. Thus, the decrypted data obtained would be in the language it was originally encrypted in.

5. DESIGN AND IMPLEMENTATION

5.1 Algorithm at Sender Side

1. Accept the input text file in English/Hindi.
2. If input is in Hindi, the translator is used to translate into English.
3. Apply RSA algorithm which generates Asymmetric key on the input data.
4. Cipher text obtained from asymmetric algorithm.
5. Separate the intermediate cipher text into individual characters.
6. Input the color-channel (R/G/B) and a color (RGB value).
7. Depending on the block-size (say n), divide the picture box into a grid of blocks, each of size n.
8. Add the ASCII value of every character with its position and put the value in the color channel selected.
9. For the remaining 2 channels, put the value of the Color inputted by the user.
10. Draw the bitmap image.
11. Send the image to the receiver.

5.1 Algorithm at Receiver side

1. Image will be received at the receiver side.
2. From each block, the pixel value of the central pixel is extracted and then converted to a character. This is done for all blocks and the corresponding characters are extracted
3. The block size and the color channel are extracted from the key.
4. Convert the resulting value into character and get the text.
5. Decrypt the text using the decryption process of the standard encryption algorithm used.
6. Thus the message is retrieved after applying Private Key on the encrypted data.
7. Get the original text back, using translator.

5.2 Flow of the system

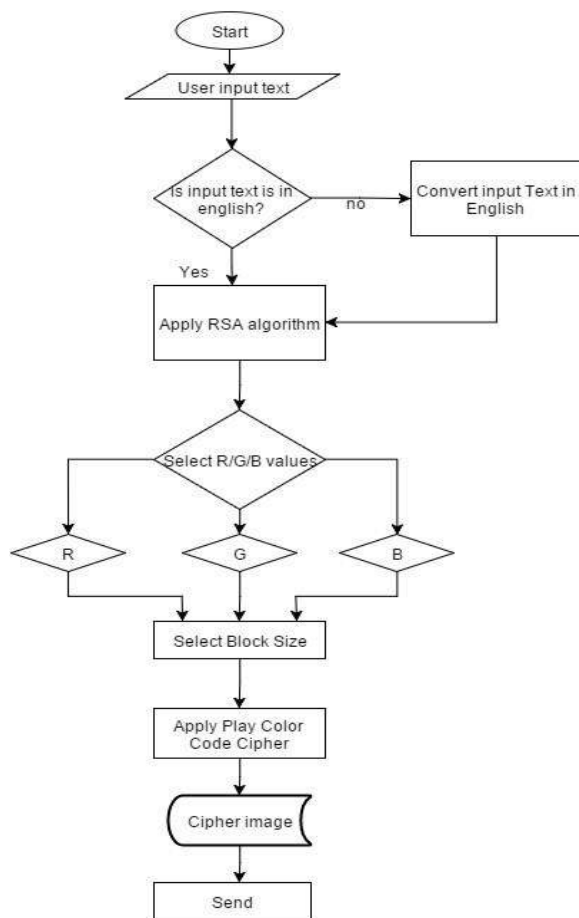


Fig 2: sender side system flow

Above figure 2 describes the working of the proposed concept. The input given by the user is first determined whether it's in English or not. If the language is used for encryption is determined to be in English, RSA algorithm is applied. One color channel from RGB is chosen. The next step is that the block size for encryption in PCC is chosen. The play color cipher algorithm is applied on this to obtain the cipher image. This cipher image is then sent to the receiver side thus completing encryption.

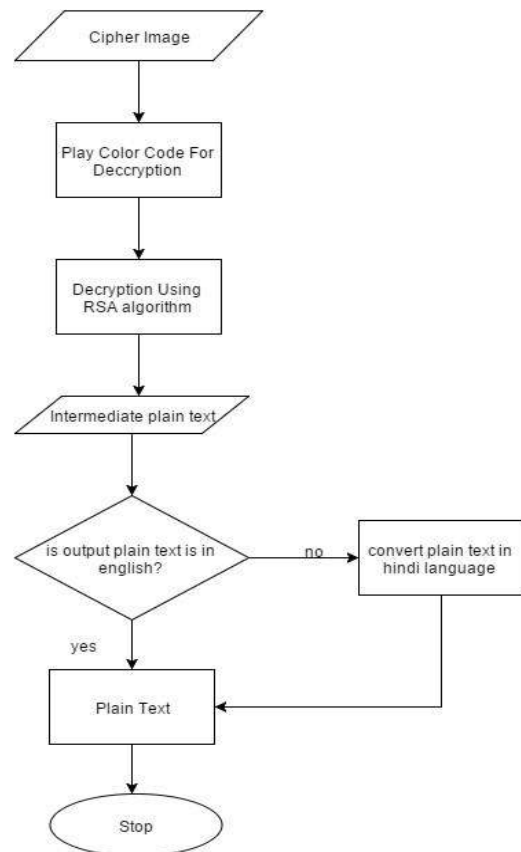


Fig 3: receiver side system flow

In above figure 3, the play color cipher algorithm for decryption is applied on the cipher image obtained after encryption. The next step is to apply the RSA decryption algorithm. The intermediate plain text is thus obtained. If this is needed in the English language then it is sent forth, otherwise translated and then sent as the plain text needed.

6. PARTIAL RESULTS



Fig 4: PCC encryption at sender side

At encryption side input text is taken which is encrypted and cipher image is then obtained

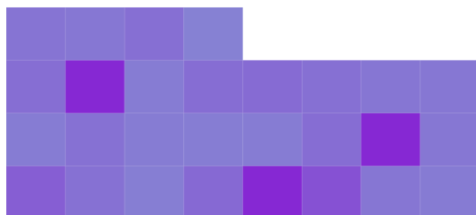


Fig 5: Cipher image

Cipher image created by PCC.



Fig 6: PCC encryption at decryption side

At decryption side cipher image is taken which is decrypted and original text is obtained.

7. CONCLUSION

In the proposed system the cryptanalysis carried out will show that the cipher has great potential as it eliminates major attacks like brute force, man in the middle, known plain text and known cipher text attacks. In this proposed system, implementation of encryption-decryption scheme will be done using symmetric and asymmetric techniques for securing the transmission of data for multiple language support using variable block. In future, the figures, tables, images, etc can be included in the plaintext for conversion and hence the scope of the algorithm can be increased. To generate a stronger cipher, the number of parameters (like alpha, gamma correction etc.) can be increased for generating the color to get 18 decillions of color combinations.

ACKNOWLEDGEMENT

We would like to express our sincere gratitude to the teaching faculty at Viva Institute of Technology whose timely inputs and suggestions, helped in the completion of the project. We would also like to thank the Library and Computer Engineering Departments of our college for allowing us to carry out our research. Finally, we are thankful for having been given this opportunity to learn something new about the world of technology.

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“VIVA-Tech SAM”: Student Attendance Management System

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ABSTRACT

Attendance is a daily activity performed by every institute and college to maintain the records of student's attendance. This record is then used by the faculty of the college whenever needed.

The current system involves a lot of manual work. This paper focuses on designing an automated attendance management system which will reduce much of the manual procedure. The proposed system will be able to store records of student attendance provided by the subject teacher, generate cumulative and defaulter lists and undertaking form automatically. This system will also be able to calculate out of 5 marks for individual student which are required at the end of each semester and provide the attendance details to the subject teachers and to the parents of the student.

General Terms

Attendance, faculty, system, automated, defaulter, marks, student.

Keywords

VIVA-Tech SAM - VIVA-Tech STUDENT ATTENDANCE MANAGEMENT, BIOMETRIC TECHNOLOGY, RFID- Radio Frequency Identification, OCR.

1. INTRODUCTION

Attendance is undertaken in every institute and college. The stored attendance is then used for the analysis by the faculty. The existing system involves a procedure which is conducted manually by the teachers. In existing system, the recorded attendance is stored in the register or on attendance sheets which are handled by the respective teacher, thus the students does not have any access to the records. Defaulter list is formed using these stored records, the calculations required are manually done by the staff. These calculations may lead to human errors and are also time consuming. To inform the parents about the defaulter student, an undertaking form is generated by the faculty and is physically distributed to the student. The form is then signed by the parents of the respective student and is handed over to their class teacher. Since all the records are stored either in register or on

attendance sheets and are need to be maintained throughout the semester the burden of record keeping is encountered.

2. RELATED WORK

Many systems have been developed to store and maintain the attendance records. These various systems include different methods and technologies. Some attendance management systems are based on Biometric Technology [1] which marks the attendance using fingerprints of employees. In some systems attendance is stored and maintained using RFID technology [3] and some uses RFID technology and Face Recognition [5]. The attendance can also be stored using Location Based Time and Attendance System [7]. This system by using the location can determine whether the employee is inside the organization or not. System based on OCR technology [9] is also developed, this technology enables the marking of attendance without user intervention. Also a system is developed which stores the attendance in a computerized way provided by the teacher of a particular class and can also generate report automatically [11].

3. PROPOSED SYSTEM

The proposed system is a web application to automate the attendance maintenance which is done manually in the existing system. The proposed system will be platform independent and will be accessible from web browser.

Using this web application, student will be able to see their cumulative attendance records through an open interface at any time from a web browser. The cumulative record will be displayed based on the choice of student (i.e. date wise, overall). Also defaulter list will be automatically generated by the system, the calculations required will be done automatically by proposed system. To notify the student's parents about the low attendance an SMS will be sent to them automatically by the system.

According to Mumbai University Engineering syllabus, students have 5 marks for their attendance in term work this marks will be calculated by the proposed system against each student.

3.1 Flow of the System

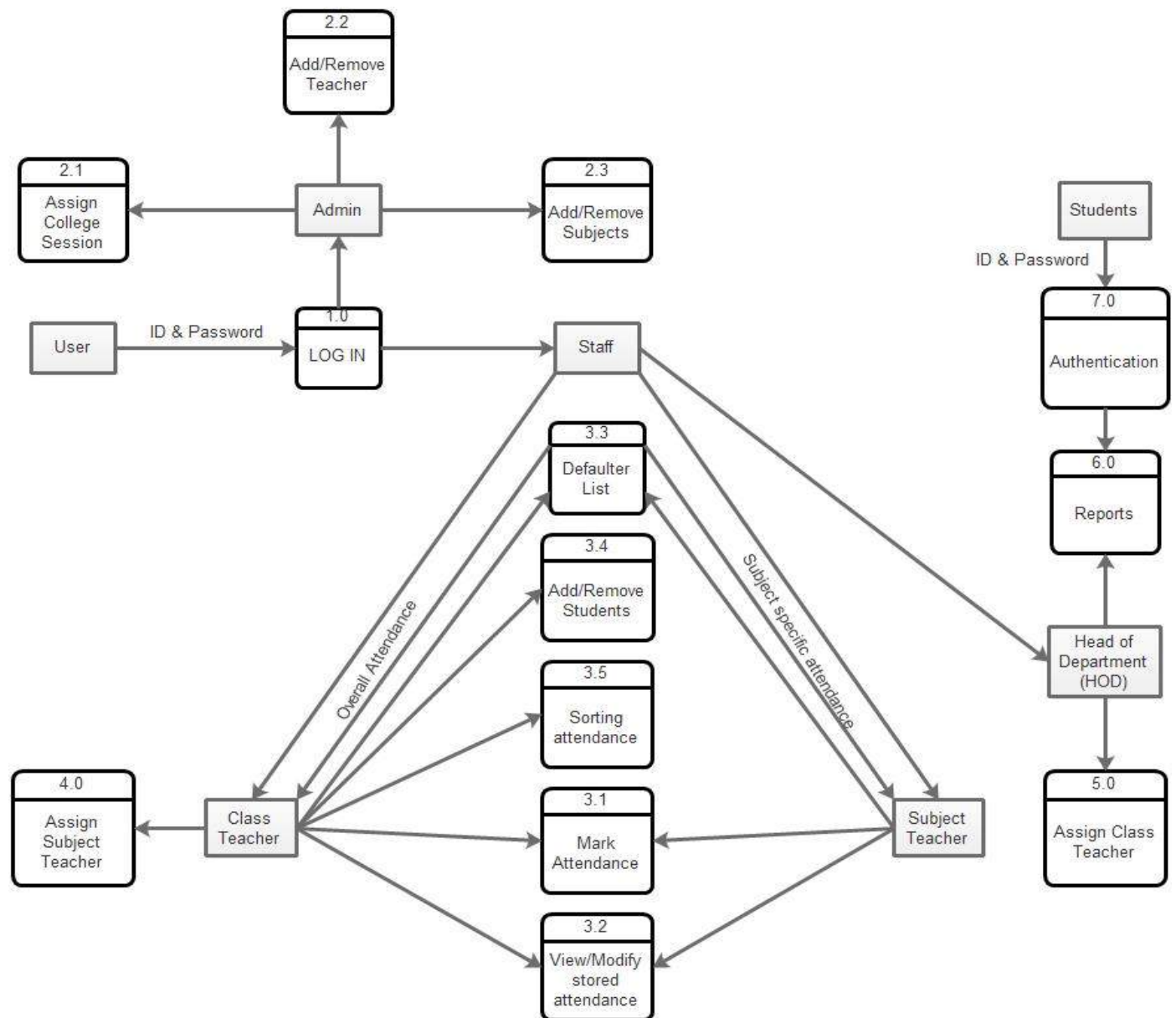


Fig 1: Flow Diagram of the System

Above figure 1. shows the flow of VIVA-Tech SAM system. This system consists of two types of user account- Administrative Account and Staff Account.

i. Administrative Account

Administrative account consists of following functions:

- Add/Remove Teacher
- Add/Remove Subject
- Assign College session

ii. Staff Account

Staff Account consists of two accounts- Subject Teacher and Class Teacher.

HOD consists of following funtions

- Assign Class Teacher

- View Reports

Subject Teacher consists of following functions

- Mark Attendance
- View/Modify Attendance
- Retrive Cummulative and Defaulter List for their respective subject

Class Teacher consists of functions included in Subject Teacher account and also contains some additional functions like

- Add/remove Students
- Sort Student List
- View Defaulters
- Assign Subject Teacher

This system also includes an additional student section function using which students will be able to view to their

4. IMPLEMENTATION

The proposed system is a web application, hence it will be accessible from any platform and whenever required. This system will be developed using PHP5 for server scripting,

attendance records.

JAVASCRIPT will be used for validation purpose, CSS3 will be used for designing frontend using BOOTSTRAP Framework, AJAX is used to implement dynamic response and MySQL database to store the data.

5. PARTIAL OUTPUT

TEACHER ID	TEACHER NAME	BRANCH	
EXTCH001	Archana Ingle	EXTC	Delete
MTCH001	Niyati Raut	Mechanical	Delete
ELTCH001	Bhushan Save	Electrical	Delete
CVTCH001	Lissy Jose	Civil	Delete

Fig 2: Assign Head of Department

Figure 2 represents the GUI of Admin for assigning Head Of Department (HOD) for a particular branch. It also shows the various teachers that are assigned as HOD for their respective

branches. Also various functions of Admin are visible in the menu of the figure.

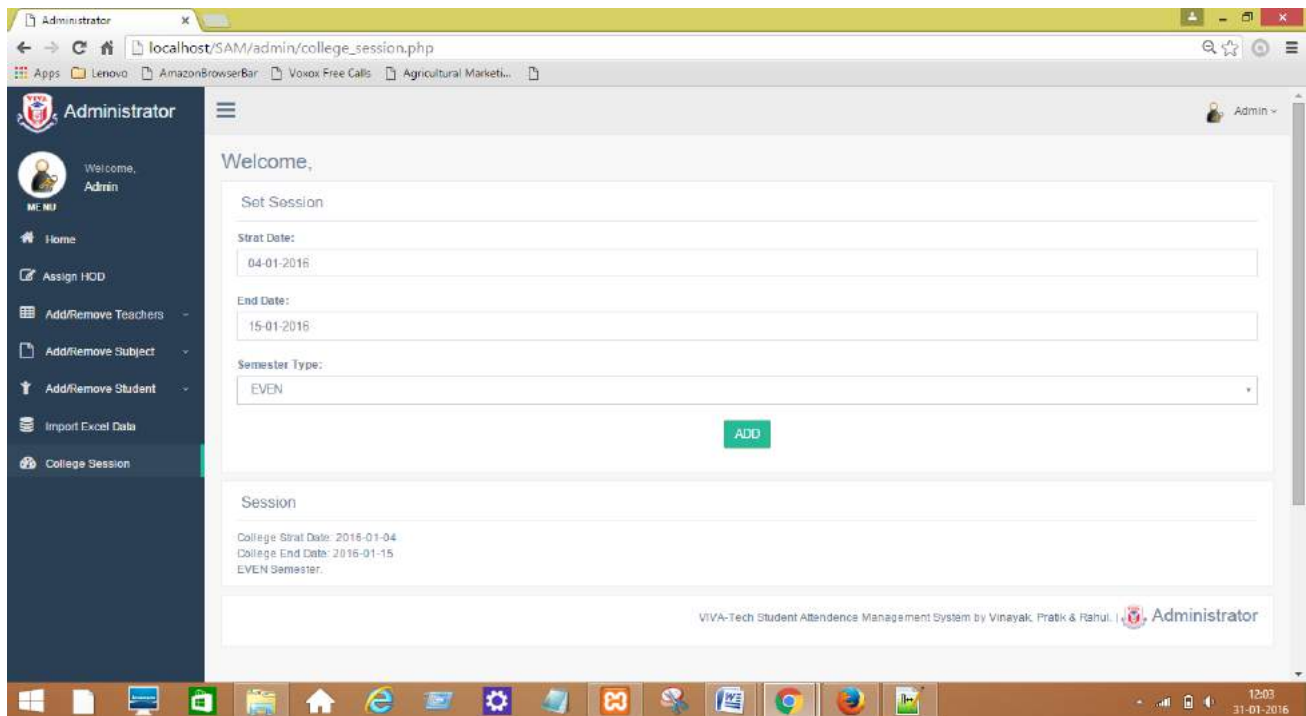


Fig 3: Assign College Session

Figure 3 represents GUI for assigning college session for the VIVA-Tech SAM system. This functionality is accessible for

the admin only. Many functionalities of the system will be depended on this college session assigned by the admin.

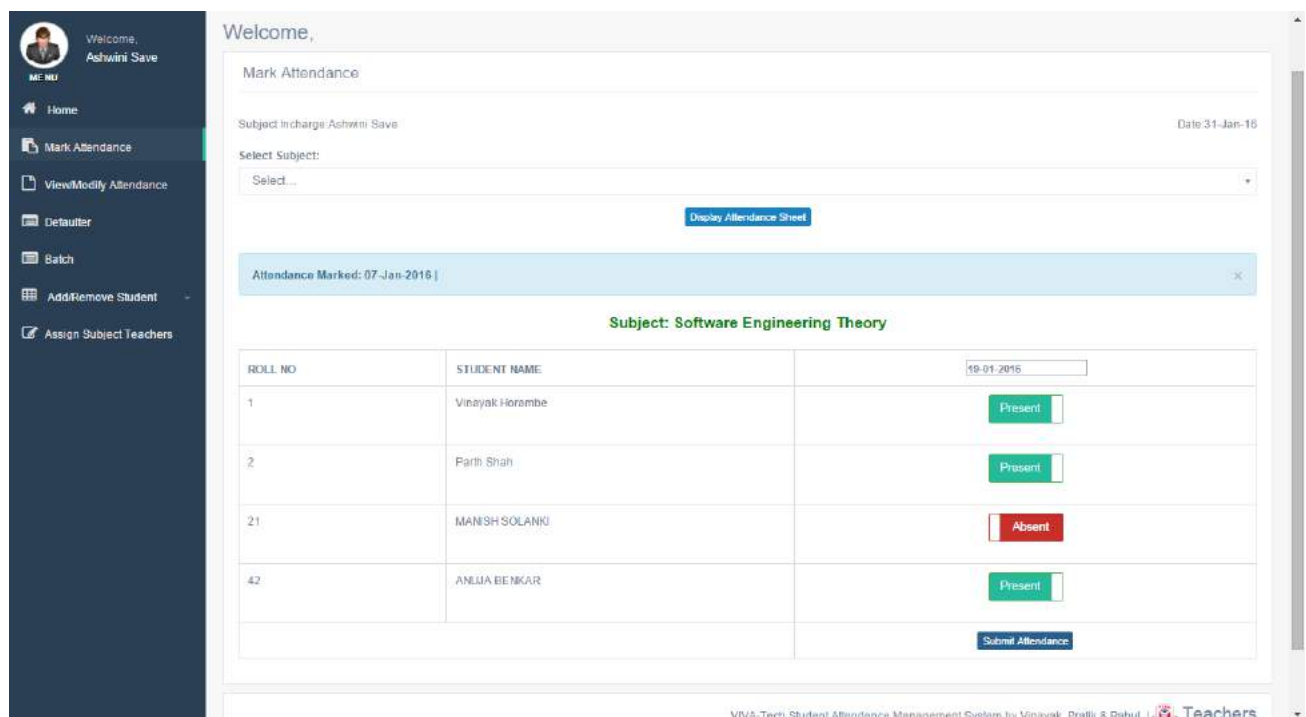


Fig 4: Mark Attendance

Figure 4 represents a GUI for marking attendance of a class. This functionality will be accessible to all the subject teachers

of all the branches in the institute. Also various functionalities of subject teacher are mentioned in the figure.

Figure 5 represents the GUI showing defaulter of a particular class. This functionality will be used by each of the subject teacher assigned in various branches of the institute to view

This paper results to a system that will provide easier record keeping, generate defaulter list automatically, provide an interface and dynamic analysis of attendance to students, printing undertaking form for students etc. Also it provides additional facilities like SMS and Email services for contact purpose. Also system will automate the procedure and reduce much of work which is presently manually done.

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Evolving Learnovators

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ABSTRACT

E-learning is one of the emerging needs of the information age. E-learning is essentially the computer and network-enabled transfer of skills and knowledge using electronic applications and processes to learn. Our main aim of creating this system is to enhance the studying pattern of students by regularly providing them with relevant content and updates. Content is delivered via the Internet, intranet/extranet, audio or video tape, satellite TV, and CD-ROM. E-learning has created new markets for teaching and learning material and equipment, attracting the attention of academic institutions as well as companies supplying them in different sectors – computer manufacturers, software producers, special training providers. E-learning has been a topic of increasing interest in recent years. In a typical e-learning scenario, many of the activities can be perceived and modeled as processes and consequently be executed as workflows. On the other hand, there are increasingly many activities, which aim at providing services of any kind on the Web. This proposed system combines the areas of e-learning and Web services. This proposed system enables content providers and content learners to communicate appropriately through a Web service platform with its common description, publication, and retrieval functionalities. Finally, the corresponding system is proposed to fulfill the e-learning environmental needs.

General Terms

Learning Management System, Text segmentation, genetic, ID3 Algorithm.

Keywords

E-learning Application, Educational Application.

1. INTRODUCTION

In this proposed system, we describe an adaptive web application, where students can adjust some features according to their preferences and learning style. This system uses the internet and related technologies for the development, distribution, enhancement of learning resources and also develops professional skills. Personalized assistance that teacher provides in a traditional classroom is not easy to implement. Students have regular contact with teachers using e-mail, chats via social networking sites so the teacher is able to provide students with their expert reviews. The proposed system provides following services-login service, question service, scrap service, upload service, remove service and study material. The system provides administrative services, faculty services & student services.

The system provides numerous features for students as well as for the faculty. This is a web application for electronically supported learning & teaching. E-Learning is the computer and network -enabled transfer of skills and knowledge.

1.1 Problem Definition

This system overcomes the drawbacks of current synchronous learning systems, besides it benefits engineering students as per their preferences. It provides optimized and relevant content which reduces unnecessary searching time. Asynchronous learning it allows the learner to decide when and where he/she wants to study the courseware. This proposed system offers an alternative that is faster, cheaper and potentially better. Although information technologies have evolved and offer many new innovations, e-learning systems are lacking functionalities that could be incorporated. This is due to two main reasons. Firstly, educators and institutions planning to embark on the deployment of e-learning solutions do not always understand the capabilities, limitations of these technologies. E-learning systems are not as per user requirements. Thus, despite many advantages, we can enumerate several drawbacks of existing e-learning systems. The knowledge delivered is frequently difficult to apply and is disconnected from the learner's current activities. There is a need to integrate and formulate a holistic and comprehensive model for evaluating e-learning. The mode of delivery is not well suited. The architecture of or proposed system will resolve the drawbacks in existing E-Learning system, such as scalability, interoperability, availability.

2. RELATED WORK

Self-paced learning modules allow learners to work at their own pace. Learners are free to decide when he wants to study the courseware. Several e-Learning trends and software's are available. LMS stands for Learning Management System. LMS is software that deploys, manages, tracks, and reports an interaction between learners. Besides its functionalities includes student registration, tracks learner progress, scheduling, delivery of content, and communication between learner and teachers.

LMSs are built on various platforms, commonly PHP, Net or Java and they will hook up to a database such as MySQL or SQL Server.

This proposed system is using the advanced version of SCROM (shareable content object reference model) i.e. TINCAN API to overcome the limitations of SCROM. It was used for proper delivery of content, exchange and sharing of

data at runtime. The extra features provided by Tin Can include simplicity, extra security measures, the ability to run courses outside the LMS, better support for offline and mobile learning and is regularly updating. Development of Tin Can is an ongoing project so we should expect more from it in the future.

E-learning makes good use of database and LMS. The data is stored in the database and LMS provides a user interface for you to add, update and delete data. A good LMS will often provide reporting tools to generate user requirements and updates.

3. REVIEW OF ALGORITHMS

3.1 Text Segmentation Algorithm

Segmentation algorithms can be applied to automatically transform unstructured data into relevant content appropriate for e-learning courses. The hierarchical LDA model with the domain and pedagogical ontology essentially tries to segment the text in such a way that the segment is topic cohesive, with respect to the domain ontology and concerned with only one pedagogical role. The user gets a privilege to have an access to relevant data as per the user requirements avoiding unnecessary search time.

3.2 Genetic Algorithm

The system seeks an optimal path starting from the learner profile to the pedagogic objective passing by intermediate courses. Hence, Genetic Algorithm is useful. The user is provided with the content which is more viewed by other users and also they get an easy analysis of the best data content available presently.

3.3 ID3 Algorithm

It describes the analysis of e-Learning behaviour Based on ID3 Algorithm Decision tree; it is used to greedy search through the given set. ID3 is one of decision tree algorithm; it uses information gain to help it decide. The final result represents a possible scenario of decisions and its outcome. Based on the decision tree analysis, the curriculum designer of e-learning will be easy to visually understand student's behaviour and then compose well-organized e-Learning contents which are updated and modified online instantly.

4. PROPOSED SYSTEM

The E-Learning system which we have built acts as an interactive media between the teachers and the students. The system acts as a forum where the transfer of knowledge takes place. The E-Learning system provides the following features:

Any user can create their own profile by registering & thereby logging into the system. A user can upload their profile picture; change/update various features associated with their profile. Study materials of different engineering fields are provided in the system. Course file of any of the specified courses/subjects can be uploaded or downloaded in the system. Students can post their queries. Teachers could thereby answer their questions and post them into the portal. Online CHAT option is also present. The system is associated with searching and feedback facility.

The proposed systems database will contain relevant information on an e-Learning platform as an information and communication tool. The system will provide improvised better engaging content through the use of meaningful

analytics data content which will be secured as the tin can is used. The material will be easily consumable whether it's your PDF or printed material and will avoid unnecessary wastage. This proposed system is highly interactive by adding audio, video, attention-grabbing images.

In text segmentation algorithm a hierarchical LDA model for segmenting e-learning materials using domain and context ontology with the required ontology concept evaluation measures has been proposed. The usage of this hierarchical LDA model makes the segmentation process flexible to accommodate the growth of large e-learning materials.

The expected features of the proposed system will be Keeping track of updated contents, Online access to videos and study contents for learning purposes, Online syllabus, Online readings, links, sites to other text -based materials, Online sharing of materials among students, Online discussions.

In Fig. 1 activity diagram gives a brief explanation of how the student, teacher, and admin entities work in co-ordination according to their respective requirements and how the admin manages to provide proper content delivery and data integration.

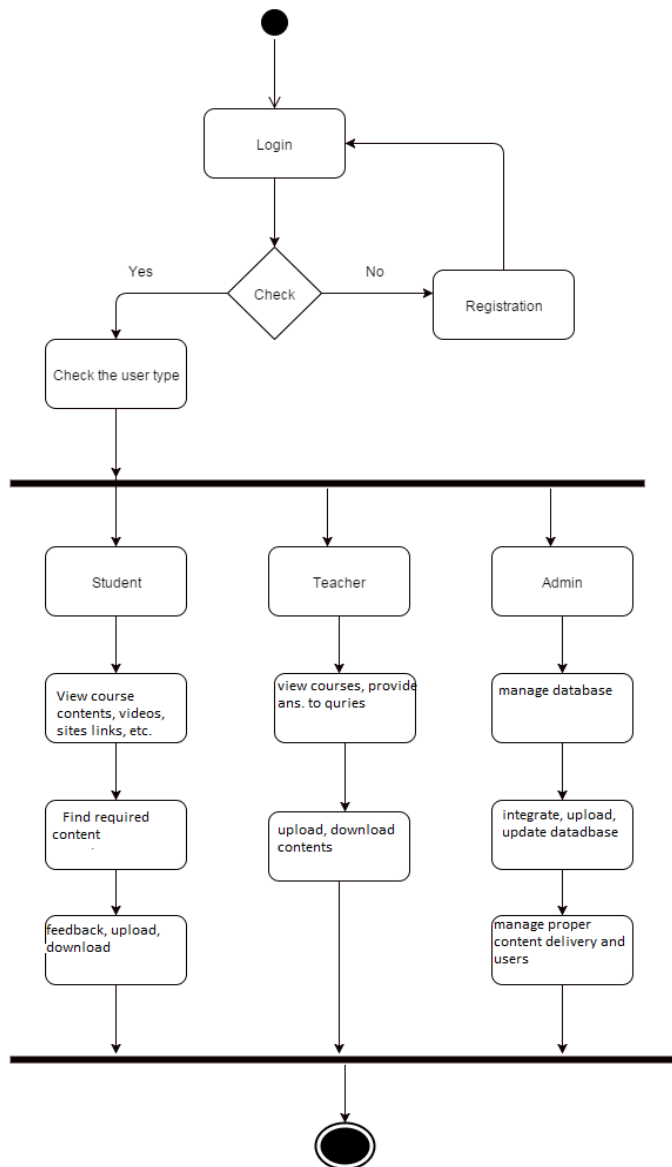


Fig 1: Activity Diagram

5. IMPLEMENTATION

Login service provides two operations namely Login and Logout. If the user is a student, all the privileges that are specified for any student are given to this user. A type variable is assigned as "student". If the user is a Teacher, All the privileges that are specified for any student are given to this user. Variable is assigned as "teacher". If the user is an administrator, the type variable is assigned as "admin". Accordingly a user is allowed access to the system on proper authentication.

This is the main service provided by our E-Learning system. The system provides various courses on different subjects (e.g. Introduction to computing). The courses are managed, manipulated, uploaded, downloaded, deleted, added and updated according to the operations provided by this system.

Upload service- Each of the users can upload various recourses to the site. They can upload various files of the courses specifies from their computer.

Remove service- The files or the photo uploaded by the user can be removed. The web methods created for this service are removing File and remove Image.

The Fig 2 stepwise flow diagram explains how we implement the proposed system using a proper flow of procedure.

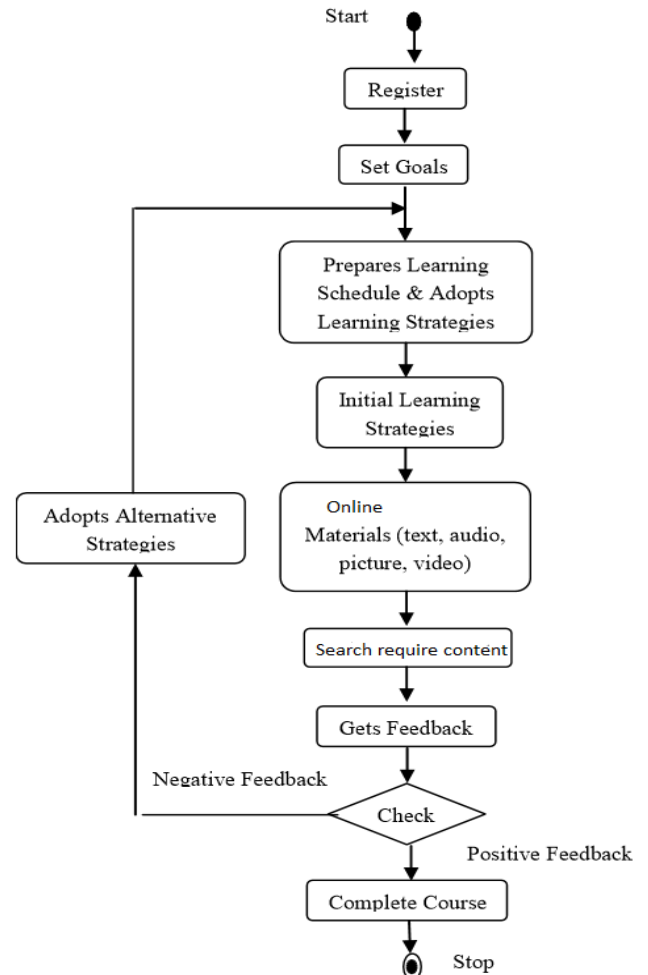


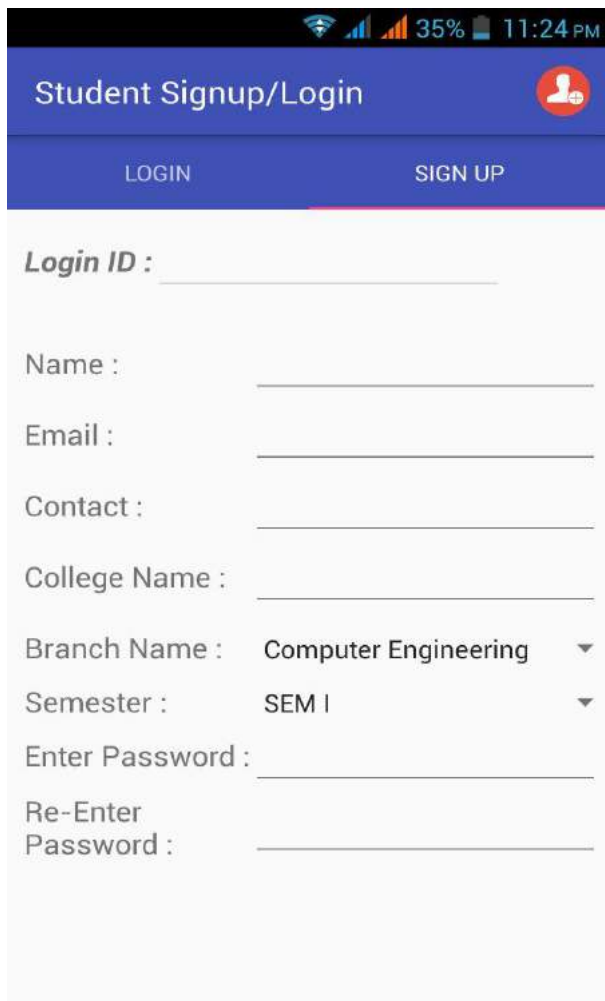
Fig 2: Stepwise Procedure

There are three users in the system:-

1. Administrator- Administrator can block or remove any user profile as required. The administrator can block or remove, upload or delete any course being provided by the E-Learning system.
2. Student - Student can create and update their own profile, they can post feedbacks or queries and teacher can answer any question posted by a student, the student can view all the question sets for a selected course provided by the teacher in the system. They can download files that are uploaded by teachers or administrator.
3. Teacher – Similarly teachers can also create and update their own profile. The teacher can answer any question posted by a student, the student can view all the question sets for a selected course

provided by the teacher in the system. The teacher can upload the files or videos related to studies.

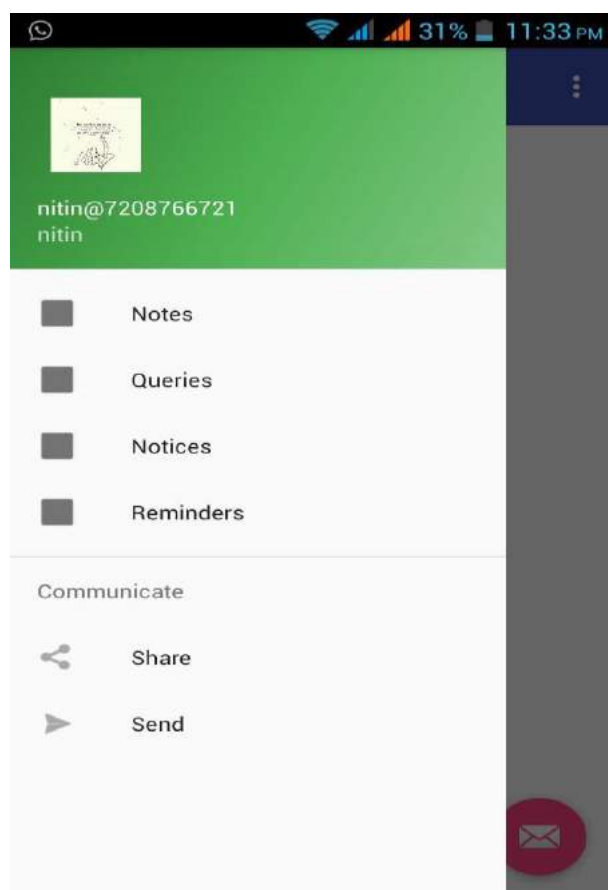
6. PARTIAL RESULT



The screenshot shows a mobile application interface for student signup and login. At the top, there's a status bar with signal, Wi-Fi, and battery icons, and the time 11:24 PM. Below that is a blue header with the text "Student Signup/Login" and a red circular icon with a white person silhouette. Under the header are two buttons: "LOGIN" and "SIGN UP". The main form area has several input fields: "Login ID :", "Name :", "Email :", "Contact :", "College Name :", "Branch Name :" (with a dropdown menu showing "Computer Engineering"), "Semester :" (with a dropdown menu showing "SEM I"), "Enter Password :", and "Re-Enter Password :".



The screenshot shows a mobile application interface for student notices. At the top, there's a status bar with signal, Wi-Fi, and battery icons, and the time 11:33 PM. Below that is a blue header with the text "Student Notices" and a home icon. Under the header is a section titled "Notices". There are three notice entries, each with a date, a message, and a sender. The first notice is dated "02-01-2016" and says "Hie comps.." by "vvf(Computer Engineering)". The second notice is dated "02-01-2016" and says "College is starting from 4th jan of 2016. Hope you had enjoyed your vacations...!!" by "aa(Civil Engineering)". The third notice is dated "01-01-2016" and says "Happy new Year...!!May you dedicate the New Year to humanity and the betterment of the world at large." by "a(Computer Engineering)". The fourth notice is dated "05-01-2016".



7. CONCLUSION

Friendly user interfaces that makes the system accessible to everyone irrespective of their computer knowledge. It overcomes the drawbacks of data integration, accessibility to course contents, and eradication of irrelevant and unstructured data of existing systems. It encompasses a wide range of functionalities not only for the students but also for the teachers. Use of open source software will not only be cost effective but will also meet the localized demands. Future testing and validating of both the proposed and the extended model will be beneficial to the continued growth of this important research. Designed services can be used by service providers.

Different security measures can be implemented to secure use of services. By accessing many more services provided by different service providers, this E-Learning project can be enriched by adding more features and proper content delivery. In this way, it is expected that this proposed system is going to satisfy the user requirements.

This project has a lot of scope for future development. Features like the ability to capture videos for making the presentation, video transition effects, etc. can be implemented in the future scope of this proposed system. Finally, the relevance of the project is that it will be a user satisfactory guide.

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Secured E-Documents and Sharing using Encrypted QR-Code

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ABSTRACT

Nowadays, technology has largely influenced various systems that we use. Many organizations have been making efforts on developing system for saving people's time, efforts and providing convenience. Organizations around the world are increasingly interested in the potential for delivering various services through internet. The proposed system aims at developing a system for managing user's documents by uploading them on cloud database after verification and making them available to the respective users. Thus the user will be able to share the required documents to third party organizations just by sharing an encrypted QR code. The third party will also be able to verify authenticity of documents with the use of digital signatures. The proposed system will not involve generation of any new documents. This system will save time and provide convenience to the user. The system will provide access to the user through secured login.

Keywords

Digital Signature, QR-Code, AES Encryption (Advanced Encryption Standard), Secure Sharing of Documents.

1. INTRODUCTION

In traditional system submission of documents is needed for a verification procedure. It is needed to submit attested copies of original documents. This procedure involves lots of paper work and makes limited use of technology and also has very less transparency. The proposed system aims at changing this traditional approach into a simple approach of document verification using digital signature and uploading on database and also allows sharing using encrypted QR-code. The proposed system will provide access to various digitally signed documents through the web portal and physical movement of documents to various government offices will be reduced and it will also reduce misplacement of user documents. An individual just need to provide a system generated Encrypted QR code and the authorized third party agency will get access to your documents by scanning the QR code. The proposed system will eliminate fake documents as there will be a manual Verification of documents before user registration. The documents will be signed digitally through digital signature by an authorized user. The authorized third parties would be able to verify the authenticity of the documents with the help of digital signature. The digital documents would be required to be updated from time to time in case of changes in documents or renewal of documents.

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The proposed system will have responsive and user friendly interface. The proposed system will thus provide access to important documents of the user with greater ease and convenience.

2. RELATED WORKS

Many systems are being developed to provide government services over the internet. The paper describes the implementation of a system to provide government issued user documents to the user over the internet and sharing of these documents to third parties in a secure way. Encryption is an important aspect of this system [7].

Encryption is cryptographic technique to convert a message or data into such a form that it becomes unreadable and thus safe. There are many encryption standards available for encryption and decryption of data. One such standard is DES (Data Encryption Standard) which uses 56 bit key for encryption and decryption [7]. In spite of being a powerful encryption standard, DES is not used due to its shorter key which makes it less secure. Today many computers can easily crack DES encryption which was not possible some years back. AES (Advanced Encryption Standard) Algorithm on the other hand which uses permutation techniques for encryption is comparatively more powerful than DES [2][12]. It uses 128,192,256 bit keys for encryption. This algorithm has speedy key setup time and good key agility. It also has low memory requirement, which makes it very much suitable for implementation in memory restricted environments. This makes implementation of AES encryption more suitable for the proposed system.

Another aspect of technology that is integral part of this system is "QR Code". Barcodes have been used since many years for purpose of storing small piece of data that can be easily read by a barcode scanner. The limitation of barcodes is that it can store only numbers. Denso Wave a Japanese corporation soon realized need to develop a new technique to store information that can be easily retrieved and has good storage capacity. This resulted in development of QR (Quick Response) code. In QR Code encoding of information is done in both the vertical and horizontal direction, thus holding up to several times more data than a traditional bar code [5]. The QR code data is used for sharing links, contact information etc. It is not used for any security based applications.

Digital signatures are one of the most important techniques of modern cryptography, and have many

applications in information security systems [6]. The proposed system will use digital signature for verifying if the document shared is authentic or not. There are various digital signatures algorithms developed for generation of digital signatures and to verify the authenticity of documents. Once such algorithm used for generation of digital signatures is DSA (Digital Signature Algorithm). DSA is based completely on difficulty of computing discrete logarithms.

3. PROPOSED SYSTEM

The system will provide access to documents of a user over the internet and also facilitate sharing of documents with registered third parties through sharing of Encrypted QR Code. The system will use HTML, JAVA Servlet Pages (JSP), CSS, JAVA, and JQuery. Following are the key technologies used in this system.

3.1 QR Code Encryption

Japanese Corporation Denso Wave developed a two dimensional Barcode known as QR (Quick Response) Code [5]. In this encoding of information is done on both horizontal and vertical directions and thus holding up to several times more data than a traditional bar code. These codes have rapidly gained popularity worldwide and have been adopted by many systems especially in Japan due to its ability to encode Kanji symbols by default which makes it especially suitable. QR codes are used for storing URLs, addresses, signs, business cards, public transport vehicles, etc. QR Codes consist of different areas that are reserved for specific purposes. QR codes are used for its faster readability and greater capacity to store information [3].



Fig. 1 QR Code

The smallest Codes are of size 21x21 modules as shown in figure 1 above. These are called version 1 QR codes. The size of QR Code increases by 4 modules for each next version of QR Code. The largest QR Code is of size 177x177 known as Version 40 QR Code [1].

QR Codes also have some error correction information which helps the QR Code reader to read the information stored on the QR Code even if some part of the QR Code is damaged. There are four distinct levels of error correction: L, M, Q, H. the lowest level is L where a QR Code can be read even if its 7% part is damaged or unreadable. The next level is M with 15%, then level Q with 25% and level H with 30% error correction[5],[11].

The capacity of a QR Code depends on the version and error correction level as well as on the type of data that needs to be encoded. A QR code can encode three data modes which are Numeric, Alphanumeric and Byte [8].

3.1.1 Encrypting QR Codes

Encryption of QR Code makes use of AES Encryption Algorithm. The contents of QR Code are first encrypted using

AES Algorithm with a Private Key from the Database and same key used for decryption at third party end.

3.2 Digital Signature

Digital signatures are one of the most important inventions of modern cryptography [4]. A signature and thumb impressions are used in various legal operations to authenticate documents. A signature for an instance on a document shows authenticity and helps to identify the person who has authenticated that particular document. In computers a similar technique is used to check if some document is authentic or not. This electronic technique is known as "Digital Signature" [9].

Some of the reasons for applying digital signatures are:

3.2.1 Authentication

Digital signatures are used to authenticate the user who created or owner of the document. When the owner has a key that was used to create the signature it becomes easy to authenticate the owner.

3.2.2 Non repudiation

Non Repudiation provides an important aspect of digital signatures, it ensures that an entity that has signed a particular information cannot at a later time deny having signed it.

3.2.3 Integrity

The integrity of a message is maintained because if a person tries to change the contents of an original document the digital signature changes and thus document will become invalid as this document will have new signature [6].

3.3 Proposed System Stepwise Procedure

The stepwise procedure of the proposed system is as follows:

1. The data operator will get himself/herself registered by a specified enrollment and verification procedure and get access to the system through a login procedure.
2. User will get his/her documents verified and uploaded through the data operator at the data center.
3. After successful completion of step 1 and 2 the user will get himself/herself registered by providing information through a web form.
4. The Authorized person will apply digital signature to documents after verifying.
5. After successful verification of uploaded documents User will receive his/her unique user-id and password.
6. The Third party user will get Registered and verified.
7. Third-party requests documents to user.
8. The user logs in and selects the documents that are stored on the database.

9. The system will generate encrypted QR code which will be shared to third party to get the requested documents.

10. Third party will get access to the User Documents provided by the user through Encrypted QR code.

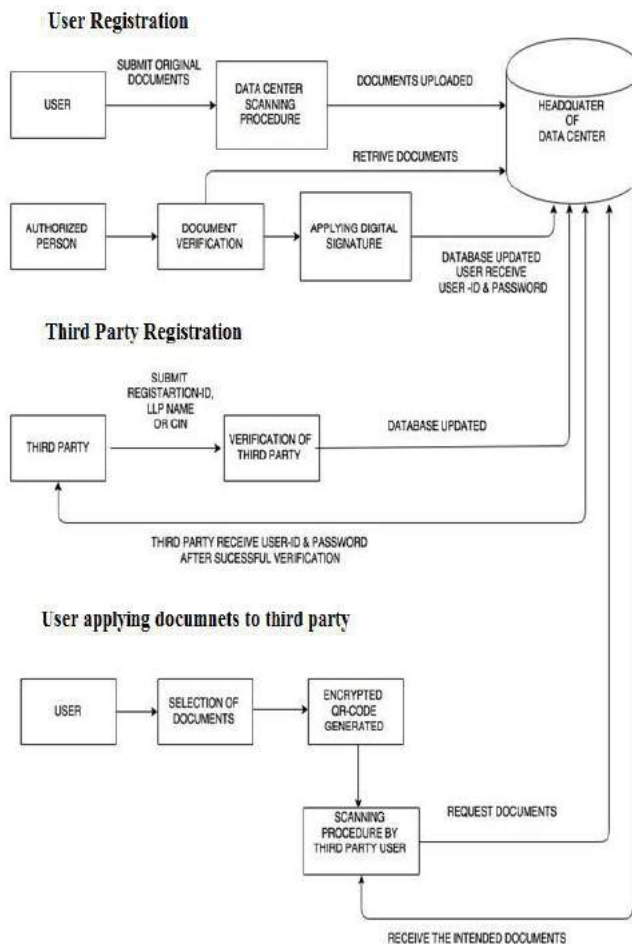


Fig. 2 Proposed System

Figure. 2 above shows the proposed system flow. In this flowchart the first part shows user registration procedure. The second part depicts registration of a third party organization. The last part of the flow chart shows how a user will use the system.

4. RESULTS

The proposed system when compared to manual system shows following results and advantages as stated in table 1. Below.

Table 1: Comparison of Traditional v/s Proposed System

Traditional System	Proposed System
Repeated manual verification	One time manual verification
Involves use of paper i.e. Attested copies of Document	Limited or no use of paper

The operational efficiency and consistency is low as compared to web-based	The operational efficiency has been increased due to web-based method
Involves physical movement of documents	No physical movement of document
Risk of Loss of original Documents	Original Documents remain Safe with user
Verification of authenticity of documents time consuming and complex	Easy to verify authenticity of documents and less time required

The proposed system proves to be a better approach in many aspects. It uses technologies that will enable users to save time and at the same time provide security.

Following images are the partial implementation of the proposed system.

USER INFORMATION

Firstname
 Middlename
 Lastname

Date of birth
 Date
 Year
 Gender
 Caste

Address
 State
 District

City
 Pincode

Email id
 Phone no

Fig. 3 User Registration

Figure 3 above shows the user information registration. In this basic information of the user like name, address, contact no etc. will be obtained through a form.

DOCUMENT UPLOAD

User EIN74762704 has been created

Select a document to upload

Photo

User.png

Maximum upload size is 5 MB.

Fig. 4 Uploading User Document

Figure 4 above shows user document uploading procedure wherein user documents will be uploaded.

LIST OF DOCUMENTS

#	Document Name	E-Signed	View	Select
1	Photo	Yes	View	<input checked="" type="checkbox"/>
2	Passport	Yes	View	<input checked="" type="checkbox"/>
3	Pan Card	Yes	View	<input type="checkbox"/>
4	Voting-Card	Yes	View	<input type="checkbox"/>
5	Caste Certificate	Yes	View	<input checked="" type="checkbox"/>
6	Electricity Bill	Yes	View	<input checked="" type="checkbox"/>
7	Adhar Card	Yes	View	<input type="checkbox"/>
8	Ration Card	Yes	View	<input type="checkbox"/>
9	Driving Licence	Yes	View	<input type="checkbox"/>
10	Birth Certificate	Yes	View	<input type="checkbox"/>

Enter the Username to be shared

Fig. 5 Selection of User Documents

Figure 5 above shows selection of user documents by user for generation of a QR Code for document sharing purpose.

QR CODE for :- EIN74762704



Fig. 6 Generated QR Code

Figure 6 above shows generated QR Code after selection of user Documents. The generated QR Code will be shared with Third party with whom the user intends to share his/her Documents

5. CONCLUSION

The implementation of the proposed system will avoid carrying of original documents, attestation of documents and provide a simple and better approach. As the documents will be stored on database the user will have access of his documents from anywhere and at any time. The proposed system provides a good level of security as it uses an encryption algorithm for encrypting the data stored on QR code. DSA Algorithm is used for digitally signing the documents. Encrypted QR-code will be used for sharing the documents in the system. The proposed system will avoid the tedious and cumbersome task of repeated verification of documents. The proposed system can be used by a large number of organizations where the requirement of document verification is more.

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Optimization of Cloud Data Centers

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ABSTRACT

Majority of the institutes are moving from traditional database server approach to the cloud storage approach. Cloud has shared and generally globally available data centers which hold the large amount of data owned by multiple users. As per the survey, size of data on the famous data centers is growing 40% annually. As the size of data center is going on increasing, the process of managing data center is also becoming complicated as well as difficult. This process involves adding new resources like computing power, storage, and network by combining hardware, software, virtualization, and orchestration. Data center optimization is important for achieving operational efficiency, delivering modern services, taking advantage of new business opportunities like Big Data, high performance computing, enterprise mobility and collaborative computing.

Availability, performance and security are the cornerstones of infrastructure quality. Data center has become the central hub for almost all technologies. Data center administrators are constantly trying to find ways of optimizing the operation of data center. This paper addresses some of the possible methodologies which can be helpful to make data centers more efficient.

General Terms

Cloud Computing, Software-defined-infrastructure, performance enhancement.

Keywords

Cloud Computing, Data-center, Software defined infrastructure.

1. INTRODUCTION

Cloud computing can be defined as a style of computing where scalable and elastic IT-related capabilities are provided 'as a service' to external customers using internet technologies. Service based, scalable and elastic, shared, metered by use, and internet technologies are the important characteristics [1].

Cloud computing provides lots of services like hosted virtual desktop, hosted servers, app virtualization, and cloud storage. Cloud also enables ubiquitous access to resources and applications, and workload flexibility [2]. All these services will be implemented on the cloud data center; if data center becomes unavailable or inaccessible then these services cannot be used by the cloud users. So the data center should be strong enough to provide the service to all users with least down time [2].

There is no any standard and fixed data center architecture style, which may fit all solutions. Some of the business

processes may require high performance and other may demand for reliability, serviceability, and availability.

Compute-intensive, latency-sensitive workloads require huge computation power to achieve high performance [3]. Such systems may include grid computing or cluster computing workstations and solid state drives. Business continuity scenarios will demand for the 24/7 availability of business operations. Here multiple replicas will be present and down time will be eliminated through redundant copies of the data. Agility and speed scenarios may be built on a highly virtualized environment. It will be able to provide on demand service and will consist of SAN storage or NAS depending on the requirements [5].

Either to build new data center or to enhance the capabilities of existing data center is a complex decision.

This paper describes various ways to optimize and manage the data center of the cloud computing effectively. Section 2 explains exact optimization process of the data center. Section 3 explains the software defined infrastructure which enhances the capabilities as well as efficiency of a data center. Section 4 gives some advanced techniques which can be implemented to make data center more effective. Section 5 includes the effective measures required for management of the data center and all its resources.

2. WHAT IS OPTIMIZATION OF DATA CENTER?

Optimization is not a complete 'rip and replace' process, it is a set of different steps which should be followed one after another. Optimizing a data center is nothing but the advancements in compute, storage and networking technology as well as setting up the optimized and updated software applications [6].

Latest hardware and software capabilities are designed to minimize the operating expenses and to maximize efficiency and to ensure the security. More powerful machines with faster processor, less power consumption will be plugged to enhance the processing capabilities [7].

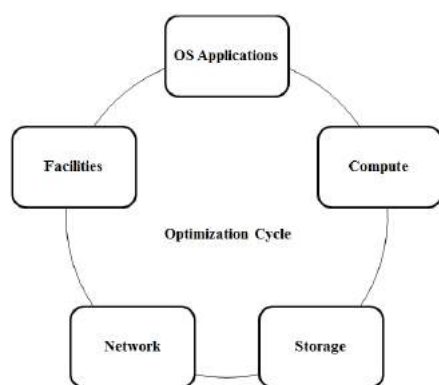


Fig 1: Data center optimization cycle

High speed network setup between cloud data centers and users as well as between two data centers will be established to enhance the communication and data access capabilities. Bandwidth of existing networks will be increased to increase the speed of data transfer [3].

Reduced physical connections will simplify the network design, and it will be beneficial for network management and maintenance. Use of solid state drives provides faster read and write operation on data. It provides speed, reliability and consistency [4].

Above figure shows the optimization cycle with all the steps involved in it.

3. SOFTWARE DEFINED INFRASTRUCTURE (SDI)

Cloud computing mainly consists of the three components wise storage, network and computation power. Software Designed Infrastructure is the mechanism to make each of these components flexible. According to the business need and the technical requirements at any specific time SDI will reconfigure the specific components [11].

3.1 Software Defined Storage (SDS)

With the help of this technique storage becomes easy to scale out. There will be multiple storage servers also called file servers present in the data center. Through the implementation of SDS all file servers will be connected to each other and new servers can be easily plugged into the system without disturbing the functionality of existing system. Multiple synchronous replicas will be maintained for high availability as well as for greater performance [12].

Customers require reduced storage costs, increased storage efficiency, protection of key data and workloads, ability to easily grow storage capacity. Software defined storage provides the following functionalities in the data center.

3.1.1 Deploying cost-effective software defined storage platform

System will support pooled direct attached storage; new clusters can be added without reconfiguration of existing servers. System will provide the performance and availability like SAN.

3.1.2 Central management and deployment of more storage on premises

All the file servers can be managed centrally. It enables the de-duplication and ease of communication among the different servers.

3.1.3 Delivering business continuity for data and workloads

There will be n-number of synchronous storage replicas, in case of failure or unavailability of any replica another replica of the same data can be used to provide the service to users. As per the environment of system usage, full replication or partial replication strategy can be used to create the replication of data. If frequency of write operations is more, then partial replication or no-replication strategy will be implemented, due to overhead of maintaining consistency of replicas. If most of the operations are read-only then full replication will be helpful for high availability. Data protection manager will be responsible to handle backup and recovery mechanisms.

3.1.4 Deployment of a scalable hybrid cloud storage solution

System can easily grow and shrink as per the requirement of storage space. As different file servers will be independent of each other, the process of resizing the system will be simplex.

3.2 Software Defined Networking (SDN)

Cloud computing systems are supposed to provide the service across whole globe. SDN makes the network flexible so that it will be restructured as and when required.

Network should be able to fulfill the business demands at all times. End-users should be able to access the system whenever and wherever it is required; accordingly network structure has to be re-configured automatically. This feature will enable the mobility of data and all other resources. SDN enables flexible workload placement and mobility.

Customer requires flexibility, reliability, and high performance application and workload focus. SDN enhances virtual networking reliability, performance, and interoperability. SDN enables centralized configuration and management across virtual and physical networks. It also transforms the network cloud by using virtualized network functions. SDN enables seamless data center extensions for flexible workload placement and mobility.

Special program called software load balancer will have the responsibility of even distribution of load to achieve better performance and to utilize all resources optimally.

3.3 Software Defined Computation (SDC)

Users want to be able to scale up VMs without downtime.

Software defined computing provides best-in-class scale and performance and resilience for enterprise workloads.

4. ADVANCED TECHNIQUES

4.1 Runtime memory resize

Users can increase and decrease the memory assigned to virtual machines while they are running.

4.2 Hot add-remove network adaptors

Network adapters can be added and removed while VMs are running; it doesn't need any restart or reboot.

4.3 Hypervisor power management improvements

Hypervisors enable running multiple virtual machines on a single physical machine, so it's very important to reduce the power consumption of VMs. Otherwise it may raise an issues regarding heat dissipation.

4.4 Remote FX

This is inbuilt functionality of some hypervisors to run larger applications which need high configuration. It has larger dedicated and reconfigurable VRAM.

5. MANAGING DATA CENTER EFFECTIVELY

Various users are accessing the data centers on daily basis, and it affects the process as well as contents of the data center, so there should be some controlling measures for managing the data centers properly [8].

Change tracking is responsible for monitoring all the changes made onto data center. Whatever the changes made into process or data of the data center can be captured and provided to the managing authority for further management. Malware assessment capabilities are the necessary requirement as the data center will be connected to the network at all the times and multiple users are accessing the system across the globe. Data center holds the large amount of important data and it should be protected against all types of malwares and viruses [9].

Configuration assessment is the measure, responsible for assessing configurations of various virtual machines running on the data center. It helps in the metering of various services as well as in the resource management. Log management system maintains whole details regarding activities of different users [10].

System update assessment is responsible to check for the updates and upgrading the system to the latest updates. It will add the new features and functionalities into system.

Capacity planning is the most important and necessary way to manage the available resources optimally. Planning tool has to keep the details of memory consumption as well the memory available at any specific time. It is also the responsibility of capacity planning tools to keep count of the total number of cores used and total number of cores which are free. After performing mining operations on the data provided by such tools, the future decisions can be made. The resource demand can be predicted with the help of past data [10].

6. CONCLUSION

As the functioning and applications are becoming more and more complex of data centers, various factors affect the performance of data center. This is the competition era and all the cloud users are expecting better performance from the CSPs. It's the responsibility of cloud service providers to implement some mechanisms which will guarantee the good response time as well as throughput. It is necessary to have some control on power consumption, proper maintenance of the network, storage, and compute infrastructure. Data as well as desired services should be available at any given time with negligible down time. Software-Defined-Infrastructure (SDI) plays a major role in optimization of cloud data centers.

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An Effective Scheduling Algorithm for CPU Scheduling using Simulator

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Abstract— CPU scheduling is integral part of learning Multiprogramming operating system which provides a specific sequence of execution for the processes waiting in queue. It has been experienced that the scheduling of processes has very much impact on efficiency and performance of CPU. There are many different scheduling algorithms like First-Come-First-Serve (FCFS), Shortest Job First (SJF), Round Robin (R-R), Genetic Algorithm Approach etc. FCFS is non-pre-emptive scheduling algorithm based on First-in-first-out concept and it is generally suitable for batch systems. SJF is pre-emptive or non-pre-emptive scheduling algorithm, which is one of the efficient CPU scheduling techniques. Each time a process with shortest burst time is selected for execution from the processes in ready queue. R-R scheduling algorithm is also a pre-emptive scheduling algorithm and is based on the given time-quantum OR time slice. It is generally suitable for time sharing systems. Here we implement & compare average waiting time and turnaround time of these algorithms and find which algorithm is effective for CPU scheduling.

Keywords— *Scheduling algorithm; First-Come-First-Serve scheduling; Shortest Job First scheduling; Round Robin scheduling; Multilevel Queue scheduling; Multilevel Feedback Queue scheduling;*

I. INTRODUCTION

The main objective of multiprogramming system is to load many processes in the main memory where they reside in the ready queues. The CPU Scheduling is the basis of multiprogrammed operating system. It contains its current activity and the program code. The CPU switching among processes, the operating system can make the computer more productive. The process works in five states i.e. New, Ready, Run, Wait and Terminate. With the help of CPU schedulers the Operating System determining that which process is allocated to CPU. The algorithms which concern with CPU schedulers is known as CPU Scheduling algorithms. The scheduling says that it is nothing but the arrangement of processes in ready queue of the system [1].

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There are many scheduling criteria for judging the various scheduling algorithm:

1. CPU utilization:-The CPU utilization keeps the CPU as busy as possible. It should have maximum value.
2. Throughput:-The number of processes that complete their execution per unit of time. It should be maximum value.
3. Waiting time:-The waiting time is the amount of time in which a process has been waiting in the ready queue or in the waiting state. It should have minimum value.
4. Turnaround time:-Turnaround time is the amount of time requires to execute a particular process. It should be minimum value.
5. Response time:-The Response time is the time between the submissions of the request to the first response is produced. It is the time required to start responding, not the time which takes to output the response.

II. RELATED WORK

Basically the scheduling algorithms are divided into Pre-emptive and Non-pre-emptive scheduling algorithms.

In pre-emptive, CPU allocated to a process is switched if another process of higher priority is scheduled. In this case, the currently running process is interrupted and moved to the ready state by the operating system. In non-pre-emptive, once the process has been allocated to a CPU, the process keeps the CPU busy until it releases by the CPU or its terminating or switching to the waiting state[3][4].

Following are the various scheduling algorithms [3][4]:

1. First-Come- First- Serve (FCFS) Scheduling: -In this, the process which request the CPU first is allocated to CPU first. When CPU is free, the process which is at the head of the queue is allocated to CPU. Its implementation is easily managed with FIFO queue. It is a non-pre-emptive scheduling algorithm. Processes are assigned the CPU in the order they

request it. The most simplest and intuitive technique is to allow the first process submitted to run first.

2. Shortest-Job-First (SJF) Scheduling:-In this, the process which has the smallest CPU burst is allotted to CPU first. The SJF uses the FCFS to break tie (a situation where two processes have the same length next CPU burst). The SJF algorithm can be pre-emptive or non-pre-emptive. The non-pre-emptive SJF will allow the currently running process to finish its CPU burst before a new process is allocated to the CPU. On the other hand, in pre-emptive SJF scheduling, the execution of a process that is currently running is interrupted in order to give the CPU to a newly arrived process with a shorter next CPU burst.

3. Round-Robin (RR) Scheduling:-In this, Processes are dispatched in a first-in-first-out sequence but each process is allowed to run for only a limited amount of time. This time interval is known as a time-slice or time quantum. Here the ready queue is treated as the circular queue. This scheduling is a pre-emptive version of FCFS scheduling.

4. Multilevel Queue Scheduling:-The processes can be classified into different groups depending upon their situation. For example, the common division between processes is background processes (batch) and foreground processes (interactive).

5. Multilevel queue scheduling: - The processes are permanently assigned to a queue when they enter in the system. But, multilevel feedback queue allows the processes to move between the queues. In this, the processes are categorized according to their CPU bursts.

Figure 1:-Process Details enter in the System

Figure 2:- CPU Scheduling Algorithm Tool

III. PROPOSED SCHEME & SIMULATION

A java based visual simulation tool is implemented for analyzing performance of the various CPU scheduling algorithm. Here we implemented and compared various CPU scheduling algorithms: FCFS, SJF, RR, MLQ and MLFQ. All these algorithms are implemented using JAVA language.

As describe in figure 1, the process name, process burst time, process arrival time and priority are need to be entered.

As shown in figure 2, the left pane depicts entered process detail values for process name, burst time, priority and arrival time. In the top pane, the implemented CPU scheduling algorithm are listed as choice. The center and bottom pane shows the performance analysis and result of the algorithm based on the parameter average waiting time and average turnaround time.

IV. PERFORMANCE ANALYSIS

The performance analysis of various CPU scheduling algorithm is done based on following parameters.

The Table 1 shows the Process, Process Burst time, Process Arrival time and Priority values for further calculation.

Table 1: Run Time of processes

Sr.no.	Process Name	Process Burst Time	Process Arrival Time	Priority
1.	P1	5	0	2
2.	P2	4	1	4
3.	P3	6	1	4
4.	P4	8	0	2
5.	P5	5	1	4

The effectiveness of scheduling algorithms under consideration is based on few criteria, which are briefly discussed in this section. The following mathematical formulae are used to calculate these criteria's.

$$\text{AVERAGE WAITING TIME} = \frac{\text{SUM OF WAITING TIME OF ALL THE PROCESSES}}{\text{TOTAL NUMBER OF PROCESSES}}$$

$$\text{TURNAROUND TIME} = \text{TIME SPENT IN MEMORY} + \text{READY QUEUE} + \text{CPU TIME} + \text{I/O TIME}$$

$$\text{AVERAGE TURNAROUND TIME} = \frac{\text{SUM OF TURNAROUND TIME OF ALL THE PROCESSES}}{\text{TOTAL NUMBER OF PROCESSES}}$$

The following Table 2 shows, the values for average waiting time and average turnaround time of FCFS, SJF, RR, MLQ and MFQ CPU scheduling algorithm. The average waiting time for MLQ is 10.2 i.e. minimum as the table shows and the average turnaround time for MLQ is 15.8 which is minimum. The comparative analysis for average waiting time and average turnaround time values of all considered CPU scheduling algorithm shows multilevel queue (MLQ) gives performance enhancement over all other algorithms.

Table 2: Calculation of Average Waiting Time and Average Turnaround time

Sr.no.	Algorithms	Average Waiting Time	Average Turnaround Time
1.	FCFS	11.6	17.2
2.	SJF	10.8	16.4
3.	RR	18.4	24.0
4.	MLQ	10.2	15.8
5.	MFQ	19.2	24.8

As shown in Figure 3 the graphical representation of average waiting time and average turnaround time values from Table 2 for considered CPU scheduling algorithm. Graph describe MLQ gives optimum values for average waiting time and average turnaround time leading to overall performance enhancement.

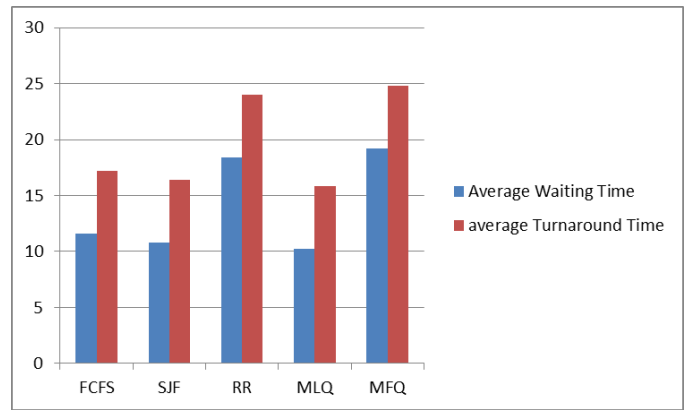


Figure 3:- Graph of Average Waiting Time and Average Turnaround time

V. CONCLUSION

This paper presents a scheduling scheme which minimizes the average waiting time and average turnaround time of processes. This paper conclude that the results of MLQ are better than FCFS, SJF, RR, MFQ.

The Future Scope of this paper is applying GA to all scheduling algorithm like FCFS, SJF, RR, MLQ and MFQ and compare it with previously designed scheduling algorithms.

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Electronic Toll Collection Using QR Code

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ABSTRACT

An Automated Toll System is developed for toll collection to avoid traffic congestion long queues, with help of QR technique. Also, by using this system, time will be saved, i.e. by avoiding long queue as no stopping the vehicle and no manual transaction. The current system for toll collection is manual transaction. Here every vehicle stops at the toll plaza for payment. This causes traffic congestion, increase in air pollution, and wastage of time. In proposed System there won't be a need to stop vehicle at toll plaza, the QR tag, which is mounted on vehicle will be scanned through high speed cameras. After detecting QR tag, the balance from the customer's account will get deducted and he will get invoice on his registered e-mail address. So this system is designed for faster movement of vehicles on toll plazas.

General Terms

QR code technology for toll collection.

Keywords

QR code, Toll automation.

1. INTRODUCTION



Figure 1: QR code

The proposed system is based on the quick response code, Capturing QR code by using camera and recognize it. Once the details are verified the amount will be deducted from the respective account. Even if the balance is below minimum it will deduct the amount and account will go in minus. That will be handled by bank and RTO. So that this will lead to no stoppage of vehicle on the toll plaza and leads to full automation.

2. RELATED WORK

Today QR code is used in many applications to embed data such as product information, contact details, links to websites, etc. It is widely use for sharing small information quickly on mass distribution. This QR code will be use in vehicles windscreen. It will help to automate the toll collection procedure by identifying the information from the QR code. It will also work if the lighting is not good.

3. REVIEW OF QR TECHNOLOGY

A QR code consists of black square dots which have been arranged in a square shape on white background, it can be read by an imaging camera, Processing is done using Reed–Solomon error correction algorithm so the image can be appropriately decoded; Data is then extracted from patterns from components of the image. QR Codes offer a number of benefits over traditional QRs that increase their flexibility, reliability and their ease of use. When it is combined, it also results in a reduced implementation cost which helps to drive their popularity. A few of these benefits include High storage Capacity, QR require Less Space, they are Dirt and Damage Resistant, QR is Readable From Any Direction . The main different between QR Codes and traditional QRs, is that QR Codes are able to store many times more data that too in a much smaller area because of their ability of storing data in 2 dimensions rather than 1.

4. TYPES OF QR CODE






QR Code Model 1 and Model 2	Micro QR Code	iQR Code	SQRC	Frame QR
				
<p>[Feature]</p> <p>Model 1 is the original QR Code. The largest version of this code is 14 (73 x 73 modules), which is capable of storing up to 1,167 numerals.</p> <p>Model 2 is an improvement on Model 1 with the largest version being 40 (177 x 177 modules), which is capable of storing up to 7,089 numerals. Today, the term QR Code usually refers to this type.</p>	<p>[Feature]</p> <p>Only one orientation detecting pattern is required for this code, making it possible to print it in a smaller space than before.</p> <p>This code can be viable even if the width of its margin is 2 module-worth (QR Code requires a margin of 4 module-worth at least around it). The largest version of this code is M4 (17 x 17 modules), which can store up to 35 numerals.</p>	<p>[Feature]</p> <p>Code that can be generated with either square modules or rectangular ones. Can be printed as a turned-over code, black-and-white inversion code or dot pattern code (direct part marking). The maximum version can theoretically be 61 (422 x 422 modules), which can store about 40,000 numerals</p>	<p>[Feature]</p> <p>QR Code that has a reading restricting function. Can be used to store private information or manage a company's internal information) Its appearance is no different from the regular QR Code.</p>	<p>[Feature]</p> <p>FrameQR is a QR code with a "canvas area" that can be flexibly used. Since letters and images can be inserted inside the canvas area, FrameQR can be used for promotion, authenticity judgment, and other various uses.</p>

Figure 2: Different types of QR codes

The symbol versions of QR Code ranging from Version 1 to Version 40. Every version will have a different module configuration or number of modules. The Module configuration is the number of modules in a symbol, starting with Version 1 which has 21×21 modules going up to Version 40 which has 177×177 modules. Each higher version has 4 additional modules on each dimension.

5. PROPOSED SYSTEM

The proposed system is based on the quick response code, camera and application program is developed for toll collection. Capturing QR code by using camera and recognize it. The QR code will contain a system generated unique code which will be linked with the customer's details in the database. This is done for protection of the information as it will only show the unique code to others who scan the QR code which would stand meaningless without the access to the database. Once the details are verified the amount will be deducted from the respective bank account which would be stated at the time of registration. Even if the balance is below minimum it will deduct the amount and account will go in minus. The recovery of this amount will be handled by bank and RTO. So this will lead to no stoppage of vehicle on the toll plaza and leads to full automation.

6. FLOW OF EVENTS^[3]

1. The car owner opens an account in the bank and obtain its customer id .
2. Recharges the account upto a minimum balance.

3. Then fills all the details along with bank account number and customer id in the application of QR generation.
4. The QR generator generates the QR code.
5. This code is then printed on sticker or painted on the car as required by the owner.
6. Later when this car arrives at toll plaza the scanning begins.
7. QR scanner , here the camera captures the image of QR code and sends it to the system. Details are fetched from the code and verified against the details in database filled by the owner.
8. Once verified successfully a green signal will be shown. If not verified or running out of balance then a red signal will be displayed.
9. On successful validation amount will be debited and the process repeat for every arriving vehicle.

7. APPLICATIONS

QR code is surely not able to completely substitute RFID. Both technologies will play their role in parallel to each other in the future and they will be used whenever needed depending on the application.

A few areas our proposed system can be implemented are as follows:

- RLTP (Remote Location Toll Plaza): In some remote areas like hilly region, regions where it is difficult to operate manually due to climatic conditions,our proposed QR code system can be

embedded anywhere to provide automation in any number of locations.

- Busy highways where traffic jam is a regular scenario due to manual toll collection process, our proposed system will reduce the wait time in the toll plaza drastically and will help in the faster flow of traffic, thus reducing jams.

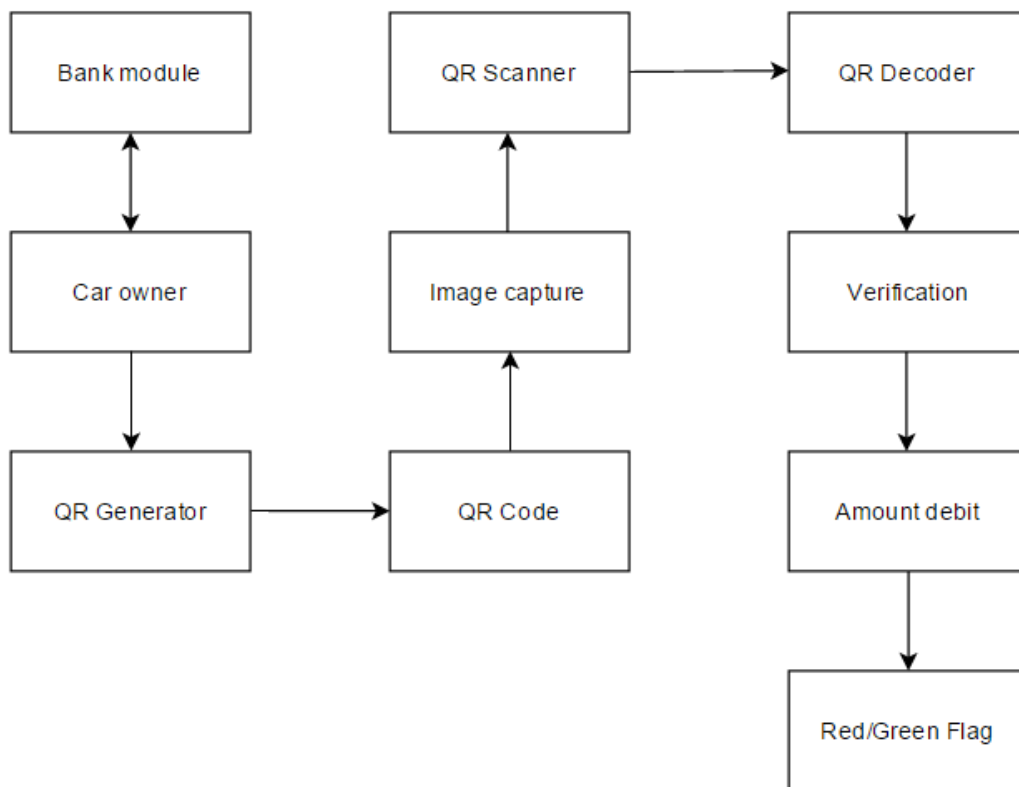


Figure 3: Block diagram of system

8. ADVANTAGES

1. Fewer or shorter queues at toll plazas by increasing faster toll booth service.
2. More efficient and quick service
3. The ability to make payments from your bank account itself
4. The use of postpaid toll statements (no need to request for receipts)
5. Lowered toll collection costs

6. Expanded capacity without building more infrastructures

9. EXPECTED RESULTS

It is expected that there would be less traffic to/ from inner city, increased accessibility, decreased emissions, change in travel patterns, traffic flow improvements, congestion reduction. QR requires no specialized equipment or chip just a image of code so it is expected that it would be flexible to work with QR codes.

Results		Messages								
	Customer_ID	FName	LName	Pan_no	Aadhar_no	Address	Pin_code	Email	Mobile_no	Account_Createdt
1	5012	HIREN	PARMAR	CSER9876P	337856743	ctfyujgdfghkhjfgdzgf	400092	abc@123.com	9876543210	2015-09-28 12:46:58.003
2	5013	PRAGATI	PATIL	HSUFHU	NFSJINF	virar	400021	abc@abc.com	9870898989	2015-09-28 15:46:04.333
3	5014	ACCOUNT	1	CPKIP2233K	112233445566	adh	400069	cpk@xyz.com	9870998877	2015-09-28 20:35:27.143

Figure 4: Table in database for Customer Information

The screenshot shows a window titled "Create_Account_BANK_". Inside the window, there is a form with the following fields and labels:

- First Name: [Text Box]
- Last Name: [Text Box]
- Address: [Text Box]
- Pin Code: [Text Box]
- Pan No: [Text Box]
- Aadhar No: [Text Box]
- Phone: [Text Box]
- Email: [Text Box]
- Starting Amount: [Text Box]
- Enter Password: [Text Box]
- Confirm Password: [Text Box]

At the bottom of the form, there are two buttons: "Create Account" and "Back".

Fig 5: Create account screen

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A survey on image based steganography

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ABSTRACT

Hiding information by embedding secret data into a redundant medium is called as steganography. However in modern times as the techniques for enforcing security have advanced, so have the methods to break them. In image steganography, the main drawback is that the pixels of the image get altered which increases the suspicions about hidden data present in it and those techniques which reduce the noise content are easier to crack. Hence every time image steganography is used, the data that is to be embedded in the image must be encrypted using some encryption algorithm. This might not completely eliminate the risk of data getting cracked by a third person but will surely make the process harder because of data encryption.

General terms

Security, steganography and cryptography

Keywords

Steganography, Cryptography, LSB, AES, RSA, DES.

1. INTRODUCTION

Steganography and Cryptography are very popular techniques that are used since ancient times for the purpose of sending secret and important messages. These techniques are used to ensure that the data is accessed only by the sender and intended receiver and not by any intruder. Steganography is the art of covered or hidden writing [2]. A steganographic system embeds hidden content in unremarkable covered media so as to not arouse an eavesdropper's suspicion [9]. Historical steganographic methods made use of physical steganography i.e. the covers used were: human skin, scalp, etc. whereas, the modern steganographic methods make use of cover media such as image, audio, video, etc. Cryptography protects the information by converting the data into an unreadable format. This process is known as encryption [8].

The Greek historian, Herodotus states that in ancient Greek society, hidden text messages were written on wooden writing tablets which were covered with wax so as to conceal the existence of those messages, by making it appear like a blank writing tablet. Another ancient form of steganography, which is also conveyed in Herodotus' writings, states that steganography was used as a form of body tattoo [9]. Herodotus writes that a tyrant of Miletus, shaved the head of his slave, tattooed the secret message on his head and then waited for his hair to grow back.

The slave was then sent to Aristogoras (receiver) who was instructed to shave the slave's head for reading the message.

In later years, the idea of invisible ink came into picture. This was done with the help of thithymallus plant which dried transparent to paper, but was dark brown when heated. In more recent history, i.e. during WWII the Nazis developed a form of steganography called as microdots. Microdots are microfilm chips generated at a very high magnification. These microfilm chips are of the size of a period on a standard typewriter machine. These dots could contain ample amount of information, drawings, etc. The Nazis also used invisible ink and null Cipher. Null Cipher is a form of steganography in which case the plaintext (message) is mixed with bunch of random non cipher messages [9].

In later years the modern digital steganography was introduced. Modern digital steganography makes use of cover media like image, audio, video, etc. These media are used to hide the message and send it over any network.

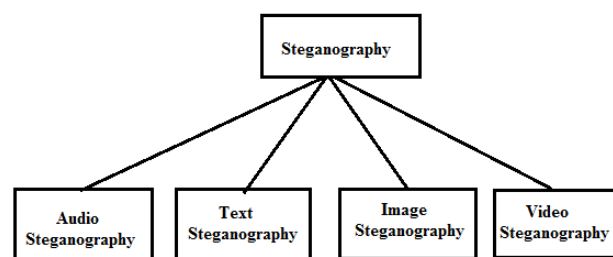


Fig. 1: Types of Steganography

The different types of steganographic techniques based on the cover mediums used [12] as shown in figure 1 are:

- i. Image Steganography: In image steganography, the data is hidden in a cover image. Images contain a lot of redundant information in which the data or the message can be embedded efficiently [9].
- ii. Audio Steganography: In audio steganography, data is hidden in an audio. This is done by modifying the audio signal so that the changes cannot be easily intercepted by unauthorized personnel.

- iii. Video Steganography: Video steganography hides the data in a video. The pixel changes in the respective frames of videos are harder to detect than image steganography.
- iv. Text Steganography: Text steganography hides data behind a cover text file.

2. LITERATURE REVIEW

2.1 Data hiding using LSB[1]

Shamim A. L., et. Al., in “High capacity data hiding using LSB Steganography and Encryption” has proposed a system that uses transposition technique for data encryption and LSB method for embedding that encrypted data in image. In transposition technique the plain text is written row wise in an N x N matrix as shown in fig 2.1 and read out column wise in a specific order depending on the key. The key is something that sender and receiver agree on beforehand. Size of the matrix is also specified in key. After that LSB method is used for embedding the encrypted data. Encrypted message is converted into its ASCII equivalent character and then converted into binary digits. Image pixel has three components i.e. RED, GREEN and BLUE. These binary bits are replaced with LSB of RGB (Red, Green and Blue) component of pixels. Each component is of 8 bits in size and hence the size of pixel is 24 bits. Each pixel contains 3 bits of encrypted data. After embedding all the bits, we get the stego image. This stego image and key then send to the receiver. On receiver side, reverse process was followed for decryption using key. First the LSBs are extracted from the stego image. Then it is converted into ASCII characters. After getting encrypted message, transposition technique is performed by using key. Hence at the end we get the plain text.

B	Y		C	O	M	B
I	N	I	N	G		S
T	E	G	A	N	O	G
R	A	P	H	Y		A
N	D		C	R	Y	P
T	O	G	R	A	P	H
Y		W	E		C	A

N		A	C	H	I	E
V	E		B	E	T	T
E	R		S	E	C	U
R	I	T	Y		O	F
	D	A	T	A		A
N	D		I	N	F	O
R	M	A	T	I	O	N

Fig 2.1[1]: Transposition cipher on longer text

The drawback of this system is, it uses transposition technique which is simplest encryption technique and easy to break. It uses LSB method which distorts the whole image. That's why it is easily recognized by third person.

2.2 Data hiding using compression technique[2]

Vipul S., et. Al., in “A new approach to hide text in image using Steganography” has proposed a system that uses compression algorithm for embedding the secret data in image. Here the compression algorithm is used to maximize the storage capacity of system. In this proposed system, the secret data is embedded in image without encrypting that secret data. In the compression algorithm, the secret message is first converted into its ASCII code and this ASCII code is converted into binary value. These binary numbers are then replaced with RGB component of pixel of cover image. But here the whole 8 bit binary number i.e. one character is embed at a time is embedded at a time. First character is stored in red component as shown in fig 2.2, second character is stored in green component as shown in fig 2.3 and third character is stored in blue component as shown in fig 2.4. Because of this, each pixel contain 3 characters i.e. 24 bit data. Hence as compared to LSB method, compression algorithm stores more data in single pixel. After completing the embedding process, the generated stego image becomes distorted and it is easy to detect that data has been hidden behind it. Therefore finally this distorted image is hidden behind another cover image.

Original red component												Replaced red component											
Red				Green				Blue				Red				Green				Blue			
1	0	1	1	0	0	0	1	0	1	0	0	1	0	0	0	0	1	0	0	1	1	0	1

Fig 2.2[2]: Character stored in a red component

Original green component												Replaced green component											
Red				Green				Blue				Red				Green				Blue			
1	0	1	1	0	0	0	1	1	1	0	0	1	0	0	0	0	1	0	1	0	1	0	0

Fig 2.3[2]: Character stored in a green component

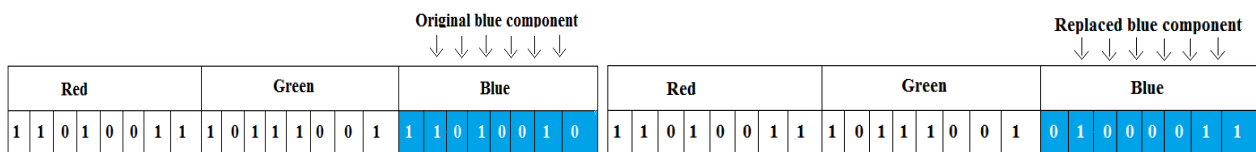


Fig 2.4[2]: Character stored in a blue component

The drawback of this system is, it embeds the actual secret data on image without encrypting it. It uses compression algorithm which distorts the whole image because it may alter all the bits of a pixel and so another cover media is necessary to hide it.

2.3 Encryption using AES and embedding using LSB method[3]

Manoj R., et. Al., in “Secured Steganography approach using AES” have proposed a system, that uses AES (Advance Encryption Standard) method for encrypting the secret image(size M x N).LSB method is used for embedding this secret image on another image. This proposed system uses 128 bit block size and 128 bit key size for AES encryption. The first 16 bytes i.e. 128 bits are used as a key for AES encryption. After that using this key, the secret image is encrypted and this encrypted secret image is further embedded on another cover image (size 2M x 2N). Here the LSB method is use for embedding purpose. Pixels of encrypted secret image are divided into 4 parts each of 2 bits. Then these 2 bits are replaced with last 2 bits of pixels of cover image. Hence the single pixel of encrypted secret image was stored in 4 pixels of cover image. In this way the whole image was embedded on cover image and generates a stego image (size 2M x 2N). This stego image is then sent to the receiver along with the key. Receiver extracts the last 2 bits from every pixel of stego image and makes the block of 8 bit size each. Then using AES encoding function and the

key, receiver gets the secret image which may contain the message.

The drawback of this system is, it uses LSB technique for embedding the secret image.

2.4 Encryption using RSA and embedding using hash-LSB[4]

Anil K., et. Al., in “A secure Steganography based on RSA Algorithm and Hash-LSB Technique” has proposed a system that uses RSA technique for encrypting the secret data and hash-LSB method for embedding data in image. RSA algorithm was given by Rivest, Shamir and Adleman and published in year 1978. In this technique two prime numbers are taken and then product of these values is used to create a public and private key. These keys are further used in encryption and decryption. After encrypting the whole data, the hash-LSB method is used for embedding this encrypted data on image. With the help of hash function a pixel is selected and then the encrypted data is embedded in LSB of RGB component of that pixel. Here 8 bits data are embedded in LSB of RGB pixel value of image in the order of 3, 3 and 2 respectively at a time. According to this method 3 bits are embedded in red pixel LSB, 3 bits in green pixel LSB and 2 bits in blue pixel LSB. As shown in fig 2.5, in this system, a specific pattern is defined for the position of the bits where the data is embedded. This pattern is also used for extracting the data from stego image.

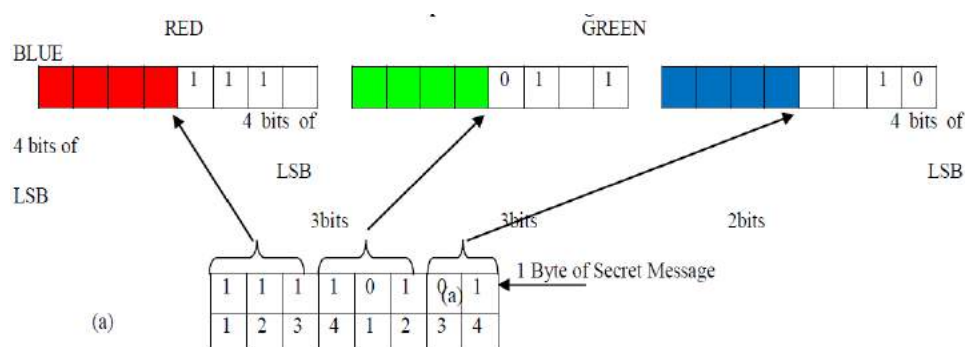


Fig 2.5[4] Pattern of embedding data in pixel

The drawback of this system is, RSA algorithm is less secure and easy to crack. Here hash-LSB technique is used but this technique may also distort the whole image and that's why it is easily recognized by third person.

2.5 Image steganography using searching bits[5]

Atallah M., et. Al., in “A new method in Image Steganography with improved image quality” has proposed a system that uses a new embedding technique which uses a

partial searching technique. In this method, a random pixel is selected from cover image. Data is embedded in RGB components of pixels. Here data is embedded sequentially and only 2 bits are stored in one component of pixel. First the secret data is converted into binary value then first 2 bits are searched in red component. If match is found then save the location in a binary table. If match is not found then replace data with 2 LSB of component and save the location. After that next 2 bits are embed in green component and 2 bits are embed in blue component using same searching method. After embedding whole data, a stego image and binary table is generated. This stego image and binary table then send to the receiver. The reverse process follows at receiver for decryption.

The drawback of this system is if the match is not found in pixel component then it uses LSB method and because of this the image gets distorted. Another thing is it sends binary table directly hence it is less secure. If a third person gets that binary table then he can easily extract data from stego image.

2.6 Image steganography using edge detection[6]

Sneha A., et. Al., in “A proposed method for Image Steganography using Edge Detection” has proposed a technique to hide the text data into colour image using edge detection method. The proposed steganography scheme is based on the LSB steganography mechanism and hybrid edge detector. As shown in fig. 2.6, for encryption, first, edge of the cover image will be detected by using 3x3 window scanning and then these edge pixels are stored in an array i.e. array1. Then a sorting algorithm is applied on the array to randomize the edge pixels. The secret text message is stored in another array i.e. array2. After that, replace the ASCII value of array2 with blue component of array1. After embedding whole data, a stego image is generated and sent with array1 to the receiver. Receiver extracts the data from stego image using symmetric key array1.

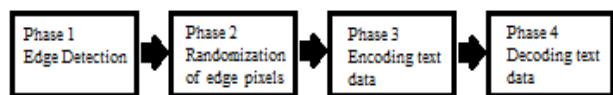


Fig 2.6[6] Phases of edge detection technique

The drawback of this system is that it embeds the secret data on image without encrypting it. Data hiding at edge is a technique that can easily be cracked by third person.

2.7 An improved LSB based steganography[7]

Mamta J., et. Al., in “An improved LSB based Steganography technique for RGB color images” have proposed a new LSB based technique for hiding data in image. This new technique work as follows: first it divides the image into smooth and edge areas using canny filter, then encrypt the input using S-DES algorithm. For embedding, here two different techniques are used. Data is embedded in edge areas using LSB method but the edge pixels are selected randomly using Pseudo Random Number Generator (PRNG). PRNG is an algorithm that generates a sequence of numbers but it first requires a seed. In this way, the randomly pixels are selected and data

are embeds in LSB of that pixels i.e. in the blue component. To embed the data in smooth areas 1-3-4 LSBs insertion technique is used. In this technique 1-bit data embeds in 1 least significant bit of red component, 3-bits in 3 least significant bits of green component and 4-bits in 4 least significant bits of blue component of each selected pixel. After embedding the data, a stego image is generated and sent to the receiver.

The drawbacks of this system are that it uses S-DES encryption technique which is not very secure.

3. CONCLUSION

This paper presents various systems that have made use of LSB or variations of LSB technique. Some systems have also made use of various encryption algorithms like DES [11] and RSA [4]. Although the LSB [8][9] technique is very easy to implement, it has some drawbacks like a lot of noise gets added in the image, also it can be easily cracked [10]. On the other hand, DES algorithm works only on block size of 64 bits which is unreliable for larger amount of data. Thus, secure algorithms such as AES [3] must be preferred for the encryption purpose. Also some advancement must be brought about as an alternative for the LSB technique.

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A SURVEY ON HOME AUTOMATION SYSTEM

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ABSTRACT

Home Automation is a system which gives user to manage all household activities and appliances. The household activities are automated. Home automation enables control of various home appliances and manages security from one centralized control system. This integrates all electrical devices with each other. For Home automation system computers are used to control home appliances.

However Home automation can be made using with various technologies such as Z-Wave, Bluetooth, ZigBee and etc. In present world system with ZigBee are made for the better efficiency and security of the system.

Keywords- HVAC (Heating, ventilation, and air conditioning), Android, Bluetooth, micro-controller, FGPA (Field Programmable Gate Array), GSM (Global system for mobile communication), ARM (Acorn RISC Machine)

1. INTRODUCTION

Home Automation is a system which gives user to manage all household activities and appliances. The household activities are automated, for example, a single centralized controller can have the capability to control and manage all household activities and security related tasks. The living standard has risen with economic expansion and therefore people urge more safe, comfortable and convenient life. So according to the demand of time a system was needed to fulfill these requirement. Main aim of home automation system is to monitor all tasks related to home activities. Android smart phone or laptops can be used to control or monitor the home automation system. Main purpose to this paper is to study about various technologies used for developing home automation systems.

2. LITERATURE REVIEW

2.1 Home Automation Using Internet of Things [1]

Vinay Sagar K.N. and Kusuma S.M. represented "Home Automation Using Internet of Things" in 2015, has proposed a system that introduces a design that employs integration of cloud networking, wireless communication for providing user control of HVAC and other embedded devices and at the same time storing sensor captured data on the cloud. The paper aims on emphasizing the usage of cloud computing in home automation which will facilitate users to have control over devices at home even when they are away from home.

Advantage:

The advantage is installations of any system is using wireless technology.

Disadvantage:

The problem with interconnections is that this latest technology often relies on mobile apps to connect to cloud-based servers.

2.2 Android Based Home Automation [2]

Shinde A.J. and Prof. Patil J.M represented "Android Based Appliances Control System" in 2013, have proposed a system that focuses on implementation of Home Automation by using fine combination of Android mobiles and embedded systems.

This paper hold two parts, hardware part called process unit and software part called monitoring unit. Process unit

contain Bluetooth module LM400, LCD, dimmer circuit, and micro controller PIC16F877 (40 pin IC).

Advantage:

The devices can be controlled from long distance.

Disadvantage:

User can make mistakes while typing the message format.

The Main focus is on controlling fan speed and light intensity is specialty of the project.

2.3 Home Automation Using FPGA [3]

Sweatha K N and Poornima M represented "Advance home Automation using FPGA Controller" in 2013, has proposed implementation of FGPA (Field Programmable Gate Array) as controller. In the paper GSM Network (Global system for mobile communication) is used. The usage of GSM ensures that the range of communication is large and system is highly robust which makes it a better choice where concerns for security are high.

The Controller is based on Basys2 development board and has many inputs and output pins to facilitate connections to multiple equipment's at once.

Advantage:

Installation and maintenance is easy, i.e. ease of installation and maintenance.

Disadvantage:

Precised programming is needed which will include things such as time, training, specialist knowledge.

The paper focuses on increasing the speed using parallel communication.

2.4 GSM Based Home Automation [4]

Salman M. and Vrindavanam J. represented "Efficient Interactive Control System based on GSM" in 2013 have proposed a system in Global system for mobile communication (GSM) technology is introduced with the use of AT89S52 micro controller. The proposed system uses a GSM modem (SIM300) interfaced to the micro controller (AT89S52) through IC MAX232 and an RS232 cable. The micro controller will process the command and it will drive the relays connected to the loads through the relay driver ULN2003.

Advantage:

More Reliable power, i.e. the system is having enough power to continue or keep the operation in process.

Disadvantage:

The Platform used in the system comprises lack of transmission range.

Aim of the project is to ensure the system sending SMS to user in event of any accident.

2.5 Mobile Based Home Automation System [5]

Pradeep G. and Venkateswarao M. represented "Ad-Hoc Low Powered 802.15.1 Protocol Based Automation System for Residence using Mobile Devices" in 2011 have proposed a low powered, cost effective, reliable and secure HAS (Home Automation System) implementation using Bluetooth (BT) protocol. The software implementation includes the communications between the closely or edgily connected devices performs well and inquires to detect the devices in that particular range the inquiry is done under 10secs of time and the energy consumed during the inquiry .

Advantage:

Low Cost in terms, because devices such as Bluetooth are available at low cost and also consumes low power.

Disadvantage:

The connection between the electronic devices and the power board is wireless in such system.

2.6 Home Control Automation Using GSM and Bluetooth [6]

Suresh D., Monali D.Wani, ShuklaS. And Aniket R.Yeole represented -"A Review on Home Control Automation Using GSM and Bluetooth" in 2015 have proposed system consisting of the two micro controller development boards namely ARM 7 and ARM 9 is used . ARM 7 and ARM 9 are divided into two sides namely transmitter and receivers side.[6]

Transmitter side is handled and controlled by ARM7 and similarly receiver side is handled and controlled by ARM9.

Advantages:

Three main factors can be saved namely Time, Electricity and Money.

Disadvantage:

Range of Bluetooth is very less around 25 meters theoretically.

3. CONCLUSION

This paper summarizes and organizes recent research results in a novel way that integrates and adds understanding to work in the field of Home Automation. A survey article assumes a general knowledge of the area; it emphasizes the classification of the existing literature, developing a perspective on the area, and evaluating trends.

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A Survey of Focused Crawling Algorithms

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ABSTRACT

The focused crawler is the more effective solution to the traditional general crawler which has some limitation in terms of precision and efficiency because of its generality, no specialty. A focused crawler traverses the web selecting out relevant pages to a predefined topic and neglecting those out of concern. The focused crawling concentrates on the quality of the information rather the quantity. In this paper we present a survey of different algorithms such as page rank algorithm, best first search algorithm, fish search algorithm, shark search algorithm which are proposed by researchers to increase the efficiency of the focused crawling.

Keyword: focused crawler, semantic web.

General terms: page rank algorithm, best first search algorithm, fish search algorithm, shark search algorithm

1. INTRODUCTION

The World Wide Web contains a huge collection of information and at every second, new information is added to it. The basic steps performed by the crawlers are as follows:

1. Remove a URL from the URL list.
2. Download the corresponding page.
3. Check the Relevancy of the page.
4. Extract any links contained in it.
5. Add these links back to the URL list.
6. After all URLs are processed, return the most relevant page.

Thus it is important for search engine to have the searcher to find required information in less amount of time as well

as in relevant manner according to user. Thus the Focused crawler is discover for collecting data on www, and keeping up with the rapidly expanding internet. The main motivation behind the discovery of focused crawling is poor performance of general purpose search engines, which depend on the results of generic web crawlers.

A focused crawler searches the web for a specific topic and retrieves the most relevant information and according to the priority of relevant pages formed the index which can be used by search engines to process the user queries.

Most important part in structuring of focused crawler is what algorithms we are using for getting results. There are many web searching algorithms are available. Different algorithms have different ways of searching. The relevancy of page is depends upon the different factors in different algorithms.

For better performance or more efficient result merging of algorithms is happened in many crawlers. According to domain of focused crawling different algorithms works together to get result list which is user specific means relevant to user. Every web search algorithms has some advantages and disadvantages. By combining some algorithm deficiencies can be overcome and efficiencies can be increases to get more efficient focused crawler

2. FOCUSED CRAWLER

When the user enters the query to search, user get hundreds of result appear on his screen and many time user is not interested in many of them. To cover this problem of the general crawlers focused crawlers are invented.

A focused crawler is a web crawler that collects web pages that belongs to the specific topic, carefully prioritizing them which can be used by search engines to process the user queries [1]. A focused crawler must predict the probability that an unvisited page will be relevant before actually downloading the page.

Focused crawling was initially introduced by Chakrabarti in 1999 [1]. They described the focused crawler in which a crawler seeks, acquires, indexes, and maintains pages on a specific set of topics that represent a relatively narrow segment of the web. So, instead of crawl the entire web it crawl only relevant pages of web. It reduces the possibility of getting irrelevant output as a result.

The performance of a focused crawler depends on the richness of links in the specific topic being searched. Focused crawling usually relies on a general web search engine for providing starting points.

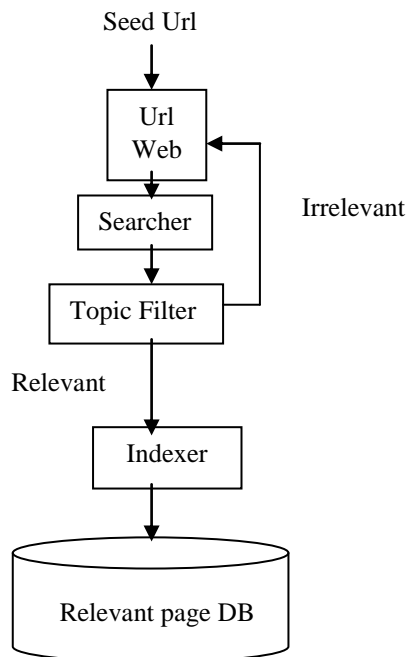


Fig. 2.1 Framework of Focus Crawling

3. SEMANTIC WEB

Semantic web crawling is a special focused crawling where semantic similarity is calculated between given topic and web pages.

The semantic web is a vision of information that can be readily interpreted by machines, so machines can perform more of the tedious work involved in finding, combining, and acting upon information on the web.

The Semantic Web, as originally envisioned, is a system that enables machines to "understand" and respond to complex human requests based on their meaning. The goal of semantic focused crawlers is to precisely and efficiently retrieve and download relevant web information by understanding the semantics underlying the Web information and these semantics underlying the predefined topics.

Priority based semantic web crawling proposed by Jaytrilok Choudhary et al. [3]. In this Ontology is used to get semantics of web page during crawling process. It

keeps all URLs to be visit in priority queue along with their semantic score.

4. FOCUSED CRAWLING ALGORITHMS

Building an effective web crawler to solve the purpose is not a difficult task, but choosing the right strategies and building an effective architecture will lead to implementation of highly intelligent web crawler application. There are many algorithms are available for web crawling out of them studies of some algorithms which are mainly used by many crawlers are as follows:

4.1 Page Rank Algorithm

It is the most popular ranking algorithm Page Rank algorithm was first introduced by Lawrence Page and Sergey Brin in 1998 as a possible model of user surfing behaviour.

It checks the relevance of the web page in terms of popularity. The popularity of the page can be decided on the basis of the page rank score which calculated by using in-links and out links to the page. The web page having highest page rank score have more priority.

The page rank is purely link structure based algorithm. Context of query keywords is not considered while computing the relevance [2].

The limitation of this algorithm is that if any page having higher rank can be revisited many times because of which pages having less page rank not get chance to visit.

4.2 Best First Search Algorithm

Best-first search is another most popular search algorithm used currently in focused crawlers. Best-First crawlers have been studied by Cho et al. [1998] and Hersovici et al. [1998].

In best-first search, URLs are not simply visited in the order they are discovered; instead, some heuristics i.e. predefine criteria are used to give priority to the URLs in the crawling queue and those that are considered more promising to point to relevant pages are visited first.

Best first search has advantages over breadth-first search because it probes only in directions where relevant pages locate and avoids visiting irrelevant pages.

As algorithm works on predefine criteria needs the knowledge about the problem domain for which algorithm is implemented. Without proper knowledge we cannot define the heuristic for algorithm.

4.3 Fish Search Algorithm

Fish-Search is proposed by De Bra and Post in 1994 for collecting topic-specific pages [1]. The fish search algorithm is based on the depth first algorithm. It works on mechanism if food is available then fish will survive otherwise fish will die.

The relevance of a document is judged based on the presence of keyword in its content. If the occurrence is high the document is considered relevant and a score '1' is assigned otherwise assigned '0' [2].

The problem of fish search algorithm is a very low differentiation of the priority of pages in the list i.e. only '1' and '0'. Because of which when many documents having same priority, the crawler search the documents at head of the list only and skips the further documents.

4.4 Shark Search Algorithm

The shark search algorithm is proposed by Hersovici et al. in 1998 which is an improvement of the fish search algorithm.

It uses a continuous valued for finding relevance instead of the binary relevance 0 and 1 in Fish-Search. In addition, the similarity score of Shark-Search algorithm child node is determined by three factors: the anchor text context, anchor text and the similarity inherited from parent node.

Still the shark search algorithm has two drawbacks such as the deficiency of anchor text of link and the deficiency of local optimum [4].

5. RELATED WORK

A web search engine is a tool designed to search for information on the World Wide Web. Its research could be derived from 1990s. One of the first "full text" crawler-based search engines was WebCrawler, which came out in 1994 [11]. Nowadays, a series of search engines are booming out, such as Yahoo, Google, and Live search and so on. The domain specific crawler that is focused crawler was first introduced by S. Chakrabarti in 1999 [4].

Promila Devi et al. provide the learning-based focused crawling approach that uses four relevance attributes to predict the relevance of unvisited URLs [8]. The four attributes are the URL words, its anchor text, the parent pages, and the surrounding text.

Anshika Pal et al. proposed an effective focused crawling technique based on content and link structure analysis [6]. Nidhi Jain et al. introduced detail of various approaches given by various authors in the past few years. It gives the stage wise development in the field of focused crawling their weaknesses and strengths [15].

S. Saranya et al. introduced A Study on Competent Crawling Algorithm (CCA) for Web Search to Enhance Efficiency of Information Retrieval [4]. The proposed algorithm CCA combines the functionality of both page rank and BFS algorithms to enhance the efficiency of Web search. The complexity of the searching problem will overcome by CCA. Meenu et al. introduced different approaches of focused crawling [6]. Anshika Pal et al. proposed an effective focused crawling technique based on content and link structure analysis [7].

Youwei Yuan et al. proposed an improved shark search algorithm by adding link-clustering and tunnelling to overcome the two drawbacks such as the deficiency of anchor text of link and the deficiency of local optimum of shark-search algorithm [5]. In this clustering algorithm is used to cluster links from different blocks of the page and tunnelling is add to the algorithm to avoid neglecting the potential topic related pages.

6. CONCLUSION

The crawler is the most important part of the search engine. The search algorithms are the heart of the crawling process which helps for effective prioritizing. For more specificity the focused crawling approach are used now a day which find out and downloads web pages that are related to the topic to be search is given to the crawler. The focused crawler is a system that learns the specialization. Thus in future focused crawlers will become important tools to support applications such as specialized Web portals, online searching.

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Campus Recruitment System

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ABSTRACT

This system is related to the campus recruitment. Basically when we are talking about the placement there is always consider a higher marks but some time students of higher marks fails to identify their qualities. Therefore we have think about this system. This system consist of three logins authorities' student, company, and admin. First, student have to register. Then there is facility to create automatic resume using the resume option as well as they can see all the vacancies. Secondly, company can resister as well as admin can invite to companies also, they can also see the list of the students who are eligible. Admin has authority to remove faulty account and as well as handle all the account. He has authority to moderate and delete any details which is not belonging to college rules. This system is effectively handles the college student data as well as the company database.

Keywords

Pattern Matching, Mahout Algorithm, TPO, Online Test, Online Notification, Recruitment.

1. INTRODUCTION

Today Internet is most useful source which helps in our daily life as well as in our personal and professional life. Now a days, students and educational systems uses internet for gathering different types of information. Therefore we are trying to introduce a web based application for campus which student can access any time anywhere. This proposed system will remove drawback of the traditional system and it will improve the functionality. This proposed system is about campus recruitment system.

Campus recruitment system will be an online application that can be access throughout the organization and outside as well with proper login provide. This system can be use as an application for the Training and Placement Officer (TPO) of the college to manage the student information with regards to placement. Students logging shall be able to upload their information in the form of a CV. Visitors/Company representatives logging in may also access/search any information put up by Students.

Campus recruitment system will be an application to facilitate students in Viva Institute of Technology (VIVA-Tech) to register, search and apply for jobs. Campus recruitment system are designing to improve existing system. Whatever the information, TPO has to pass to the student and he or she can inform online. Improve accuracy in result. It will have user-friendly interface having quick authenticated access to documents. It will provides the facility of maintaining the details of the students. It will reduce the paper work and utilize the maximum capabilities of the setup and organization as well as it will save time and money, which are spending in making reports and collecting data. This system can be use as an application for college to manage the student information concerning placement. Also will helps company coming for campus recruitment to see student details. Before coming for campus, company can get information about eligible students along with interested students.

2. RELATED WORK

Many systems [2] have been developed for campus recruitment. These various systems [3] include different methods and technologies. Some recruitment systems [1] are based on Mahout Algorithm. It takes input from the user as Resume and after that the mahouts naive biased algorithm are used to classify the data of the resume for the purpose of pattern matching. Pattern matching is done about the classified data and criteria of the company. Some recruitment systems are based on [8] Psychometric tests. psychometric test enable filtering of candidates from the pool of those who might be interested in a vacant position in question. A web based recruitment website [9] has been developed that acts as a prototype to be implemented on a company website. It was designed in such a way that candidate can create an account on the company website and log on the website. The candidate would then go to vacancies where a list of vacancies would be displayed. The job seeker will then select a vacancy in his /her respective field and a briefing of the vacancy is given.

3. PROPOSED SYSTEM

The proposed campus recruitment system meant to give more easiness to the users that they can add and retrieve information so quickly. Once you will open this web application at the front end all the schedule/event will be available to everyone. Also in the every current student

login this schedule/event are available. There will be mainly four types of users are Current Student, Alumni, Training and Placement Officers (TPO) of the college and Companies. The administrator will be the master user; he will gets the most number of priorities than the other users. The administrator will also perform different functions that is updating and approval. The administrator will view and approve the various application forms.

3.1 Flow Diagram of the System

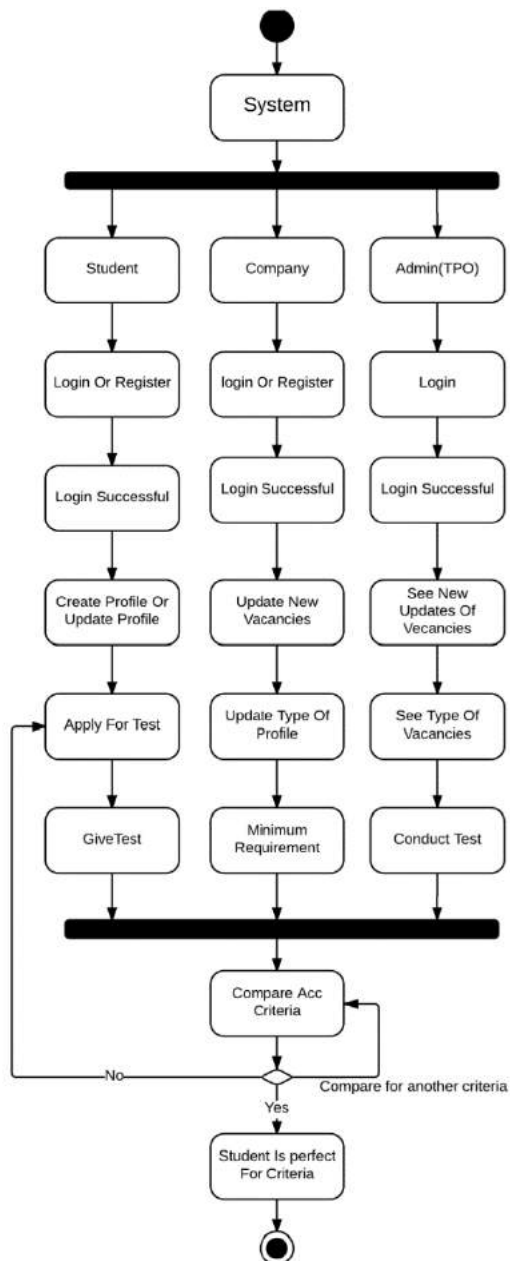


Fig1. System Flow Diagram

Student: There will be two types of student; Current Student and Alumni. Current Students can review and enter information from any location. Students can edit their CVs online, and update them constantly. Students can very flexibly search for and View Company and

vacancy details, and apply to vacancies by attaching a CV. For alumni the last three years data will be maintained. A separate registration will be done by the alumni and separate profile will be maintained of each alumni. Alumni will be kept in touch by an automated notification by E-mail message. They will have access of forum, with which they can post queries, reply queries. This will help the current student as there will be sharing of ideas by alumni's. Students on placement will also use the system to read important announcements, to obtain information on assessment, to see the results of assessments recorded in the system.

TPO: TPO will work as a system administrators. The TPO can give an approval to edited information done by the student. In addition, TPO can search the eligible student based the company criteria and can generate the list. Also TPO can conduct online aptitude test for selection of student. Also TPO can send an automated email to the eligible student. TPO can communicate with the student through the forum module.

TPO can gather information on all students for which they have appropriate permissions; this can be on an individual or group basis, they can also export a spreadsheet of important statistics on a group for further or detailed analysis. TPO will also provide the approval and conformance to the student through automated email system. TPO will give the validation of the information provided by the student through automated email system. They put online notices, schedule and events so that the entire user can view this.

Company: The companies will have to get register for the first time so that their information's like the URL, the contact information, papers, vacancies will be provide. Companies can edit their own contact information to help keep it current. They can also edit information about the company and any vacancies, producing much richer and current information, and a sense of ownership for the company. Companies can see relevant resources made available to them, and companies have space allocated for resources they wish to make available. Companies can view all students that have applied for vacancies, together with information on their availability, application time, cover letters, attached CVs etc.

4. CONCLUSION

In the existing system, maximum work done manually, it is error prone system, takes time for any changes in the system. In placement system their major problem of sorting, updating and searching of student records as well as all the placement updates are displays on only notice board there no any notification method.

This system will assist in automating the existing manual system. The propose system will reduce the paper work and man efforts. This system will control and monitor remotely. In this propose system, there are three users, student, TPO and company will work together. This system will get automated online registration for all users, activation and deactivation of user and provides all resources for information. System will conduct aptitude test according to carrier options. Propose system will helps to the students to get direction of their carrier.

The propose system will implemented for only single college but in future this system will implemented for all the colleges.

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VIVA-TECH Online Feedback System

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ABSTRACT

Online Feedback Analysis System is a web based application that provides platform for the colleges to conduct student's feedback online. This online system is the best place to find feedback report according to the requirement such as feedback given by the various kind of people and so on and it is the efficient place to get feedback analysis and maintain security. Students will fill online feedback using a standard form. In this project security will also be maintained that is the result of feedback will be only visible to authentic user. Every user will be provided with user name and password. Every student will be able to give the feedback only once. The student as a user will be able to give the feedback. The staff as a user will be able to view the feedback. All other rights will be given to the authorized administrator who will handle the overall functioning of the system. This proposed system will be able to overcome the flaws in traditional manual feedback system. Online feedback is an integral feature of effective & efficient learning & teaching. It can be one of the powerful way to enhance & strengthen student learning.

Keywords

Feedback, Online, Student, Teacher, Authentication, Web-based

1. INTRODUCTION

Feedback is information about how we are doing in our efforts to reach a goal. Student feedback is a practice used in various institutions as to let improve the performance of the teachers in the institution. The feedback lets the students to provide their views about teaching of a particular teacher. This feedback also helps the teacher to know their flaws and improve their performance. The traditional student feedback system is a manual system. In this system the teacher has to distribute the questionnaires to each student [1]. Then the student gives its feedback as per the questions. Once the feedback is given the teacher has to collect all the questionnaires and submit it to the head of department. Then the HOD goes through all the feedbacks and calculates it and then the result is displayed. This traditional approach is a time consuming approach as all the questionnaires [1] are to be distributed and collected, some calculations are needed to be done also there is wastage of paper and as the calculations are done by humans the error rate is more and hence no guarantee of precise results. To overcome this problem we are proposing the online feedback system.

This system will be an automated system hence no wastage of time and paper. No need of any calculations. The results will be accurate as compared to the traditional system of feedback.

2. RELATED WORK

Feedback management system for evaluating and generating monthly reports: This is an implemented online feedback system. The implemented system provides feedback in various departments of the collage such as library feedback, training and placement feedback, infrastructure feedback and office feedback. The system is divided basically into three main forms student login, staff login and administrator login. The system provide feedback on monthly bases.[1]

Comparison of manual v/s online feedback: This comparison states the major differences between the traditional feedback system and online feedback system.

Table 2.1:-Comparison of paper-based v/s web-based feedback[2]

Paper-based feedback	Web-based feedback
Gives chance to limited amount of students to give the feedback.	Gives every student in the class the opportunity to give the feedback.
Cost required is more to conduct the paper based survey.	Due to web-based survey the cost is reduced.
The operational efficiency and consistency is low as compared to web-based.	The operational efficiency has been increased due to web-based method.
The results depends upon the no of students present in the class at the time of feedback.	The results depends upon the no of students registered in the web-based system.
Result compilation is difficult as compared to web-based survey.	Results are easier to compile.
Difficult to modify and revise.	The web-based system can be modified easily.
Response rate is more.	Response rate is less.

Feedback For Learning: This is a book which have stated what is feedback and keys to effective feedback .Feedback is

information about how we are doing in our effort to reach a goal.

The key points for effective feedback are as follows:-

1. Goal-Referenced:- Effective feedback requires that a person has a goal, takes action to achieve the goal, and receives goal-related information about his or her actions[3].
2. Actionable:- Effective feedback is concrete, specific, and useful it provides actionable information. Actionable feedback must also be accepted by the performer[3].
3. Timely:- Good feedback is timely[3]. The feedback should be performed on timely basis[3]. The sooner u get feedback the more u can improve.
4. Ongoing:- Adjusting our performance depends on not only receiving feedback but also having opportunities to use it. The more feedback one can receive in real time, the better my ultimate performance will be [3].

3. Proposed System

The proposed system provides students to give feedback over the internet rather than the traditional paper feedback. The system will be prepared using technologies such as HTML, CSS, PHP and MySQL. The proposed system provides separate GUI (Graphical User Interface) for each user for ease of access. The proposed system provides an accurate result as compared to the manual feedback system. In this proposed system the admin has its GUI which provides various options such as edit student information, edit staff information, edit/add questions, start new feedback, etc. For the student the proposed system will provide a feedback form on the desktop from with multiple choice questions. The staff will be able to see their results through their login id in the separate GUI provided for them.

3.1 Stepwise procedure of the proposed system

As the system consists of three users the procedure is divided into three parts which is as follows:

3.1.1 Stepwise procedure for Admin:

1. First the admin logs into the system.
 2. After login the admin can perform various operations such as edit student information, teacher information, change the questions and report generation, starting a new feedback.
 3. Once the required operations are done the admin logs out.
- Above steps are stated in the below figure 1

3.1.2 Stepwise procedure for student:

1. First the students logs into the system or if he is a new student then he sign up into the system.
 2. After login the student is able to give the feedback.
 3. Once the feedback is given the student shall log out of the system.
- Above steps are stated in the below figure 1

3.1.3 Stepwise procedure for Staff:

1. The staff logs into the system.
 2. After log in the staff can view his/her result of the feedback.
 3. Once the result is viewed the staff logs out of the system.
- Above steps are stated in the figure 1.

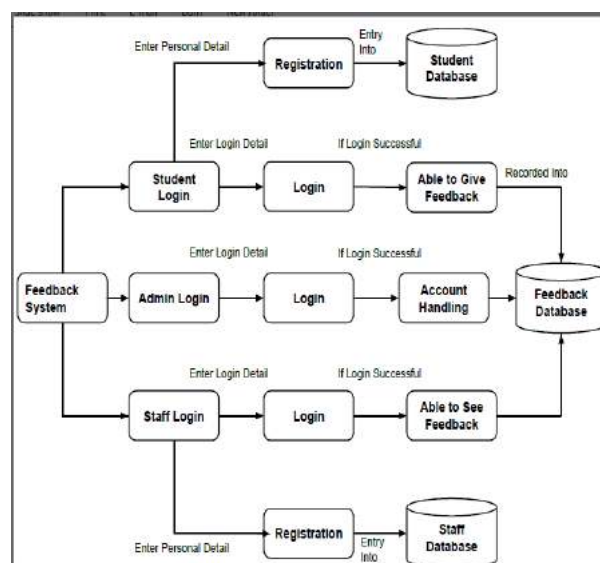


Fig 1: System flowchart for online feedback system

4. Analysis and advantages

Analysis of MD5

1. MD5 message-digest algorithm takes as input a message of arbitrary length and produces as output a 128-bit message digest of the input. [4]
2. Md5, with its 128 bit encryption algorithm has 1,280,000,000,000,000,000 possible combinations.
3. Even if the exact same value found, possible other string combination could have created it.

Steps of MD5 implementation:

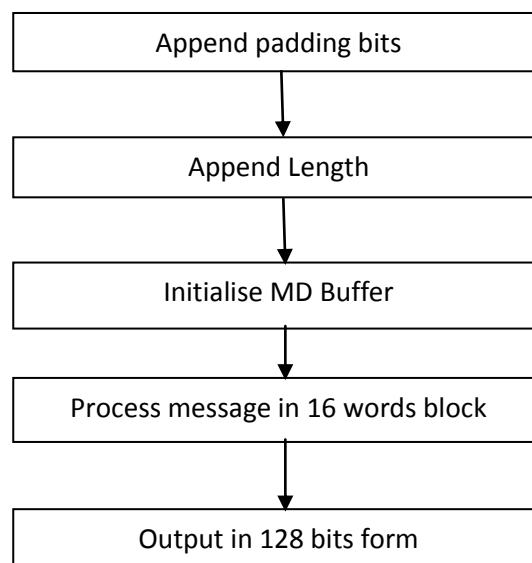


Fig 2: MD5 working steps[4]

4.1 Comparison of md5 algorithm with other message digest

	Key size/hash size(bits)	Extrapolated Speed (Kbytes/sec.)	PRB Optimized (Kbytes/sec.)
TEA	128	700	-
DES	56	350	7746
Triple-DES	112	120	2842
IDEA	128	700	4469
RSA	512	7	-
SHA	160	750	25162
MD5	128	1740	62425

Fig 3: Comparison of md5 algorithm with other message digest

4.2 Advantages of proposed system

1. The proposed system is an online which is better in performance than the traditional system.
2. No wastage of paper.
3. Calculations made easy.
4. Increase in the amount of feedback.
5. Precise result compared to traditional system.

5. Conclusion

The traditional feedback system was a manual approach and also had many flaws such as waste of time, paper and human efforts. The amount of student that could give the feedback was less. These were the flaws in traditional feedback system. The project "VIVA Tech Online Feedback System" is being developed by our team. This project will make sure to overcome all the disadvantages of the current traditional system. The project will save paper, time, and human effort required in traditional method of feedback. This proposed system will provide more accuracy in form of accurate results as compared to the traditional approach.

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Indian law System

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ABSTRACT

Crime is presented in various forms in India. Organized crime includes drug trafficking, gunrunning, money laundering, and extortion, murder for hire, fraud and poaching. Other crimes are homicide, robbery, assault etc. The statistics of every crime in the country are separately recorded and collected, making it easier to determine the crime rate. Indian Law System will address not only the cited reasons for not only the cited reasons for not reporting, but also the need of police departments for more accurate, complete and reusable information that may free up their time and resources to allocate them to policing the streets.

People have to refer laws related information from different sites and from different books which may not be adequate and also leads to wastage of time. To overcome this problem Indian law system is put forward. User can get information about the laws, nearby courts, lawyers and police can refer laws by inserting FIR in order to save time. User can be police, lawyers, or common people who want to get information about the laws. This system contains all the laws of IPC code.

Keywords

ILS (Indian law system), IPC Code, law extraction, court address, criminal updates, lawyer information.

1. INTRODUCTION

In India crime is present in various form. Each and every crime has specific law and punishment related to it. Drug trafficking, misuse of gun, misuse of money, extortion, murder for hire, fraud, human trafficking and poaching are included in organized crime. Many criminal operations are engaged in black marketing, political violence, religiously motivated violence, terrorism and abduction. Other crimes are homicide, robbery, assault etc. Property crimes include burglary, theft, motor vehicle theft and arson. Corruption is a significant problem. The statistics of every crime in the country are separately recorded and collected, making it easier to determine the crime rate.

Indian Law System(ILS) will not only help police or lawyers but it is also going to be useful for common peoples to get information about the laws and various other entity.

Nowadays many crimes are taking place in our society and people are unaware about the laws for such crimes.

Usually people refer laws from the given two options

- a. Online source
- b. Law books.

People have to refer laws related information from different sites and from different books which may not be adequate and also leads to wastage of time. To overcome this problem Indian law system is put forward. User can get information about the laws, nearby courts, lawyers and police can refer laws by inserting FIR in order to save time. User can be police, lawyers, or common people who want to get information about the laws. This system contains all the laws of IPC code, court address, lawyer information, criminal updates and various law updates.

2. RELATED WORK

Different information extraction systems have been put forward like NLP based retrieval of medical information for diagnosis of human diseases, Crime automation & reporting system, extract medical problems from electronic clinical documents by using natural language processing.

Gunjan Dhole and Nilesh Uke proposed NLP based retrieval of medical information for diagnosis of human diseases. The goal of this system is to extract the information regarding diseases from the medical document by using natural language processing method This system consists of two main parts document processing and query processing with natural language processing. It consists of data extraction, data processing, query processing, answer matching and filtering the answers. Data is stored in MongoDB. MongoDB (from "humongous") is a cross-platform document-oriented database. Classified as a NoSQL database, MongoDB eschews the traditional table-based relational database structure in favor of JSONlike documents with dynamic schemas (MongoDB calls the format BSON), making the integration of data in certain types of applications easier and faster. The Intellect rule engine is a rule engine which is used to maintain a list of rules. Query processing involves spell checking, capitalization, tokenization, post tagging, noun entity reorganization. Classifiers are given the query as a input and it figure out which class (Disease name) it belongs too.

The disease name with the highest probability will be given as output to the user [4] .

Stephane Meystre and Peter Haug proposed a system to extract medical problems from electronic clinical documents by using natural language processing. it uses NLP technologies to extract potential medical problem from free text medical document. This system is made of two main components a background application and problem list management application. The background application does all the text processing and analysis and stores extracted medical problem in the central clinical database. These problems are accessed by the problem list management application integrated in electronic health record. The NLP part of this system uses UMLS Meta Map, transfer(MMTx) application and Negation detection algorithm called NegEx to extract 80 different medical problem selected for their frequency of use in our institution.

Anil Jaiswal, Neeta Gunjal, Pooja Londhe, Shikha Singh, Ramesh Solanki proposed Crime Automation & Reporting System. It uses Software as service (SaaS) which is sometime referred to as “on-demand software” supplied by ISV’s or “Application Service Provider”(ASP’s). It is software delivery model in which software and the associated data are centrally hosted on cloud. Easier administration, Automatic updates and patch management. Compatibility, Easier collaboration, for the same reason Global accessibility all these things are provided by SaaS model [1].

K. Sudhakar and Dr. M. Manimekalai studied the various data mining techniques available to predict the heart disease and to compare them to find the best method of prediction. Data mining is a process of analyzing data from different perspective and gathering the knowledge from it. The discovered knowledge can be used for different applications for example healthcare industry [2].

An Intelligent Heart Disease Prediction System (IHDPS) is developed by using data mining techniques Naive Bayes, Neural Network, and Decision Trees was proposed by Sellappan Palaniappan et al. To build this system hidden patterns and relationship between them is used. It is web-based, user friendly & expandable.

To develop the multi-parametric feature with linear and nonlinear characteristics of HRV (Heart Rate Variability) a novel technique was proposed by HeonGyu Lee et al. [5]. To achieve this, they have used several classifiers e.g. Bayesian Classifiers, CMAR (Classification based on Multiple Association Rules), C4.5 (Decision Tree) and SVM (Support Vector Machine).

Akhil Jabbar et al. proposes efficient associative classification algorithm using genetic approach for heart disease prediction. The main motivation for using genetic algorithm in the discovery of high level prediction rules is that the discovered rules are highly comprehensible, having high predictive accuracy and of high interestingness values.

3. PROPOSED WORK

The proposed system also includes registration of user.

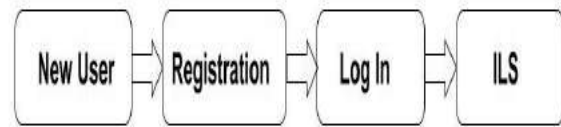


Fig 1: The architecture of registration for Indian Law System

For having a proper access to the system, the new user has to register them in order to access all the features of the system as shown in figure 1 above. A new user has to register by providing email id, name, phone number and password. Bootstrap is used for providing interface for users to have access to the system. Verification of password is done by using SHA-1 algorithm.

The proposed system consists of query processing and displaying the predicted IPC code, court and lawyer information. Both are very important phase of this project. The proposed system consists of following modules query input (descriptive or definitive), query processing, answer prediction, filtering the answers as shown in figure 2.

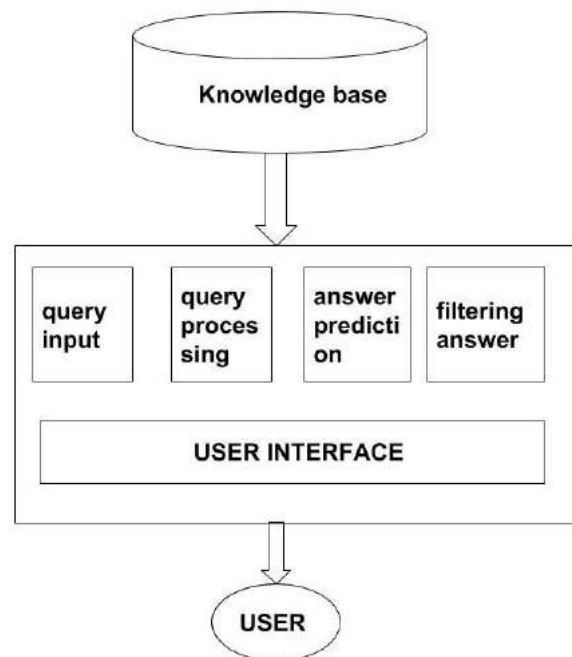


Fig 2: The architecture of Indian Law System

Proposed system consists of following modules:

1. Query Input
2. Query Processing
3. Answer Prediction
4. Filtering the Answer

3.1 Query Input

To get information about the specific law, court, lawyer or criminal. User has to provide query such as keyword or the situation of the crime in order to get specific information about the crime. Input can be of two type descriptive or definitive. The input is taken from the user through the data field prepared by using bootstrap which provides responsive websites.

3.2 Query Processing

Once the query is inserted in the data field of website by the user, the query further moves for query processing. Here the query is processed by using exclude function and further more calculations in order to match the keywords inserted by the user and the keywords present in the knowledge base.

3.3 Answer Prediction

Answer prediction module involves the prediction of answer from the given set of keywords. The answer which has highest percentage as compared to that of the other answer is considered as the predicted answer for the particular query inserted by the registered user.

3.4 Outcome of the Project

The goal of the project is to get the answer of the query inserted by the user with the best prediction. If the user enters keywords or set of keywords or situation of the crime, the system should be able to answer the query with the proper IPC code, court address, lawyer information and criminal updates.

4. Implementation

Implementation stages:

Steps which is being performed

Step 1: registration of new user

Step 2: login

Step 3: validation of user.

Step 4: get the query from user

Step 5: get the type of query definitive or descriptive

Step 6: process the query by using exclude function and calculating the percentage of the related keywords present in the query and the database.

Step 7: predict the answer according to the query.

Step 8: get the law or various other information from described queries.

4.1 Knowledge Base

Data related to all laws, IPC code, court, lawyers, criminals are been taken from Wikipedia and Indian law cases. These include all the information related to laws and various laws entities as mentioned above. It also includes all the information of the registered user.

4.2 Data Storage

Data is stored in mysql which is a database technology where all the information from the Wikipedia and Indian law cases are used for extracting data. Data storage also includes all the registered user information. SQL is a standard language for accessing and manipulating databases. SQL stands for Structured Query Language. SQL lets you access and manipulate databases. SQL is an ANSI (American National Standards Institute) standard. PHP is used for connecting database and front end. PHP is a server scripting language, and a powerful tool for making dynamic and interactive Web pages. It is a widely-used, free, and efficient alternative to competitors such as Microsoft's ASP.

4.3 User Input

The user login to the system by using user interface that accepts the user name and password from the user. It also accepts the query from the user. Query inserted by the user can be descriptive (paragraph) or definitive (keywords). The user interface will accept the query from the user and will provide the related laws, court address, and lawyer information.

The front end of the system is made by using Bootstrap, which is used for responsive websites. Responsive websites are those which will fit in all size of display devices whether be laptop, desktop or mobile. Front end will be in html, css, jquery. For validation and functioning Ajax or angular java script is used. AJAX is the art of exchanging data with a server, and update parts of a web page without reloading the whole page. Angular JavaScript extends HTML with new attributes. It is perfect for Single Page Applications (SPAs). Ajax and angular java script are both JavaScript frameworks which are latest technologies used and both are used for fast response.

4.4 Query and Answer Type Analysis

The input is taken from the user through the data field prepared by using bootstrap which provides responsive websites. Query inserted by the user are of two types descriptive and definitive.

1. Definitive: queries considering the keywords queries like: rape, thief, robbery, illegal action etc.
2. Descriptive: A robbery took place in Mumbai yesterday at 9 pm, 3 lakhs jewelry and 2 lakhs rupees were stolen.

4.5 Query Processing

It consists of following steps:

1. Explode function.
2. Comparing arrays.
3. Calculation.

4.5.1 Explode Function

If the query inserted is descriptive, explode function is used, which breaks string into array. The "separator" parameter cannot be an empty string. This function is binary-safe. Separated words are stored in two different arrays. Array1 stores all the small words and array2 stores keywords.

4.5.2 Comparing Arrays

The array2 is compared with the keywords present in the knowledge base of laws, court, lawyers. For each law related entities comparison of the keywords section of law tables, court tables, lawyer tables and array2 is done. This comparison is stored in result.

4.5.3 Calculations

Threshold value is set for calculating the predicted answer for the inserted query. For this proposed system threshold value is set to 30%.

%value= result*100/count (array2).

If percentage is greater than threshold value the predicted query is displayed to the user.

4.7 Algorithm for query processing

Step 1: query input.

Step 2: Remove the small words such as and, or etc.

Step 3: Store them in array1

Step 4: The keywords are exploded i.e. separated with space and stored in array2.

Step 5: Compare database and array 2 and store it in result.

Step 6: For each query, compare the keyword section of various law tables and array2 and calculate

%value= result*100/count(array2).

Step 7: if(percentage>threshold value)
show result.

Step 8: else nothing

5. Conclusion

This paper result to a system that will provide the proper knowledge about the laws of Indian judicial system and to get various other information related to it. Till now there is no such system in existence which provides knowledge about laws and various other information related to it under one roof. We get information through sites about particular crime by just inserting some keywords like half murder, drink and drive case etc. Citizens will not have to browse sites or read books in abundance to get information. All information will be present in our system and even extracting of laws from FIR/complaints would be performed in this system.

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A Survey on Twitter Sentiment Analysis with Various Algorithms

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ABSTRACT

The era of social networking has increased the amount of data generated by the user. People from all over the world share their opinions and thoughts on the micro-blogging sites on daily basis. Twitter is one of the most widely used micro-blogging site where people share their reviews in the form of tweets. The short and simple nature of the tweets makes it easier to use and analyze. The tweets also provide a richer and more varied content of opinions and sentiments about the latest topics. Sentiment is the feeling or attitude towards something and sentiment analysis is analyzing or studying about the various reviews given by people. The process of Sentiment Analysis tends to understand these opinions and categorize them into positive, negative, neutral.

Keywords

Social networking, micro-blogging, Twitter, sentiment analysis

1. INTRODUCTION

Sentiment analysis is a category of natural language processing for tracking the mood or review of the public about a particular product or topic. Now a day, large quantity of data is available on internet, data mining is applied to collect knowledge from the data in many domains. Users express their opinions on day-to-day basis about various services or products using micro-blog posts, review sites etc. For example, while considering the movies the classification of sentiment is mainly to find out the opinion about the viewer or customer and how the director or producer can do better in their next movie. Discovering the sentiments manually from a huge data is very difficult. The other vital issue faced is that the data available may be unstructured. So, getting the sentiments from the huge unstructured data is very difficult and automatic classification of sentiment is at great demand. This Automatic classification can be very useful for sentiment analysis in various applications like analysis of news sites on the Web, marketing report survey, opinion mining, system recommendation, and summarization of opinions. Classification of Sentiment can be represented as the training a classifier problem using reviews shown with the help of polarity i.e. Positive, Negative, and Neutral sentiment. This is extremely useful for both for the producers as well as the consumers to know what public think about a service or product.

Sentiment analysis over various micro-blogs faces several new challenges due to the typical short length and irregular

order of such type of content. Following are some challenges faced in sentiment analysis of Twitter feeds [1]:

- i. Named Entity Recognition (NER): NER is a technique to extract entities such as organization, people, and locations from tweets.
- ii. Anaphora Resolution: This process resolves the issue of what a noun phrase and pronoun are defined to. For example, "I went to Arijit Singh's concert then for a long drive, it was amazing". For a machine, "it" is an unknown parameter.
- iii. Parsing: The process that identifies a subject and object of the sentence.
- iv. Sarcasm: The process of using irony for conveying contempt.

1.1 Sentiment Analysis and Opinion Mining

The study of people's point of view or emotions towards a product or an event is "Sentiment Analysis". Sentiment analysis helps to track the reputation of product or services in general. Sentiment classification can be at sentence level or document level. Document level classification needs to filter out the sentences that contain no opinion before classifying the opinions in it to positive or negative. The method for classifying the phrases first extracts the opinionated text, then estimates the positions of these texts in the phrases and finally positive or negative value is assigned to the given phrase.

1.2 Twitter

There are almost 111 micro-blogging sites today over the internet. These micro-blogs are actually social media that the people use to share their posts. Among the 111 micro-blogs, twitter is one of the most popular sites. Twitter lets the people post tweets (message) of 148 characters in length. Micro-blogging websites are nothing but social media site to which user makes short and frequent posts. As one tweet only consists of 148 characters, it makes the process of sentiment analysis easier.

2. SENTIMENT CLASSIFICATION TECHNIQUES

The main twitter sentiment classification techniques are Support Vector Machines (SVMs), Naïve Bayes Classifier, Fuzzy logic, Baseline Model, Feature vector approach, and Hybrid approach.

2.1 Support Vector Machines (SVM)

Support Vector Machines are widely used algorithms since 1960s. SVMs are the set of algorithms that are used for pattern recognition. SVM algorithms are well-known and powerful

classification learning tool. Different model can be built using SVMs. Three models that can be developed using these algorithm for machine learning are Unigram Model, feature based model and tree kernel model. Feature extraction can be done using these models.

2.2 Baseline Model

In baseline model, initially the preprocessing steps are carried out study the polarity frequencies of unigrams, bigrams, and trigrams in the training data set. Three probability score is given to each token: Neutral probability, Positive probability and negative probability. A feature vector is then created for the tokens that can differentiate the tweet's sentiment effectively. Before the probability values are calculated the infrequent words are filtered out, this serves the baseline model. For Example, Emotion Determiners present with value 1 indicates its presence in the text and 0 indicates its absence in the text. Various features are appended to this model after building it.

2.3 Fuzzy Logic

Fuzzy logic is used to draw and retrieve sentiments from a text or document. Fuzzy logic uses the concept of reasoning that gives results in approximation rather than exact results. Fuzzy logic is useful for managing such approximate information. The numerical score of sentence is evaluated between the range from 0 to 1.

2.4 Corpus & Dictionary Based

In Dictionary based approach, first the seed words of opinions are searched and then it looks for their synonyms and antonyms. Some of the opinion words are listed manually. The list is then expanded by searching into popular or well-known corpora like WordNet. The strength of polarity is also listed in the dictionary for each word. The corpus based approach is use to find opinion words with context-specific orientations which depends on syntactic patterns.

3. DIFFERENT RESEARCHS ON SENTIMENT ANALYSIS

3.1 Sentiment Analysis on Twitter Data

V. Sahayak, V. Shete and A. Pathan [3] proposed in 2015 about "Sentiment Analysis on Twitter Data" suggested the hybrid approach that classifies the tweets from twitter dataset in sentiment categories like positive , negative, and neutral. The two techniques used in this approach are corpus based, dictionary based sentiment classification, and it includes POS for polarity features and tree kernel to avoid monotonous features. The feature extractor & different machine learning classifier are explained and used in this methodology. The machine learning classifiers are Naïve Bayes, Support Vector Machines (SVM), and Maximum Entropy. These classifiers are used to make three models for feature extraction process namely unigram model, tree kernel model, feature based model. They developed the process of sentiment analysis of tweets, which contains three sections. First section is data extraction, which helps to extract opinion words from tweets. Second section does preprocessing of all the extracted words, which includes emoticons handling, filtration, tokenization, removal of stop words, n-gram construction. Third section classifies the sentiments using machine learning classifiers. This section works in two steps: 1. Model construction. 2. Model usage to check accuracy of classification. When complexity of emoticons and opinions increases, it becomes difficult for this approach to give right answer. This can be a

drawback. For example, "The product was awesome but the services were gruesome". In this case, this approach may get confused for the result of sentiment.

3.2 Sentiment Analysis using Fuzzy Logic

Md. A. Haque & T. Rahman[2] proposed in 2014 "Sentiment Analysis with the help of Fuzzy Logic" by ranking the review in terms of positive and negative is the ranking perspective and it is achieved using fuzzy logic. The need of sentiment analysis is based on the two sectors i.e. classification of documents according to the orientation of sentiments such as positive and negative, other sector is gathering information by identifying the subjective or objective (SO) polarity of the comment or post, identifying the positivity or negativity (PO) polarity of comment or post and by identifying the degree of PN-polarity in terms of good, better or best. The tool to determine the polarity of lexical (the sentence is converted into sequence of tokens) is SentiWordNet. This gives numerical score to token range from 0 to 1. By having the values of the post and the weights, the result can be computed by calculating the weighted and arithmetic mean, from that percentage of the individual sentiment(subjective & objective) is declared and by using concept of normalization the results are present in better way.

3.3 Sentiment Analysis on Twitter

A.Kumar and T. M. Sebastian[5] proposed in 2012 about "Sentiment Analysis on Twitter" developed hybrid approach using dictionary based and corpus based method to calculate semantic score of the opinion words in tweets. This approach uses the features like capitalization, emoticons, etc. while preprocessing the tweets. The approach more focuses on opinion words which must be a combination of adjectives and verbs. In this hybrid approach, dictionary based method is used to find semantic score of adverb, and verb. And corpus based method is used to find semantic score of adjectives. The list of adverbs and verbs along with their semantic strengths ranging from -1 to 1 are taken into consideration while calculating semantic score of adverbs and verbs. The varying semantic strengths of words provides high accuracy while handling multiple opinions and emoticons. For example, "very good" will get more semantic strength than "good" . The negation handling is also achieved by this approach and it is accurate. The linear equation which is the highly focused part of this approach is used to calculate overall semantic score of single tweet. This linear equation calculates semantic score of each tweet more accurately by considering uppercase tweets, repeated letters, exclamation marks, emoticons, adjective group, verb group. According to semantic score of tweet, tweet is classified into three categories namely positive, negative, neutral.

3.4 A Fuzzy Logic Based on Sentiment Classification

J.I.Sheeba and Dr.K.Vivekanandan[6] proposed in 2014 "A Fuzzy Logic Based on Sentiment Classification" which says that, fuzzy logic is a type of probabilistic logic and it deals with reasoning that is approximate rather than fixed. Fuzzy logic is used for dealing with heterogeneous or vague information. Traditional logic may have many values but fuzzy logic can have values that range from 0 to 1. The input to the fuzzy logic is from sentiment classification step. The weights are assigned for each word. Based on the weight of the word, the "Threshold" value is calculated. The threshold value is calculated based on the average of each listed word. Finally, the list of positive, negative and neutral words are

listed which is greater than or equal to the Threshold value. The algorithm is Fuzzy C-means algorithm use in this method which gather all the same words to reduce the emotions list and group the emotions based on the cluster centroid. The topic of particular category which is input is identified by the framework. The main motive of the method is to return the reduced and accurate emotions list. The five major steps are:

- i. To classify the both implicit and explicit emotions includes data processing and sentiment classification.
- ii. Apply fuzzy logic for sentiment classification.
- iii. Implement Fuzzy C-means algorithm.
- iv. To generalize author classification i.e identification and characterization using POS(Part of Speech) tagger or Qtag Tool.
- v. Finally identify the topic.

The evaluation of the result is done by Considering Metrics in term of quality measures name as precision, recall and F-Measure.

3.5 Sentiment Analysis and Opinion Mining

Y. Sharma, V. Mangat and M. Kaur [4] proposed in 2015 about “Sentiment Analysis & Opinion Mining” that suggested various approaches based on which the sentiments can be analyzed.

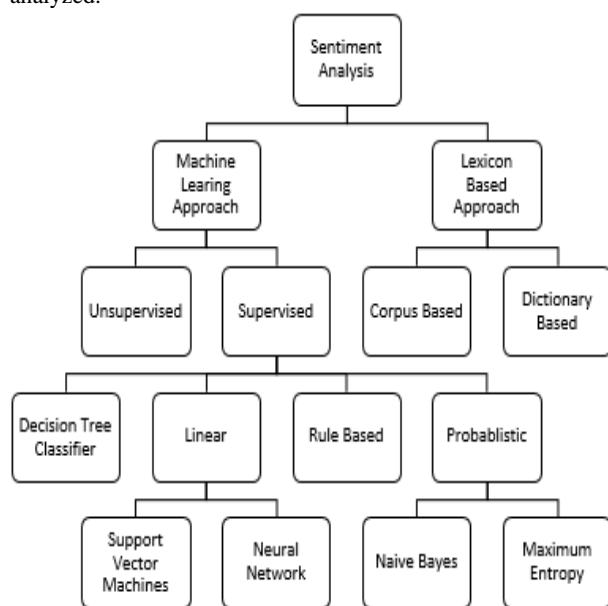


Fig. 1: Sentiment Classification Technique

The different approaches for sentiment analysis are shown in figure 1. It also included the feature selection method, which reduces the unconnected information. It enhances the classification accuracy, and also decreases the running time of algorithm. The selection step is to remove the target, stop words, URL, & stemming. The two broad ways in which the sentiment analysis is done are Machine learning approach and Lexicon based approach. Machine learning approach learns from the previously generated results whereas the Lexicon based approach is usually fixed and gives approximated results.

3.6 A Hybrid Approach for Twitter Sentiment Analysis

N. Mittal & B. Agarwal [7] proposed “A Hybrid Approach for Twitter Sentiment Analysis” which is a three stage hierarchical model for sentiment extraction, in first stage the emoticons are labeled, then tweets are assigned sentiments using pre-defined lists of words with polarity and finally based on subjectivity of lexicon, the proposed probability based method assign the weight to all the tokens. The lexicons are weighted using various approaches like SentiWordNet, proposed probability based method, SentiWordNet (SWN) then probability based method, probability based method then SentiWordNet or Hybrid approach. The accuracy measured for hybrid approach was comparative higher than all the approaches i.e. 72.563 %. Hybrid method uses both SWN and probability based method to calculate the polarity of the token. Hence proposed hybrid approach improves the sentiment classification accuracy.

3.7 Opinion Mining of Real Time Twitter Tweets

A. Shrivatava, S. Mayor and B. Pant [8], proposed “Opinion Mining of Real Twitter Tweets,” In this proposed system, a tweet puller is developed which automatically fetch the public opinion on a topic and using SVM the opinions are classified into positive, negative and neutral. First, tweets are collected using twitter API then creating domain specific dictionary. Extracting all the tweets from Twitter when server is connected is done by tweet puller. Using classification tool to generate threshold frequency for each feature and generate a text file. Text file is input to LIBSVM tool, which is proposed to provide accurate rate for testing the classification.

3.8 Combining Lexicon-based and Learning-based Methods for Twitter Sentiment Analysis

L. Zhang, R. Ghosh, M. Dekhil, M. Hsu, and B. Liu [9], proposed “Combining Lexicon-based and Learning-based Methods for Twitter Sentiment Analysis”. The proposed system is a new entity-level sentiment analysis approach for Twitter, which is done using lexicon based method, the input preprocessed tweets are analyzed and categorize into sentence type detection, coreference resolution, using opinion rule aggregate opinions are formed which is input to train sentiment classifier that is Learning-based method and finally the extract opinionated tweets are classified. Coreference resolution gives the closest entity. For example, “I went to Arijit Singh’s concert then for a long drive, it was amazing”. “it” can be resolved by considering the closest entity that is “long drive”. This system gives high precision, recall, and F-score.

3.9 Twitter Sentiment Analysis The good, the bad and the neutral

Ayushi Dalmia [12] proposed “Twitter Sentiment Analysis The good, the bad and the neutral!”. In this system, the lexicon based feature is further augmented by tweet specific features. The system includes English dictionary, acronym, and emoticon dictionaries. The preprocessing includes tokenization, removing non-English tweet, replace emoticons, remove URL, remove target mentions, remove punctuations from hash tags, handling sequences of repeated characters, removing numbers, removing nouns and prepositions, removing stop words, handle negative mentions and expand acronyms. After preprocessing & feature extraction, the tweets are feed into a classifier; it concludes that SVM gave the best performance. Hence, by building supervised system

which merge lexicon based feature with tweet related features classify the tweets into 3-way classification-positive, negative and neutral.

3.10 Mining Sentiments from Tweets

A. Bakliwal, Piyush Arora, Senthil Madhappan, Nikhil Kapre, Mukesh Singh, Vasudeva Varma [10] proposed “Mining Sentiments from Tweets”. In this system, the method for sentiment analysis is used on Stanford dataset & Mejj dataset with achieves 88% accuracy. The feature vector approach is used to form feature using unigrams, bigrams, hash tags (#), targets (@), emoticons, special letters, & semi-supervised SVM classifier. The feature is distinguishing into Twitter specific and NLP feature. This approach is very useful when the user has to extract maximum information out of small content. It includes Emotion and Punctuations handling, spell correction, stemming, stop word removal using unigram model, noun indication, and finally score of the tweet is based on all the factors.

4. COMPARATIVE STUDY

This comparative study mainly based on above mentioned sentiment classification techniques. Table 1 shows studies done in different research papers on various classifiers and percentage accuracy given by those classifiers in year 2011 to 2015.

Table 1: Mining Techniques and their accuracy in different research papers

Studies	Mining Techniques Used	Performance (Accuracy)
V. Sahayak, V. Shete , A. Pathan[3]	Naïve Bayes Classifier or Support Vector Machines (SVMs).	better accuracy
Md. Ansarul Haque1 , Tamjid Rahman[2]	Fuzzy logic	Moderate accuracy
J.I.Sheeba, Dr.K.Vivekanandan[6]	Fuzzy logic	85%
Akshil Kumar, Teeja Mary Sebastian[5]	Hybrid approach with Corpus based and dictionary based method	80%
Namita Mittal, Basant Agarwal[7]	Hybrid approach Subjectivity lexicon and probability	71.12%
A. Shrivatava, S. Mayor and B. Pant[8]	SVM	70.5%
L. Zhang et al. [9]	Hybrid approach	85.4%
A. Bakliwal et al. [10]	Baseline method on Stanford Dataset	87.2%
	Feature vector approach on Stanford	87.64%

	Dataset	
Prerna Chikersal, Soujanya Poria, and Erik Cambria [11]	SVM	71.5%
	SVM with a rule-based layer.	72.3%
Ayushi Dalmia, Manish Gupta., Vasudeva Varma [12]	Baseline Model	59.83%

5. CONCLUSION

Many of the organizations are putting their efforts in finding the best system for sentiment analysis. Some of the algorithms give good results but still many more limitations in these algorithms. As the twitter users are increasing day by day and the posts shared by the people are short messages (tweets) it can be very useful to analyze its data set. Fuzzy logic helps sentiment analysis provide efficient results as it is based on reasoning on the approximate values. Sentiment analysis when used with fuzzy logic helps to take decisions effectively but sometimes it may differ from the real time values. Future work may combine many different types of techniques to overcome individual's limitations, benefit from each other's merit, and measure the performance of classification technique.

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A SURVEY ON ANDROID BASED INDOOR WI-FI POSITIONING SYSTEM USING TRI-LATERATION

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ABSTRACT

Indoor Positioning System (IPS) has been studying in many fields. Recently, the IPS market is growing rapidly and many companies are working on indoor maps, tracking and navigation technologies and services. There many different schemes for indoor positioning such as Wi-Fi based positioning system (WPS), Bluetooth, Infrared, ultrasound, etc. Global Positioning System is one of the best positioning system but it works accurate for outdoor localization and is also used for navigation and tracking for any devices or smartphones. However, unfortunately it is difficult to use for indoor applications i.e. inside the buildings the signal is not available, IPS solves this problem and for more accuracy IPS is done using Wi-Fi positioning, accordingly, this paper proposes indoor positioning system using tri-lateration method, which uses RSSI data from Wi-Fi access points to do localization in indoor environment.

Keywords

Access Points (AP's), Indoor Wi-Fi Positioning, Received Signal Strength Indication, Tri-lateration, Android, Smartphone.

1. INTRODUCTION

To locate people or objects inside buildings an Indoor Positioning System is used. Indoor Positioning System basically uses sensory information from acoustic signals, radio waves or magnetic fields collected by mobile devices. There are many systems on the market, but IPS systems has no particular standard. Different technologies like magnetic positioning, distance measurement to nearby anchor nodes (nodes with known positions, e.g. Wi-Fi access points). To find exact location at least three independent measurements are required by system and this is known as tri-lateration. The methods using Wi-Fi are more preferable because Wi-Fi networks are prevalent in most public buildings, its use does not require additional infrastructure, and it allows determination of the location of each mobile device. The Wi-Fi signals provide a low precision for tracking the locations. Therefore, in order to acquire more accurate location of a target, Wi-Fi APs dedicated for localization should be installed in the target area.

In this paper, a Wi-Fi base indoor positioning system is explained. In Wi-Fi, various methods are used for positioning purpose.

One of the methods used in proposed system is Trilateration method for indoor localization, which makes use of the point of intersection of three circles of Wi-Fi APs, which gives the exact position of user. The rest of the paper is organized as follows. Section II describes Indoor localization, III explains the literature review, section IV describes Survey of IPS, V explains the Results, VI explains the Conclusion, VII shows the references.

2. INDOOR LOCALIZATION

2.1 Wi-Fi Trilateration Approach

Signal strengths from all the existing Wi-Fi AP's are gathered in trilateration. Signal propagation models relates the received signal strengths from existing AP's and converts to distance from respective AP's. Afterwards to obtain the position of user in indoor environment trilateration algorithm is used. Trilateration is simple and easy to implement method for indoor localization. Further to improve the accuracy and to reduce the errors various methods are used in trilateration method. Trilateration is also called as dynamic method of positioning. Fingerprinting method is used for indoor positioning. It has got mainly two phases which is offline training phase and online phase. In offline training phase, the database of Wi-Fi RSS fingerprints with respective location co-ordinates is prepared. This is the most important phase and accuracy of the system depends on this phase. In online phase, fingerprint database is queried for location of user. Various pattern matching algorithms are used to match the database entries with dynamic RSS. We have explained the indoor positioning system based on Wi-Fi technology which uses Trilateration method to estimate user position in indoor.

Trilateration algorithm is shown in the Fig 1 and calculates the exact location of user given the exact location of access points and distances from each access points to user. Name of the algorithm suggests that it requires minimum of 3 Wi-Fi access points in indoor environment to calculate user location co-ordinates.

The three circles are nothing but the three AP's whose center co-ordinates are known. The point of intersection of three circles is the position of receiver. Now, knowing d1, d2, d3 i.e. distances from center of access points and center co-ordinates(x_i, y_i, z_i) of AP's the exact location of receiver (x, y, z) can be calculated by solving this set of equations.

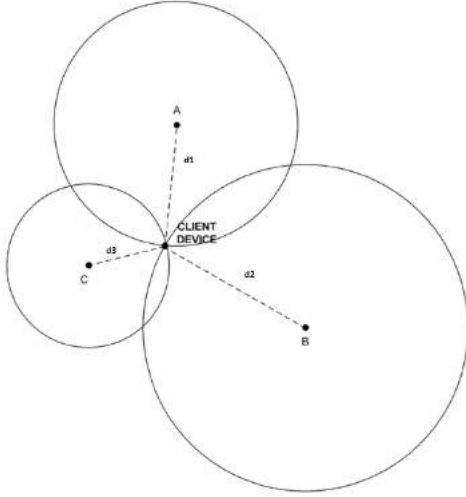


Fig 1: Trilateration algorithm

$$(x_1 - x)^2 + (y_1 - y)^2 + (z_1 - z)^2 = d_1^2$$

$$(x_2 - x)^2 + (y_2 - y)^2 + (z_2 - z)^2 = d_2^2$$

$$(x_3 - x)^2 + (y_3 - y)^2 + (z_3 - z)^2 = d_3^2$$

These equations reduce to linear set of simultaneous equations which can be solved easily using matrices. The system gives unique solution (x, y, z) which is the required position of user in indoor environment.

2.2 Wi-Fi Trilateration based on RSSI approach

Received Signal Strength Indicator (RSSI) is a measurement of the power present in a received radio signal. RSSI is usually invisible to a user of a receiving device. Trilateration or multi-lateration. In triangulation, position of target is determined using a combination of range and angle information. In multi-lateration, position of target is determined using time difference of arrivals of the transmitted signal, at three different receivers. This is called as hyperbolic positioning. These techniques cannot overlook certain shortcomings. In triangulation, angle information is needed apart from distances between APs. Measurement of angles subtended is difficult and either AOA or TOA information is required. In multi lateration, a minimum of 4 APs are needed for localization in 3D space. These will increase the hardware complexity. To overcome these difficulties, trilateration technique is adopted.

3. LITERATURE REVIEW

3.1 RSSI based Indoor Localization for Smartphone using Fixed and Mobile Wireless Node [2]

Md Osman Gani, Casey O'brien, Sheikh I Ahamed, Roger O Smith in 2013 has presented that there are several methods for estimating positioning and the three types of measurements mainly used a) Angle of Arrival (AOA) b) Time of Arrival (TOA) and Time Difference of Arrival (TDOA) and c) Received Signal Strength Indicators (RSSI). Each of these parameters has some advantages and disadvantages. In contrast with AOA, TOA/TDOA, measuring the RSSI value is very simple and also available in all of the existing wireless systems. That is why RSSI based methods are preferable and easy to implement.

Mathematical Model: The result from a separate experiment (RSSI value and orientation of smartphone and wireless node) was used to build the mathematical model. From the experimental result, the RSSI value was found which varies with the orientation of mobile device and Wi-Fi node. To normalize the orientation, effect the system collected RSSI value with the rotation of smartphone by 360 degrees 5 on the horizontal plane. Then the system used mean value of the collected RSSI to compute the distance.

3.2 Efficient Wi-Fi Fingerprint Training Using Semi supervised Learning [1]

Y. Yuan, L. Pei, C. Xu, Q. Liu, T. Gu in 2014 has presented the concepts and algorithms of the Wi-Fi fingerprinting technique for indoor positioning- based systems as it is the approach being used for the system developed in this work. Wi-Fi fingerprinting, a scene analysis technique, has been shown to be a reliable way to localize people indoors since it uses infrastructure already deployed indoors. A novel approach to improve accuracy of an indoor positioning system based on Wi-Fi fingerprinting was presented. The results of this work also show improvement for an indoor positioning system. The approach takes advantage of the AP option in most smartphones to create dynamic access points and fingerprints. The accelerometer embedded in most smartphones was used to predict the movement patterns of the users as static or dynamic using machine learning algorithms.

3.3 Dynamic Wi-Fi Fingerprinting Indoor Positioning System [3]

Omar Costilla-Reyes, Kamesh Namuduri in 2014 has presented, an indoor positioning system (IPS) is a solution to locate objects or people inside a building using radio waves, magnetic fields, acoustic signals, or other sensory information collected by mobile devices. Instead of using satellites, IPS solutions rely on different technologies, including distance measurement to nearby anchor nodes (nodes with known positions, e.g., Wi-Fi access points). An Android app on an ordinary smart phone, it

comprises a calibration stage and a navigation stage. In the calibration stage, the system creates a Wi-Fi fingerprint for each room of a building, where the received signal power of multiple signals are collected over time and space and stored as multivariate Gaussian distributions. During the navigation stage, the system determines its position by matching Wi-Fi signal strengths to the fingerprints with maximum-likelihood classification.

Fingerprinting involves two stages: 1) Offline stage: Creation of radio map(Database) by collecting Received signal strength integration readings from available surrounding Wi-Fi Access Points (APs) within the area of interest in particular known and selected positions (Reference points). 2) Online stage: Device position estimation by comparing the online RSSI readings of the device with the offline RPs observation, forming the database.

4. SURVEY OF WLAN IPS

There are many approaches of indoor positioning and localization techniques as GPS based, Cellular based, WLAN, Bluetooth, etc. We focus on the WLAN for indoor positioning. The overview of basic WLAN indoor positioning is described as follows:

4.1 Wi-Fi Based

This midrange wireless local area network (WLAN) [12] standard, operating in the 2.4-GHz Industrial, Scientific and Medical (ISM) band, has become very popular in public hotspots and enterprise locations during the last few years. With a typical gross bit rate of 11, 54, or 108 Mbps and a range of 50–100 m, it is currently the dominant local wireless networking standard. It is, therefore, appealing to use an existing WLAN infrastructure for indoor location as well, by adding a location server. The accuracy of typical WLAN positioning systems using RSS is approximately 3 to 30 m, with an update rate in the range of few seconds.

4.2 HORUS

Horus system offered a joint clustering technique for location estimation, in this system each candidate location coordinate is regarded as a class or category. In order to minimize the distance error, location is chosen while its likelihood is the highest. The experiment results show that this technique can

acquire an accuracy of more than 90% to within 2.1 m. Increasing the number of samples at each sampling location could improve its accuracy because increasing the number of samples would improve the estimation for means and standard deviations of Gaussian distribution.

4.3 RADAR

RADAR localization technique uses the nearest neighbor(s) in signal-space technique, which is the same as the KNN [8]. The accuracy of RADAR system is about 2–3 m. RADAR was enhanced by a Viterbi-like algorithm. Its result is that the 50 percentile of the RADAR system is around 2.37–2.65 m and its 90 percentile is around 5.93–5.97 m.

4.4 CUPID

CUPID computes the distance of the client by combining the time-of-flight and energy of her direct path, called TFDP and EDP respectively. The average positioning error under high density (40 clients) and low overhead (1% airtime usage) is approximately 3:2m. The error will be lower if a higher overhead is acceptable (1:7m with 5% overhead) because CUPID2.0 can utilize the TFDP more frequently to deal with the errors in EDP-based location estimation.

5. RESULT

Table 1 briefly compares the current systems and solutions. The systems solutions shown in this table are mainly the ones whose specifications have been reported by their developers. Some of the results obtained of localization at different locations are shown in Table 1.

Table 1. Different Wireless Indoor Positioning Systems

System/ Solution	Positioning algorithm	Accuracy	Precision	Complexity	Scalability/Space dimension	Robustness	Cost
RADAR	KNN algorithm	3-5m	50% within 2.5m & 90% within 5.9m	Moderate	Good	Good	Low
Horus	Probabilistic method	2m	90% within 2.1m	Moderate	Good	Good	Low
RSS	Trilateration	2.5-3m	50% within 2.5m	Moderate	Good	Good	Low
Cupid	TFDP	3.2m	90% within 3.5m	Moderate	Good	Good	Medium
Robot Based	Bayesian	1.5m	Over 50%	Moderate	Good	Good	Medium

	Approach		within 1.5m				
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6. CONCLUSION

The proposed system achieves better positioning accuracy for mobile devices using the Wi-Fi signals which is easy to implement and requires lower cost than other localization systems and the method is used to implement is tri-lateration. The accuracy of positioning can be further improved by using more number of Aps i.e. access points in the system. We expect the indoor WPS for smart phones to be used at various places.

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“SMART RAILWAY”: Making a Handy Indicator for Mumbai Local Train Commuters

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ABSTRACT

Mumbai's Local Train is one of the largest Railway Network. Here Majority of the people use train for their daily transport, because of its robust frequency and it connects different parts of the city. Apart from that its ticket fare is low compared to other transport services. But the most observed problem faced by the passengers is the delay caused by the trains or cancellation without any prior indication. In most railway stations indicators present on the platform are not updated on time and sometimes the indicators fail to work. This creates lot of confusion amongst the passengers.

There is a need to develop an advanced mobile application which will help to provide railway services. The previous system on which the passengers relied was based on a static application which was not so convenient. It only provided the time table for the trains.

Smart railway is an advanced mobile application which provides with the railway indicator of the station you are at. As a result, people won't have to look for indicators on the station they are at and they will get updates regarding the concerned train. This paper presentation describes more about this application and its advantages for the rail commuters.

KEYWORDS

Railway, Mumbai Local Train, Platform Indicators.

1. INTRODUCTION

A gigantic number of commuters travel daily by Mumbai local trains. Sometimes due to train delays and technical issues people

tend to get confused and they miss their train and sometimes they themselves get late for a few seconds and miss the train. This issue can be solved if they have a prior information about the train so that accordingly they can manage their time. The current application only provides with the train timings. It does not provide any live status of the train. For the current status of the train, passengers have to look for the railway indicators present in few particular locations in the station. This sometimes becomes tedious as the indicators are not present everywhere. And at times indicators cease to work due to technical failure which leaves the passenger clueless.

The layout of Smart Railway App is planned in such a way that the passengers get the updates of the train as soon as they enter the zone of the respective station. This app provides details of the concerned train such as arrival time, platform number and time delay and along with its number of coaches.

2. RELATED WORK

There already exist applications and websites to obtain the train timetable. They also provide us with the platform number on which the train is going to arrive. Here are some few examples of existing application and websites.

Applications such as M-indicator, RailEazy, MRM (Mumbai Rail Map) provide us with train timetable along with its platform number and other train information. They only provide us with static data. It does not provide us with information like train delay and cancellation. As a result, it becomes inconvenient for the passengers to find the details of the train if any emergency re-scheduling is done by the railway authority.

There are some websites like <http://indiarailinfo.com/> that provides live updates of train location and delay for express/mail

trains. But such kind of facility is not available for local trains which are used by majority of crowd on a daily basis.

The proposed application aims to provide dynamic information regarding the Mumbai local train timetable and scheduling.

3. PROPOSED SYSTEM

The proposed system aims to provide hassle free service to the commuters so that they can travel without any wastage of time and energy. The control room of each station has the latest updates of all the arriving trains but sometimes it fails to update the indicators accordingly. This app provides the user with live updates of all the trains at the particular station by synchronising with the smart app database (which is linked with control room database) when they enter the “smart app zone” (the radius in which the smart railway app gets synchronised with the database). As a result, passengers do not need look for indicators located in railway station and they need not worry if those indicators does not work because they already have one in their hand.

With this app, confusion amongst the passengers can be reduced to a large extend and they will get a clear information about the trains. This application enables the passengers to get quicker access of the updated information on a faster rate.

3.1. ACTUAL WORKING

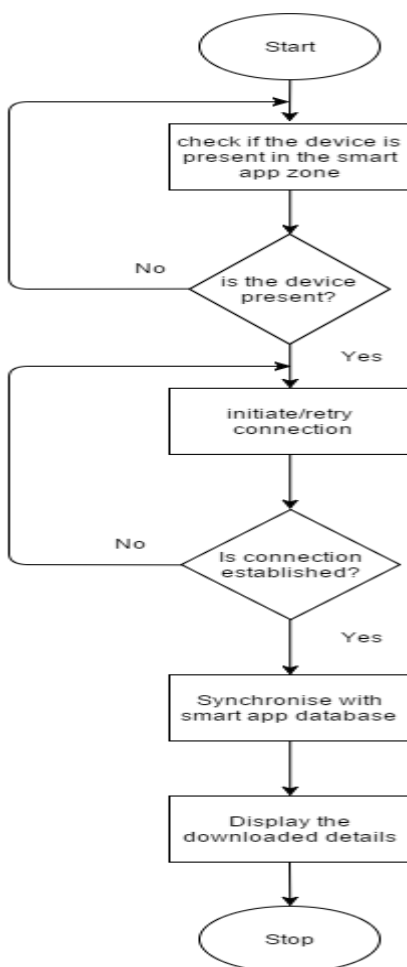


Fig. 1: Working of the System.

The motive of smart railway app is to provide the passenger with a train indicator which contains the train delay time and arrival time, when they enter the respective railway station spectrum. To do this a smart app zone is created in which the smart railway app gets synchronized with the smart app database using WLAN (Wireless LAN). Here the smart app database retrieves all the needed information from the control room database. [1] First the app gets synchronized with the database. It then downloads the latest train updates and displays accordingly. Internet is not required as it will use WLAN network topology. It is not only fast and efficient but it also saves time and money of the passenger.

3.2. SERVICES OFFERED IN APP

- Live platform indicator
- Timetable
- Favourite
- Rail fare
- map

4. RESULT AND ANALYSIS

The major highlights of this application is that it provides the user with the indicator of the railway station in their phone which is much handy and efficient. It provides with the train's live updates to the passenger when they enter the smart app zone, they need not wait to reach the railway station to look for the indicators for the same. Hence it provides flexibility to the user. It does not require mobile data connection which makes this app much more feasible for the user. [2] The interface of the app is designed in such a way that it is user friendly and it does not need any technical knowledge.

BORIVALI			
PF	Time	Train	ETA
2	12:45	CHG F	07
3	12:47	VIRAR S	Cancelled
4	12:54	DADAR F	00
1	12:59	CHG S	01
2	13:05	ADH S	09
8	13:12	CHG F	13

Fig. 2: GUI of the System

The Fig. 2 shows the graphical user interface of our proposed system. The menu bar consists of three options, viz., TIMETABLE, which displays the timetable of the local trains, LIVE STATUS, which displays the timetable along with the estimated time for arrival (ETA). It even displays the cancelled status of the train. And the last menu is of the FARE, it displays the Fare for travelling to particular destinations.

5. CONCLUSION

This paper results into an efficient system on which the daily commuters can refer to without relying on the Indicators present on railway platform which does not provide live updates on train or may be faulty sometimes. One of the important thing is that the System is robust in terms of data.

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MOOD SWINGER APPLICATION

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ABSTRACT:

My exploration is on mobile application named by us as Mood Swinger, which uses two upcoming technologies that is Artificial Intelligence and Internet of Things. The name itself demonstrates that this application relies on the common man's mood, this application is composed purposefully for the excitement and help with crisis for common man, common man needs help of any application in two distinct perspectives, for example, first is the point at which he or she is in various states of mind, for example, happy, sad, bored.. In that inclination this application will offer a man for his diversion some assistance with according to his state of mind and second is the point at which he or she is in emergency and is alone in crisis then he or she needs help of a virtual person. In that situation this application will offer a man to handle the situation ,some assistance with using the assistance of a GPS tracking system and Artificial Intelligence, how to tackle and come out of it. This application will be extremely client friendly and a need of a typical man since it incorporates all the fundamental necessities required by basic man in everyday life. This application has one more delightful element that it contains diverse sorts of applications in one application so we don't need to stress for finding distinctive applications for various reasons, for example, surfing all these things like shopping, health, finance, movies, music etc as it includes all in one application.

General Terms

Sensors, Internet of Things, GPS tracker, Social Networking, Entertainment

Keywords

Mood, gps tracking system, artificial intelligence

1. INTRODUCTION

My entire exploration is on common man's help and stimulation in his diverse moods, named as mood swinger, this application has some part in view of long range interpersonal communication site, for example, for instance as I said before, this application depends on common man's mood, as we can watch our-self and a typical man is dependably in various sorts of moods that is happy, sad, bored. So, in that different moods a common man needs to do something for his entertainment. So, people will be associated correspondingly like Whatsapp, yet the distinction is that a unique individual's mood and the reason behind that mood will be asked and his mood will be updated as his status which can be seen by his companion list in that application.

so an individual person's companion will better know about him or her through his mood daily, this will be one of the features of the application the primary component of this application is for instance A client will be given diverse choices for clicking as his inclination case happy, sad, bored....So when he taps on happy he will be requested that do a few exercises, for example, shopping or motion pictures or technique amusements and so on the intriguing part of the application is we have included an element known as gps tracker, for example, gps tracker, this will be useful for instance if a client taps on shopping then his area will be empowered and he will distinguish shopping centers nearby to him or her, this highlight can be accomplished by introducing a mood swinger's gps tracker in each shopping center in a city, this idea is likewise taking into account the OLA,UBER application where nearby cars can be detected by the user's in their application, moreover we have included an idea of Artificial Intelligence through that application to help the crippled person, for example if a visually impaired individual is strolling through the street and the application will be stay on in background keeping in mind walking all of a sudden any obstruction arrives before him then consequently the application will alert the individual by indication of vibrating phone using the sensors, moreover this application will have one more extraordinary element that it will be completely based on One click concept for instance all application in one application that implies you can shop, travel, book tickets of movies, flights, train, listen music, play recreations ,book a taxicab in one app no need to download distinctive sorts of applications for various purposes. Moreover we will be using some feature related to the latest concept of internet of things.

2. SPECIAL FEATURES OF APPLICATION:

2.1. PERSONAL ASSISTANT:

In our research, we have composed a personal assistant in the application which will help the individual in his troublesome times for an instance if a man is distant from everyone else at home and all of a sudden he became ill like heart attack then the application will tell that individual how to handle that circumstance by recommending a few traps ,moreover if a man is in crisis and need a prescription at midnight then the application will identify close-by hospitals and medicinal shops by utilizing gps tracker respectively. For the gps usage it will be obligatory for each clinics and restorative shops to introduce a gps tracker at their places separately.

2.2. INTERNET OF THINGS:

2.2. (A). Problem definition:

The Internet of Things (IOT) is the network of physical objects, devices, vehicles, buildings and other items which are embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data. The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure using an application, creating opportunities for more-direct integration between the physical world and computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. When IOT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. Experts estimate that the IOT will consist of almost 50 billion objects by 2020.

2.2. (B) Features of Internet of Things in Mood Swinger:

Example 1: Utilizing LPG gas efficiently:

We are utilizing the most recent innovation as a part of our application known as Internet of things which uses internet as a part of our physical objects so they can get associated with the smart phone from anywhere. This illustration demonstrates that how gas will utilize itself effectively for instance if a man leaves a gas on and goes out for wandering then the gas stove will sense the leakage of gas and an emergency message will be sent to the client on the application that his gas is on please turn it off so he can off that gas from anyplace on the planet through that application utilizing the idea of internet of things, this will almost prevent all the gas accidents happens in day to day life

Example 2: Utilizing Refrigerator efficiently:

In this example, An individual can set a reminder to the fridge about the ingredients to be kept in it, for example if a man goes out he will be sent message from the refrigerator about the things to be brought at home using concept of Internet of things the below picture clarifies how things will get associated with people through this innovation.



Fig: Diagrammatic representation of future of Internet of things in day to day life.

3. CONCLUSION:

Finally, we can conclude that this application will be a need of common man in his near future because of the three critical components presented in this application which is gps tracking, sensors and Internet of things which will help us in World sensor systems Home automation and domotics in Daily life (movement checking, shopping)Tracking and dispatching of products and keep a track on Health and numerous more Unpredictable improvements will be seen which will end up being an essential need of individuals.

4. ACKNOWLEDGMENTS:

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2.3 DIAGRAMATIC REPRESENTATION OF IOT:

FUZZY LOGIC FOR DOCUMENT CLUSTERING

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ABSTRACT

We have shown document clustering by applying fuzzy logic. The method involves cleaning up the text and stemming of words. Then, we chose 'm' features which differ significantly in their word frequencies (WF), normalized by document length, between documents belonging to these two clusters. The documents to be clustered are represented as a collection of 'm' normalized WF values. We use Fuzzy c-means (FCM) algorithm to cluster these documents into two clusters. After the FCM execution finishes, the documents in the two clusters are analyzed for the values of their respective 'm' features. By using fuzzy logic, we not only get the cluster name, but also the degree to which a document belongs to a cluster.

Keywords

Fuzzy c-means algorithm, fuzzy logic, Document clustering

INTRODUCTION

In this paper we proposed fuzzy logic to text mining to perform clustering of documents into a number of pre-specified clusters. As in our example we have shown how to classify given documents into two categories with the fuzzy system that is sports and politics. Initially, the documents are cleaned. After that for every word we carry out word stemming. Each document will now be treated as a bag of words. We calculate the word frequency (weight of the word on basis of their significance in the document) as :

$$WF = (\text{Word Count} / (\text{Total Words in the Document})) \times 10000 \quad \dots (i)$$

Where 'm' no of words are selected [3][4][5]. After this we then perform FCM to cluster the documents into required number of categories. To name these particular cluster pre known knowledge is used.

FUZZY LOGIC

Fuzzy logic is nothing but mathematical logic model in which truth can be partial i.e. it can have values between 0 and 1 that may be completely false or completely true which is based on approximate reasoning instead of exact reasoning. Fuzzy logic is an approach to computing based on "degrees of truth" rather than usual true or false on which modern computer is based.

CLUSTERING

Fuzzy logic helps us to cluster similar documents together.

In this algorithm every observation has a membership value associated with each of the cluster which is related inversely to the distance of that observation from the cluster centre.

ALGORITHM FOR FUZZY C-MEANS

1. Initialize the fuzzy partition matrix, $U = [u_{ij}]$ matrix, $U(0)$
2. At k-step: calculate the centre vectors $C(k) = [c_j]$ with $U(k)$ using equation (3).
3. Update $U(k), U(k+1)$ using equation (4).
4. If $\|U(k+1) - U(k)\| < \epsilon$ then STOP; otherwise return to 2

The main aim of FCM algorithm is to minimize the objective function given by [6]:

$$J_m = \sum_{i=1}^N \sum_{j=1}^C u_{ij}^m \|x_i - c_j\|^2, \quad 1 \leq m < \infty \quad \dots (ii)$$

Where

m = any real number greater than 1

u_{ij} = membership degree of x_i in J th cluster

x_i = i th dimension of the measured data

c_i = i th dimension of the cluster centre.

The formula for updating the cluster centre c_i is:

$$c_j = \frac{\sum_{i=1}^N u_{ij}^m \cdot x_i}{\sum_{i=1}^N u_{ij}^m} \quad \dots (iii)$$

The values of partitions matrix are updated by using formula

$$u_{ij} = \frac{1}{\sum_{k=1}^c \left(\frac{\|x_i - c_j\|}{\|x_i - c_k\|} \right)^{\frac{2}{m-1}}} \quad \dots(iv)$$

When the maximum change in the values of fuzzy c partitions matrix is less than E the FCM algorithm iteration stops. Where E is termination criteria with value between 0 and 1. The “Bag of words” is a representation based on which the documents are clustered.

“BAG OF WORDS” Representation

Every word contains some weight according to significance in the document which can be no of occurrence of word in that document.

Consider the following paragraph:

“It is a variation of the Hard C-Means clustering algorithm. Each observation here has a membership value associated with each of the clusters which is related inversely to the distance of that observation from the center of the cluster.”

The Bag of Words representation looks like this:

Table 1: Bag of Words

Word	Occurrences
Variation	1
Hard	1
Cluster	2
Observation	2
⋮	⋮
Centre	1

In this approach we have assigned the weights as the number of occurrences of a particular word in the document normalized by document length and multiplied by 10,000.

Fuzzy logic to text mining

Following are the steps required for converting fuzzy logic to text mining

1. Text preprocessing

It involves cleaning up the text like removing advertisements , removing extra tags, hyphens, etc. Removal of this un-wanted text helps improve the efficiency of our algorithm.

2. Feature Generation

The documents are represented in the “Bag of Words” method. Stop words like “the”, “a”, “an” etc. are removed. Word Stemming [2] is carried out. Word Stemming refers to representing the word by its root, example the words - writing, wrote and written should be represented by write.

3. Feature Selection

The features to be used are selected. This selection of features can either be done before use or based on use. We choose only the features which will help us in our process [3][4][5] .

In order to cluster separately, the documents relating to sports and politics; presence of names of people in a document will not help much. However, presence of words like “ground”, “bat”, “commentator” etc. will help relate the documents to the field of “sports”. Similarly, words like “vote”, “dictatorship”, “president” will relate the documents to the category “politics”.

CLUSTERING

We use FCM clustering algorithm. Each document to be clustered has already been represented as a “bag of words”, and from that “bag” only the essential important “words” (features) have been assigned. The aim now is to cluster the documents into categories (called classes in FCM). Using FCM, the documents having similar frequencies (normalized by document length) of various selected features are clustered together.

Once the FCM execution finishes, because of max-change in the Fuzzy Partition Matrix being lesser than the threshold, we get the required number of clusters and all the documents have been clustered among them.

EVALUATION AND INTERPRETATION OF RESULTS

From the Fuzzy logic Partition Matrix, one can find to what degree a given document contains belongs to each cluster. If the membership value of a document for a given cluster is high, the document can be said to strongly belong to that cluster. However, if all the membership values corresponding to a specific document are almost same (Example .35, .35, .30 among three clusters), it would imply that the document does not quite strongly belong to any of those clusters.

EXAMPLE

Suppose we are given some documents which we have to cluster into two categories - “sports” and “politics”. We will start from the third – feature selection, as first two steps are simple. We had no idea about which words (features) we could use to cluster our documents. Hence, we had to find such features.

We took some documents that we knew were related to Sports and Politics respectively. We applied step1 and step 2 on them and then counted the word frequency of various words using eq(i). Then we analyzed the differences in these WF values for same words between documents relating to Sports category and the documents relating to Politics category.

Table 2. Word Frequencies for Sports and Politics-related documents

Word	WF (Sports)	WF (Politics)
Victory	10.0213	8.9012

Ground	203.2321	7.1214
Dictatorship	1.1213	140.1213
Bat	501.6553	30.2121
Group	250.6312	80.8452
Member	38.7658	40.2313
Publicity	8.8350	9.4213

By looking at the Table 2, it was apparent that words like “victory”, “publicity” are used in similar amounts in documents belonging to both groups. However, words like “Ground” (203 v/s 7), “Bat” (501 v/s 30), “Group” (250 v/s 80) and “Dictatorship” (1 v/s 140) could be used to differentiate among documents belonging to Sports and Politics respectively. For the sake of simplicity and an easy example, we chose only 4 words – “Ground”, “Bat”, “Group” and “Dictatorship”. On basis of these 4 words, we clustered the given documents into Politics and Sports types of categories.

Now we could start our clustering process.

Let $D = \{d_1, d_2, d_3 \dots d_n\}$ represent our “n” documents to be clustered.

Now each of these documents, D_i , is defined by the “M” selected features i.e. $d_i = \{d_{i1}, d_{i2}, d_{i3} \dots d_{im}\}$

Now we have to initialize the fuzzy partition matrix. Keeping in mind the constraints that all entries should be in the interval [0, 1] and the columns should add to a total of 1 and considering that we are given 4 documents to cluster:

Table 3. Fuzzy Partition Matrix

	Doc 1	Doc 2	Doc 3	Doc 4	Doc 5	Doc 6	Doc 7	Doc 8
Cluster 1	1	1	0	0	1	1	0	0
Cluster 2	0	0	1	1	0	0	1	1

Our initial assumption is that Doc1, Doc2, Doc5 and Doc6 belong to cluster 1 and Doc3, Doc4, Doc7 and Doc8 belong to cluster 2. Now we have to calculate the initial cluster centres.

For $c=1$, that is cluster1, the centre (V_1) can be calculated using eq (iii). Since, the membership value of Doc3, Doc4, Doc7 and Doc8 in Cluster 1 is 0, we have

$$V_{11} = (180+200+210+7)/4=149.25$$

Similarly, Calculating all V_{1j} we get

$V_1 = \{149.25, 300, 162.5, 7.5\}$ is the centre of cluster 1.

Similarly, $V_2 = \{50, 110.75, 67.75, 33.25\}$ is the centre of cluster 2.

Now calculating the Euclidian distances of each Document vector from both centre clusters:

$$D_{11} = ((180-149.25)^2 + (400-300)^2 + (200-162.5)^2 + (1-7.5)^2)^{1/2} = 111.32$$

Similarly,

$$D_{12} = 149.5, D_{13} = 339.5, D_{14} = 352.5, D_{15} = 102.2, D_{16} = 353.4, D_{17} = 109.2, D_{18} = 351.1$$

Similarly, from the cluster two:

$$D_{21} = ((180-50)^2 + (400-110.75)^2 + (200-67.75)^2 + (1-33.25)^2)^{1/2} = 345.10$$

$$D_{22} = 382.2, D_{23} = 105.1, D_{24} = 118.3, D_{25} = 334.4, D_{26} = 119.6, D_{27} = 339.7, D_{28} = 116.9$$

Now that we have distance of each vector from both cluster centres, we will now update the

Fuzzy Partition Matrix, by using eq(iv).

Note that we have already decided the value of the „m” in this formula, earlier in the example.

$$U_{11} = [1 + ((111.32 / 345.10)^2)]^{-1} = .90, U_{12} = .867, U_{23} = .913, U_{24} = .898, U_{15} = .9146, U_{26} = .897, U_{17} = .906, U_{28} = .901$$

Say our threshold change (stopping condition) was 0.001. Our max change here is 0.133 which is greater than 0.001. Hence we will continue. Now we will repeat the process by again calculating the new cluster centres. But now we will use the updated fuzzy partition matrix values. So, now our centre for cluster 1 will be calculated using

Table 5. Updated fuzzy partition matrix after one iteration

	Doc 1	Doc 2	Doc 3	Doc 4	Doc 5	Doc 6	Doc 7	Doc 8
Cluster 1	0.900	0.867	0.087	0.102	0.915	0.103	0.906	0.099
Cluster 2	0.100	0.133	0.913	0.898	0.085	0.897	0.094	0.901

$$V1j = (0.900x1j + 0.867 x2j + 0.087 x3j + 0.102 x4j + 0.915x5j + 0.103x6j + 0.906x7j + 0.099x8j) / (0.9002 + 0.8672 + 0.0872 + 0.1022 + 0.9152 + 0.1032 + 0.9062 + 0.0992)$$

RESULT INTERPRETATION

Suppose that our final fuzzy partition matrix for 8 documents looks something like this.

Table 6. Fuzzy Partition Matrix

	Doc 1	Doc 2	Doc 3	Doc 4	Doc 5	Doc 6	Doc 7	Doc 8
Cluster 1	0.890	0.804	0.149	0.155	0.865	0.159	0.810	0.168
Cluster 2	0.110	0.196	0.851	0.845	0.135	0.841	0.190	0.832

We see that Doc1, Doc2, Doc5, Doc7 belong to cluster 1 whereas Doc3, Doc4, Doc6, Doc8 belong to cluster 2 on basis of high membership values in those respective clusters.

In the example we took, the documents Doc1, Doc2, Doc5, and Doc7 had higher frequency of words like stadium, ball and team (which are related to sports). Since these documents have been clustered together, one can say that Cluster 1 is Sports. At the same time, Cluster2 will contain documents with higher frequency of words like democracy (which are related to politics). Hence Cluster2 represents Politics.

Here, Doc1 relates to Sports to a large degree (due to its very high membership value). If we set the criteria that membership values greater than 0.85 with respect to a given cluster can be called “strong membership”, then Doc1 and Doc5 can be said to “strongly” belong to Cluster1 which is sports. Moreover, we can say that Doc1 relates to Sports more “strongly” than Doc5 does. This interpretation of results in linguistic form [8] is what gives advantage to usage of Fuzzy Logic over Probability models like Bayesian in Text Mining.

CONCLUSION

We have shown how one can use fuzzy logic in text mining to cluster documents by taking an example where the documents were clustered into two categories :- “sports” and “politics”. The advantage of using fuzzy logic was that, we could calculate the degree to which a given document belonged to either categories- “sports” as well as “politics”. By doing this for all documents in the data-set, we could also

compare two documents and tell which one belongs “more” to which topic.

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MARKETING TACTICS IMPROVEMENT BY LOOKING OUT THE KEY USERS FROM FACEBOOK

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ABSTRACT

Talking about running a lasting business, a social media presence is critical. Understanding the interest of all users & based on it, publishing the required information as per their tastes is an important factor, when it comes to establishing a social media presence that makes an impact. For advertising campaign, discovering the appropriate target markets and audience is an important stage in the market research.

Identifying the target users, Designing of market strategy/plan, Building the marketing network (groups) & Statistical analysis of categories are the four important tasks we aim to focus on. Categories have been found based on their influence by using clustering technique. Further this paper helps to extract emotional feelings of the user so that any related articles, posts or videos can be posted to that user.

Keywords

Clustering, FCM, K means, Facebook Graph Api.

INTRODUCTION

For the last few years, social media phenomenon emergence has been one of the most remarkable developments in the world of Internet. Internet is the powerful tool and the ability to connect with people around the world.

Social media lets people communicate either directly or via media objects. The year 2006 can be regarded as the breakthrough year of social media. At that point, the popular early applications like Wikipedia and MySpace had gathered significant numbers of users, while Facebook and YouTube had been introduced to the public. YouTube since early 2006 and Facebook since early 2007 after it opened its doors to anybody to register. Our work is concentrating mainly on Facebook.

PROBLEM DEFINITION

Quality improvement is an important factor for any business. But, the question is that how to move the users towards our product? & how to find who is interested in knowing our new products, versions, features, facilities etc.

Social media is used to find the users. Here we have proposed a competent design & a clustering technique to grow up the advertising way towards identifying the key users using Facebook.

METHODOLOGY

Fig.1 shows the steps involved in applying clustering algorithm to find the key users i.e.

1. **Preprocessing:** Includes Training of the system.
2. **Extraction:** Includes Data extraction from Facebook.
3. **Filtering:** Includes Tokenization and Cleaning functions.
4. **Clustering:** Includes Classification of Post Message and Comment into different categories
5. **Identifying targeted users:** Includes finding of influential users.
6. **Design of Marketing strategy:** Put out the new posts to key users based on their interests.

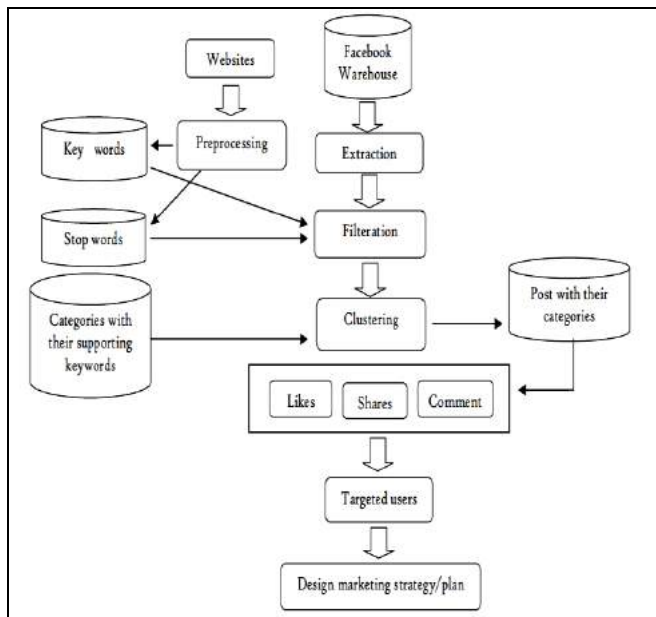


Fig.1 System Architecture

1. Preprocessing:

Includes training of the system. Targeting potential users on Facebook is not so easy with social networking sites. Without permission nobody can access the user's profiles, but on the fan page we can promote businesses. For good analysis of post we have collected thousands of keywords also called buzz words related to posts'. It is important to select the significant keywords that carry the meaning, and discard the words that do not contribute to distinguishing between the posts. Keywords are defined as a sequence of one or more words and provide a compact description of a post's content.

2. Extraction:

In the Extraction we include Data extraction from Facebook. A basic token is assigned to any Facebook user and can be used to search any publicly available information. This will still not include a "friends" list. However, we can search for wall posts for any known Facebook IDs as long as we have a basic authentication token and the Facebook user has declined to make this information private. This will allow us to see when people in our list have posted to each other's walls for a given time range. Facebook allows you to search based on an ID. Basic format for sending HTTP requests to the Facebook API also known as the Graph API is detailed in [6] & [7] for an example of this approach.

3. Filtering:

As the extracted information are stored in a separate database as knowledge source, which is retrieved for further tasks. Filtering includes Tokenization and Cleaning functions. Filtering is done based on the list of stop words and stemming words, which are analyzed or mined by examination from the training corpus. Stop-words, which are language-specific functional words, are frequent words that carry no information.

Stemming techniques are used to find out the root/stem of a word. Stemming converts words to their stems, which incorporates a great deal of language dependent linguistic knowledge. These stop words and stem words are stored in StopWords table and StemWords table of databases respectively in the preprocessing phase for providing assistance in the process of filtering the contents of message. A sample of collected stop words and stem words are shown in Table I and Table II. [8][9][10]

TABLE I. SAMPLE – STOP WORDS LIST

able, about, above, according, after, afterwards, again, ain't,...
be, became, because, behind, being, brief, but, by,... came,
can, can't,... each, edu, eg, etc, even, ever,... from, further,
furthermore,... had, hadn't, happens, hardly, has, hasn't, have,
he, hello, help,... her, here, hereby, his, indeed.....

TABLE II. SAMPLE – STEMMING WORDS LIST

Word	Stem	Word	Stem
Consign	consign	Consist	consist
Consigned		Consisting	
Consigning		Consisted	
Consignment		Consists	

We have used the Porter Stemmer algorithm to perform the stemming of keywords into stem words. [8][9]

Algorithm: Porter Stemmer Algorithm

1. Gets rid of plurals and -ed or -ing suffixes
2. Turns terminal y to i when there is another vowel in the stem
3. Maps double suffixes to single ones: -inaction, -national, etc.
4. Deals with suffixes, -full, -ness etc.
5. Takes off -ant, -ence, etc.
6. Removes a final -e

4. Clustering:

Clustering partitions the data set into clusters or equivalence classes. We have clustered users into different categories based on the posts made by them on Facebook. For comparative analysis of the results, we have made use of two clustering algorithms, Fuzzy C-Means & K-Means respectively.

i. Fuzzy C-Means Algorithm

Fuzzy C-means (FCM) is a method of clustering which allows one piece of data belong to two or more clusters. This method

(developed by Dunn in 1973 and improved by Bezdek in 1981) is frequently used in pattern recognition.

The FCM algorithm is composed of the following steps:

Algorithm: Fuzzy C-means algorithm

- 1: Let us suppose that M-dimensional N data points represented by x_i here $(i=1,2,\dots,N)$, are to be clustered
- 2: Assume the number of clusters to be made, that is, C, where $2 \leq C \leq N$.
- 3: Choose an appropriate level of cluster fuzziness $f > 1$.
- 4: Initialize the $N * C * M$ sized membership matrix U, at random, such that $U_{ij} \in [0, 1]$ and $\sum_{j=1}^C U_{ij} = 1.0$, for each I and fixed value of m.
- 5: Determine the cluster centers C_{jm} , for the j^{th} cluster and its m^{th} dimension by using the expression given below:

$$C_j = \frac{\sum_{i=1}^N u_{ij}^m \cdot x_i}{\sum_{i=1}^N u_{ij}^m} \quad \text{--- (i)}$$

- 6: Calculate the Euclidean distance between i^{th} data point and j^{th} cluster center with respect to, say m^{th} dimension like the following:

$$D_{ij} = \sqrt{\sum_{m=1}^M |x_i - C_j|^2} \quad \text{--- (ii)}$$

- 7: Update fuzzy membership matrix U according to D_{ik} ,
If $D_{ik} > 0$, then

$$U_{ik} = \frac{1}{\sum_{j=1}^C \left(\frac{D_{ik}}{D_{jk}} \right)^{\frac{2}{m-1}}}, \quad 1 \leq i \leq C, \quad 1 \leq k \leq N \quad \text{--- (iii)}$$

If $D_{ik} = 0$, then the data point coincides with the corresponding data point of j^{th} cluster center C_j and it has the full membership value, that is, $U_{ij} = 1.0$

- 8: Repeat from step 5 to step 7 until the changes in U $< \epsilon$, where ϵ is a pre-specified termination criterion.

ii. K-Means Algorithm

K-Means algorithm is a hard partitioned clustering algorithm widely used due to its simplicity and speed. It uses Euclidean distance as the similarity measure. Hard clustering means that an item in a data set can belong to one and only one cluster at a time. It is a clustering analysis algorithm that groups items based on their feature values into K disjoint clusters such that the items in the same cluster have similar attributes and those in different clusters have different attributes.

The K-means algorithm is composed of the following steps:

Algorithm: K-means algorithm

- 1: Define the number of clusters K.

- 2: Initialize the K cluster centroids. This can be done by randomly selecting K data items from the data set.
- 3: Calculate the Euclidean distance between i^{th} data point and j^{th} cluster center, like the following:

$$D_{ij} = \sqrt{\sum_{m=1}^M |x_i - C_j|^2}$$

- 4: Assign each item to the cluster with the nearest centroid. In this way all the items will be assigned to different clusters such that each cluster will have items with similar attributes.
- 5: After all the items have been assigned to different clusters re-calculate the means of modified clusters by taking the average coordinate among the items. The newly calculated mean is assigned as the new centroid.
- 6: Repeat step (iii) until the cluster centroids do not change.

iii. Illustration of Fuzzy c-means and K-means using sample data

Here, we will consider 2 categories mainly- Technology as cluster-1 & Sports as cluster-2.

Firstly, we generate a domain specific data set for all objects i.e. posts. In the next phase the post contents is divided into tokens & non-significant characters are removed (hyphens, stop words, white spaces, tags are removed). Tokenization & Cleaning is done in this phase. In this phase, calculation of Initial Matrix is done by analyzing the FCM algorithm & K-means algorithm to place the posts into clusters with different instances.

TABLE III.
NO. OF OCCURRENCES OF TWO CATEGORIES

Special Words	Occurrences (Technology)	Occurrences (Sports)
Mobile	100.201	5.234
Game	120.345	150.456
Cricket	2.223	201.432
Job	10.562	15.785

We have taken the sample posts that are related to the categories of Technology & Sports respectively.

Now we find out the number of occurrences of the special words (which helps to cluster posts into categories) in each posts respectively. Table III. gives a clear idea of the occurrences.

Seeing a table, we can identify that the “Game” & “Job” belong to both groups with equal amounts. Whereas the words like Mobile & Cricket have more differences between the

1	0.87	0.03	0.13
0	0.13	0.97	0.87

categories i.e. Mobile (100,5), Cricket(2,201).

Let’s consider these 2 as special words for further processing, the next phase is clustering wherein we are going to cluster the given posts & classify them to categories.

Let $M = \{m_1, m_2, m_3, m_4 \dots m_n\}$ represents m messages (posts content) to be clustered.

Each of these messages, m_i , is defined by the, ‘s’ special words i.e. $m_i = \{m_{i1}, m_{i2}, m_{i3}, \dots, m_{is}\}$

Here, each m_i in the universe M is a s -dimensional vector representing the “s” special words which will be normalized

	Post 1	Post 2	Post 3	Post 4
Mobile	1	1	4	5
Cricket	1	2	3	4
RESULT	Post 1 Belongs To Cluster 1	Post 2 Belongs To Cluster 1	Post 3 Belongs To Cluster 2	Post 4 Belongs To Cluster 2

using equation below:

$$\text{Occurrences} = \text{WC/TC} * 100$$

WC-Word Count

TC- Total no. of words in a message

Consider we have 4 posts collected from Facebook. The table below shows the sample occurrences of special words in these 4 posts.

	Post 1	Post 2	Post 3	Post 4
Mobile	1	1	4	5
Cricket	1	2	3	4

Now we perform Fuzzy C-means & K-means one by one ,to cluster posts into required categories (Technology & Sports).

Initial parameters:

- No. of clusters, $k = 2$ (Technology & Sports)
- Fuzziness component, $m = 2$
- Termination criterion, $\epsilon = 0.03$

A. By Fuzzy C-Means Algorithm:-

1. Initial Cluster Center

Assume post 1 & post 2 as initial cluster center.

So, $C_1 = (1,1)$ & $C_2 = (1,2)$

2. Euclidean Distance Matrix (D^0)

0	1	3.61	5
1	0	3.16	4.47

3. Initial Matrix G^0

1	0	0	0
0	1	1	1

4. New Cluster Center

$C_1 = (1,1)$ & $C_2 = (3.33,3)$

5. Euclidean Distance Matrix (D^1)

0	1	3.61	5
3.07	2.54	0.67	1.94

6. Update Matrix G^1

After multiple iterations, we get the final updated matrix as follows:-

Final Updated Matrix G

0.99	0.98	0.04	0.02
0.01	0.02	0.96	0.98

Termination Criterion met. So, we stop.

RESULTS

Post 1 & Post 2 have higher occurrence keyword “Cricket” which belongs to the SPORTS category, so we conclude that both posts belong to the SPORTS category.

Post 3 & Post 4 have higher occurrence keyword “Mobile” which belongs to the TECHNOLOGY category, so we conclude that both posts belong to the TECHNOLOGY category.

Now, we shall solve the same example by K-means algorithm, as follows:-

B. By K-means algorithm:-

1. Initial Cluster Center

Assume, post 1 & post 2 as initial cluster center.

So, $C_1 = (1,1)$ & $C_2 = (1,2)$

2. Euclidean Distance Matrix (D^0)

0	1	3.61	5
1	0	3.16	4.47

3. Initial Matrix G^0

1	0	0	0
0	1	1	1

4. New Cluster Center

$C_1 = (1,1)$ & $C_2 = (3.33,3)$

5. Euclidean Distance Matrix (D^1)

0	1	3.61	5
3.07	2.54	0.67	1.94

6. Update Matrix G^1

7. New Cluster Center

$C_1 = (1, 1.5)$ & $C_2 = (4.5, 3.5)$

8. Euclidean Distance Matrix (D^2)

9. Update Matrix G^2

1	1	0	0
0	0	1	1

Here, $G^1 = G^2$, groups don't change anymore. So we stop.

RESULTS

	Post 1	Post 2	Post 3	Post 4
Mobile	1	1	4	5
Cricket	1	2	3	4
RESULT	Post 1 Belongs To Cluster 1	Post 2 Belongs To Cluster 1	Post 3 Belongs To Cluster 2	Post 4 Belongs To Cluster 2

Post 1 & Post 2 have higher occurrence keyword "Cricket" which belongs to the SPORTS category, so we conclude that both posts belong to the SPORTS category.

Post 3 & Post 4 have higher occurrence keyword "Mobile" which belongs to the TECHNOLOGY category, so we conclude that both posts belong to the TECHNOLOGY category.

5. Identification of Targeted Users:

Identify the people who are interested in information related to a particular category like Advertisement, Sports, Politics, Entertainment, Social awareness, etc.

The process uses selection of category to identify the interested users from the posts. The process involves Extraction of users who have liked or shared or commented the post/s in that category. Prepare the database of users interested in each category.

6. Design of Market Strategy:

To promote the new post to a set of users, first find the category of the post. Then select the targeted users of that post. Thus, Multicast the post to only interested users.

RESULTS

From the above solved example & other test results, it is very clear that both the clustering algorithms generate similar clusters & hence similar results. But, what differs is the time efficiency between the two algorithms. Figure 2, shows the time efficiency of Fuzzy C-Means algorithm vs K-Means

1	1	0	0
0	0	1	1

algorithm. It is very evident from the figure that K-Means algorithm has a better Time efficiency as compared to the Fuzzy C-Means algorithm. Fuzzy C-Means requires more computation time than K-Means because of the fuzzy measures

0.5	0.5	3.35	4.72
4.30	3.81	0.71	0.71

calculations involvement in the algorithm. Figure 3 & Figure 4 show the clustering of 5 users on Facebook. Users are clustered on the basis of the LIKES made by them on Facebook & on the basis of the POSTS written by them on their Facebook wall.

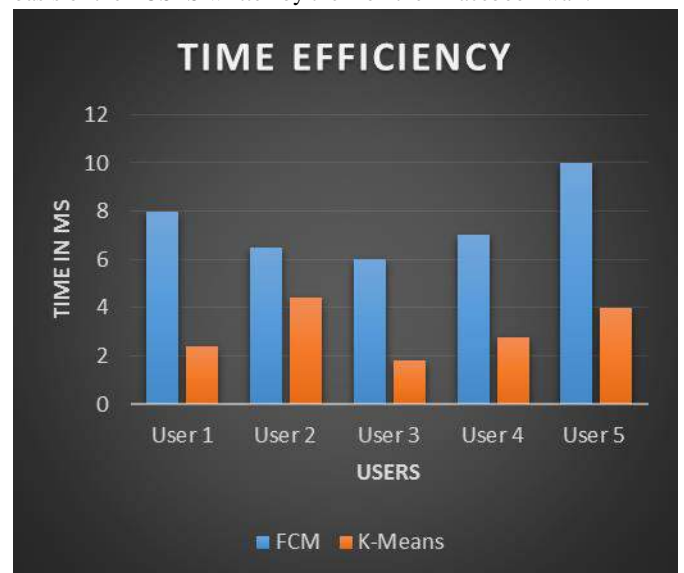


Fig.2 Time Efficiency of FCM & K-Means algorithm

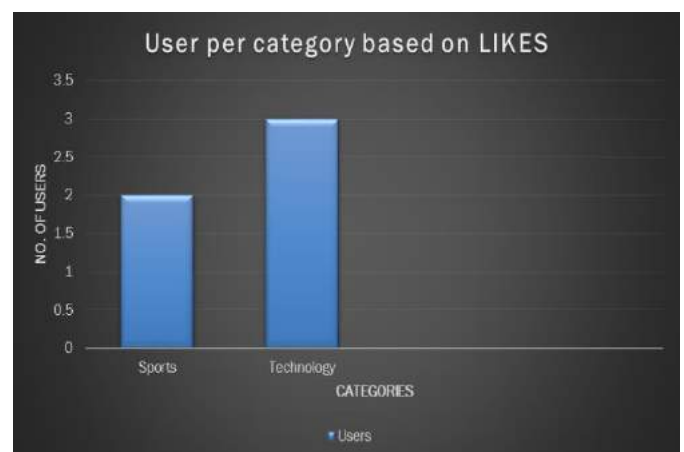


Fig.3 Number of Clustered Users per category based on Likes

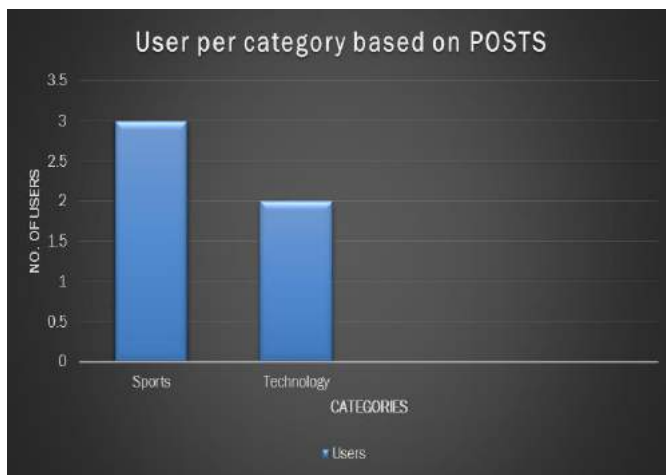


Fig.4 Number of Clustered Users per category based on Posts

CONCLUSION

This research successfully classifies the Facebook users into specific category based on their data from the Facebook. The application makes the right use of Facebook Graph Api, to fetch user's personal information with his permission & allowing the application to perform clustering algorithms on the user's data to classify him into a specific category.

The research can be a great boost to the business world. It can help businesses, market their products & services to the targeted customers only. This will surely improve their marketing tactics & help them reach to their desired group of customers directly. As Facebook is the most used social media in today's world, this research will definitely be a boom to all the businesses who wish to create their identity in the online marketplace.

Here, the experimental results are promising: Performance of Facebook Graph Api is simply amazing. It ensures to fetch all the user's desired data within few steps. The performance of K-Means algorithm is better compared to the Fuzzy C-Means algorithm. Hence, classification is faster and more efficient.

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Green Energy- An Alternative Source for Sustainable Development

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ABSTRACT

Solar energy is one of the greatest assets human kind has ever got. It's free of cost and available abundantly over the earth surface. Today we are looking for alternate source of energy which can fulfill our demands and can satisfy our day to day needs. In developing countries like India we need energy to cope up with industrial requirement and increasing population. Still many parts of India electricity is just a word known to them. So what can we do to overcome such demands and needs? Every day, the sun radiates an enormous amount of energy—called solar energy. It radiates more energy in one day than the sphere uses in one year. This energy comes from within the sun itself. Lack of awareness regarding solar implementation and our government policies made our people unaware of the fact that solar can be a great part of our energy resources and can fulfill the demands of any developing countries. This paper summarizes the government policies and ongoing scenario of solar PV off grid and on grid systems and proposed liter lamp which can be implemented commercially as well as at our homes. And what are the benefits of installing a solar plant.

General Terms

Government Policies, Risk and Challenges.

Keywords

Solar PV cell, on grid off grid, policies.

1. INTRODUCTION

Energy cannot be destroyed it can be transformed form one body to another. Sun being the major part of the energy a human being can make use of. What's amazing is free of cost and available abundantly. With India's population which is growing with 1.4%, which is about 17 million people are added in our country every year. And Indian economy growing with high rate India needs more energy supply. 78% of our energy comes from fossil fuels, 19 % from renewable and 2.6% from nuclear. Out of 19% traditional biomass consists of 9% whereas solar energy only consists of 0.24% as shown in figure 1. So why India lacks in making use of this energy. With about 300 clear sunny days India has abundant solar potential. Daily average solar energy incident over India varies 4 to 7 kwh/m². MNRE ministry of new and renewable energy and Maharashtra energy development agency MEDA are helping in development of solar awareness and introducing new policies for on grid and off grid systems.

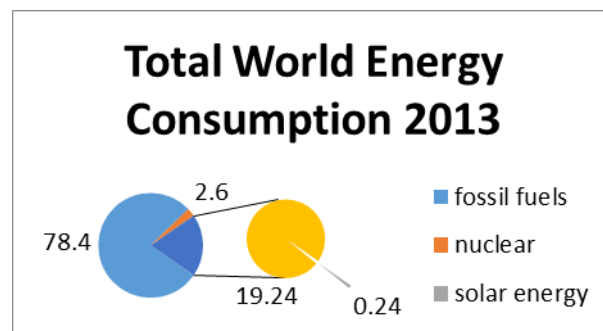


Figure 1: Total World Energy Consumption [1]

LONG TERM FUTURE OF SOLAR POWER: solar power could contribute to an increasing part of the total energy consumption is estimated for the long term in future. With appropriate policies both in developed and developing countries, EPIA and Greenpeace have devised in a joint scenario, that in 2030 as shown in figure 2, photovoltaic could produce enough energy to supply electricity to 3, 7 million people globally. The majority of them will be located in remote areas where there is no access to the electricity grid [1].

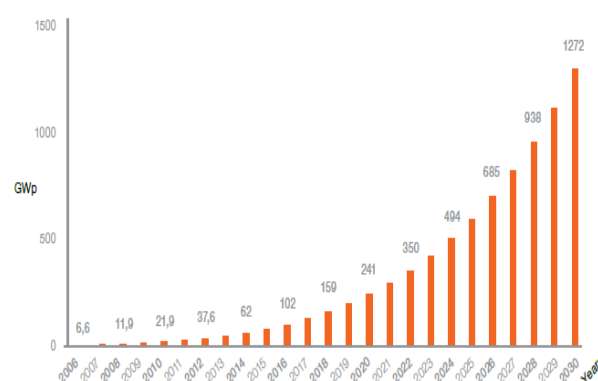


Figure 2: Global Cumulative Capacity up to 2030 - Advanced scenario [1]

Table 1: RENEWABLE ENERGY CURRENT CAPACITY AND POTENTIAL THE END OF MARCH, 2009

Sr. No.	Alternative Energy	Current capacity(MW)	Potential(MW)
1	Wind power	10242.5	45195
2	Bio Power	703.3	16881
3	Bagasse co-generation	1048.73	5000
4	Small Hydropower(up to 25)	2429.67	15000
5	Energy Recovery From waste	92.97	2700
6	Solar photovoltaic power	2.12	-
7	Biomass / cogeneration	170.78	-
8	Biomass gasifies	105.46	-

Solar PV Cell: Solar energy can broadly be divided in two main categories is the solar photovoltaic PV and solar thermal. Solar PV uses sunlight to generate electricity and solar thermal uses heat of sunlight for heating or power generation. Solar PV is the combination of photos a particle representing quantum of light or other electromagnetic radiation having energy proportional to the radiation frequency and voltaic or volt a unit of measuring the electricity at a given point. Adding together the photovoltaic is a device capable of producing a voltage when exposed to radiant energy especially light.it works on the photoelectric phenomenon in which electron are emitted from matters after absorption of energy from visible light. Electrons gain energy from incoming photons and are emitted when this absorbed energy exceeds the work function of the material. Electric field associated with a semiconductor P-N junction can form and electric current and deliver power to an external load. Thus a specially build semi-conductor junction can function as SOLAR cell converting natural sunlight into electricity.

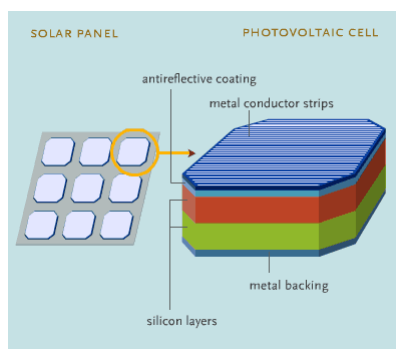


Figure 3: Solar PV Cell [6]

On Grid and Off Grid System: System which is not using any grid for transferring or receiving energy is termed as off grid. And it requires that the solar panels are able to produce electricity. Most homes have higher electricity demand in the evening or at night, so off-grid systems usually use either a battery to store energy produced during the day, a backup source of energy like a generator, or both. Off-grid systems are complex and less flexible than grid-tied systems and it is suitable for remote location and places where utility no utility grid supply.

Figure 3 shows the On Grid solar system. Solar on grid solar system consist of tied/synced with existing utility grid. Using special type of inverter known as grid inverter. It feeds the excess generated power into grid and takes back power in case of high demand. There is no wastage of power. No back up battery is needed.

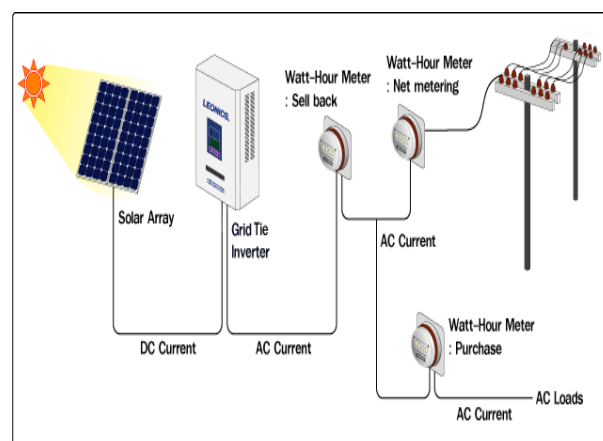


Figure 4: On Grid Solar System [6]

System which is not using any grid for transferring or receiving energy is termed as off grid. Off Grid solar system is as shown in figure 4. It requires that the solar panels are able to produce electricity. Most homes have higher electricity demand in the evening or at night, so off-grid systems usually use either a battery to store energy produced during the day, a backup source of energy like a generator, or both. Off-grid systems are complex and less flexible than grid-tied systems and it is suitable for remote location and places where utility no utility grid supply.

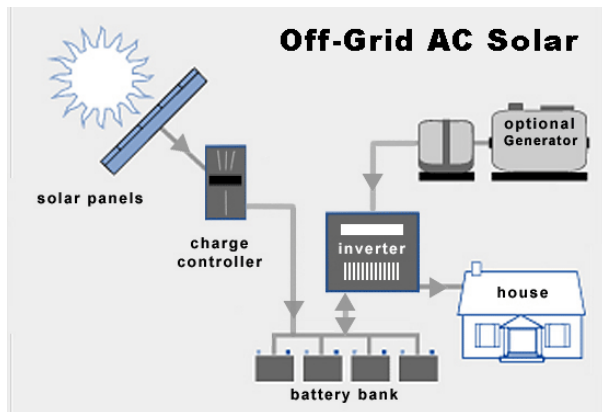


Figure 5: Off Grid Solar System [11]

2. LITERATURE REVIEW

In paper [1] they have explained the capacity of renewable energy sources in India and renewable energy installations. They have described the areas of India where more insolation of sunlight is available. Solar Power plants is installed in that place. Conventional and positive scenario for penetration of RES is also described in this paper.

In paper [10] researchers have developed boat for inland navigation of developing countries to minimize cost and reduce fossil fuel dependency. If the distance and travelers changes then PV cell, battery and engine specification change according to condition. Proposed boat is based on low cost, simple design, efficient and reliable so developed boat is good option for pollution free navigation system.

3. GOVERNMENT POLICIES

Government policies: For the public support and to promote the renewable energy government introduces many policies from center as well from states.

The Jawaharlal Nehru National Solar Mission (JNNSM) was launched on the 11th January, 2010 by the honorable Prime Minister. The Mission has the ambitious target to deploy 40000 MW of solar rooftop by 2022 which has been aimed at reducing the cost of power generation in the country through long term policy, aggressive R&D; and in-house production of raw materials, components and its products. This mission

will make India a strong country in solar energy production. Maharashtra state policy has set a target, amongst other, for deploying of grid connected solar power capacity of 7500MW and center policies for farmers, for agriculture support growth.

Risk and Challenges: When it comes to installation of solar power source there are innumerable risks and challenges to come up with. Main is the policy barrier. It consists of 63% of the problem in installation of the solar power source. Due to inadequate knowledge and improper study of the policies many individual fail to make or understand these policies. Another factors causing solar energy to introduce in our society is the lack of infrastructure. In cities with flat systems and inadequate place it is very difficult to install the solar system for individual purposes. Rural areas are more feasible for installation of solar system. Other factors are the solar radiation data unavailability. In many places in Indian people are unaware of the radiation it gets from the sun. Sun's radiation factor plays an important role in establishing solar power system in any area. Unavailability of technology and new equipment's it's also one of the barriers in implementing solar power system.

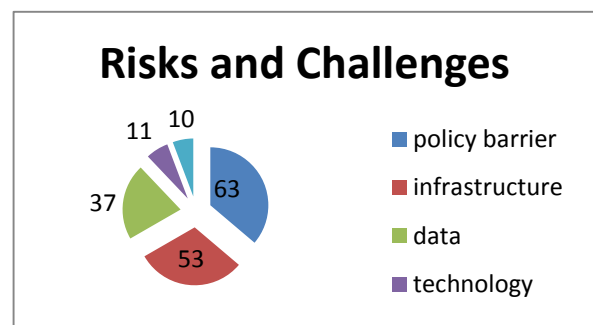


Figure 6: Risk and Challenges of Solar System [11]

4. CONCLUSION

With increasingly high demands and depletion of other fossil fuels we have to turn to the renewable source to fulfill these demands. Developing country like India with its ever growing population and industrialization and to fulfill the overall requirements of all we have to set up solar power systems in place of conventional sources. Awareness about the return of investment and tax exemptions can be benefited by installation of solar. Though the initial investment is high but it guarantees the long terms return and its further steps in sustainable development of India and its economy. Indian governments are now promoting various policies over renewable resources. By overcoming various barriers and risks we can make India one of the most powerful nations in utilization of solar power.

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A Survey on Semi Supervised Learning Based on Data Mining for Product Reviews

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ABSTRACT

Before the invention of the internet, while purchasing any product people used to ask the opinions to their family, friends for particular product. But nowadays as there is an increase in usage of the internet, more users are motivated to write their opinions about particulars in the form of comments on different sites like Facebook, twitter, online shopping sites, blogs, etc. These comments are the sentiments of the users and may be positive, negative or neutral. Opinion analysis is the recently processing research field in the data mining. This sector mainly deals with classifying the sentiments among different types of comments that are written by various users. This paper is about the different techniques, challenges and applications related to sentiment analysis.

Keywords

Sentiment Analysis, Product Aspect, Text summarizing, Text Classification, Data mining, Opinion mining

INTRODUCTION

Opinion mining (Sentiment Analysis) refers to identification and classification of the opinion expressed in the text; using information retrieval. Sentiment analysis extracts the subjective information from the reviews using techniques such as natural language processing, and text analytics [1]. Opinion plays important part in our information-collection behavior before taking a decision. Gathering of sentiments of products or object using information technologies is facilitated by online review sites or personal blogs. The main task of Opinion mining is to determine the comment polarity (positive, negative or neutral) by extracting features and words of the object that have been commented [2, 3].

Millions of products from number of retailers are available for online shopping. Like Amazon .com contains more that 36 million products and Shopper.com has the records more than five million products from over 3,000 retailers [2]. Generally, the opinion expressed in a review text could be of two types direct opinion or comparative opinion. Direct opinion is given as shown in e.g.: “The Zoom of the HTC camera is great.” The other type that is Comparison opinion tells about the

Similarities or differences of more than one object usually stating a better form both the products. E.g.: “car x is cheaper than car y.” Different types of comparatives are Non equal Gradable (less than), Equities (same), Superlative (longest).

For doing the classification and determining the polarity there are different methods through which it can be achieved. This paper presents a survey on different methods of sentiment analysis available related to product reviews. Opinion mining is carried at either document level or sentence level. In sentence level opinion mining, Subjective or Objective are the two tasks performed as shown below:

Objective: I bought an HTC a few days ago.

Subjective: It is such an awesome phone.

For subjective sentences or clauses, classify positive or negative.

Positive: It is such an awesome phone.

Negative: The phone has poor reception.

Assumption: Single opinion holder’s reviews are considered at one time. E.g., thumbs-up or thumbs-down, star ratings (2 stars, 3 stars...).

For the sake of convenience the remainder of this paper is structured as follows: Section 2 contains the source of the data which is used in sentiment analysis. Section 3 gives information about the related work in this field. Section 4 contains sentiment analysis. Section 5 explains the NLP, Natural Language processing techniques. Section 6 states the different applications of the sentiment analysis. Last section concludes our study and discusses the directions of the future research.

2. SOURCES OF DATA

Sources of data mean through which medium the opinions or the reviews of the users or consumers are obtained. Number of data sources is available for sentiment analysis. Customer’s opinion is a major criterion for developing the status of the

company and for quality betterment. The different data sources are social media, news articles, review sites, blogs, datasets, etc. [4].

2.1 Social Media

Sentiments of the people are expressed in a large content on social media. It is a big and fast growing network where at a time millions of people can express their views about the topic of their interest on the sites like www.facebook.com, www.linkedin.com, www.twitter.com etc.

2.2 News Articles

This helps in recording the sentiments of the people in issues that are of current affairs and importance, like politics and corruption on the sites like www.starmajha.com, www.aajtak.com, www.bhaskar.com, and many more [5].

2.3 Review Sites

It is very important to know the opinion of the product before purchasing it. Ecommerce sites like sites like www.flipkart.com, www.cnet.com, www.amazon.com, www.snapple.com, etc. always request customers to write down their opinion about the product they have purchased [6].

2.4 Blogs

It is a personalized webpage on which users can write their likes, dislikes, opinions, hyperlinks to various sites etc. Twitter is an example in which user creates status messages in a limited word count which called as tweets. Tweets can also use as data source for sentiment classification [8].

2.5 Datasets

Movie reviews data is used mostly in the field of sentiment analysis which is available on various sites one of which is (<http://www.cs.cornell.edu/People/pabo/moviereview-data>). For the product reviews Multi-domain sentiment (MDS) dataset can be used which contains four different types of product reviews extracted from e-commerce site like www.amazo.com including DVDs, Electronics, Books and Kitchen appliances, with 1000 positive and 1000 negative reviews for each domain.

3. RELATED WORK

Ellen et al.(2010) presented a bootstrapping process that learns linguistically rich extraction pattern for subjective expression. This process learns many subjective patterns and increases recall while maintaining high precision. The Bootstrapping process for subjectivity classification that explores three ideas: (1) high- precision classifiers can be used to automatically identify subjective sentences from unannotated texts, (2) This data can be used as a training set to automatically learn external patterns associated with subjectivity and (3) the learned patterns can be used to grow the training set, allowing this entire process to be bootstrapped.

In this paper a positive or negative sentiment word may have their opposite meaning in a particular domain so it is hard to predict by its keyword meaning.

Bo Pang et. al. (2008) proposed a novel machine learning method that applies text categorization techniques to adjust to just the subjective portion of the document, which is in following process: (1) Label the sentences in the document as either subjective or objective, discarding the latter; and then (2) Apply a standard machine learning classifier to the resulting extract. Authors used an efficient and intuitive graph-based formulation relying on finding minimum cuts. Their experiments involve classifying movie reviews as either positive or negative. To gather subjective sentences or phrases, authors collected 5000 movie review snippets from www.rottentomatoes.com, and for objective data they taken from the internet movie dataset (www.imdb.com). Both Naïve Bayes and SVMs can be trained on subjectivity dataset and then used as a basic subjective detector [6].

A sentiment classifier that is trained to classify opinion polarities in a domain may produce miserable results when the same classifier is used in another domain. Sentiment is expressed differently in different domains .For instance, consider two domains, digital camera and car.

Y. Sharma, V. Mangat and M. Kaur proposed in 2015 about “Sentiment Analysis & Opinion Mining” that suggested various approaches based on which the sentiments can be analyzed.

For the feature selection purpose, the Link Grammar Parser can be used which reduces the unconnected information present in above paper. It enhances the classification accuracy. The selection step is to classify the words into the standard parts of speech (POS).

Similarly, Wilson et al. (2005) focused on the task of phrase-level sentiment analysis. They followed a two-tiered approach (1) determining whether a phrase is polar or neutral (2) and in the case of a polar phrase, trying to disambiguate its polarity [6].

Sometimes sentiments does not use any sentiment words like good, better, best, worst, bad etc. but the sentences may have its positive or negative feedback about the product, services and policies.

4. SENTIMENT ANALYSIS

4.1 Sentiment analysis at sentence level

Sentiment analysis is the computational study that analyzes people’s opinions, attitudes, appraisals, sentiments, and emotions towards entities such as services, products, individuals, organizations, topics and their attributes [9]. For emotion detection, the pitch of the voice, attitude of the speaker, tone of voice, are the features which are involved in it when we deal with the general terms [13].

General structure for sentiment analysis process for product reviews is shown in figure 4.1 which contains Product Reviews, POS Tagging, Feature Extraction, Opinion Word

Extraction, Opinion Word Polarity Identification, Opinion Sentence Polarity identification and Summary Generation.

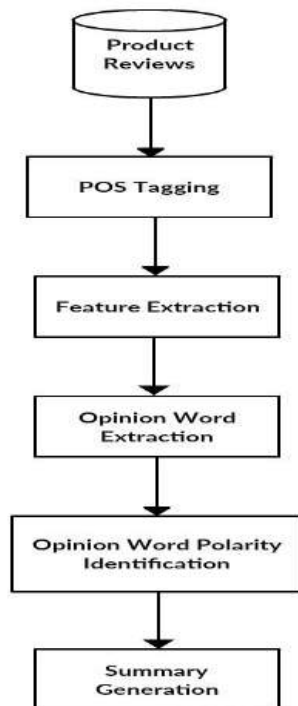


Fig 4.1: Sentiment Analysis Process for Product Reviews

A. Product Reviews

Product Reviews are extracted from the website using web crawler and then after performing preprocessing unwanted texts other than product reviews are eliminated and reviews are stored into database [15].

B. POS Tagging

In part-of-speech (POS) Tagging, each word of the review is tagged with its part-of-speech such as noun, adjective, adverb, verb etc.

C. Feature Extraction

As product features are generally nouns, so in feature extraction phase each noun is extracted from the review.

D. Opinion Word Extraction

In this phase, opinion words are identified. When review contains one or more opinion words, it is called as opinion sentence and opinion words are generally adjectives.

E. Opinion Word Polarity Identification

In this phase, whether opinion word is expressing positive opinion, negative opinion, or neutral opinion is identified. After finding the polarity of opinion word it is necessary to find polarity of opinion sentence. Some set of rules can be set to get the accurate result. For example, if a review contains odd number of negative words like 'not', 'no', 'but', etc. then its final polarity would be opposite of the polarity of opinion word.

F. Summary Generation

The summary is generated based on the features of product. The summary can be in the form of tables or graphs. Sentiment analysis can be done at various different levels such as document level, sentence level, aspect level and phrase level. Type of sentiment analysis will be selected depending upon which type of data is to be processed.

4.1 Sentiment analysis at document level

Document level sentiment classification is used to predict whether the document expresses positive effect or negative effect [14]. However, other studies are focusing on developing and building sentiment dictionaries (lexicon).

4.2.1 Supervised method

In supervised method, document level sentiment classification is done by testing and training the document. This method assumes that document should be classify into finite set of classes like five star ranking for positive and at most two star ranking for negative.

4.2.2 Unsupervised method

Unsupervised method is also known as automatic document level classification. It is based on semantic orientation. Semantic orientation means determining whether opinion word is expressing positive opinion, negative opinion or neutral opinion.

A) Sentence level sentiment classification

Sentence Level sentiment classification analyzes the document at sentence level. This level is composed of two tasks. First task is to deal with identifying whether the given sentence is subjective or objective. Second task is to find polarity of opinion word such as positive, negative or neutral based on sentence. Two popular approaches at this level are corpus based approach and dictionary based approach. Whenever there are complex sentences in user review sentence level sentiment classification is not useful.

B) Aspect level sentiment classification

Aspect level is also known as feature based sentiment analysis. As its name suggest it directly look for the features included in the opinion itself rather than looking for language constructs like sentence, word and phrase [16]. A negative sentiment on any particular object does mean that the reviewer dislikes everything about the object. Similarly, a positive sentiment on any particular object does not mean that the reviewer likes everything about the object [7]. Based on this analysis, a structured summary of sentiments about products and their features can be represented.

C) Phrase Level

Phrase is nothing but the words which appear much near to each other that is the neighbor words. The phrase level classification is focused in opinion mining [14]. The exact sentiments about any particular product can be classified correctly in some problems. But in some other problems

where contextual polarity matters then the results will not be correct and accurate. When negative words occur locally, in such examples, these levels of sentiment analysis are adequate. If sentences with negative words which are very far from the sentiment words in review, phrase level analysis is not efficient.[16].

5. NATURAL LANGUAGE PROCESSING (NLP)

Natural Language Processing uses the grammatical structure of the sentence and according to the grammar it finds nouns, adjectives, adverb, verbs, etc. so for identifying features of any particular product it will be best suited. For example, "The mobile phone has excellent Camera". Here as we are human so we can easily identify Camera is the feature of the product mobile. But it is difficult for machine to understand that camera is the feature [5].

If we observe that the camera is the noun term here (POS tagging). So if we broke the sentence into English grammar structure then it will be easy to train the machine that the noun term is the feature of the product camera. The only drawback of using Natural Language Processing (NLP) is that it runs badly if the user reviews use grammatically incorrect words and as we see today's large part of electronic text contains bad English sentences. So before using it on a large scale there are methods to detect and correct bad English words [12].

6. APPLICATION OF SENTIMENT ANALYSIS

Under the umbrella of Sentiment Analysis there are certain areas which attract the researchers in today's world towards opinion mining [12]. The natural language processing (NLP) communities are showing their interest in Sentiment mining and opinion mining. The leading applications of the sentiment analysis are as listed below

1) Intelligent product purchasing

Whenever we want to purchase a product or want to deal with any service, taking right decision is a lengthy procedure and a tedious task in earlier days. But now it has become easy. By using sentiment analysis people can easily analyze opinions regarding any particular domain without dealing with the third party consultant.

2) Developing marketing strategies

The result of Sentiment Analysis can be used for developing marketing strategies [5]. By using sentiment mining methodologies, the recent trend of customers about services and products can be analyzed. By using sentiment analysis anyone can decide attitude and nature of customer towards purchasing various products [16].

3) Making Decisions

People find it very easy for decision making about any particular product or service by using opinion mining.

Opinion mining gives analyzed opinions of people so that it will become more efficient for new customer. Instead of studying and analyzing all the unstructured data, analyzed results are more beneficial and time saving.

4) Improvement in Quality of Service

While dealing with Sentiment Analysis the retailers or the merchant sites can collect the opinions of people about their product features [15] and then they can summarize and can make decision which features should be improve to increase the quality of service. Different online product selling sites are there like Flipkart.com, Snapdeal.com, Amazon.com, Cnet.com, etc.[15].

5) Disaster Detection

Using Sentiment Analysis continuously monitoring of newsgroups, forums, social networks, and blogs is easily possible. Opinion mining can easily detect arrogant words [10], shaking words or hatred language which may be used in tweets, social media, and newsgroups on different internet sources.

6) Recommendation System

By classifying user's sentiments into positive, negative and neutral, the system can detect which product should get recommended and which should not get recommended to the new customer [12].

7) Policy Making

One can build a new user friendly policy by analyzing what are the pitfalls in current working policy using sentiment analysis [14].

8) Spam Detection

Since few years web is become easily available to all, anyone can place anything on web, so this increases the spam content on internet. Sentiment analysis and opinion can classify the web contents into "spam" contents and normal contents [13].

7. CONCLUSION

In this survey paper we have studied the survey of sentiment analysis for dominating products which include different techniques used for Sentiment Analysis, Natural Language Processing (NLP), challenges of the Sentiment analysis and the applications of it. Sentiment analysis is a prominent field of the data mining used to extract the essential knowledge from an enormous amount of users comments, sentiments, reviews, feedback on any post, product or statement. Opinion mining is most helpful to recognize and predict the current and future trends, product survey, people sentiments for social issues, effect of particular event on people. Big organizations like SAP, TC, SAS uses the sentiment analysis for Business Intelligence applications

8. FUTURE SCOPE

The system now can give polarities of positive, negative and neutral but they can improve on the suggestions that people or

users give through their reviews. The improvements can be a turning point for the sentiment analysis where producers can easily know what the shortcomings of the product are and can improve it based on the user's reviews. The analysis of reviews which are in the form of images and videos should also be analyzed and the polarity should be determined based on it. It will prove a better and more developed system for opinion mining.

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Design of Series Connected Forward Fly back Step up Dc-Dc Converter

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ABSTRACT

Now a days, small scale solar array and PV module is having low voltage. So to connect them to grid, it is necessary to boost the output voltage higher than 300 V. There are some technologies available like high voltage boost converter, soft switching converters. But they have poor reliability due to absence of isolation and low power conversion efficiency. This paper represent a high step up Dc-Dc converter which has series connected forward converter and flyback converter using transformer technology to increase the utilization with an advantage of high system reliability and high power conversion efficiency. In this paper design and analysis of proposed system are presented along with the performance analysis and simulation. Also, a 125 W hybrid Dc-DC converter hardware model has implemented for experimental verification.

Keywords

Dc-Dc converters, forward-flyback converter, forward flyback transformer.

1. INTRODUCTION

The solar power generation has some noticeable advantages in the installation condition and manufacturing cost compared to other sustainable renewable energy sources. Solar arrays can be installed on top of commercial buildings or residential houses. These features have brought about much concern with small-scale solar power generation systems as a highly distributed power sources. Since the electrical characteristic of the typical small-scale solar array is low-voltage output, the high step-up dc to dc converter is necessary for the grid connected power systems. There are some technologies available like high voltage-boost power converters and soft-switching converters. But they have poor reliability due to the absence of isolation. On the other side, an isolation type converter has an advantage of the safety and system reliability, in fact of the high power conversion efficiency. In this project, an output-series forward-flyback (SFFB) dc-dc switching converter has presented, which serially connects the secondary outputs of a multi winding forward-flyback converter in order to solve these isolation type disadvantages. Series connected forward-flyback converters deliver the

required energy to the load through a transformer no matter whether the main switch turns ON or OFF, holding an advantage in terms of supplying more power to the load. The proposed scheme improves the weaknesses of insulation type converters, such as low efficiency, bigger size, and much costly, by utilizing the structure of the forward-flyback converter. A utilization factor of the transformer is highly boosts up by continuous power delivery from primary to secondary which contributes to the reduced volume of the forward-flyback converter.

2. SFFB CONVERTER

2.1 Block diagram

Fig.1 shows that the block diagrams of proposed system. The primary has a switching voltages occurred by a single main switch. Structure of the secondary where the forward converter and the fly back converter are separated by transformer winding. Yet the outputs are serially connected for the output voltage boost

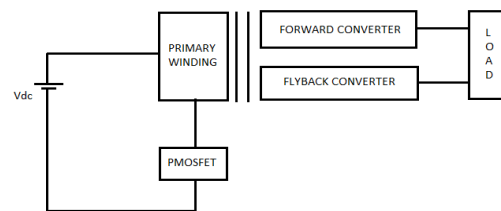


Fig. 1 Block Diagram of SFFB converter

The flyback supplies power to the load during the off time of the transistor and the rectifiers work as peak rectifiers. This means the output voltages follow the peaks of the transformer secondaries during the flyback period. If having multiple outputs, the voltages at the transformer secondaries during

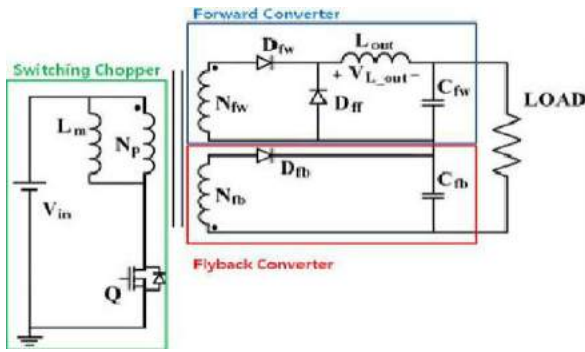


Fig. 2 Equivalent circuit diagram

the flyback period will tend to follow one another, reason of that transformer action. Because of the peak rectification, it follows that the output voltages will follow each other. In a forward, transformer action is still present, but the power is delivered during the on time and the rectifiers just work as average rectifiers. Fig.2.Circuit Diagram for Flyback Converter gives output voltages are the averages of the voltage at the transformer secondaries at on time. But the averages depend on the duty cycle. And the duty cycle is adjusted to regulate the final output. But that means the duty cycle will only be right for the final output and it could be totally wrong for a slave output, because the output could be fully loaded reason of that needing a large duty-cycle, while the final output is only lightly loaded (needing and forcing a low duty cycle). Or the other way around the final is fully loaded, forcing a large duty cycle; while a slave output is only lightly loaded, thus needing a low duty cycle.

2.2 Operating principle

The proposed system has four operating modes as shown in Fig. 3, 4, 5 and 6, according to the switching state of the circuits.

Mode 1: Current flows to the magnetizing inductance and the primary winding N_p as a result of turning ON the switch Q . The current of primary is transferred to the secondary N_{fw} coil of the forward converter via the magnetic linkage. After, the ac power is rectified into dc which load requires through a forward diode D_{fw} and a low pass filter L_{out} and C_{fw} . Because a flyback diode D_{fb} is reverse biased, the output capacitor provides the load current during this mode.

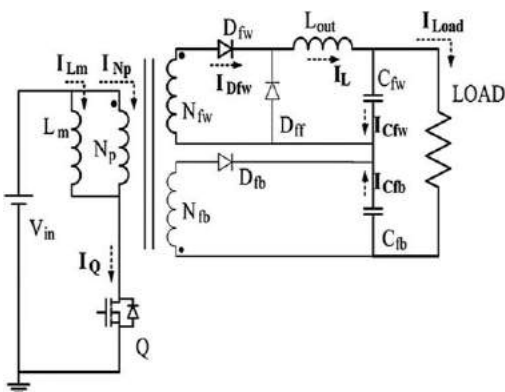


Fig. 3 Equivalent Circuit Diagram of Model

Mode 2: When switch Q is turned OFF, a forward diode D_{fw} is reverse biased and the stored energy in L_{out} is transferred to the load by the freewheeling current via D_{ff} , and at the same time, magnetically stored energy at L_m is also supplied to load through D_{fb} of the flyback converter. Thus, all the free-wheeling current in magnetic devices decreases linearly.

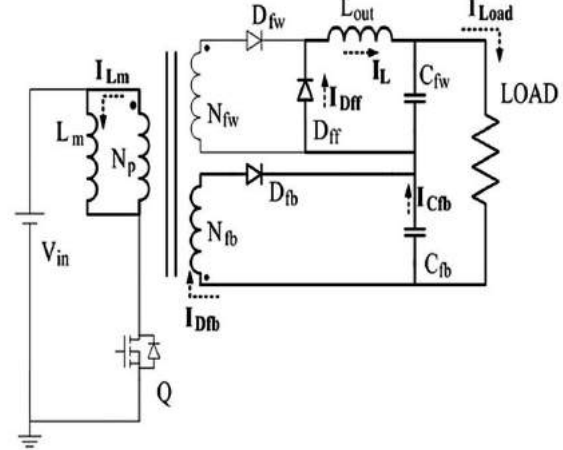


Fig. 4 Equivalent Circuit Diagram Of Mode 2

Mode 3: The forward converter starts operating in DCM when all the energy in L_{out} is discharged, and then a freewheeling diode D_{ff} is reverse biased. Then stored energy in L_m is only supplied to load through the flyback converter.

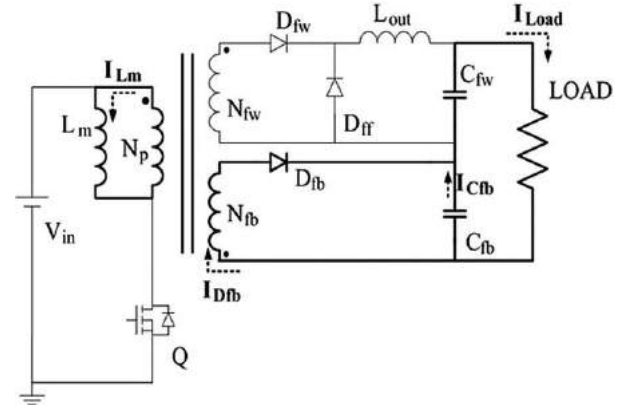


Fig. 5 Equivalent Circuit Diagram Of Mode 3

Mode 4: During this mode the transformer of the forward-flyback converter is demagnetized completely and the output voltage is maintained by the discharge of the output capacitors. C_{fw} and C_{fb} the rectifier diodes are reverse biased.

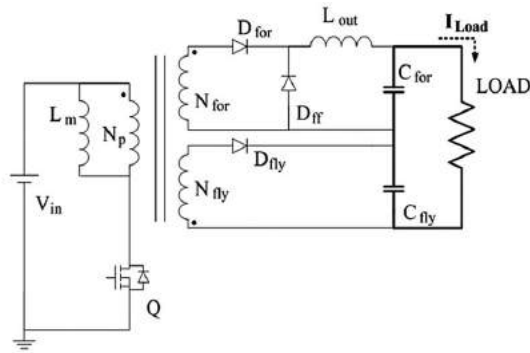


Fig. 6 Equivalent Circuit Diagram Of Mode 4

3. SIMULATION RESULTS:

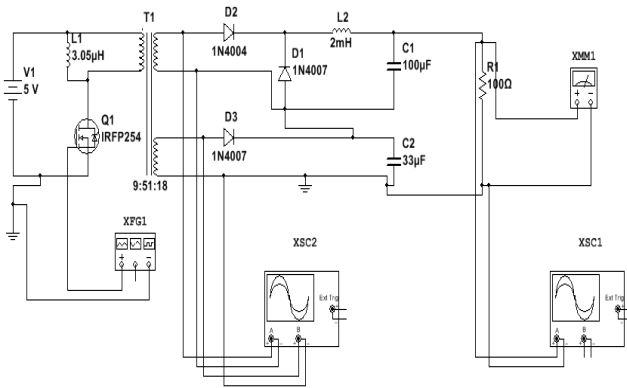


Fig. 7 Simulation on Multisim

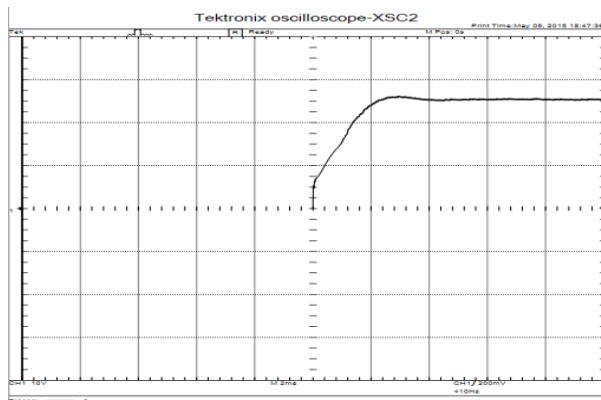


Fig. 8 Output Voltage

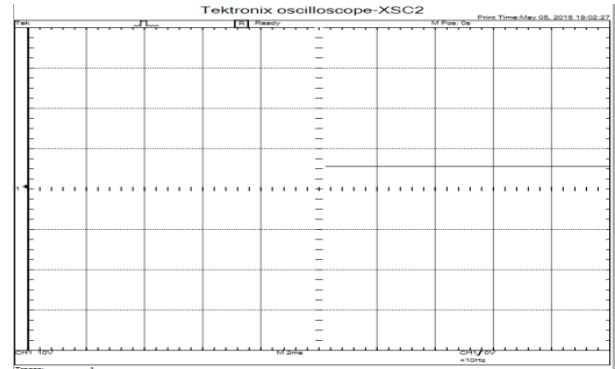


Fig. 9 Input voltage

4. DESIGN AND ANALYSIS

Vi(Min) : 15V, Vi(Max) : 30V, Vo : 200V, P(Max) : 125W,
Io(Max) : 0.625A, f : 50kHz,

Ac: 118.5mm², η : 80%, B(Max) : 1500T.

Transformer type: EI33- W=34mm, D=29mm, H=31.5mm.

Diodes: UF4007, 800V, 1A, Vd=1.7V

MOSFET: IRFP260N

A. Primary Winding

$$N_1 = \frac{V_i(\max) * 10^8}{4 * f * B_{\max} * A_c} \dots \dots (1)$$

$$N_1 = 8.46 \text{ turns} \sim 9 \text{ turns.}$$

B(Max)=1500 Gauss (Range 1300-2000 G).

Actual value of B(max),

From (1), We get,

$$B(\max) = 1406.46 \text{ G}$$

This is under range.

B. Duty cycle

$$D = 1 - \frac{V_i(\max) * \eta}{V_o} \dots \dots (2)$$

$$D = 0.88 / 88\%.$$

C. Secondary Winding

At maximum duty cycle=88%,

$$\text{Voltage to transformer} = 0.88 * V_i(\max) = 0.88 * 30 = 26.4V \dots \dots (3)$$

$$\text{Voltage ratio (sec : pri)} = 200:26.4 = 7.57.$$

Since, voltage ratio (sec : pri) = 7.57, turns ratio (sec : pri) must also be 7.57 as turns ratio (sec : pri) = voltage ratio (sec : pri)

Turns ratio is designated as 'N'.

So, in our case, N = 7.57

N₁ = 9 turns,

N₂ = N * N₁ = 7.57*9 = 68.1 ~ 69 turns..... (4)

So, for FORWARD AND FLYBACK CONVERTERS the windings and the voltage of secondary winding is divided such that we get the N(fw) & N(fb) forward and flyback winding respectively & their voltage is as given below.

N_{fw} = 51 turns, N_{fb} = 18 turns, V_{fw} = 149.6 V, V_{fb} = 52.8 V

D. Output Inductor for Forward Converter

Ripple current, $\Delta I_L = 0.4 * I_o(\max)$ (5)

$\Delta I_L = 0.4 * 0.625 = 0.25A$,

$V(fw) = D(\max) * \frac{N_{fw}}{N_1} * V_i(\max)$ (6)

V(fw) = 149.6V

L_o = ?

$\Delta I_L = \frac{1}{f * L} * V_i * \left(1 - \frac{V_i}{V(fw)}\right)$ (7)

L_o = 1.92mH.

E. Magnetizing Inductance

$L_m = n^2 * \frac{(1 - D)^2 R(fb)}{2f_s}$ (8)

Where,

n = Turns ratio,

R_{fb} = Flyback Winding Resistance,

D = Duty cycle.

$n = \frac{N_1}{N(fb)}$, $R(fb) = \frac{V(fb)}{I_o(\max)}$

n = 0.5, R_{fw} = 84.8Ω.

Therefore,

L_m = 3.05μH.

F. Output Capacitor

C(fw) = 100μF & C(fb) = 33μF.

G. Air gap length of a transformer

$l_g = \frac{\mu_0 * L I^2}{B^2 * A_c} 10^4 \text{ m}$ (9)

L_g = 3.53mm

L_{g1} = 1.76mm & L_{g2} = 1.76mm

H. Diameter of Primary & Secondary Winding

According to the current rating the diameter of the enameled copper wire is taken from the table given below.

Hence we get,

N₁ = 1.628mm

N_{fw}, N_{fb} = 0.573mm.

5. EFFICIENCY ANALYSIS

Table 1 on load Parameters of SFFB Converter

Serial No.	Parameters	Value
1	Input Voltage (V _i)	27 V
2	Input Current (I _i)	1.75 A
3	Input Power (P _i)	47.25 W
4	Output Voltage (V _o)	145 V
5	Output Current (I _o)	0.31 A
6	Output Power (P _o)	44.95 W

Efficiency (η) = $\frac{\text{Output Power}}{\text{Input Power}} \times 100$ (10)

$\eta = \frac{44.95}{47.25} \times 100$

η = 95.13 %

The Load test of the SFFB converter is done on 100 W load.

6. PROTOTYPE AND OUTPUT

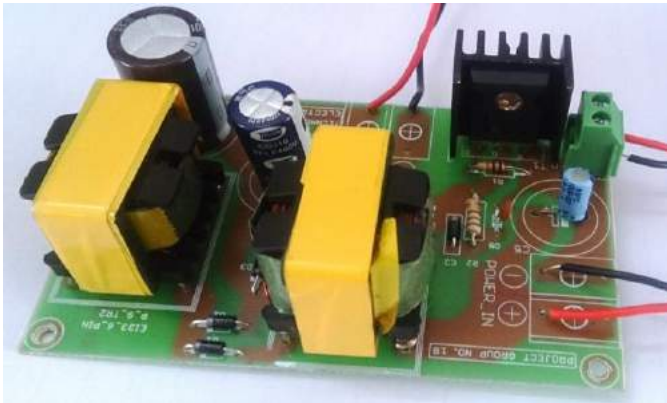


Fig. 10- 125W SFFB Converter Prototype

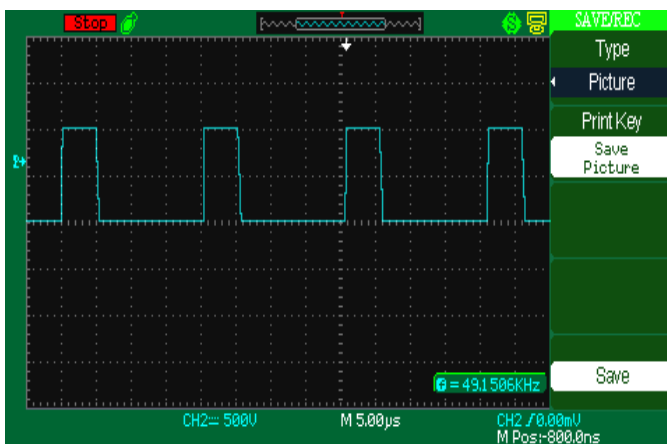


Fig 11- Prototype Output

7. ADVANTAGES

- I. As we are giving isolation between the primary & secondary winding of transformer, it will increase the safety and reliability of converter.
- II. The separated secondary windings in low turn-ratio reduce the voltage stress of the secondary rectifiers and thus high efficiency can be achieved.
- III. Using forward-flyback converter we can reduce the cost and size of circuit.
- IV. 'N' number of outputs can be stacked on secondary side.
- V. With less input voltage high DC Voltage can be achieved on output side.

8. FUTURE SCOPE

As a future work, it will be effort spent to obtain the soft switching operation in extremely step up applications for the more different specifications such as high-frequency applications, high/low voltage/current applications, etc. in this circuit primary winding uses, PWM technique which belong hard switching of switch. The disadvantage of PWM technique is, it should withstand high voltage and high current when the switch is ON and OFF. Switching losses are occurs and it is directly proportional to the switching frequency, instead of which we can use soft switching technique such as ZVS and ZCS.

9. CONCLUSION

In this project, a pre-regulating dc-dc converter of an SFFB converter for multistage PV power conditioning systems has been proposed. The single-ended forward- flyback operation contributes to high-density power delivery of the transformer with a galvanic isolation and the series connected output is quite beneficial to the enhancement of the output voltage. The high voltage and low-current output has a filter inductor under DCM operation that contributes to better performances by completely removing reverse recovery of the rectifying diodes. The operation principle and the design based analysis of the forward-flyback converter have been presented. The experimental result with a 125-W hardware model is also included to show that the proposed system has a high efficiency greater than 95% with isolation from 20–30-V input range to 145-V output.

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Single phase Grid system using single stage connection

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ABSTRACT

The electricity sector in our country have many critical issues regarding the electricity supply, so the renewable energy policies have increased the consumption of solar energy. This paper proposes the single stage inverter with MPPT (maximum power point tracking) and one cycle controlled (OCC) for the grid connected PV system. OCC scheme is predicated on the current adjustment of the output signal. Schemes predicated on OCC do not require the accommodation of a PLL (phase locked loop) for interfacing the inverter to the grid. these schemes are increasingly being used for such applications. As compared to the previous schemes, it requires less number of sensors i.e. only two. The maximum power extracted from the PV array uses Perturb and Observation method.

General Terms

Grid system, single stage connection.

Keywords

One Cycle Control (OCC), Maximum Power Point Tracking (MPPT), Photovoltaic (PV) array, Single phase grid connected inverter, Perturb and observation method.

1. INTRODUCTION

With the rapid increase in the industrial area, the consumption of fossil fuel is increasing day by day. With the rapid increase in the pollution, the environment is incrementing ecological warming and is damaging ecological. Due to these, there is a requirement to increase the use of renewable energy in the environment, also there are many renewable energy sources available in the environment such as solar, wind, tidal etc. Among all these renewable energy sources, the solar energy is obtainable on a large scale so that the renewable energy sources can be used to a large extent & there is ordinance dictation for photovoltaic (PV) panel. The output voltage is varied along with current on a PV panel with irradiation, panel temperature and the power loading is nonlinear. Under certain conditions in atmosphere, there exists maximum power point. To extract maximum power from the PV panel, large number of researchers have proposed, maximum power point tracking (MPPT) algorithms which include voltage feedback method [1].

In this paper we are discussing about photo voltaic cell connected to the grid. A grid connected photo voltaic system is very popular because of their application in distributed generation and for utilizing efficiently the PV array potency. The symbolic grid connected PV system is shown in the fig 1. In a grid connected PV system there are many power

processing stages [2], [3]. The first stage involves dc –dc conversion. It extracts maximum power by utilizing a

maximum power point tracking (MPPT) method. The second stage is to invert D.C. to A.C. conversion. It then alimnts to the grid.

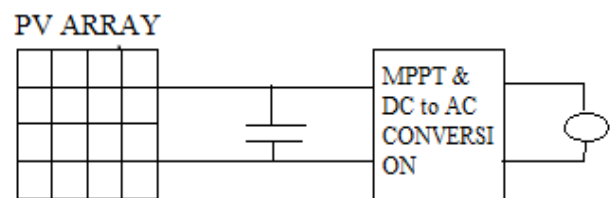


Fig.1 A generic grid connected PV system.

The inverter makes sure that whatever amount of potential energy is extracted from solar array, it is being dumped on the grid. This is achieved by maintaining the dc-link voltage to a set reference value. The single stage inverter performs two functions like two stage systems: 1) to obtain maximum power by utilizing MPPT algorithm. 2) the potencies are distributed to the grid by maintaining the power quality discipline of the utility. The grid connected PV system consist of: two current control loop, an expeditious inner current controller which regulates the current injected to the grid. It also maintains the prescribed total harmonic distortion (THD) and also power factor, while a slow outer current control loop incorporates the MPPT algorithm employed. When PV system is interfacing to the grid, it requires phase lock loop (PLL). Designing a PLL for interfacing with the grid is always difficult to propose considering the non-idealities as of frequency variation and harmonic distortions present in the line voltages [4]. The system based on OCC does not require the accommodation of PLL [5]-[7].

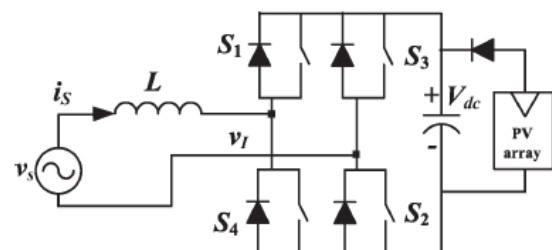


Fig.2 1 phase single stage grid connected PV system

Due to the current controller loop the operations become faster. Single phase Grid system using single stage connection with one cycle control can be operated at maximum power point tracking. For obtaining maximum power, OCC is using

perturb and observed method at maximum operating power point.

2. VOLTAGE-SENSORLESS OCC BASED INVERTER for PV SYSTEM

A single stage grid connected photovoltaic system which has a single phase full bridge voltage source inverter (VSI) is shown in Fig. 2. The inverter switches are controlled to give an output voltage whose fundamental component is V_{I1} . By controlling the phase and magnitude of V_{I1} through a (PWM) strategy, the continuous flow from the solar array to the grid can be obtained and controlled while maintaining a limit of high power factor and low harmonic distortion in it. Considering the phasor model of the system as shown in fig. 5 and assuming the system to be lossless, the expression for good quality power flow from the inverter to grid can be expressed as under:

$$P = \frac{V_{I1} V_s \sin \delta}{\omega L} \quad (2.1)$$

where V_s is the grid rms voltage, I_s is the grid frequency and δ is the phase angle between fundamental component of the output voltage of inverter and grid voltage. The inverter used cannot be controlled with fundamental OCC predicated control technique as the rudimental OCC predicated schemes exhibit instability in the operation when the converter which is involved is operated in an inverting mode of operation [8], [9]. In order to resolve this problem, a modified OCC (M-OCC) predicated scheme has been used. The scheme presented in [9] does not require the use of a PLL, it needs to sense instantaneous grid voltage. In the scheme reported in [9], the grid voltage which is sensed is multiplied by a constant gain to produce a fictitious current signal that is in phase with the grid voltage. The fictitious current signal is integrated to the original current drawn by the inverter. The sum of the two signals is then used by the OCC core controller to produce gating pulses for the inverter switches as shown.

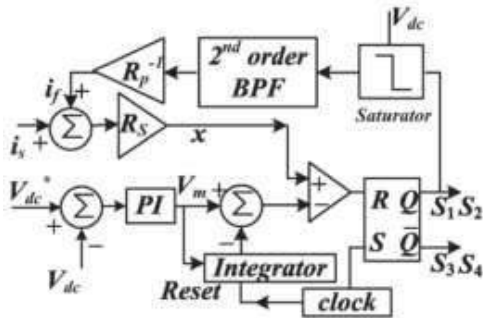


Fig.3. control block diagram of voltage sensor less grid connected PV system

The scheme proposed in the paper does not sense the voltage to produce the fictitious current signal that is required to resolve the issue of instability in OCC predicated inverter. It combines the required fictitious current signal by multiplying the fundamental component of the output voltage of inverter with a constant gain. Information of the inverter output voltage is obtained from switching function used to fire the inverter switches. It is not by sensing the inverter output voltage per sec. The control block diagram of the proposed scheme is as shown in Fig. 3. The dc link capacitor voltage is sensed in the figure and compared with a set reference, and the error so produced is given to a proportional and integral regulator to produce a signal V_m . A sawtooth waveform with

constant frequency having peak to peak value of voltage of $2V_m$ is produced utilizing a resettable integrator. A free-running clock which has a duration of T_s is utilized to reset the integrator, hence, the frequency of the clock T_s decides the frequency of sawtooth waveform and also the switching frequency of the contrivances. The time constant of integrator T_i is opted to be a part of T_s as expounded in [7]. A fictitious current signal that is proportional to the fundamental component of the voltage output of inverter (if = V_{I1}/R_p) is integrated with source current and proportionally scaled to obtain the modulating signal x .

Where

$$X = I_s + I_f = I_s + \frac{V_{I1}}{R_p} \quad (2.2)$$

In order to obtain V_{I1} and if the inverter switching pulses are passed through the saturator, the output of the saturator moves between the scaled dc link voltage and zero in response with the pulsation of switching sequence between the state one and zero. The signal in proportion to V_{I1} is obtained by filtering the output of saturator. The harmonic spectrum of saturator output has: 1) a fundamental frequency component (50 Hz); 2) a dc component; and 3) higher frequency components centered about multiples of switching frequency. Hence, a Band Pass Filter (BPF) is required to revive the fundamental component of the signal and remove the dc and higher order components. A second order BPF which has a central frequency identical tantamount to the original frequency (50 Hz) is utilized for the purport. The circuit diagram is shown in Fig. 4. The modulating signal is multiplied by gain R_s and is compared with the sawtooth waveform to produce the switching pulses. At every increasing edge of the clock pulse, S_3 and S_4 are turned on that leads to the increment in source current I_s . When the modulating signal becomes identically similar to the sawtooth waveform, S_3 and S_4 are turned off and then S_1 and S_2 are turned on so the modulating signal is decreased. The elevating and falling slopes of I_s is given by $(V_s + V_{dc})/L$ and $(V_s - V_{dc})/L$, respectively, where V_s is utility voltage, V_{dc} is the dc link capacitor voltage, L is the magnitude of boost inductor. The modulating signal x is being compared with sawtooth waveform to produce the switching pulses.

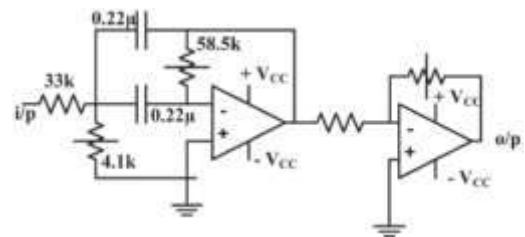


Fig. 4-Circuit diagram of analog implementation of BPF

When x is below the sawtooth waveform, S_3 and S_4 are on, and output voltage of the inverter is $-V_{dc}$. When x is greater than the sawtooth waveform, S_1 and S_2 are turned on and the output voltage of the inverter is $+V_{dc}$. Therefore, the average output voltage of inverter during switching duration (time period of the sawtooth waveform) is

$$V_m = \frac{V_m - X}{2V_m} (-V_{dc}) + \frac{V_m + X}{2V_m} (+V_{dc}) = \frac{V_{dc} X}{V_m} \quad (2.3)$$

Therefore, it can be seen from equation (3) that the average output voltage of inverter in a switching duration is proportional to modulating signal x . Furthermore, the

fundamental component of the inverter output voltage will be in phase with modulating signal. By combining (2) and (3), the expression for the output voltage of inverter averaged over a switching time period is gathered as follows:

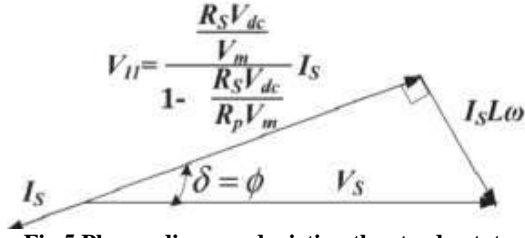


Fig.5.Phasor diagram depicting the steady-state comportment of the proposed voltage-sensor less system.

$$V_m = \frac{R_s V_{dc}}{V_m} (I_s + \frac{V_1}{R_p}) \quad (2.4)$$

From the above expression, it can be obtained that V_i and I_s have a phase shift of either 0° or 180° in between each other. The phasor diagram showing the grid voltage, the fundamental component of the output voltage of inverter, and the drop along the series filter inductance is depicted in Fig. 5 for the inverting mode of operation.

3. MPPT IMPLEMENTATION USING P&O METHOD

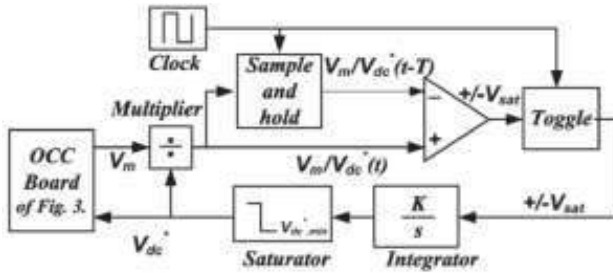


Fig. 6.block diagram of MPPT realization

P&O method is one of popular methods to track the maximum-power point [10]. Implementing MPPT by P&O method is generally done. It is done by utilizing DSP or microcomputer. But digital circuitry and discrete analog can add the utilization for the purport [11]. The following figure shows the analog controller which is proposed in this paper to implement P & O method. In the figure, the controller consists of analog multiplier, sample and hold circuit, a free-running clock, an integrator, and a toggle switch.. The P&O controller receives the V_m signal from the OCC controller of Fig. 3. The output of the controller is V_{dc}^* which sets dc link voltage reference that is required by the OCC controller of Fig. 3. An integrator is connected to the output of a toggle flip-flop which engenders the voltage reference V_{dc}^* . P&O cycle decides the period of a free running clock that sets sampling instants for the sample and hold circuit and also toggling instants for the toggle flip-flop. To understand the working of the MPPT controller, the typical variations of different signals of MPPT controller block are shown in Fig. 9. Depending on the output level of toggle flip-flop, V_{dc}^* can have either an elevating / falling slope. The rate of vicissitude in V_{dc}^* is kept much more small than the control bandwidth of the OCC controller.

4. SIMULATION AND EXPERIMENTAL RESULTS

In order to prognosticate the performance of the proposed study of one cycle controlled (OCC) voltage sensorless grid connected system, detailed simulation studies are worked out on MATLAB– Simulink platform. In order to show that, the proposed voltage sensorless scheme does not have the difficulty of current instability while the operation in inverting mode, a model of the system shown in Fig. 2 is simulated [12]. The parameters which the inverter culled for the purpose of simulation [12] and the controller are as follows:

Table I: PARAMETERS

Sr. No.	Parameter	Value
1	Switching Frequency	20 kHz
2	DC-link Capacitor	2200 μ F
3	Series Inductor	2 mH
4	R_p	1.5 Ω

The utilization of the designations for the solar array in the simulation study are provided in Table I, corresponding to 1000W/m² and 800W/m² insolation levels. The dc link reference is externally set to 220 V. The grid is considered as a 230 Vrms 50-Hz system.

Table II: PV ARRAY SPECIFICATIONS

Peak Power (P_p)	2KW	1.5KW
Peak Power Voltage (V_{mp})	220V	188V
Current at peak power (I_{mp})	8.8A	6A
Open circuit voltage (V_{oc})	230V	195V
Solar isolation	1000W/M ²	800 W/M ²

When isolation level abruptly changes from 1000W/m² to 800W/M², the DC link voltage suddenly falls at 188V and current is changed from 8.8A to 6A. And maximum power output of PV array is changed from 2kw to 1.5kw at 3 sec. After 8 sec, the voltage, current, power is settle back to the initial value. Fig. 6 shows the simulation results as the waveforms of the DC link voltage, DC link current, and Grid voltage abruptly transmuted from 1000W/m² to 800W/m².

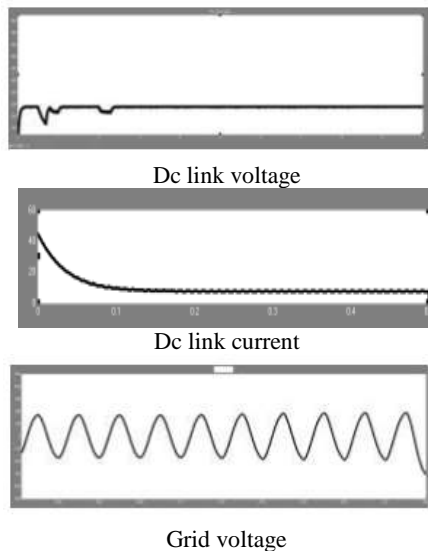


Fig 6. show the a) dc link voltage b) dc link current c) grid voltage.

From the simulated performance, it can be concluded that the system supplies the maximum power from the PV array to the grid. The transient performance of the system can be optically found out during the vicissitude in insolation levels. It can also be observed from the simulated performance that vicissitudes in PV current and dc link voltage are smooth during the transmutation which implicatively insinuates a proper transient performance for the system. The steady-state source current, the fictitious current signal, grid voltage, dc-link voltage obtained from the filtered output of the switching pulses of the inverter are shown in Fig. 5.

It can be noted that the grid voltage and source current are virtually 180 out of phase which demonstrates the inverting mode of operation. The quantity qualified harmonic spectrum of the current supplied by the system to the grid, the grid voltage from which it can be inferred is all the low order harmonics to that of the fundamental component. As an OCC predicated scheme has itself an equipollent impedance to the grid, disturbances present in the grid voltage does not appear in the current drawn by the system from the grid.

5. CONCLUSION

An M-OCC predicated single phase grid system using single stage connection has been proposed. The circumscription of using the subsisting OCC predicated inverters, such as, requisite to sense the grid voltage which requires to tackle the instability quandary, is resolved in the proposed scheme. The proposed scheme is functioned on a single stage of potency conversion and is to realize by utilizing less number of sensors compared to that of the conventional schemes. Further, the main controller of the proposed scheme can be realized by designating very simple analog controller. All the mentioned features of this scheme can make it an ideal candidate for very small and distributed single phase grid connected PV systems. Detailed simulation studies have been solved to verify the efficiency of the scheme. The viability of the scheme has been confirmed by performing detailed simulation studies.

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“Analytic Approach to Smart Grid: Active Power & Frequency”-A Review

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ABSTRACT

Grid Integration and Grid Management, in conjunction can bring about a tremendous change in the way electricity is generated and consumed. Smart Grid uses two-way flow of electricity and information to create an automated energy delivery network, it is even regarded as the next generation power grid. In this paper, a Smart Grid has been designed by MATLAB simulation approach for synchronization of two power plant and for analysis of active power and grid frequency. Using active power and frequency of grid, we can analyse the range of maximum permissible loads that can be connected to their relevant bus bars.

Keywords

Smart Grid, MATLAB, Active Power, Frequency

1. INTRODUCTION

Smart grids are modernized electricity grids that integrate information technology and communications infrastructure to provide greater transparency on electrical energy use and to improve the quality of energy supply. Grid Integration and Grid Management, in conjunction can bring about a tremendous change in the way electricity is generated and consumed. Smart Grid uses two-way flow of electricity and information to create an automated energy delivery network, it is even regarded as the next generation power grid. Smart grid is technically classified in three categories namely Smart Infrastructure System, Smart Management System and Smart Protection System [2]. The simulation works of this paper is done under the Smart Infrastructure System. The main parameter in any power system network to show stability is active power and frequency.

In today's power system network, distributed and conventional generation are combined used to control the power flow in order to get a highly stable network. The smart grid model will be including 4 units of Thermal power plant (conventional generation) and 6 units of Wind power plant (distributed generation). The wind power plant is connected to major load side to control the power flow and this connecting point is treated as smart grid. Synchronous Generator is used to generate power in Thermal power plant and in Wind power plant Doubly Fed induction generator (DFIG) [9]. The overall Frequency of system is controlled by controlling the frequency of both synchronous generator and DFIG independently. The model simulates the power system network with two area system control where each area is characterized with two conventional thermal power plant each having 900 MW capacity.

2. CONTROL METHOD

Active power and frequency analysis process and control of this power system is explained by two ways and they are as:

- (i) By Automatic load frequency control (ALFC) loop of synchronous generator and measuring active power values at each individual bus bar.
- (ii) By Automatic frequency control of doubly fed induction generator and measuring active power values at each individual bus bar.
- (iii) By using FACTS devices.(Statcom)

2.1 FREQUENCY AND POWER ANALYSIS OF CONVENTIONAL GRID

Depending upon the load angle gradient the flow of real power takes place from source to load or from one area to another area. As the loads are increasing or decreasing then frequency will decrease or increase accordingly. For automatic frequency control, in both single and double area loop ALFC is used.

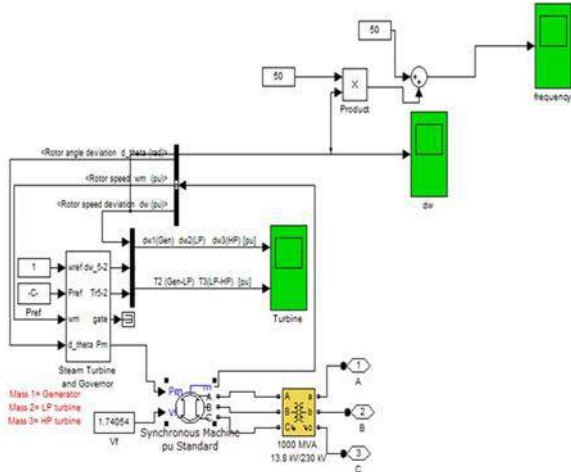


Fig 1: Block Diagram Of Synchronous Generator

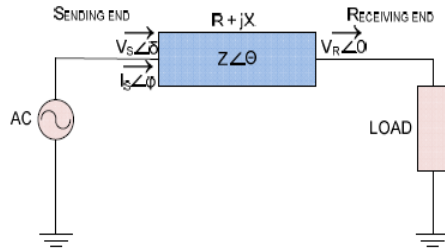


Fig 2: Single Line Diagram

Automatic frequency control loop (ALFC) can be used for frequency control in thermal power plant, which comprises generator, load, prime mover and governor.

The steam input of governor system is adjusted with respect to turbine speed which is proportional to load variation. As the change in the value of speed reduces, the error signal becomes smaller and the position of the governor and fly balls come closer to the point, required to maintain the constant speed. One way to restore the speed or frequency to its value is to add an integrator on the way. The integrator unit will monitor the average error over a period of time and will get the better offset. Thus as the load of the system varies continuously, the generation is adjusted automatically to restore the frequency to the normal value. This is known as Automatic Generation Control. In an interconnected system, the role of the AGC is to divide the load among the system, stations and generators so as to achieve maximum economy and reasonable uniform frequency.

When a group of generators are closely coupled internally

and swing in unison, the generator turbines tend to have the same response characteristics. Such a group of generators are said to be coherent. It is assumed that the

ALFC loop represent the complete system and the group is called the control group. In a two area system, during normal operation the real power transferred over the tie line is given by

$$P_{12} = \frac{|E_1||E_2|}{X_{12}} \sin \delta$$

Where $X_{12} = X_1 + X_{tie} + X_2$

And $\delta_{12} = \delta_1 - \delta_2$

For a small deviation in the tie-line flow

$$\Delta P_{12} = \left. \frac{dP_{12}}{d\delta_{12}} \right| \Delta \delta_{12} = P_s \Delta \delta_{12}$$

$$\Delta P_{12} = P_s (\Delta \delta_1 - \Delta \delta_2)$$

Where

P_{12} = power flow between area 1 and area 2.

E_1 = generated voltage of area 1.

E_2 = generated voltage of area 2.

X_{12} = reactance between area 1 & area 2.

X_1 = reactance of area 1.

X_2 = reactance of area 2.

δ_1 = load angle of area 1.

δ_2 = load angle of area 2.

δ_{12} = load angle between area 1 & area 2.

The tie-line power deviation then takes on the form

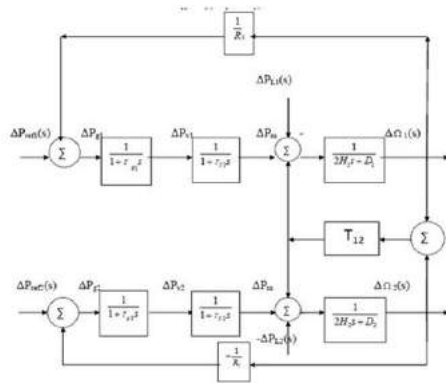


Fig.3: Representation Of Tie Line Power

Doubly-fed electric machines are basically machines in which alternating currents are fed into both the stator and the rotor windings. They allow the amplitude and frequency of their output voltages to stay at a constant value, no matter the speed of the wind blowing on the wind turbine rotor. Because of this, DFIG can be directly connected to the ac power network and remain synchronized with the ac power network.

When the magnetic field of the rotor rotates in same direction as the generator rotor, the speed of rotor n_{rotor} and the speed of the rotor magnetic field $n_{\phi, rotor}$ (proportional to f_{stator}) add up. The frequency of the voltages developed across stator windings of the generator can thus be calculated using the following equation:

$$f_{stator} = \frac{n_{Rotor} \times N_{Poles}}{120} + f_{Rotor}$$

Where

f_{stator} = frequency of the voltage induced across the stator winding

and

f_{rotor} = frequency of the ac currents fed into DFIG

Conversely, when the magnetic field of the rotor rotates in the direction opposite of the generator rotor, the frequency is calculated using

$$f_{stator} = \frac{n_{Rotor} \times N_{Poles}}{120} - f_{Rotor}$$

2.3 FACTS DEVICES

FACTS are represented by a group of power electronic devices. This technology was developed to perform the same functions as traditional power system controllers such as tap changer transformer, phase shifting transformers, reactive passive compensators, synchronous condensers, etc. Particularly FACTS devices allow controlling all parameters that determine reactive and active power transmission. Replacement of the manual switches by

2.2 Frequency Control of DFIG

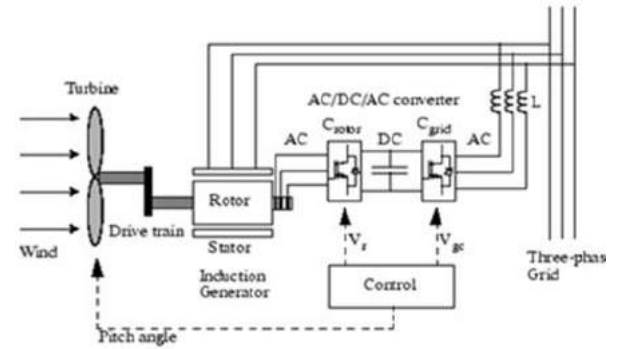


Fig 4: DFIG System

semiconductor switches allowed much faster response times without the need for limiting number of control actions. However, FACTS technology is much more expensive from the mechanical one. FACTS devices is divided into two generations. Older generation based on the thyristor valve, where newer use Voltage Source Converters (VSC). In both categories there are corresponding devices that perform similar services. VSC technology offers faster control over a wider range. Moreover, new generation don't need bulky reactors, thus size of these devices is considerably smaller than the thyristor controlled ones. However, VSC technology requires use of self commutating semiconductor devices which is more expensive, have higher losses and smaller voltage ratings when compared to the thyristors. FACTS devices can also be categorized by the way they are connected to power systems shunt, series or shunt series connection. The purpose of shunt devices is to provide reactive power compensation and dynamic voltage support to the lines or loads. Static VAR Compensator (SVC), can be seen as a variable susceptance with a smooth control over a wide range from capacitive to inductive. It is the oldest FACTS device and has the biggest number of applications. STATCOM is another shunt connected device, which behaves like a synchronous voltage source which can inject or absorb reactive power. Biggest advantage of STATCOM over SVC is the ability to maintain the reactive current output at its nominal value over a large range of node voltages, where SVC has limited current capability when voltage is reduced.

A. Static Synchronous Compensators (STATCOM)

The STATCOM system is one of the FACTS devices used for the integration of wind farms with Grid to improve the transient and steady state stability of the power system. STATCOM injects or absorbs reactive power to or from the grid to compensate small voltage variations at the connection point of the wind farm with the grid. STATCOM is also used when a voltage dip occurs. Many studies show that STATCOM helps the wind farm to stabilize voltage especially after a voltage dip occurs.

According to the IEEE, STATCOM system is a static synchronous generator operated as a static compensator

connected in parallel whose output current (inductive or capacitive) can be controlled independently of the AC system voltage. A charged capacitor acts as a source of dc. This current feeds an AC/DC power converter, which produces a set of outputs with controllable three-phase voltages. Also, the frequency of these voltages is the AC system frequency. Since the AC/DC power converter is controlled by PWM techniques, so the output voltages achieved are practically sinusoidal. This controlling is possible by the high switching frequency of the IGBT, GTO, IGCT or IEGT transistors of the power converter.

The system is characterized by a rapid time response and its ability to provide a control voltage to the connection point through reactive power compensation. It can be used for filtering harmonics, improving transient and dynamic stability, dynamic over voltages and under voltages, voltage collapse, steady state voltage, excess reactive power flow and undesirable power flow. This enables the wind farm, for instance, to have a better response in voltage drop as well as more stable system. Usually, STATCOM is installed at the MV bus in the wind farm. Its aim is to help the wind farm in situations of voltage drop, voltage regulation, power factor control and power flow stabilizing.

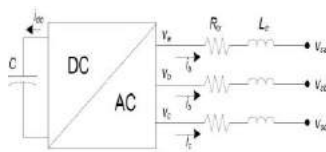


Figure 5. Schematic of STATCOM

The operating principle of STATCOM as shown in figure.

If $V = V_s$ (pu values), no current flows through R_r and L_r . If $V > V_s$, current flows through R_r and L_r . As the impedance is essentially inductive, the current phasor is perpendicular to V_s and V voltages. STATCOM injects reactive current to the grid (Capacitive current).

If $V < V_s$, current flows through R_r and L_r . This time the current flow is opposite to the previous, which implies that STATCOM absorbs reactive power from the grid.

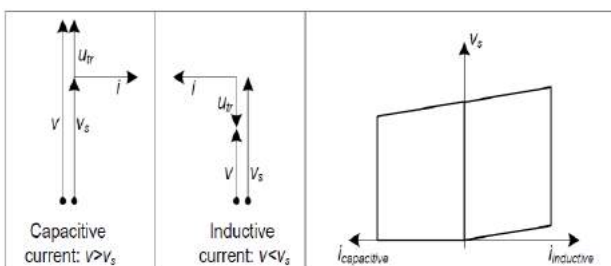


Figure 6. Operating principle of STATCOM

STATCOM reactive current is determined by the difference between grid voltage and power converter voltage. Reactive current is not dependent of the voltage of the connection point of STATCOM and is limited by the capacity of the

power converter and grid voltage variation. The operation area of STATCOM is determined in figure 2. The maximum inductive current is not assumed until a certain lower limit of the voltage. This is because the voltage drops across the coupling transformer as shown in figure 3. The STATCOM control system, d-q reference is possible to control d-q current independent of DC voltage and reactive power of STATCOM. The calculation of Re-active Power related to STATCOM DC voltage are expressed $Q = -V^2 B + kV_{dc} V B \cos(\theta - \alpha) - kV_{dc} V G \sin(\theta - \alpha)$ Here, V is the transmission voltage, B is the susceptance, k the modulation index, V_{dc} the capacitor voltage, α the thyristor firing angle, θ phase angle of the transmission line, G is the admittance of coupling transformation.

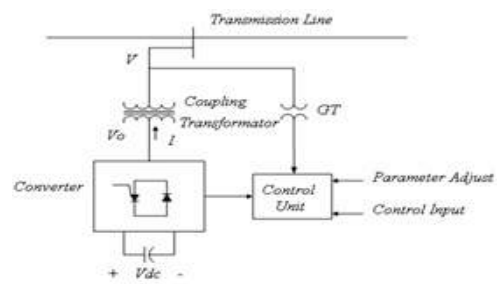


Fig7. Systematic of STATCOM

3. CONCLUSION

In this paper three controlling methods for frequency and active power analysis for smart grid has been studied. Out of these three methods, the DFIG method is best for controlling the above parameters but its initial cost is high as compared to other controlling methods discussed in this paper.

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Solid works approach to Biogas Compression and Bottling Systems

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ABSTRACT

The ever increasing demand of the combined heat and power particularly electrical energy is in greater demand due to enhanced industrialization and urbanization in last few decades has led to higher pressure on fossil fuels and need for alternatives like renewable energy sources. Biogas being site specific, it is not possible to transport and put in use to the extent it is required. This paper presents a working model to bottle such a gas which can be carried out at the required site as a source of supply for heat and power and Solid work Simulation of the working model with various cut plots for temperature & pressures.

Keywords

Solid works, Biogas compression, Bottling, scrubbing unit, Compressor, Manifold system.

1. INTRODUCTION

Energy is the key input for the socio-economic development of any nation. Industrialization, urbanization and mechanized agricultural techniques have generated a high demand of energy in all forms i.e. thermal, mechanical and electrical. To meet this ever-increasing demand, fossil fuels such as coal, oil and natural gas have been exploited in an unsustainable manner. This exploitation has been posing serious environmental problems such as global warming and climate change [7]. While we have shortage of energy and are dependent on imports in case of petroleum, we are blessed with plenty of natural sources of energy such as solar, wind, biomass and hydro. Biogas is a clean burning fuel which consists of about 50-60% methane [1]. It has the potential for leveraging sustainable livelihood development as well as tackling local and global land, air and water pollution. Biogas can be used for various applications namely, cooking, heating, space cooling / refrigeration, electricity generation and gaseous fuel for vehicular application [7]. At present it is not possible to transport biogas over long distances and to put in use to the extent where it is required. Biogas is becoming an increasingly important source of energy for rural areas in developing countries, as can be seen by the increased construction of bio digesters. Biogas has become an important fuel source because it is driven by readily available biomass. Because of this, there is a need to increase the versatility and availability of this natural fuel source to accommodate

increased use. This biogas is produced by bio digesters that are currently in place. At the moment there is no system available to store the gas that these digesters produce, so all the gas that is created must be used at the same rate that it is produced.

2. WORKING MODEL

The biogas compression and bottling process consist of different steps such as biogas purification, compression and bottling. Figure. 1 represents the typical arrangement of biogas compression and bottling process.



Fig1. Typical arrangement of biogas compression and bottling process.

The proposed method as depicted in figure 1 has;

1. Biogas digester
2. Scrubbing unit
3. Compressor unit
4. Storage Unit

The raw biogas from the digester is first allowed to pass through a set of three scrubbing units for removal of impurities as shown in fig.1. The methane rich content biogas is now allowed to compress by passing it through a compressor. The compressed gas is finally stored into small cylinders with the help of manifold system and adapter upto a pressure of 4 bars. The manifold system used in the prototype is of single input and double output. Gas cylinder is connected to one output port where as a pressure gauge is connected to the other output port. The reverse flow of the biogas is avoided by using ball valve and non-return valve.

3. EXPERIMENTAL RESULTS

Raw biogas is purified, compressed and is filled into small Cylinder. 2 kg cylinder was used for filling purified biogas. The results obtained during biogas compression and bottling are tabulated as follows,

Table 2. Experimental readings.

1.	Weight of Empty cylinder	2.840 Kg
2.	Weight of cylinder after filling biogas	3.936 Kg
3.	Total purified biogas in cylinder 1	3.963 Kg - 2.840 Kg = 1.096 Kg
4.	Time required to fill cylinder	15 Minutes
5.	Flow of biogas	7 liters per minute

4. ABOUT SOLID WORKS

The modelling of the proposed prototype can be done by using SOLID WORKS software. To start with the modelling of the prototype, it is first necessary to fix the basic dimensions of every component in the prototype. It is also necessary to finalize the entire assembly of the prototype. The solid work software is a mechanical design automation application that takes advantage of the Microsoft windows graphical user interface. It is 64 Bit software. The complete simulations are done in **SOLID WORKS 2013**. This software makes it possible for the designers to quickly sketch out ideas, experiment with features and dimensions and to produce models & detailed drawings. In solid works, you can sketch ideas and experiment with different designs to create 3D models. It consists of two sections

- A. Parts.
- B. Assembly.

5. SOLID WORKS MODEL

With the help of **SOLID WORKS 2013** software, a 3-D model of the proposed prototype is created which is depicted in figure below. It consists of biogas digester, 3 units of scrubbing system, a ball valve, compressor unit and finally a manifold block. The detailed dimensions of each and every block can also be seen from the software.

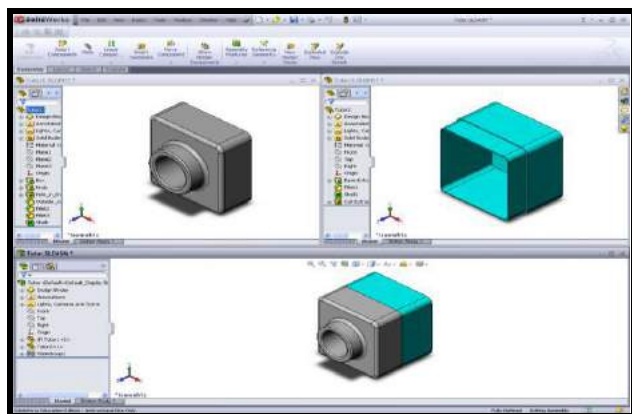


Fig 2. Solid works Model

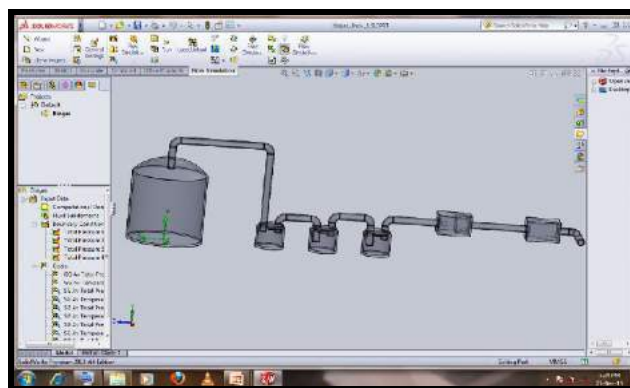


Fig3. Prototype 3D Model

Fig.5 & 6 throws a light on how actually a Ball valve operates during the flow of biogas. Different colours indicate different values of pressures and temperatures which can be taken from the counters. It may happen that in some areas two different colours might appears together which may lead to human error. In order to overcome this problem a facility of probe is provided, which will directly give the reading at any desired point.

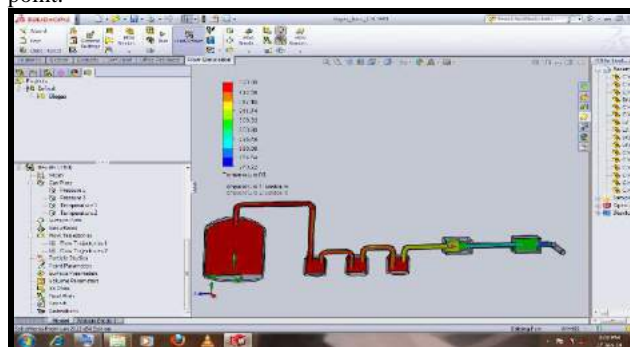


Fig4. Prototype 3D Model with temperature & Pressure Cut plots

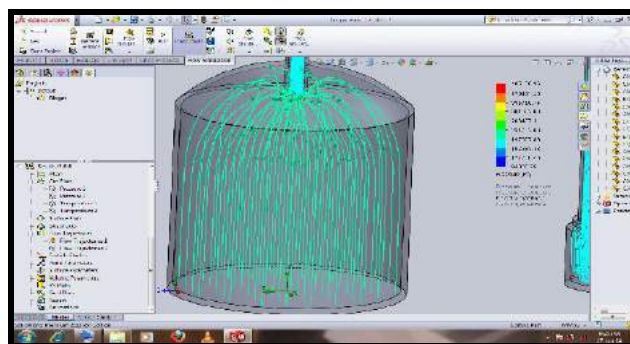


Fig5. Prototype 3D Model with Flow trajectory in digester

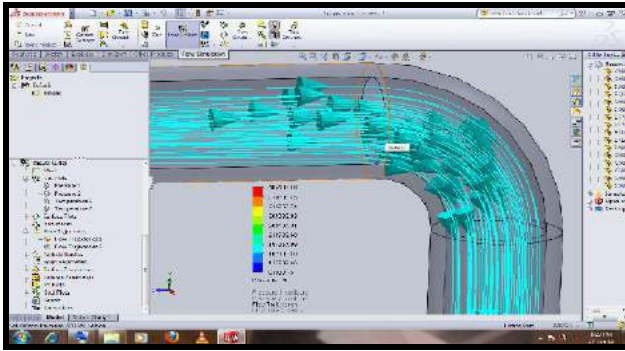


Fig6. Prototype 3D Model with Flow trajectory in gas pipes

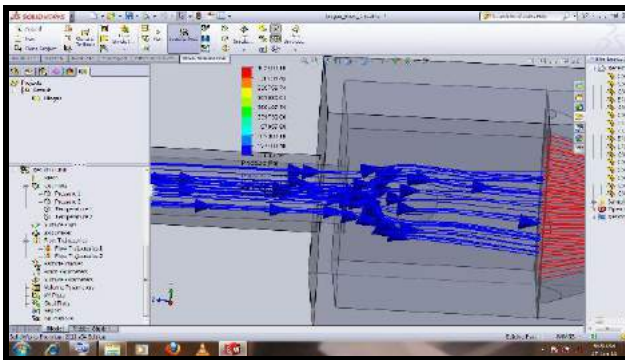


Fig7. Prototype 3D Model showing Ball valve flow trajectory

The cut plots are divided into 4 sections mentioned as below;
 Cut Plot- Pressure 1.
 Cut Plot- Pressure 2.
 Cut Plot- Temperature 1.
 Cut Plot- Temperature 2.

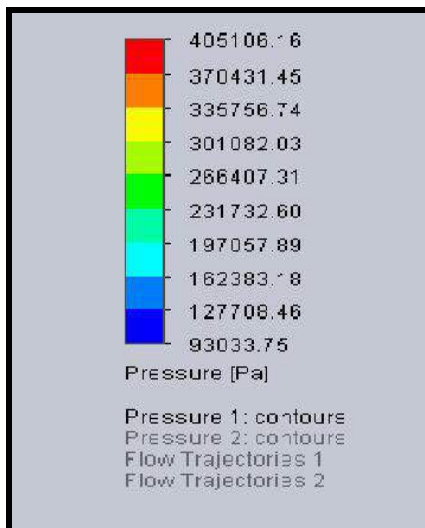


Fig8. Cut plot for pressure 1 & 2

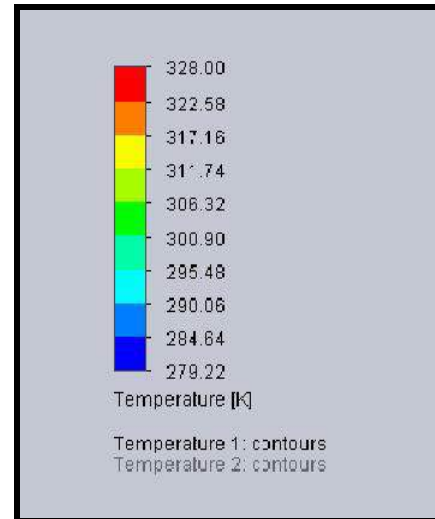


Fig9. Cut plot for Temperature 1 & 2

Depending on the colour counters Temperature & Pressure readings can be taken out. It is concluded from the simulations that the pressure of biogas goes on decreasing from digester to Compressor unit. Once it reaches compressor, biogas gets compressed at 4bar pressure and further it again decreases till it reaches output point i.e. storage systems (cylinder). The same is true in case of temperature. The software also provides the results in the form of animations which clearly visualize the idea of gas flow right from digester up to the storage systems.

6. CONCLUSION

On the studies carried out, it is clearly seen that the renewable and alternating energy sources need to be tapped on the background of scarce fossil fuels and climate change issues. Biogas is seen to be one of the best alternatives as depicted in this paper. It is observed that compressed biogas could hold successfully in the measuring cylinder after purification. Various values of pressure & temperature can be easily obtained from Solid works simulation. Based on the simulated values it becomes easier to construct and model biogas compression & bottling system.

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SOLAR POND

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ABSTRACT

Had you ever mentally conceived of storing the solar thermal power without any sumptuous solar storage contrivances? .Can't we engender solar thermal energy in the form of low grade heat of 70-80.c with 20.c ambient temp .Yes this paper suggest a solutions of storing the non conventional energy energy only by constructing a simple pool of brine ,isn't it astounding?. Thus a solar pond is a pool of brine which accommodates as the solar energy amassment and sensible heat storage.The solar ponds made a tremendous progress in the last 30 years . This paper withal mainly reviews the fundamental principles of the solar pond and the quandaries encountered in its operation and its maintenance. Here we withal discuss the factors that enhance the heat storing capacities and withal the factors that influence the technical and the economical viability of the solar ponds.

1. INTRODUCTION

Ecumenical warming could be one of the world's most paramount issues in the 21st century [5].Every year, billions of tons of carbon dioxide have been emitted into the ecumenical atmosphere[1].Global warming mainly occurs due to human activities such as conveyance, engendering electricity and in industries which involves burning fossil fuels[2], which could lead to a consequential decrease in world fossil fuels reserves[3].However, renewable energy technologies have been developed and introduced as an alternatives sources for energy engenderment; renewable energy technology can engender energy with zero carbon dioxide emissions, illimitable sources and benefits the economy[11]. Solar energy is one of the essential world conventional energy sources. The conversion of the energy can be operated by several techniques such as photovoltaic systems for engendering electricity and solar sultry dihydrogen monoxide for heating dihydrogen monoxide with solar energy. Solar ponds have been suggested to be simple and economical in terms of amassing and storing energy on an immensely colossal scale. There are two types of solar ponds depending on the converting deportments and the non-converting solar ponds [4]. Solar energy is an abundant and renewable energy source. The annual solar energy incident at the ground in India is about 20K times the current electrical energy consumption. The utilization of solar energy in India has been very constrained. This is because solar energy is a dilute energy source (mean daily solar energy incidents in India is 5 kWh/m² day) and hence energy must be

accumulated over sizably voluminous areas resulting in high initial capital investments; it is withal an intermittent energy source. Hence solar energy systems

must incorporate storage in order to take care of energy needs during nights and on nebulous days. This results in further increase in the capital cost of such systems. One way to surmount these quandaries is to utilize a sizably voluminous body of dehydrogenase monoxide for the accumulation and storage of solar energy. This concept is called a solar pond.

2. PRINCIPLE OF SOLAR POND:

In a clear natural pond about 30~ solar radiation reaches a depth of 2 metres. This solar radiation is absorbed at the bottom of the pond. The sultrier dihydrogen monoxide at the bottom becomes lighter and hence elevates to the surface. Here it loses heat to the ambient air and, hence, a natural pond does not procure temperatures much above the ambient. If some mechanism can be devised to avert the commixing between the upper and lower layers of a pond, then the temperatures of the lower layers will be higher than of the upper layers. This can be achieved in several ways. The simplest method is to make the lower layer denser than the upper layer by integrating salt in the lower layers. The salt used is generally sodium chloride or magnesium chloride because of their low cost. Ponds utilizing salts to stabilize the lower layers are called 'salinity gradient

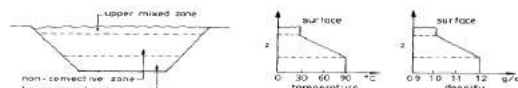


Fig no. 1 solar pond

ponds'. There are other ways to avert commixing between the upper and lower layers. One of them is the utilization of a transparent honeycomb structure which traps stagnant air and hence provides good transparency to solar radiation while cutting down heat loss from the pond. The honeycomb structure is composed of transparent plastic material. Ortobasi & Dyksterhuis (1985) have discussed in detail the performance of a honeycomb-stabilized pond. One can additionally utilize a transparent polymer gel as an expedient of sanctioning solar radiation to enter the pond but cutting down the losses from the pond to the ambient. Wilkins & Lee (1987) have discussed the performance of a gel (cross-linked polyacrylamide) pond. In this review we discuss salinity gradient solar ponds as this technology has made tremendous progress in the last fifteen years. Typical temperature and

density profiles in an immensely colossal salinity gradient solar pond are shown in figure 1. We find that there are three distinct zones in a solar pond. The lower commixed zone has the highest temperature and density and is the region where solar radiation is absorbed and stored. The upper commixed zone has the lowest temperature and density. This zone is commixed by surface winds, evaporation and nocturnal cooling. The intermediate zone is called the nonconvective zone (or the gradient zone) because no convection occurs here. Temperature and density decrease from the bottom to the top in this layer, and it acts as a transparent insulator. It sanctions solar radiation to pass through but reduces the heat loss from the sultry lower convective zone to the cold upper convective zone. Heat transfer through this zone is by conduction only. The thicknesses of the upper commixed layer, the non-convective layer and the lower commixed layer are customarily around 0"5, 1 m and 1 m, respectively.

3. STATIC STABILITY

The internal stability of a solar gradient pond is predicated on salt diffusion from the storage zone toward the upper zone of the pond. Diffusion can be defined as the kineticism or migration of an individual component within an amalgamation solution medium. The primary cause of diffusion is the different concentrations or the concentration gradient of a component in a fluid. Such fluids endeavor to become internally stable through equalizing the concentrations, and consequently the molecules peregrinate from the high concentration area to the lower one. If there is no applied pressure or coerced diffusion in a binary or multi-component fluid, the mass flux in the coalescence is primarily dependent on the concentration difference and the temperature gradient. The former is kenneed as molecular (mundane) diffusion and the latter may be expressed by thermal diffusion or Soret effect. Lamentably, both molecular and thermal diffusion work against the stability of any salinity gradient solar ponds. Ergo, the salt management is absolutely essential for monitoring and operating a gradient solar pond.

3.1 Static stability Criteria

The salt density gradient resulting from salt concentration difference magnitude in a solar pond is sometimes called a positive gradient, as it contributes to composing the desired shape of the gradient profile inside a non-convecting layer within a solar pond, i.e. the salinity gradient is concentrated downward. On the other hand, the density gradient may engender a inverted profile in the salinity gradient due to the Soret effect; this is not authentically desired and it may be called a negative gradient. These counter effects of positive and negative density gradient should be investigated to soothsay the static stability in a gradient pond, and if a negative stratification dominates 86 the positive gradient, convection may gradually take place inside the gradient zone; this gradient will then be eradicated or at least the performance of the pond will be reduced. In other words, the net concentration value at any point in a salinity gradient pond must be lower than at any point underneath in order to suppress vertical convection in the gradient zone [7]. This stability condition was first suggested by Weingerger [6], and it has been widely accepted and adopted by the most researchers.

If the molecular diffusion is only considered in a solar pond study, then Fick's law can be expressed as the following:

$$j = K_s \frac{dc}{dx} \quad (1)$$

The condition can be expressed by the following formula :

$$\alpha \frac{dt}{dx} \leq \beta \frac{ds}{dx} \quad (2)$$

$$(\alpha = -\frac{1}{\rho} \frac{d\rho}{dx})_s \quad (3)$$

$$(\beta = -\frac{1}{\rho} \frac{d\rho}{dx})_T \quad (4)$$

where:

$\frac{dt}{dx}$ = temperature gradient with depth (°C/m).

$\frac{ds}{dx}$ = salinity gradient with depth (kg/m4).

ρ : density (kg/m3).

α : thermal expansion coefficient (1/°C).

β : salinity expansion coefficient (m3 /kg)

Consequently, the density change with depth must satisfy this equation to indicate that a solar pond is sufficiently stable:

$$\frac{d\rho}{dx} = \alpha \frac{dt}{dx} + \beta \frac{ds}{dx} > 0 \quad (5)$$

Alternatively, the above correlation can be expressed by a finite different approach:

$$\frac{\Delta\rho}{\Delta x} = \alpha \frac{\Delta t}{\Delta x} + \beta \frac{\Delta s}{\Delta x} > 0 \quad (6)$$

$\frac{\Delta\rho}{\Delta x}$: the net density gradient with depth (kg/m4).

$\frac{\Delta\rho_s}{\Delta x}$: the density gradient with depth caused by salt concentration (kg/m4)

The stability criterion can be withal viewed by another formula predicated on thermal and saline Rayleigh number. It is a dimensionless number resulted by multiply Grashof number, which expresses the cognation between buoyancy and viscosity in a fluid, by Prandtle number, which describes the relationship between momentum and thermal diffusivities. Thus, the Rayleigh number may be considered as the product of the ratio of buoyancy and viscosity forces and the ratio of momentum diffusivity and thermal diffusivity. Hence;

4.1 Dynamic stability

When the above static stability condition is obtained and the salinity gradient is amply concentrated to suppress vertical convection, the solar pond inclines to be stable. However, there are several external perturbation factors, such as wind, falling particles, rainfall, evaporation, heat loss, etc., which may support the Soret thermal gradient to revolt against the salinity gradient suppression force. This may occur due to the potential energy stored into the inverted temperature profile and, if the transmitted external energy together with the profile potential energy is more vigorous than the viscous damping, then vertical convection will be initiated and will grow with time, leading to the commixing of the solar pond layers. It has been found that heat diffusivity is 100 times more expeditious than salt diffusivity[9],[10] In a laboratory

experiment, the internal oscillation was identified as having a minutely diminutive value but then it grew gradually until it was ultimately fortified by convection; shortly afterwards, the saline gradient was debilitated by the mass transfer resulting from this oscillation

The dynamic stability condition equation for a gradient solar pond was introduced by Weinberger [14]. The proposed formula can maintain the gradient adequately to avert any oscillatory kineticism effects developing with time, and this condition may be expressed by the following relationship:

$$(v + \alpha_T) \frac{\partial p}{\partial T} \frac{\partial T}{\partial x} + (V + \alpha_S) \frac{\partial p}{\partial S} \frac{\partial S}{\partial x} \geq 0 \quad (7)$$

α_S are thermal and salinity diffusion coefficient respectively can be rewritten in another suggested.

$$\frac{\partial p}{\partial T} < \left(\frac{p_r + \tau}{p_r + 1} \right) \left(\frac{\beta}{\alpha} \right) \left(\frac{\Delta S}{\Delta T} \right) \quad (8)$$

where the Prandtl number (Pr) and the Lewis number () are:

$$p_r = \frac{v}{k_T} \quad (9)$$

$$\tau = \frac{K_S}{K_T} \quad (10)$$

The above equations have been adopted by most investigators, and they have been used widely to investigate gradient solar pond stability. Equation is employed to carry out the stability calculation from the top to the bottom of a solar pond, including both convecting and non-convecting zones. In the case of unidimensional instability, Schladow [15] suggested a simplification of the above equation:

$$R_p = \frac{p_r + 1}{p_r + \tau} \quad (11)$$

The mathematical analysis of thermohaline (double-diffusive) diffusion in a gradient study may predict the marginal stability, and can be represented in this equation [16]:

$$R_T = \frac{v + k_S}{v + k_T} R_S + \left(1 + \frac{K_S}{K_T} \right) \left(1 + \frac{K_S}{V} \right) \left(\frac{27\pi^4}{4} \right) \quad (12)$$

The salinity and thermal Rayleigh correlations have an effect much more immensely colossal than the second term in the left hand side of Equation hence, the latter term can be neglected, leading again to the Weinberger dynamic stability criterion in Equation this simplification is commonly surmised. For a typical salinity gradient solar pond, Hull [16] verbally expressed that the Lewis number conventionally varies from 30 to 140, and that the Prandtl number is expected to be between 3 and 10. It was corroborated in the same report that the salt concentration gradient should be far more preponderant than that obtained through the dynamic stability correlation in order to ascertain that the marginal stability is vigorous enough to keep a gradient zone in a fine-tuned position.

4.2 Instability Sources

Albeit the internal demeanors of the three components of a solar pond are not plerarily understood including the gradient zone and boundary erosion, there are several factors believed

to cause destabilization issues in an SGSP. The following factors may cause static or dynamic instability issues.

4.3 Mass Flux

In solar gradient pond studies, the dihydrogen monoxide inside a pond is conventionally considered as a binary system (a single solute substance in an aqueous solution). There is a paramount lack of information about the diffusion coefficient of a ternary system not to mention multi-component saline dihydrogen monoxide. However, the stability of the system significantly depends on the mass convey rate. The mass transfer rate per unit area in a uniform temperature binary solution depends on the concentration gradient and the molecular diffusivity. Thus, the upward salt migration from the affluent salty lower zone to the surface layer would contribute to gradient pond destabilization.

4.4 Salt types:

The salt type contribution to SGSP stability should be appreciably considered. A typical salt for a gradient pond must have the following essential features to enhance the pond's performance and stability

- The salt solubility value must be high enough to meet the highest level of solutions density require.
- The salt solubility should not change significantly with solar pond temperature variations.
- When the salt is dissolved in water, the solution must be sufficiently transparent to permit solar irradiation to the bottom of the ponds.
- It must be environmentally friendly.
- It must not cause any contaminations to the ground water.
- For cost considerations, it should be cheap and large in quantity, and near to the pond's location.
- The salt molecular diffusivity K_S should be low.

The firmness of salt solubility against solar pond temperature variation with time and with position in the pond (depth) is quite consequential for solar pond stability. Different types of salt exhibit sundry solubility demeanors with temperature transmutation in dihydrogen monoxide, which are summarized, It can be optically discerned that the top three salts in terms of stability with temperature are sodium chloride (NaCl), magnesium chloride ($MgCl_2$) and sodium sulphate (Na_2SO_4).

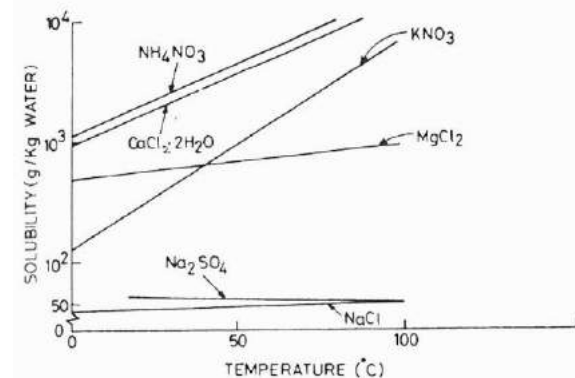


Fig.4.4 solubility of three salt with temperature variation.

The salt diffusivity value is another consequential factor in terms of enhancing SGSP stability. Generally, the molecular diffusivity of a salt is a function of salinity and temperature, as the solvent viscosity decreases with elevating temperature. For example, the solubility of sodium chloride (NaCl) at 90°C is 5 times more preponderant than its solubility at 10°C. On the other hand, the molecular diffusivity K_s may vary less than 10% with the salinity percentage variation at between 0 and 20 at a certain temperature. The molecular diffusivities of variants of salt at room temperatures. Hull et al. reported that the diffusivities at other temperatures have not been investigated but it is understood that the diffusion coefficient customarily increases at higher temperatures, which leads to raising the upward salt flux.

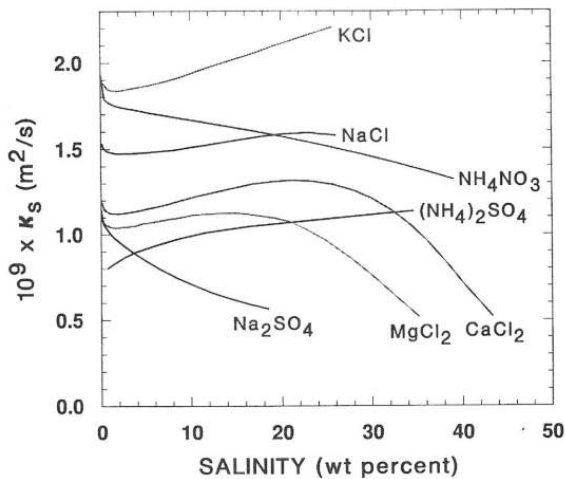


Fig no 4.4 (a). : Salt molecular diffusivities with salinity variations at 25 °C.

According to the above information, it is not surprising that it is verbally expressed that sodium chloride is the most efficacious salt by far for filling and operating solar ponds all over the world. Sodium chloride withal represents the most astronomically immense proportion (77%) of sea and ocean dihydrogen monoxide salts, and it is one of the most stable salts with temperature variation. Moreover, the transparency of sodium chloride brine is appreciably high, and it is one of the most frugal salts in the world. This salt has the ability to be dissolved in dihydrogen monoxide up to 27-30% afore reaching saturation, which is relatively low. The astronomical majority of the US SGSPs have been utilizing sodium chloride.

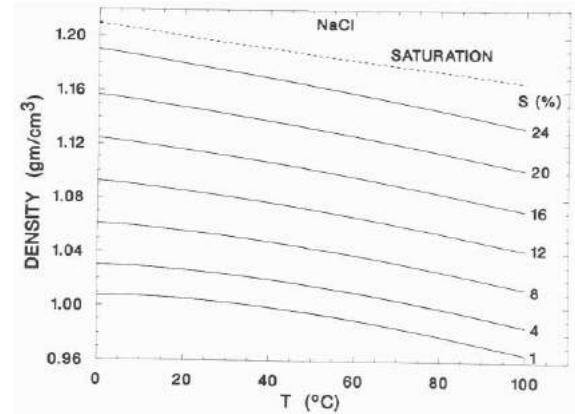


Fig no.4.6(b) : Density-temperature variation for NaCl solution.

However, another commonly used salt in salinity ponds is magnesium chloride ($MgCl_2$), which is considered the second most immensely colossal salt constituent of sea and ocean dihydrogen monoxide, albeit it is the most immensely colossal proportion of salt in the Dead Sea (as well as in some saltworks brines). This salt is exceptionally stable during operation; it additionally exhibits great solubility in engendering brine with high density, as it is able to dissolve between 35 and 40% according to the solution temperature. This salt has been utilized in two ponds in Israel and an astronomically immense pond in the USA [33, 81, 123]. In comparison with sodium chloride, magnesium chloride is able to engender higher salinity brine, and is more stable during the solar pond's operation. However, it is much more extravagant than sodium chloride.

The brine most widely used in Israeli gradient ponds is Dead Sea brine, as it is costless and can be drawn directly from the Sea. The Dead Sea is unlike other seas and oceans as magnesium chloride represents the major salt in percentage terms, at about 13%, while NaCl stand for only 8%. $MgCl_2$ is the most dense brine in the world; its average density is about 1230 kg/m³.

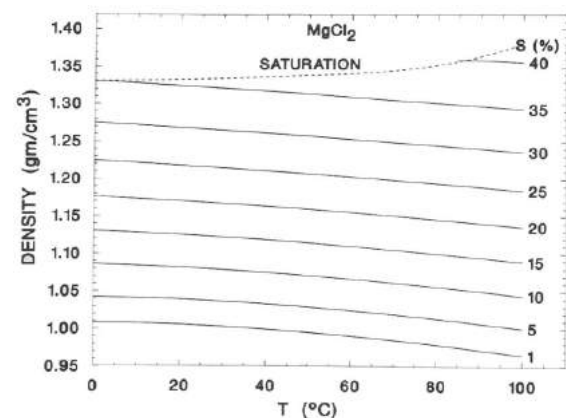


Fig no. 4.4(c): Density-temperature variation for $MgCl_2$ solution

5.1 Heat Flux:

Heat convey from a solar pond to the circumventing area affects the saline dihydrogen monoxide density, which in turns affects the stability of the gradient pond, as expounded above. The heat within a dihydrogen monoxide medium is influenced by radiation, convection and evaporation. The latter represents the primary mechanism of solar pond heat losses and represents the main process in concentrating the upper layer of a pond. Surface dihydrogen monoxide cooling, by either evaporation or any other processes, and concentrating the upper zone solution increase the density of the dihydrogen monoxide. This incrementation in dihydrogen monoxide density correspondingly results in a elevate in convection kineticism, which may affect the stability of the gradient zone and its upper boundary. It may withal erode the upper zone and raise the upper-middle zone boundary. This is what was reported by in an investigation that followed a considerable period of surface layer evaporation in the Ohio State University solar pond. It was found that the gradient had expanded upwards by 10cm, representing an impuissant gradient extension.

The heat flux from the lower zone at high temperatures may lead to the boiling point being reached; consequently, one of the worst instability cases will occur because the gradient zone with all boundaries may be entirely eradicated. This solar gradient pond disaster has been observed in a few ponds and it seems that the presence of air bubbles was the main factor in these ponds becoming commixed.

5.2 Heat Extraction System:

The potential for a gradient pond to become unstable due to the brine withdrawal process from the lower convecting saline region is logically to be expected. Harsh suction and/or reinjection procedures through a turbulent flow mechanism coupled with an improper diffuser system design would definitely increase the middle zone erosion risk. This happened in the 400m² OSU and the 2000m² Miamisburg Ohio solar ponds, where uneven returning flow was the reason given for gradient erosion in the former pond, while the problem was caused as a result of the high suction rates in the latter SGSP.

Authentically, many solar pond monitoring cases have attested that brine withdrawal for heat extraction is not a quandary if a congruously designed system is employed. The withdrawal point should be several centimetres just below the top of the storage convecting zone, and the returned more arctic brine should be re-injected at a lower level of this bottom zone. It is additionally recommended that the returned fluid temperature should be well below the storage zone temperature, otherwise a rapid erosion may be caused to the gradient zone above in such cases [33]; albeit there was not a given reason, it can be interpreted that this system is recommended to satiate the natural convection phenomenon, as the more gelid pumped molecules, which are heavier, would incline to flow toward the bottom. A high suction rate of 1000w/m² for obtaining energy was utilized in the 40,000m² Israeli solar gradient ponds with an opportune diffuser setup, and there was some conspicuous erosion. Another example of such precise operational investigations was reported on the 156m² Wooster SGSP, which had a heat energy extraction rate of 112w/m².

6. EVAPORATION

As mentioned above, the evaporation effect on a solar pond's stability and performance is prodigiously consequential. Customarily, the greatest proportion of lost heat from a solar pond heat occurs as a result of evaporation, and this heat loss cools the pond, categorically the surface layer. Thus recorded temperatures are conventionally less than the ambient temperature; the evaporation equations were given in the antecedent chapter. Daily evaporation lessens the amount of dihydrogen monoxide in the upper zone, and consequently the salt concentration increases. Both losses of heat and dihydrogen monoxide are not desired in any SGSP operation, as these will act as instability factors, as discussed above. Consequently, some fresh dihydrogen monoxide must be integrated to compensate for the evaporated dihydrogen monoxide and to maintain the gradient stability. The required amount of fresh dihydrogen monoxide is directly dependant on the evaporation rate, which in turn is conventionally affected by the prevailing weather conditions. According to different Israeli SGS ponds, it is reported that each 1m² of pond area needs about 1.8m³ every year of fresh dihydrogen monoxide for this purport; the average salinity in the upper zone elevates to around 2% (at most) in this timeframe.

7. WIND

The air current blowing parallel to the top surface of a dihydrogen monoxide body engenders wind shear; the dihydrogen monoxide becomes wavy (according to the wind speed) and the dihydrogen monoxide then resists this action. In fact, the mechanism of the wind-dihydrogen monoxide interaction is quite involute. Van Dorn in 1953 carried out several experiments in an artificial pond to investigate the effect of wind accentuate on the pond, finding that the effects of friction drag for a body of dihydrogen monoxide are directly proportional to the square of the wind speed and to air density. It was withal descried that this drag action is not engendered unless the wind is blowing at higher than a certain speed.

In a comparison with other findings regarding wind shear estimations, Van Dorn concluded that the differences were a result of the height at which the wind speeds were quantified. Francis in 1954 found that the drag coefficient is only constant as long as the wind speed is not higher than (proximately) 4.12m/s, but that with more expeditious winds, it becomes a function of wind speed.

8. ACKNOWLEDGMENTS:

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“Case-study-Optimization and Modeling of Hybrid System for Tumnipada Village with Real Time Data”

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ABSTRACT

Rural electrification with renewable sources implies rethinking on electrification strategies taking into consideration economic, social and environmental aspects. In that respect, renewable distributed generation linked with micro grids presents interesting features for remote or sparsely populated areas. This paper focuses the residential energy use with the help of micro grid concept for Tumnipada village, Sanjay Gandhi National Park, Borivali in Maharashtra. The uniqueness of this project is the use of the renewable energy resources which are easily available such as solar, wind, biogas or hydro, fuel cell for electricity generation. The paper also covers the main steps in the process of designing, surveying and modeling of a new micro grid system with the help of Matlab Simulink..

Keywords

Microgrid MATLAB Electrification

1. INTRODUCTION

The Electricity sector in India had an installed capacity of 225.133 GW as of May 2013, Worlds 5th largest. Captive power plants generate an additional 34.444 GW. This generated power constitutes 87.55% of Non-Renewable Power Plants and 12.45% of Renewable Power Plants.

Even after such a huge generation capacity there is still a huge shortage of power in India. This is due to ever increasing demand of electricity, drastic achievements in technology, increase in population and also wastage of electricity. Still more than 40% of rural areas are unelectrified.

Our approach is to electrify one rural area of the remaining 40% mentioned above to provide a small but beautiful home with the facilities where children can learn at night, farmers or workers can rest with fans on their head and a little bit of entertainment for children with education on computers. The aim is to power all 36 huts and a community classroom in Tumnipada, Sanjay Gandhi National Park. Borivali where currently there is no electric supply from state board.

The concept of Microgrid using renewable energy sources (Solar Energy) is to be implied for electrification of a total load of 500W. The use of solar is due to its efficiency

readily available and derived directly from sun i.e. free of cost. The other alternative for microgrid is fuel cell or biogas plant which can be easily installed in this situation.

1.2 RURAL ELECTRIFICATION

- One of the indicators for the socio-economic development of any country is the access to electricity. There are billions people in the world, especially in underdeveloped and developing countries that are excluded from using electrical energy.
- In today's emerging world our country lags behind as, there are places where electricity being the basic need not still been reached.
- So to help the country and those places by making them accessible to electricity, Rural Electrification is important.
- Total of 40% of backward areas in India are still waiting for electricity in their houses.
- This is our effort at grassroots level to contribute to the community by electrifying at least one small village.

1.3 MICROGRID

The term microgrid refers to a single electric power subsystem linked to a small number of distributed generators that can be powered by either renewable or conventional sources of energy, along with different load clusters.

- The key feature of microgrids is that they are able to operate independently of the central grid. This can help improve the power quality and reliability, as well as allow the local community to have more control over their power network
- The main criteria for distinguishing different kinds of microgrids are as follows
 - a) Whether it is connected to a central grid
 - b) What kinds of generation sources are connected to the microgrid.

1.4 SOLAR ENERGY

- Sun is the never ending source of energy, will be able to generate electricity even after millions and trillions of years coming in future.
- Compared to windmill, solar energy is very much noise free and the installation cost for solar is lesser than that of windmill.
- Compared to other source of energy solar is the cheapest.

- There is no need for heavy electrical machines such generators or turbines to produce electricity from solar energy. This further reduces the cost of solar energy.
- It is easily scalable i.e it is easy to add solar panels to the existing system. Less intrusive than wind energy or tidal energy.

Above discussed advantages of solar energy over other renewable sources easily qualifies solar as the best and reliable source of generating electricity and which would play a major role.

2.1 RURAL LITERATURE

The rural electrification typically focuses on economic & physical aspects of development and also on needs of the local communities. The rural electrification would be called a successful one based on its value, as perceived by the user from a personal perspective, inclusive of the needs and priorities at the end user is seen as the key factor in the design of infrastructure of the project. The aim of the project is to identify properties that are important for shaping the rural place and fulfilling the energy needs. The current energy source in project site is heavily reliant on burning of biomass. The use of traditional fuels as the main source of energy by rural households, which is the area of concern. The survey of the rural area (project site) concludes that it has an abundance of potential renewable energy sources that, if pursued could significantly alter the nature's energy and can cause a shift away from the combustion of biomass. In additional, small scale hydropower can also be raised for meeting the load demand. In short term period a micro grid will be set up for supplying the required load demand to the rural area. There are few problems and challenges faced which are listed below:

- High capital cost
- Dependence of donor
- Lack of policy and legal construction

1.2 SITE SURVEY

The proposed site is located in SANJAY GANDHI NATIONAL PARK at Borivali in Maharashtra state. The geographical coordinates of location is Latitude: 19°14'05" Longitude: 72°51'35" Elevation above sea level: 22 m. The site is located in midst of Sanjay Gandhi National Park, about 9.5 km away from the main entrance named as TUMNIPADA. TUMNIPADA is a small locality, now presently consisting of total 36 houses and a student study room (powered by NGO), total inhabitants are around 150. A decade ago, the population there was only 50 but recently it has increased to 150, so the requirement of electricity has also increased. So, it is important to make some changes and bring about Rural Electrification.

TUMNIPADA is isolated from electricity supply due to the Forest Act and their protest against the rehabilitation. So, still there is no source of electricity. The inhabitants there in are still classified as backward class and use the old methods for lighting their houses (like kerosene lamp). The houses are made of cow dung and mud. Only natural cooling is used.

The demand of electricity is depend upon the mindset of the villagers, there is some basic need of villagers e.g. lamp, fan, mobile charging etc.

1.3 VILLAGE STATISTICS

Table 1: Village Summarization

Rural Energy Needs	Primary sources of Energy				
	Kerosene/ Candles	Dry cell Battery	Bio- Mass	Human Energy	Not Used
Household					
Lighting	✓				
Cooking					
Water Heating					
Fan					
Community Enhancement					
School/ community Room	✓	✓			
Street Lighting					

2. PROPOSED METHODOLOGY

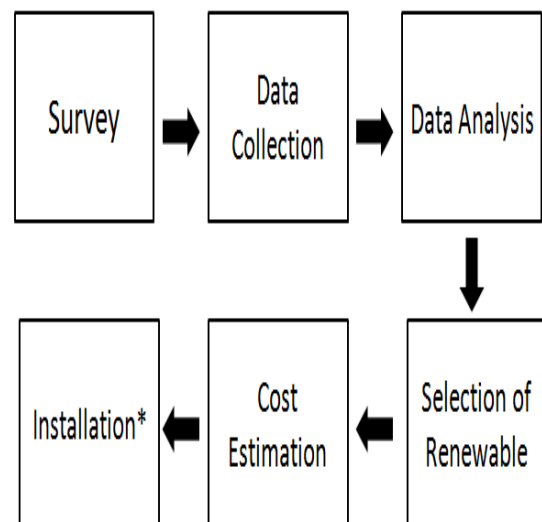


Figure 1: Flow chart

- **SURVEY:** The complete analysis of the site with survey of area of site, population, standard of living, type of land and geographical conditions along with present state of electricity supply.

- **DATA COLLECTION:** This includes the load collection, lux analysis, wind speed, biomass availability and hydro-scope analysis.
- **DATA ANALYSIS:** According to the survey, load is to be calculated and the complete calculations of solar panels, batteries and inverter selection.
- **SELECTION OF RENEWABLES:** As per the geographical conditions, solar is the best fit for the renewable energy source as wind speed is inadequate and no scope of hydro power generation.
- **COST ESTIMATION:** According to the load calculations, site survey and solar calculations, the cost estimation is done. 1kW of power generation costs upto 1 lakh rupees. But the increment is not linear in case of solar, so the estimation is to be precisely done. Costing includes prices of PV panels, batteries, inverter, panel mounting, fuses, MCBs, wiring, sockets and switches, CFLs, fan and battery housing.
- **INSTALLATION:** This is to be done if funds are provided by NGOs or any other sources. If not so, the community classroom only will be powered. Efforts are made to receive funds from NGO already working in the same village already.
- **PV CELLS & OTHER RENEWABLES:** The first block indicating what renewable source of energy is to be used. According to the condition of the village, use of solar energy is the best fit. So PV panels are used. In accordance, other sources can be used in the microgrid such as fuel cells, biogas, etc.
- **BATTERY:** This is the power storing element for the PV cells. Since solar energy is not available for 24 hours, battery is to be used to provide energy during non-sunshine hours. The battery connection depends upon the voltage level which is required by the user.
- **INVERTER:** Most of the user load consists of AC appliances, but power generated by renewable sources is of DC nature. So, use of Inverter is must in this situation. Ratings of inverter to be used also depend upon load calculations.
- **CONTROL CIRCUIT:** Recent trends have developed inverters with built in control circuits which can be easily programmed due to use of microprocessors.
- **PROTECTION CIRCUIT:** Due to load fluctuations, protection is necessary for inverter, battery as well as PV panels as they are of very high costs. Protection devices used are fuses for dc side circuit and MCBs for AC side circuit.

3. CALCULATION

Table 2: Load Details for 36 huts

Sr. no.	Appliance	No. of Appliance	Watt Rating of Appliance
1	CFL	72	25
2	Ceiling Fan	36	40

➤ Total load:

$$1. 1800W \times 5hr = 9000Wh = 9kWh$$

$$2. 1440 \times 6hr = 8640Wh = 8.6kWh$$

$$\text{So, Total load} = 17.5kWh$$

➤ Battery Bank Sizing

- Assuming System Voltage = 120V

- Total load = 17.5KWh

$$Wh = \frac{17500 \cdot V \cdot I \cdot h}{120 V}$$

$$= 145 \text{ A-hr}$$

Considering the inverter efficiency = 85% & DoD = 80%

- A-hr = 145A-hr/(0.85*0.8) = 213.23 A-hr
- So we need a battery of rating 12V, 120 A-hr, 20 batteries
- Autonomy = 1 day
- A-hr = X + nX
- = 213.34 + (1*213.34)
- ≈ 418 A-hr
- For 1 day = 20 batteries
- For 2days = 40 batteries

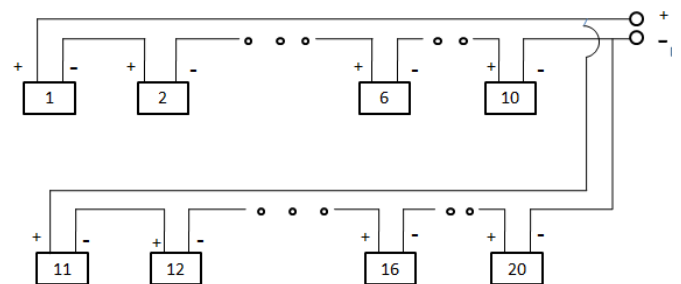


Figure 2: Connection Of Batteries

➤ Calculations for Solar Panel:

- Efficiency of Batteries = 85%

- Energy supplied by PV panels at the input of inverter = input of inverter/efficiency of battery

$$= (17500/0.95)/0.85$$

$$= 20588.2356 / 0.85$$

= 24211.45 W-hr

- Total A-hr generated by PV panels = W-hr/System voltage
- = 24211.45/ 24
- ≈ 1000 A-h
- Total sunshine hours = 7 hrs
- Total current generated by PV panels
= 1000A-hr/7hr
= 142.85 A
- Assuming PV panel of 250W_p (24V,10A)
- Number of PV panels needed = 142.85/10 ≈ 14
- So we will have to use a total of 28 panels of 250W_p.

8. A Hybrid Micro Grid for Remote Village in Himalayas
Abhishek Kumar, Gomar Bam, BikashSah & Praveen Kumar

9. An Integrated Control and Protection System for Photovoltaic Microgrids
Laijun Chen, Member, IEEE and Shengwei Mei, Fellow, IEEE

4. CONCLUSION

Depending upon the load profile of a typically located village in National Park, a Micro-grid system based on locally generated renewable energy sources is to be implemented. Based on the qualitative and quantitative analysis of geographical conditions of the site and availability of different sources, a solution is presented. The ability of MG to island generation and loads together has a potential to provide a higher local reliability than that provided by the power system. To sum up, rural electrification based on renewable energies in developing countries promises a cleaner, cheaper and more democratic way of the quality standard of an important section of the world's population.

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M. S. Carmeli, P. Guidetti, M. Mancini, S. Mandelli,

On Line Condition Monitoring Of Induction Motor Using DSP

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ABSTRACT

In this Paper the stator fault of online induction motor based on stator current using DSP is put up. Induction motors are the most widely used in industry. The early detection of abnormalities in motor drive systems is very important for safe, economic, and uninterrupted operations. Therefore fault diagnosis is very important as motor themselves. This proposed method is applied for induction motor using DSP processor Kit to identify the fault online, based on the stator current.

Keywords

DSP processor, Induction motor, Rotor fault, Squirrel cage Induction Motor.

1. INTRODUCTION

Induction motors are play important role in industrial applications. Although, these devices are highly reliable, they are susceptible to many types of faults. Such fault can became catastrophic and cause production shutdowns, personal injuries, and waste of raw material.

Induction motor faults can be detected in an early stage to prevent the complete failure of an induction motor and unexpected production costs. As Induction motors are most widely used motors in industrial, commercial and residential area for about 75% of the motors in use, fault diagnosis and protection is very important as machine themselves. There are a number of techniques available for detection of nature and degree of faults in an Induction motor. But now days more emphasis is given to the integration of the diagnosis system into the DSP.

In this paper the stator fault detection of an induction motor is done by using DSP.. this proposed method is applied to an induction motor using DSP processor kit to identify the fault online based on the stator current and the measured data get analyzed.. The manufacturers and users of electrical machine initially relied on the simple protection such as over current, over voltage; earth fault etc.to ensures safe and reliable operation. However the tasks performed by these machine grew increasingly complex, improvements were also sought in the field of fault diagnosis.

There are number of limitations of conventional method systems such as inflexible, high cost, hardware limitations which are heavily dependent upon particular instruments. In the recent years the fault of electrical machines moved from conventional to intelligent, advanced system. As DSP is used

in various fields like biomedical, protection, monitoring, signal processing, and military applications etc. it has now also entered in the field of protection of an electrical machine. Owing to recent DSP technology developments, motor fault diagnosis can now be done in real time fashion based on the stator line current, causes precise and low cost motor fault detection. So it is possible to control the motor and detect the fault at very early stages simultaneously. There are many condition monitoring methods including vibration, thermal, but all these monitoring methods require expensive sensors specialized tools, whereas current monitoring out of all does not required additional sensors. because the basic electrical quantities associated with electromechanical plant such current and voltage are readily measured by tapping into existing the current and voltage transformer that are always installed as a part of protection system . So the stator current is used for monitoring and fault detection of induction motor to DSP.

Digital Signal Processors (DSPs) are microprocessors with the following advantages

- (a) Real-time digital signal processing capabilities. DSPs typically have to process data in real time.
- (b). DSPs can sustain processing of high-speed streaming data, for e.g audio and multimedia data processing.
- (c) Deterministic operation. The execution time of DSP programs can be predict accurately
- (d) By software Re-programmability can possible

2. Stator faults

These faults are usually related to insulation failure. It is believed that these faults start as undetected turn-to-turn faults that finally grow and culminate into major ones .Almost 30%-40% of all reported induction motor failures fall into this category Armature or stator insulation can fail due to several reasons. i.e. high stator core or winding temperatures, slack core lamination, slot wedges, and joints ,loose bracing for end winding ,impure oil, moisture, and dirt ,short circuit or stresses ,electrical discharges, leakage in cooling systems. These faults can diagnosis as, For large generator and motor stator windings rated 4 kV and above, online partial-discharge (PD) test methods give very accurate results. However, for low-voltage motors, stator fault detection procedures are yet to be standardized. Penman et al. were able to detect turn-to-turn faults by analyzing the axial flux component of the machine using a large coil wound concentrically around the shaft of the machine. So far small rating machine stator fault diagnosis based on current analysis, is the main aim of this paper.

2.1 Problem Identification

A motor failure that is not identified in an early stage may become catastrophic and the induction motor may suffer severe damage. Thus, undetected motor faults may cause motor failure, which may in turn production shutdowns. Such shutdowns are costly in terms of lost production time, maintenance costs, and wasted raw materials.

Before some decades the monitoring methods are use like Thermal, noise, partial discharge, etc. but these conventional methods was not adequate to fulfil the purpose and also additional circuit, sensors, etc was also required for monitoring. So cost increases and accurate results was also not meet. As the complexity of motor operation goes on increasing, condition monitoring also needs more accurate and intelligent system.

Most of the researchers it has been found that, stator current get affected due to various faults and maximum information can be extracted from stator current to diagnose various faults. For that purpose signal processing is done. Now a days digital signal processor have been occupied important place in many areas of engineering including condition monitoring. If we study about motor faults, we found that in induction motor about 40% faults are stator faults. In that also turn to turn faults are of the great importance. but most of the research work have been carried in the area of rotor fault . so therefore I have selected the stator fault monitoring for my project work.

2.2 Scope of Work

The objective of this Work is to monitor the different faults occurred in Induction motor by connecting existing condition monitoring system with DSP, to get more accurate results for nature and location of faults in motor. As previous work is done on stator related fault using DSP is very low as compared to other fault.so that literature in this case only external single phasing fault of online induction motor get monitored using DSP. In future another stator and rotor fault can be identify using the same DSP. In my future work, I have to work for condition monitoring to detect stator related fault. Basically, the scope of this project consist of 3 parts which are listed as follows:

1. To apply stator current signal based external fault detection technique in IM .
2. To Investigate and apply stator current based fault detection scheme for stator and rotor of IM.
3. Compare results of DSP Based technique and conventional methods for fault diagnosis by simulation and real time practice

2.3 Methodology

In this seminar work , fault of induction motor based on stator current by using Digital signal processor is presented. In this case a single phasing faults can be considered for condition monitoring and then apply to the three phase system.

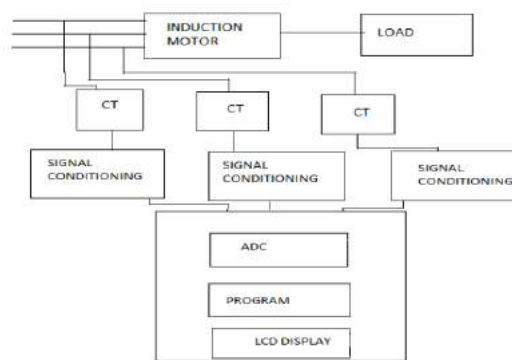


Fig 1: Block diagram of Stator Fault diagnosis

Fig 1 shows the experimental setup for fault detection method by using DSP. It consists of 3 phase induction motor, fault creation setup, current transformer, signal conditioning circuit and DSP controller. The three phase AC current signals are fed to ADC of DSP controller through fault creation setup, current transformer and signal conditioning circuit. The fault creation setup is used to create single phasing fault. The current transformer is used to step down current signals. The signal conditioning is used to convert ac signals coming from current transformer to pure dc signal. Then the pure dc signal is fed to ADC of DSP controller.

3. Conclusion

In this paper, stator faults of induction motor based on current analysis using Digital processor is presented.

4. Acknowledgment

It is privilege for me to have been associated with Prof. S. S. Dhamal my guide, during this project work. I am thankful to him, for his constant inspiration and valuable guidance, carefully reading and editing my work and always boosting my confidence to complete my work. I would be failing in my duties if I do not make a mention of my family members including my friend Prajakta Patil, my parents and my brothers for providing moral support, without which this work would not have been completely. This kind of work cannot be finished without many others help, even some of them have not aware of their contribution and importance in producing this project work. It is a great pleasure for me to take opportunity to express my gratefulness to all of them.

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Multiport DC-DC Converter for Renewable Energy Sources

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ABSTRACT

This is a new isolated multiport DC to DC converter. The main purpose of this converter is for power management of several renewable sources which can be of similar type such as solar or may be of different type. The proposed DC to DC converter only uses one controllable switch to each port to which a source is connected, so it uses a switch mechanism. It uses topology of less number of switches. Here we use capacitor on low voltage side which use as power storage component. Which mainly use when all switches are off so power will be provided by capacitor. Also on high voltage side we use filter circuit to smooth the DC pulse to get more accurate output. In future for AC voltage we can connect inverter.

General terms

Solar panel, switches

Keywords

Multiport converter, maximum power point tracking (MPPT), solar energy

1. INTRODUCTION

Renewable is very useful energy source. Since this energy is free of cost and widely present on earth so it is useful mainly in the field of electricity generation. So main aim of this project is to connect different renewable sources in the form of grid type structure. We can use solar, wind, tidal and many more. The main purpose of connecting so many input is to satisfy the peak load requirement of today's generation. Today load demand is so high that one load can not fulfill the demand. So we connect many number of input. The main advantage of this idea is renewable energy is free of cost so by connecting different number of input and sum up their power at output we get large amount of power. In this DC-DC converter we many use solar as input. The solar is huge source of energy and also it provide large amount of power. Using less number of switch we can reduce the complexity of system. Also each switch for each input to control duty cycle. Here using MPPT concept we can extract maximum energy from each input. Which gives us benefit when we get increment in output power rating.

Here we connect three solar panel on input side which is connected through MPPT. By varying the duty cycle of each switch we can adjust the output power. This DC voltage is actually rippled DC wave. to make this rippled DC into smooth DC we use filter circuit. This smooth DC is given to output side where DC load is connected. Mainly we combine maximum power available from each sources and provide to the load. As per the requirement we provide the necessary power to system. MPPT plays an important role in the whole system.

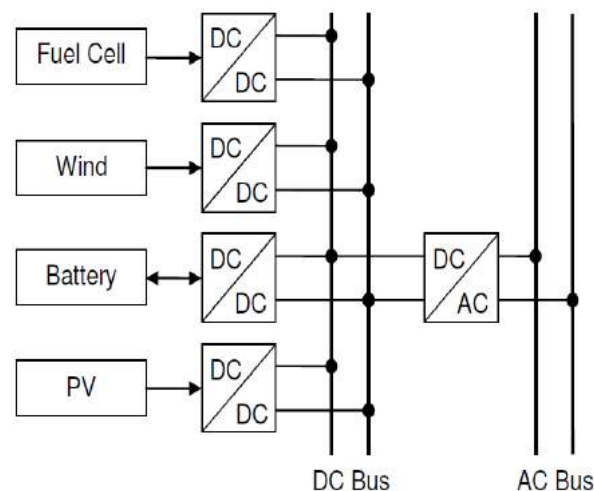


Figure 1: Conventional System

2. EXISTING ISOLATED MULTI-PORT DC-DC CONVERTER

The main objective of this converter is to fulfill the load demand by various renewable input. Previously we use high frequency transformer mainly to switching up the switches to control the output. But as we know it contains low voltage side and high voltage side windings. So it may have some losses which surely reduce the efficiency of the whole system

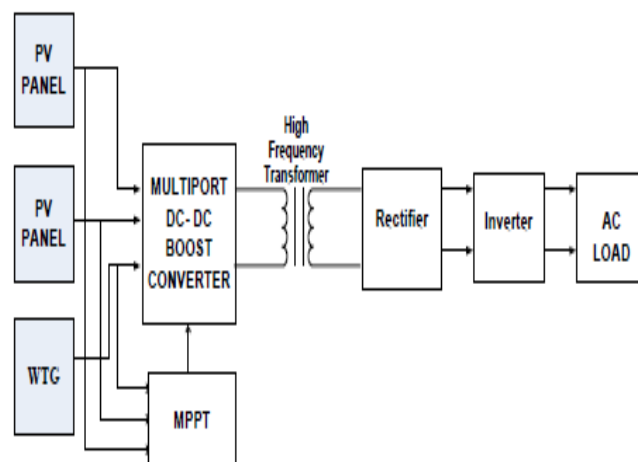


Figure 2: Existing System

here there is a isolated DC-DC converter which contains PWM circuit to convert DC wave into square DC wave to fed to transformer. This transformer controls the switching phenomenon of circuit. Which further pass to dc filter. So we get smooth DC wave. for future scope if we want AC load so we connect inverter circuit to get AC output.[1]
this system increase complexity of system. So the modified DC-DC converter .

Category	Conventional structure	Multiport structure
Need a bus common bus	Yes	Yes
Conversion steps	More than once	Minimized
Control scheme	Separate control	Centralized control
Power flow management	Complicated, slow	Simple, fast
Implementation effort	High	Low

Table 1: Comparison between conventional and multiport structure

3. PROPOSED SYSTEM TOPOLOGY

It is more efficient type of system as compared to previous system. Here complexity is less. In previous system high frequency transformer is used for stepping up the voltage. In this system, to increase the voltage we can use boost converter . Here buck converter provide input to battery. Battery is provided for backup purpose. At night time solar radiation is absent so battery provide the extra power needed. here mainly multiporting is done. as per output requirement power is extracted from solar input. Current and voltage sensor are provide to sense the rating of incoming current and voltage.

3.1 Block Diagram

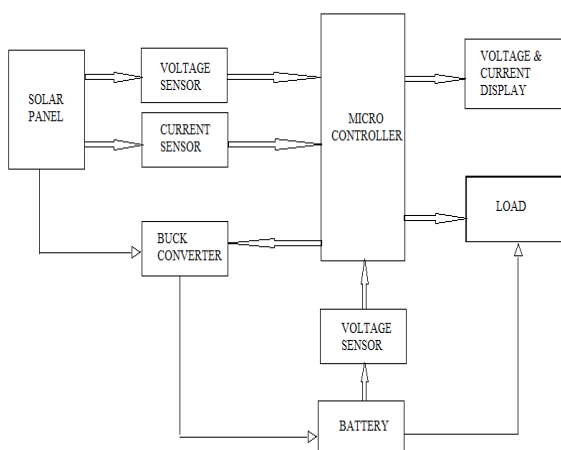


Figure 3: Block Diagram

3.2 Description

3.2.1 Solar panels :- We will be using 3 solar panels of 6 volts, 150mA each in our project as an input.

3.2.2 Microcontroller (MPPT charge controller) :- We will be using a microcontroller in our project for varying the duty cycle of the switches of buck converter. We will be using Arduino microcontroller. The microcontroller is the heart of MPPT charge controller. It will sense the voltage and current of each solar panel and according to that it will active the perturb and observe algorithm used in it to change the duty cycle of the switches of buck converter, and our load requirement will be fulfilled.

3.2.3 Buck converter:- The buck converter is used for the switching operations of the solar panels according to its modes of operation which is dependent on the load requirement. If load requirement is not fulfilled by all the solar panels then buck converter provide remaining voltage by chopping the voltage of battery.

3.2.4 Battery:- The battery is used for the storage purpose. In case of excessive generation of power, the battery will store that excess power. In case of lesser generation of power the battery will supply its stored power to fulfill the load demand.

3.2.5 Load:- The load is used to check the successful operation of the proposed system. The load that we will be using is a dc lamp.

3.2.6 Display:- We will be showing the rms value of current and voltage of the multiport dc-dc converter.

3.3 Circuit Diagram

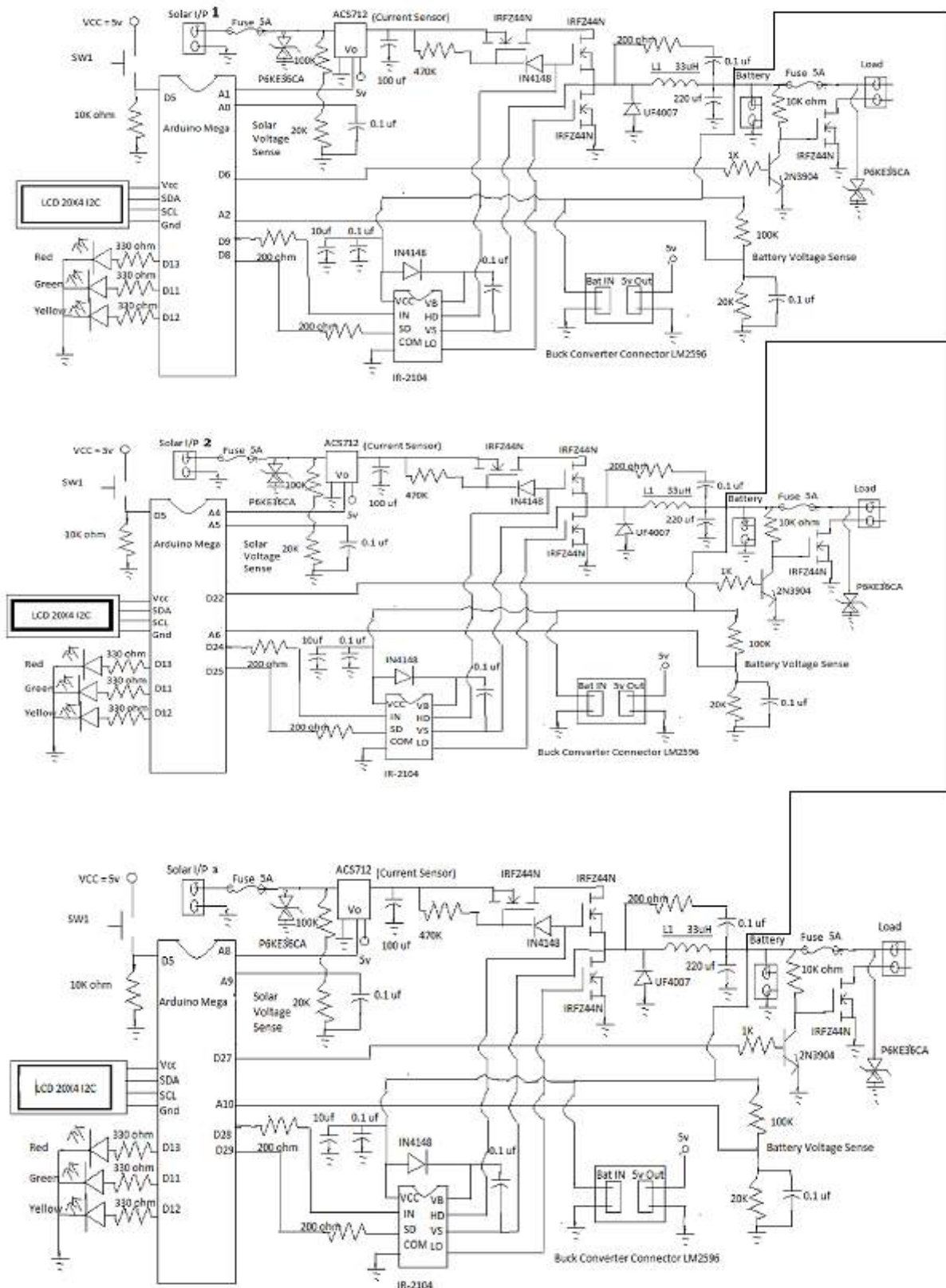


Figure 4: Circuit Diagram

3.4 Description

In circuit diagram, there is only one arduino microcontroller, battery and load. For simplicity of circuit diagram and according to arduino pins, above diagram is made.

The input power connector to the solar panels is the screw terminal solar panel 1,2 and 3 with battery .The another connector is connected for the load. are the 5A safety fuses.

The buck converter is made up of the synchronous MOSFET (IRFZ44N) switches Q2 and Q3 and the energy storage devices inductor L1 and capacitors C1 and C2 The inductor smooths the switching current and along with C2 it smooths the output voltage.Capacitor C8 and R6 are a snubber network,used to cut down on the ringing of the inductor voltage generated by the switching current in the inductor.

The third MOSFET(IRFZ44N) Q1 is added to allow the system to block the battery power from flowing back into the solar panels at night. As all diodes have a voltage drop a MOSFET is much more efficient.Q1 turns on when Q2 is on from voltage through D1. R1 drains the voltage off the gate of Q1 so it turns off when Q2 turns off.

The diode D3 (UF4007) is an ultra fast diode that will start conducting current before Q3 turns on. It is supposed to make the converter more efficient.

The IC IR2104 is a half bridge MOSFET gate driver. It drives the high and the low side MOSFETs using the PWM signal from the arduino (Pin -D9) .The IR2104 can also be shut down with the control signal (low on pin -D8) from the Arduino on pin 3. D2 and C7 are part of the bootstrap circuit that generates the high side gate drive voltage for Q1 and Q2. The software keeps track of the PWM duty cycle and never allows 100% or always on. It caps the PWM duty cycle at 99.9% to keep the charge pump working.

There are two voltage divider circuits(R1,R2 and R3,R4) to measure the solar panel and battery voltages.The output from the dividers are feeds the voltage signal to Analog pin-0 and Analog pin-2 .The ceramic capacitors C3 and C4 are used to remove high frequency spikes.

The MOSFET(IRFZ44N) Q4 is used to control the load.The driver for this MOSFET(IRFZ44N) is consists of a transistor and resistors R9 ,R10.

The diode D4 and D5 are TVS diodes used for over voltage protection from solar panel and load side.

The current sensors ACS712 sense the current from the solar panel and feeds to the Arduino analog pin-1.

The 3 LEDs are connected to the digital pins of the microcontroller and serve as an output interface to display the charging state.

Reset switch is helpful if the code gets stuck. The back light switch is to control the back light of LCD display.

4. MAXIMUM POWER POINT TRACKING (MPPT).

When a solar PV module is used in a system, its operating point is decided by the load to which it is connected. Also since solar radiation falling on a pv module varies throughout the day the operating point of module also changes throughout the day. As an example, the operating point of a pv module & a resistive load of a pv module & a resistive load for irradiance of 200 W/m², 400 W/m² ,600 W/m² ,800 W/m² ,1000 W/m² is shown in fig. denoted by resistive load line

intersection points. It is desired to have maximum power transfer from a pv module to the load. The trajectory for maximum power is also shown & the operating points for maximum power transfer are denoted by maximum power line. In order to ensure the operation PV modules for maximum power transfer a special method called 'Maximum Power Point Tracking' (MPPT) is employed in PV system.

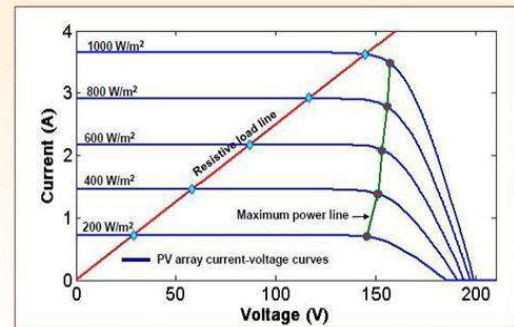


Figure 5: Graph Of Maximum Power Point

4.1 Mechanism

The maximum power tracking mechanism makes use of an algorithm and an electronic circuitry.

The mechanism is based on the principle of impedance matching between load & pv module which is necessary for maximum power transfer By using dc-dc converter the impedance is matched by changing the duty cycle (d) of the switch. The power from solar module is calculated by measuring voltage and current. This power is an input to algorithm which then adjusts the duty cycle of the switch, resulting in adjustment of reflected load impedance according to power output of pv module. For instance the relation between the input voltage (Vi) and the output voltage (Vo) and impedance of load (RL) reflected at input side (Ri) of a buck type dc-dc converter can be given as

$$V_o = V_i * d$$

$$R_i = R_L / d^2$$

By adjusting the duty cycle Ri can be varied which should be same as the impedance of solar pv module in a given operating condition for maximum power transfer.

4.2 Perturb & Observe Algorithm

One of the most popular algorithms is the hill climbing method. It is applied by perturbing the duty cycle d at regular intervals and by recording the resulting array current and voltages values thereby obtaining power. The algorithm of this scheme is described below with help of mathematical expressions.

In voltage source region

$$dP/dV > 0 \text{ --- } d = d + \Delta d \text{ (i.e. incremented) (A)}$$

In current source region

$$dP/dV > 0 \text{ --- } d = d - \Delta d \text{ (i.e. decremented) (B)}$$

At mpp

$dP/dV = 0 \rightarrow d = d$ (i.e retained) ____ (C)

According to equation (A) the the duty cycle is increased ($P_{new} > P_{old}$).this means that slope is positive and module is operating in constant current region. According to equation (B) the duty cycle is decreased ($P_{new} < P_{old}$).this means that slope is negative and module is operating in constant voltage region.

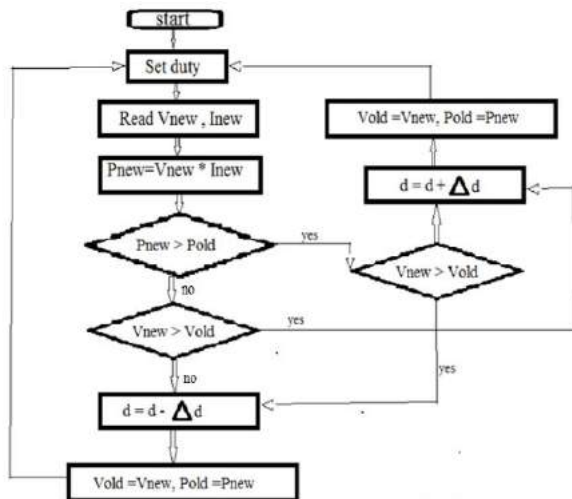


Figure 6: P&O Algorithm

5. CONCLUSION

A multiport DC-DC converter that uses the minimum number of switches has been proposed for simultaneous power management of multiple renewable energy sources. The proposed converter has been applied for MPPT control of a three-source solar panel system. The advantage of the proposed multiport DC-DC converter is its simple topology while having the capability of MPPT control for different sources simultaneously. The proposed converter can be easily applied for power management of different types of energy sources, such as batteries, as well.

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Model of Turbine Speed Governing Mechanism

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Abstract

The speed governor of turbine is a apparatus of controlling the flow rate of steam into a steam turbine, so as to maintain its speed of rotation persistent. The variation in load during the action of a steam turbine can have a significant impact on its performance. In practical situation the load frequency varies from the designed or economic load and thus there always exists a considerable deviation from desired performance of a turbine. The load also changes according to usage, so it is necessary to control speed of turbine. This can be achieved by means of speed governing system of turbine. The project focuses on developing a small scale model of turbine speed governing system, in order to study the actual mechanism of turbine speed control.

General terms

Speed governor, hydraulic amplifier

Keywords

Speed Governor, Steam Turbine, Hydraulic Amplifier, Steam Valve

1. INTRODUCTION

Turbine has large moment of inertia masses which conserves kinetic energy. All the kinetic energy stored in a power system in such rotating masses is related to the grid inertia. When system consumer load demand increases, grid inertia is used to supply the load. This, however, leads to a decrease in the stored kinetic energy of the turbine generators. Since the mechanical power of these turbines concerned with the delivered electrical power, the turbine generators have a decrease in velocity, which is directly proportional to a decrease in frequency in synchronous generators

The purpose of the turbine -governor control is to maintain the desired system frequency by adjusting the mechanical power output of the turbine.

Governing system is major to control system in the power plant to regulate the turbine speed, power and maintains grid frequency. In starting, loading governing system is the main operating system. Power plant response depends on Steady state and dynamic performance and capacity in which governing system works perfectly. Use of hydraulic governing system processing capacities have been increased.

2. CONCEPT

The aim is to make a prototype of actual model of hydraulic amplifier, linkage mechanism, speed governor etc. The model will be developed into stages and then later assembled. A speed governing system works as a control mean for steam input and output. Governor valve control means for adjusting the opening of the governor valve in response to changes in

turbine speed, stop valve is used for cutting off the governor. System consists of components like hydraulic amplifier which

steam cannot be control by means of other control. The fly ball governor and linkage mechanism helps hydraulic amplifier in this process.

3. Objective

The main objective of turbine speed governing system is to maintain the desired megawatt output power of a generator matching with the changing load. Also to assist in controlling, the frequency of larger interconnection. In addition to this, TGS keeps the net interchange power between pool members at the predetermined values. Governing of steam turbine means to regulate the supply of steam to the turbine in order to maintain speed of rotation sensibly constant under varying load conditions. The ALFC loop will maintain control only during small and slow changes in load and frequency. It will not provide sufficient control during harsh situation when large power imbalances occur.

4. BLOCK DIAGRAM

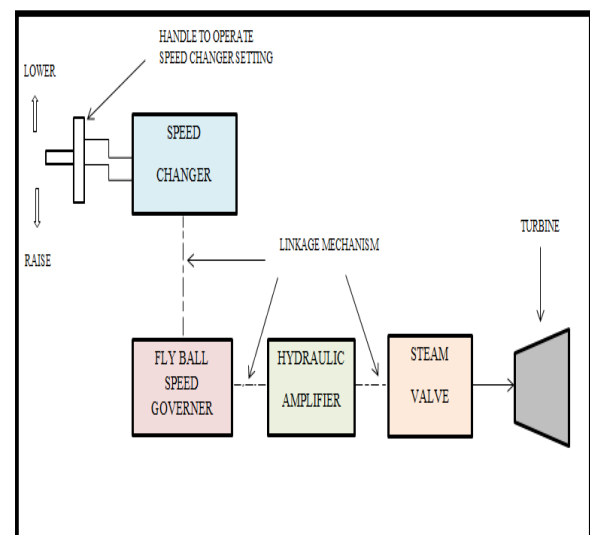


Fig.4.1. BLOCK DIAGRAM

4.1 Block Diagram Description

4.1.1 Flyball Speed Governor:

This is the heart of the system which senses the change in speed (frequency). As the speed increases the fly balls move outwards and the point B on linkage mechanism moves downwards. The reverse happens when the speed decreases.

4.1.2 Hydraulic Amplifier:

It comprises a pilot valve and main piston arrangement. Low power level pilot valve movement is converted into high power level piston valve movement. This is necessary in order to open or close the steam valve against high pressure steam.

4.1.3 Linkage Mechanism:

ABC is a rigid link pivoted at B and CDE is another rigid link pivoted at D. This link mechanism provides a movement to the control valve in proportion to change in speed. It also provides a feedback from the steam valve movement

4.1.4 Speed Changer:

It provides a steady state power output setting for the turbine. Its downward movement opens the upper pilot valve so that more steam is admitted to the turbine under steady conditions (hence more steady power output). The reverse happens for upward movement of speed changer.

5. Modeling of speed governing system

Assume that the system is initially operating under steady conditions-the linkage mechanism stationary and pilot valve closed, steam valve opened by a definite magnitude, turbine running at constant speed with turbine power output balancing the generator load. Let the operating conditions be characterized by

f^0 = system frequency (speed)

P^0 = generator output = turbine output (neglecting generator loss)

y^0 = steam valve setting

We shall obtain a linear incremental model around these operating conditions.

Let the point A on the linkage mechanism be moved downwards by a small amount Δy_A . It is a command which causes the turbine power output to change and can therefore be written as

$$\Delta y_A = k_C \Delta P_C \quad \dots(5.1)$$

Where, ΔP_C is the commanded increase in power.

The command signal ΔP_C (i.e. Δy_E) sets into motion a sequence of event the pilot valve moves upwards, high pressure oil flows on to the top of the main piston moving it downwards; the steam valve opening consequently increases, the turbine generator speed increases, i.e. the frequency goes up. Let us model these events mathematically.

Two factors contribute to the movement of C:

(i) Δy_A contributes -- $\frac{l_2}{l_1}$ Δy_A or $-k_1 \Delta y_A$ (i.e. upwards) of $-k_1 k_C \Delta P_C$

(ii) Increase in frequency Δf causes the fly balls to move outwards so that B moves downwards by a proportional amount $k'_2 \Delta f$. The consequent movement of C with A

remaining fixed at Δy_A is $+\left(\frac{l_1 + l_2}{l_1}\right) k'_2 \Delta f = +k_2 \Delta f$ (i.e. downwards)

The net movement of C is therefore

$$\Delta y_C = -k_1 k_C \Delta P_C + k_2 \Delta f \quad \dots(5.2)$$

The movement of D, Δy_D , is the amount by which the pilot valve opens. It is contributed by Δy_C and Δy_E and can be written as

$$\begin{aligned} \Delta y_D &= \left(\frac{l_3}{l_3 + l_4}\right) \Delta y_C + \left(\frac{l_4}{l_3 + l_4}\right) \Delta y_E \\ &= k_3 \Delta y_C + k_4 \Delta y_E \quad \dots(5.3) \end{aligned}$$

The movement Δy_D depending upon its sign opens one of the ports of the pilot valve admitting high pressure oil into the cylinder thereby moving the main piston and opening the steam valve by Δy_E .

Certain justifiable simplifying assumptions, which can be made at this stage, are:

(i) Inertial reaction forces of main piston and steam valve are negligible compared to the forces exerted on the piston by high pressure oil.

(ii) Because of (i) above, the rate of oil admitted to the cylinder is proportional to port opening Δy_D .

The volume of oil admitted to the cylinder is thus proportional to the time integral of Δy_D . The movement Δy_E is obtained by dividing the oil volume by the area of the cross-section of the piston.

Thus

$$\Delta y_E = k_5 \int_0^t (\Delta y_D) dt \quad \dots(5.4)$$

It can be verified from the schematic diagram that a positive movement Δy_D , causes negative (upward) movement Δy_E accounting for the negative sign used in Eq. (5.4).

Taking the Laplace transform of Eqs. (5.2), (5.3) and (5.4), we get

$$\Delta Y_C(s) = -k_1 k_C \Delta P_C(s) + k_2 \Delta F(s) \quad \dots(5.5)$$

$$\Delta Y_C(s) = k_3 \Delta Y_C(s) + k_4 \Delta Y_E(s) \quad \dots(5.6)$$

$$\Delta Y_E(s) = -\frac{1}{k_5 s} \Delta Y_D(s) \quad \dots(5.7)$$

Eliminating $\Delta Y_C(s)$ and $\Delta Y_D(s)$, we can write

$$\begin{aligned} \Delta Y_E(s) &= \frac{K_1 K_3 K_C \Delta P_C(s) - K_2 K_3 \Delta F(s)}{\left(K_4 + \frac{s}{K_5}\right)} \\ &= \left[\Delta P_C(s) - R \frac{1}{s} \Delta F(s)\right] \left[\frac{K_{sg}}{1 + T_{sg} s}\right] \quad \dots(5.8) \end{aligned}$$

Where $\frac{K_1 K_3 K_C}{K_4}$

$R = \frac{K_2}{K_4} =$ speed regulation of the governor

$\frac{K_1 K_3 K_C}{K_4}$

$K_{sg} = \frac{K_4}{K_5} =$ gain of speed governor

Equation (5.8) is represented in the form of a block diagram in fig 5.1

5.1 Block diagram:

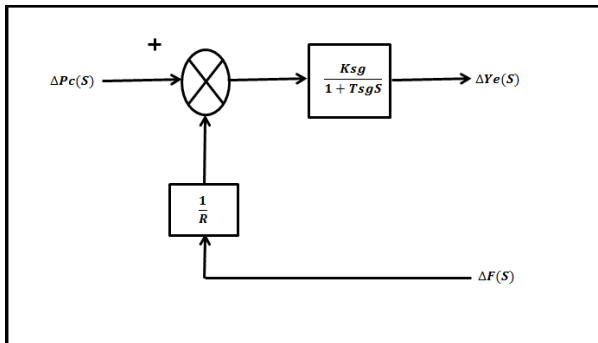


Fig 1: BLOCK DIAGRAM REPRESENTATION OF SPEED GOVERNOR SYSTEM

The speed governing system of a hydro-turbine is more involved. An additional feedback loop provides temporary droop compensation to prevent instability. This is necessitated by the large inertia or the penstock gate which regulates the rate of water input to the turbine.

5.2. Turbine Model

Let us now relate the dynamic response of a steam turbine in terms of changes in power output to changes in steam valve opening Δy_E . Figure 5.2a shows a two stage steam turbine with a reheat unit. The dynamic response is largely influenced by two factors, (i) entrained steam between the inlet steam valve and first stage of the turbine, (ii) the storage action in the re-heater which causes the output of the low pressure stage to lag behind that of the high pressure stage. Thus, the turbine transfer function is characterized by two time constants. For ease of analysis it will be assumed here that the turbine can be modeled to have single equivalent time constant. Figure 5.2b shows the transfer function model of a steam turbine. Typically the time constant T_t lies in the range 0.2 to 2.5 sec.

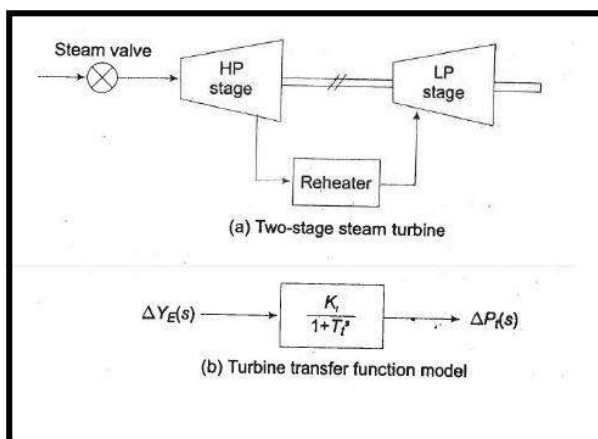


Fig.5.2: Turbine Model

The complete block representation of load frequency control of an isolated power system is as follows:

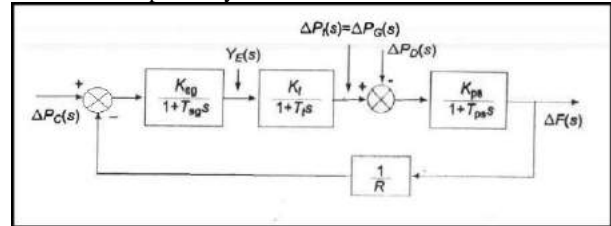


Fig.5.3: Complete Block Representation Of Load Frequency Control Of An Isolated Power System

6. Modeling Diagram

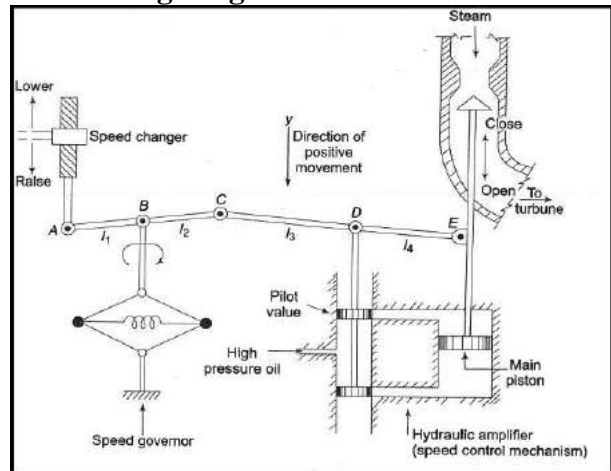


Fig.6: Overall Model

6.1 Components:

1. Fly ball:

Fly ball is the heart of the system which senses the change in speed (frequency). As the speed increases the fly balls move outwards and the point B on linkage mechanism moves downwards. The reverse happens when the speed decreases. Fly ball is connected to speed changer by means of a linkage mechanism. There are two types of fly ball mechanisms one with gear mechanism and one with spring mechanism.

2. Hydraulic amplifier:

Hydraulic amplifier consists of two pistons, one is pilot and other is main piston. The pilot piston with low pressure is pushed up or down with linkage mechanism. Then the main piston is moved and opens or closes the steam valve. The linkage mechanism is connected to pilot as well as main piston. The pilot piston is actuated by linkage mechanism. As handle is raise or lowered the piston is moved accordingly and the steam valve opening and closing is controlled.

3. Linkage mechanism:

Linkage mechanism connects all the blocks like speed changer, hydraulic amplifier, fly ball. Linkage mechanism is operated by speed changer and fly ball. There are 4 linkage rods and 5 pivot points.

4. Speed changer:

Speed changer is nothing but the handle used to raise or lower the steam input flow rate. The handle is connected to linkage mechanism. In order to increase the steam flow rate, the handle is raised which in turns triggers the linkage mechanism, and hydraulic action opens the nozzle.

7. CONCLUSION

The governing system has a vital role in synchronization and loading of a steam turbine generating unit in order to get stable and secure operation. With the increasing developments in technology, the digital governors are increasingly being used. The current project includes a process overview of the turbine speed governing system.

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WRIST WATCH MULTIMETER

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ABSTRACT

This paper discusses about the prototype of a Wrist Watch Multimeter, which is a portable measuring device that can perform all the hybrid features of multimeter. The device has auto-ranging, Bluetooth facility for ease of data transfer. The retractable probes needs to be placed in between the multimeter and the device whose parameters are to be measured to obtain appropriate resistance, voltage and current (AC/DC). After the probes are connected, the input goes to the attenuators, ADC, sampling ICs and PID algorithm, which will provide an accurate reading. This multimeter can be constantly worn on your hand similar to that of your wristwatch even while taking the readings.

Keywords: - Wrist Watch Multimeter, Bluetooth, PID algorithm.

1. INTRODUCTION

A Multimeter or a Multitester, also known as a Volt-Ohm meter or Volt-Ohm-milliammeter is an electronic measuring instrument that combines several measurement functions in one unit. It is the most important instrument and is used in each electrical or electronic laboratory for measuring various quantities or testing various devices.

In small laboratories or in big complex circuits it becomes difficult to take reading using the traditional multimeter. At times, we even need to carry the multimeter from one place to other for taking measurement. This thought gave us the idea of developing a portable multimeter through which the readings can be easily noted.

2. EXISTING PRODUCTS

Much like our project, modern digital multimeters only measure voltage. Current is measured as the voltage across a shunt and resistance is measured by measuring the voltage across the resistance with a constant current flowing through the resistance.

How a digital multimeter works internally depends on the manufacturer. The early meters used a dual slope integrating digital conversion technique that was reasonably accurate and good at suppressing noise. It is slow however, about ten readings per second or less.

Wrist Watch Multimeter has the advantage of timers o its MCU so it can measure all of these things, and its placement on the user's wrist allows for the operation that is unique form any multimeter from the market. With continued improvement

in the read outs, we are confident that our project has great potential to make an impact to multimeter users everywhere.

3. PROPOSED MODEL

Hands are one of the most highly utilized parts of human body, which interacts with the external environment most of the time. This provoked our group to design a wearable device that can be used for measuring electrical parameters. Wrist Watch Multimeter is a device, which bring the functionality of a high-end digital multimeter to anyone's fingertips for an affordable price. All the functionality of multimeter is made possible through the Atmega 328p microcontroller and peripheral circuits. Essentially the wearer only needs to select a mode and hold the probes across the object the microcontroller will calculate the quantity to the highest possible accuracy and display it on to the screen. It also has an auto ranging facility which makes the observer to note the reading accurately and fast. The most important feature of this wristwatch multimeter is that it also has a Bluetooth facility, which allows you to transfer the data into any storage device, which has a Bluetooth facility in it.

4. INTEGRATED DESIGN

The next important part of the paper is the measurement algorithm. For every parameter to be measured there will be a pre-defined set of algorithm according to which the microcontroller will perform its operation.

4.1 Resistance Measurement

For auto ranging of the resistance measurement, we have taken five decade of resistors ranging from 100 ohm to 1mega-ohm. These resistors are connected to the analogue DEMUX that are turned on one by one during the measurement for auto ranging purpose. We actually measure the voltage (V_{in}) which results from the division with a known resistance value coming from the DEMUX. Suppose the selected resistor be R ohm (auto ranging resistors) and the resistance under test be R_t . Then the value of the unknown resistance R_t will be calculated by the microcontroller from the expression given below and will be displayed on the LCD screen.

$$R_t = R (V_{cc}/V_{in} - 1)$$

4.2 Voltage Measurment (DC)

4.2.1 Low Voltage Measurement (<5V)

If the incoming voltage is less than 5V than the input is directed towards the ADC pin of microcontroller. The microcontroller reads the analog input voltage and converts it into a corresponding digital value. This value is displayed onto the screen.

4.2.2 High Voltage Measurement (>5V)

If the incoming voltage is greater than 5V it will use a voltage divider bridge which will have a fixed resistor of 10K and a variable resistance "R ohm". This will reduce the incoming voltage below 5V in order to protect the microcontroller by dissipating the excessive voltage across the resistors. Now this voltage is fed to the microcontroller, which is capable of reading the reduced voltage. The actual voltage is calculated by multiplying the measured voltage by a suitable multiplying factor. The mathematical formula for calculating the actual voltage is given below.

$$\text{Voltage} = \text{measured voltage} * ((R + 10k) / 10K)$$

4.3 Current Measurement

As the current rating of each pin of the microcontroller Atmega 328p is only 10mA which is very small. Thus for measuring the current we are converting the current into corresponding voltage using an opamp LM324. This voltage is then Measured by the microcontroller in the similar fashion as that of the voltage measurement. The measured voltage is converted in terms of current by using Ohm's Law ($I = V / R$).

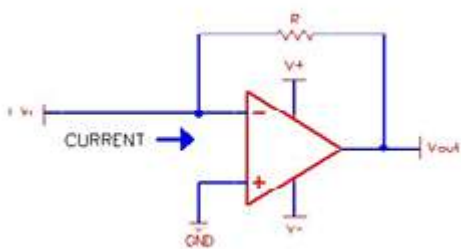


Fig: - Basic current to voltage converter circuit

4.5 Capacitance Measurement

The capacitance is measured by noting the time to charge the capacitor through the RC circuit. R3 and R4 assumed equal and the voltage level will be $V(t/2) = V_{cc}/2$. R4 resistor is used for maintaining accuracy. R2 will be known, we can get C because voltage on capacitor will be

$$V(t) = V_{cc}(1 - \exp(-t/R_2 * C)).$$

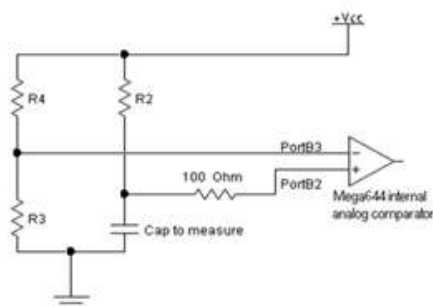


Fig: - Circuit diagram for capacitance measurement

4.4 Connectivity Testing

Connectivity testing is done by connecting a LED in between the pin of the microcontroller and the ground. We set that pin as high pin. When object is held between the probes the current flows from that PIN to the object through the LED, which proves the success of the continuity test.

4.6 Bluetooth module

The prototype is also provided with a Bluetooth facility. Use of Bluetooth module has provided a boon in field of data storage. The industries where the data needs to be stored very immediately can use wristwatch multimeter as a perfect device for data storage. The data can be immediately be transferred to device which has Bluetooth facility in it. This property of saving the data has provided a way to store data and secured data loss.

5. BACKGROUND MATHEMATICS

PARAMETERS	FORMULA
Resistance	$R_t = R (V_{cc}/V_{in} - 1)$
Voltage	$V_{in} * ((R + 10k) / 10K)$
Current	$I = V / R$
Capacitance	$V(t) = V_{cc}(1 - \exp(-t/R_2 * C))$

6. Flowchart



Fig:- Flowchart

7. Conclusion

Considering all the literature study and analysis of data, we found that wrist watch multimeter is a more technically advanced device in comparison to the normal laboratory multimeter. As we know that, a multimeter, which we use in the laboratories, are easy to deal with, but they lack data storage and auto ranging facilities. The price of a daily multimeter is less as compared to the prototype developed and discussed in this paper. The prototype has better functions than the daily multimeter. The prototype has the main advantage that it is, portable and has many advantages over the daily multimeter. The Wrist Watch Multimeter is free of knob settings, which makes it free of the tedious job in daily multimeter. The Wrist Watch Multimeter is provided with bluetooth facility due to which data transfer is also possible.

Hence, Wrist Watch Multimeter can be considered as a more preferable device.

8. Future Scope

1. Miniaturize using a custom PCB – We would like to design and fabricate a custom printed circuit board (PCB) which can literally fit the size of an average human wrist. This will consist of a combination of circuit components, micro size chargeable batteries and a flexible LCD display. We even might consider making use of flexible printed circuits so that it gives the user freedom of flexing the hands without worrying about the rigidity of the setup. This will make the device “wearable” in the true sense.
2. Implement AC Current and Voltage Measurement – We would like to have an additional functionality of measuring the AC current and voltage. This will make it complete in terms of DMM functions.
3. Protection Shield – It is essential that we provide a right insulation for the Wrist Watch to minimize the risk it possess to the user.
4. Add-On functionality – It will be very useful if we can get other functionalities such as function generator, oscilloscope, transistor testing, and temperature measurement.

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Power comparison of MPPT techniques for solar system

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ABSTRACT

This theorem is helpful to produce the maximum power from the solar cell and there are number of technique to do the same but we are discriminating between them. Many maximum power point tracking techniques for photovoltaic systems have been developed to maximize the produced energy and a lot of these are well established in the literature. These techniques vary in many aspects as: simplicity, convergence speed, digital or analogical implementation, sensors required, cost, range of effectiveness, and in other aspects. This paper presents a comparative study of widely-adopted MPPT algorithms; their performance is evaluated on the energy point of view, considering different solar irradiance variations.

Key-Words: - Maximum power point (MPP), maximum power point tracking (MPPT), photovoltaic (PV), comparative study, PV Converter.

1. INTRODUCTION

Renewable energy is very useful energy source in this world. As there are so many energy in opposition to the renewable energy like coal, gas, nuclear, etcetera. But solar energy is free from pollution and impossible to use up completely and free of cost or easily available everywhere. And if we talk about application it can be used in water pump lighting, vehicles, charging battery army and air.[1] And along with this the most important by solar energy we can feed power to the grid but power delivered from the Photo voltaic cell depend upon the illumination, temperature and current of the cell. This theorem (MPPT) is useful to get maximum power from the system. To attain maximum power converter is used for that simple and complex voltage relation need to develop by the designer. Now mainly we need to focus on efficiency because of the weather condition means irradiation changes according to the weather condition. So the VI characteristics of the PV cell vary according to the irradiant and temperature of the cell and we need to find the maximum power point to produce the maximum power. There are so many theorems to produce the maximum power according to the technique used and the can be chosen by considering simplicity, speed and implementation.

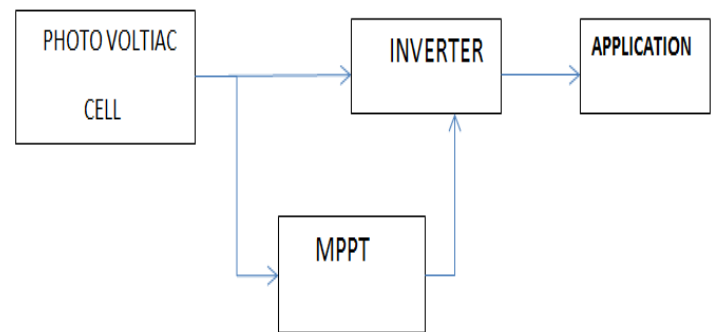


Fig 1: Block Diagram of the system

2. MODELING PV CELL

A PV array comprises the arrangement of several PV panels. The PV panel constitutes number of series connected PV modules. A photovoltaic module is formed by connecting many solar cells in series since the output of each solar cell is 0.7V. Considering only single solar cell which can be modelled by utilizing a current source, a diode and a resistor as shown in Fig. This model is known as a single diode model of solar cell. The equivalent circuit for solar cell considering all the elements mentioned.[2]

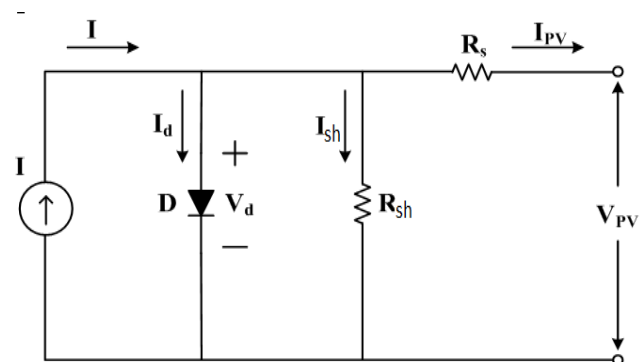


Fig 2: Equivalent circuit of PV cell

R_s is contact resistance .

R_{sh} is cell resistance.

I_{pv} & V_{pv} are PV module current & voltage.

I_{sh} leakage current

3. HILL CLIMBING ALGORITHM / P&O METHOD

As we have the output power characteristics of the PV system as functions of illumination and temperature curves are nonlinear and influenced by solar illumination and temperature. We have to fetch the maximum power by using some iteration in which we adjust the voltage and measure the power and try to balance the required power and if power is less we need to increase and if the power is more we need to decrease the power[4] .This method also called the perturb and observe method and is most used, It is referred to as a *hill climbing* method, because it depends on the rise of the curve of power against voltage below the maximum power point, and the fall above that point. Perturb and observe is the most commonly used MPPT method due to its easy implementation. Perturb and observe method may result in top-level efficiency, provided that a proper predictive and adaptive hill climbing strategy is adopted. It may possible to have multiple maxima, but overall there is only one true maximum power point.

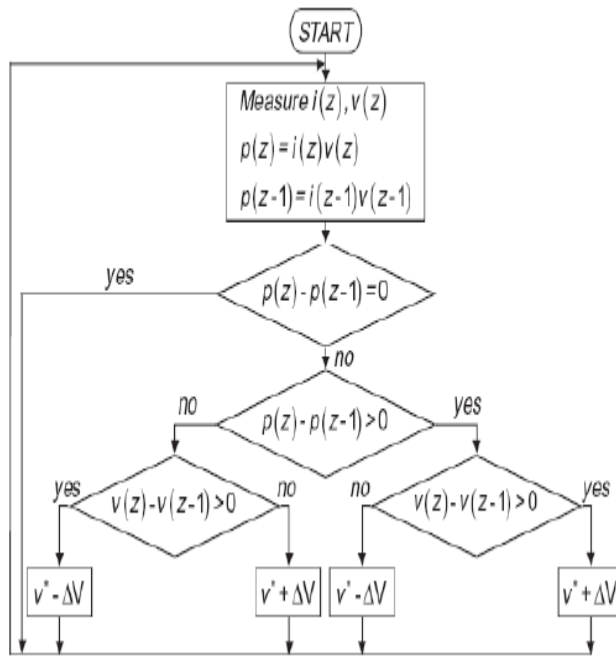


Fig 3: Flow chart of P & O

The algorithm will first measure the current and voltage than calculate the power and along with this calculate the

previous power. Then if the difference of power to the previous power is zero it goes to the start button and if difference is not zero than it compare with the zero. If the difference is greater than zero then it compares the present and previous voltage and if greater than zero than some voltage will add to the present voltage otherwise subtract. And if the power difference is less than the zero it compare the present and previous voltage and if the voltage difference is greater than the zero some voltage need to subtract from the present voltage otherwise add.

4. INCREMENTAL CONDUCTANCE

This method mainly deals with the slope of the PV curve. At maximum power point the slope of the curve will be zero, negative on right side of maximum power point and positive on the left of the maximum power point. Now we need to find the conductance by using I/V [5]. In this method first we measure the current and voltage and find the change in current(ΔI) and voltage(ΔV) by subtracting the previous value from present values. Now if the ΔV is equal to zero we compare ΔI with zero and if coming zero than we need to go at start button and if ΔI is greater to zero than reduce the voltage by ΔV and if not add the voltage in ΔV [6]. Now if the ΔV is not equal to the zero the find addition of current and index factor and compare it with zero, if equal to zero than again go at start otherwise after getting it greater than zero, add ΔV in voltage otherwise subtract ΔV from voltage.[7]

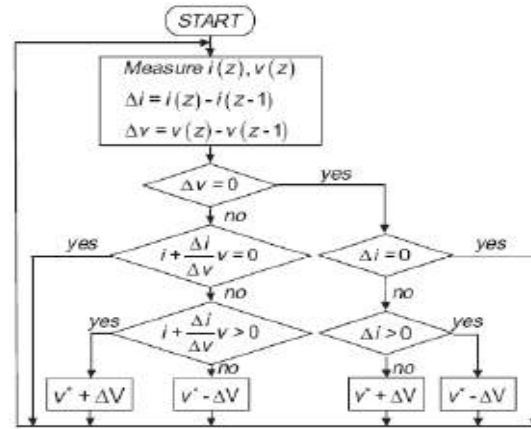


Fig 4: Flow chart of P & O

5. CONSTANT VOLTAGE

In this method output voltage is regulated to a fixed value under all conditions and one in which on a constant ratio the output voltage is regulated to the measured open circuit voltage (V_{OC}). If the output voltage is found to be constant, there is no way to track the maximum power point. We need to adjust the operating voltage only on seasonable basis we assuming lower MPP voltage in summer and higher MPP voltage during winter. where in a particular day the irradiance change is very less the method

is not so much accurate. The power delivered to the load is time to time interrupted and with zero current the open-circuit voltage is measured.

V_{MP} in some cases is programmed by an external resistor connected to a current source pin of the control IC. The method will give around 80% of the available maximum power. The actual performance we can determine by taking average of irradiance.

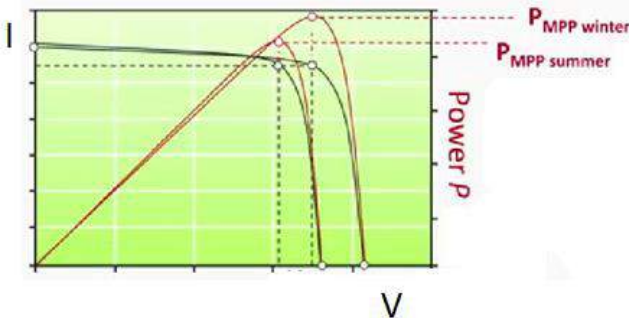


Fig 5: VI characteristics with power

6. SHORT CIRCUIT CURRENT METHOD

This method achieves the Maximum power point by calculating the operating current I_o by current-controlled power converter. And the optimum operating current I_o for maximum power output is proportional to the short-circuit current I_{SC} under different conditions of irradiance level.

$$I_o = k \cdot I_{SC}$$

where k =proportional constant.

Now by using this relation I_o can be determined by finding I_{SC} . So we are getting the relation of I_o and I_{SC} along with the temperature change from 0°C to 60°C. So this method need to mainly find the short circuit current which is somewhat difficult and make other problem related to the voltage calculation of PV because to calculate the short circuit current we need to place one parallel static switch with PV module. And the major problem during this is we can not deliver the power to the load

7. FRACTIONAL OPEN CIRCUIT VOLTAGE

In this method we use the a relationship between the M_{pp} voltage (V_{MPP}) and the open circuit voltage (V_{OC}), which varies with the illumination and temperature[4]

$$V_{MPP} = K \cdot V_{OC}$$

where k is a constant

Now the V_{pp} and V_{MPP} we can find by finding V_{OC} . So now we face the difficulties in finding V_{OC} because we need to remove the load by shut down the converter and another problem is M_{pp} because whenever the illumination change we have to find it again and again. And there are some approximation so real M_{pp} is not possible to calculate. So by choosing pilot cells V_{OC} can be obtain but cost of the system will increases. If the V_{OC} is measured

the V_{MPP} can be easily estimated. This technique is easier compare to the other complicated technique

8. COMPARISON OF METHODS

P&O and incremental conductance both can find the local maximum of the power under the operating condition of PV cell and provide a maximum power point. P&O produce oscillations even in steady state condition of the cell while incremental conductance method is not having the oscillation even in varying illumination condition. But incremental conductance method take more computational time because of slowing down of the sampling frequency and the complexity of the algorithm increased compared to the P&O method.

In the constant voltage method, we assume the voltage value according to the seasonable basis for finding the MPP but in the fractional open circuit voltage, current from the photovoltaic array must be set to zero momentarily to measure the voltage and then afterwards set to a predetermined percentage of the measured voltage. Energy may be wasted during the time the current is set to zero. Although simple and low-cost to implement, the interruptions reduce array efficiency and do not ensure finding the actual maximum power point. However,

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On Line Rotor Fault Detection for Induction Motor Using DSP

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ABSTRACT

The Induction motors are widely used because of enormous merits. The early detection of deteriorating conditions in fundamental stage and its removal is necessary for the prevention of external failure of the induction motors, reducing repairs costs and motor interruption time. Implementation of DSP processor kit to identify the single phasing fault online, base on the stator current and measured results can be analyzed. DSP based architecture of detection of rotor fault allows machine monitoring to be carried out on-line with a consequent increase in the system. This paper presents the fault detection for induction motor drives based on Digital Signal Processor.

Keywords

DSP processor, Induction motor, Rotor fault, Squirrel cage Induction Motor.

1. INTRODUCTION

As we know that induction motors are highly reliable so we cannot avoid the possibility of failure. These failures may be very harmful to the motor and hence initial detection of failure is needed before they can affect the whole operational performance of the system. This kind of early fault diagnosis can increase machinery availability and performance, reduce consequential damage and breakdown maintenance. To avoid the unwanted shutdown and increases the usable life of equipment, one must go for predictive maintenance instead of the regular time based maintenance. This process reduces the possibility of motor failure during operation. By using presaging maintenance we can get the higher reliability and low considerable cost. Therefore fault diagnosis and protection is very important as machine themselves. There are a numerous of systems available for detection of nature and degree of faults in an induction motor. But now days more attention is given to the integration of the diagnosis system into the DSP board containing control algorithm. The external fault detection of an induction motor is done by using DSP. The different types of faults in induction motor are single line to ground fault, double line to ground fault, line to line fault, single phase fault, under and over voltage fault etc. this proposed method is applied to an induction motor using DSP processor kit to identify the single phase fault online base on the stator current and the measured data get analyzed. Research has picked up a religious place in the area of fault

detection of electrical machine. The manufacturers and users of electrical machine initially relied on the simple protection such as over current, over voltage; earth fault etc .to ensures safe and reliable operation. However the tasks performed by these machines can grow increasingly complex, improvements were needed in the field of fault diagnosis. The regular method system has many limitations such as inflexible, high cost, hardware limitations which are heavily dependent upon specialized instruments. In the recent years the fault of electrical machines moved from conventional to intelligent, advanced system. It includes ANN, fuzzy logic, MCSA, etc. As DSP is used in various fields like biomedical, protection, monitoring, signal processing, and military applications etc. it has now also entered in the field of protection of an electrical machine. Owing to recent DSP technology developments, motor fault diagnosis can now be done in real time fashion based on the stator line current, allowing precise and low cost motor fault detection. So it is possible to control the motor and detect the fault at very early stages simultaneously. There are plentiful condition monitoring methods including thermal monitoring, vibration monitoring, chemical monitoring, auditory emission monitoring, but all these monitoring methods require costly efficient sensors and specialized tools, whereas current monitoring out of these cannot required additional sensors. This is because the basic electrical quantities combined with electromechanical plant such as current and voltage are readily measured by tapping into existing the current and voltage transformer that are installed as a part of protection system. So the stator current is used for monitoring and detection of fault in induction motor to DSP.

Digital Signal Processors (DSPs) are microprocessors with the following advantages

- (a) Real-time digital signal processing capabilities. DSPs have to process data in real time, i.e., the correctness of the operation depends on the time when the data processing is completed.
- (b) High throughput. DSPs can save processing of high-speed emerging data, such as audio and multimedia data processing.
- (c) Deterministic operation. The execution time of DSP programs can prepared accurately, thus guarantee for repeatable and desired performance.
- (d) Re-programmability by software. Different system behavior can have capacity to obtain by re-coding the algorithm executed by the DSP instead of by hardware modifications.

DSPs came in the market in the early 1980s. Over the years they have been the key enabling technology for many electronics products in fields such as communication systems, multimedia, automotive, instrumentation and military. Induction motor has advantages, energy supplied to the induction motor is distributed in the two parts, the first is in the form of mechanical output and second is in the form of losses. For the high performance of the motor the motor losses should be small, so the output of motor goes high. An efficient motor not only saves the energy and money, but will also generate less internal heat, and run cooler and quietly. It is also likely to be extensive and more reliable than a less efficient motor.

2. ROTOR BROKEN BAR AND END RING FAULT

It has been showed that 10% faults of entire induction motor deterioration are produced by rotor winding. In an induction motor rotor faults are mainly broken rotor bars because of pulsating load and direct on line starting. It can execute into fluctuation of speed, torque pulsation, vibration, overheating, arcing in the rotor and damaged rotor laminations. The broken rotor bars problem belongs obviously to the rotor related faults. This can be a severe problem with certain induction machines submitted to start-stop constraints. Although broken rotor bars do not initially cause an induction machine to fail and to stop definitively, they can lead to serious secondary effects. The fault mechanism conclude in broken parts of the bar hitting the end windings at high velocity, this can produce serious mechanical damage to the insulation and consequently a winding failure may occur resulting in a costly repair and a lost of production. In hazardous environments, sparking at the fault site during the degradation process can be a potential safety hazard. The reasons for rotor broken bar and end-ring breakage are various and they can be a consequence of thermal stresses due to the overload on the shaft, imbalance in the power supply, hot spots, excessive losses, magnetic stresses generated by electromagnetic forces, imbalanced magnetic pull, electromagnetic noise or vibration, dynamic stresses induce from shaft torque or bearing failure. Various methods for rotor fault detection have been reported in the literature. Motor Current Signature Analysis (MCSA) can diagnose problems such as rotor broken bars, shorted turns in low voltage (LV) stator winding and air gap eccentricity in three-phase induction motor drives. Induction machine stator voltages and currents are measured, recorded and used for calculation of the partial and total input powers and the estimated torque. The different waveforms for the stator current, partial input power, total input power and estimated torque are subsequently analyzed using the Fast Fourier transform (FFT). Use of induced voltage in the stator due to the rotor flux to detect rotor broken bars. An adaptive, analytical, time frequency method for the detection of broken bar is also used.

The reasons for rotor broken bar and end ring breakage are different. These can be produced due to,

- (a) Thermal stresses generated by thermal overload and unbalance, hot spots or excessive losses, sparking mainly found in fabricated rotors,
- (b) Magnetic stresses induced due to electromagnetic forces, unbalanced magnetic pull, electromagnetic noise and vibration,
- (c) Residual stresses due to manufacturing problems,

(d) Dynamic stresses arise from shaft torques, centrifugal Forces and cyclic stresses,

(e) Environmental stresses cause by contamination and can scratch rotor material due to chemicals or moisture,

(f) Mechanical stresses due to lose laminations, fatigued parts, bearing failure etc.

The objective is to identify the fault in their incipient stage to avoid any unwanted shutdown and malfunctioning of motor. In online condition monitoring this objective can be achieve accurately and in very short time.

2.1 Problem Identification

Reliability of a motor operation is especially important where an unexpected shutdown might result in the disturbance of demanding services such as medical, transportation or military, industrial operations where failure potentially could lead to costly maintenance or loss of life. A motor failure that is not identified in an initial stage may become tragic and the induction motor may suffer severe damage. Thus, undetected motor faults may precipitate into motor failure, which in turn may cause production shutdowns. Such shutdowns are costly in terms of lost production time, maintenance costs, and wasted raw materials. Therefore condition monitoring and fault detection of machine is most important. If we study about motor faults, we found that most of the research work has been carried in the area of stator fault. As the stator related faults are 40% so researchers concentrated on the stator faults. Rotor related faults are 10% though percentage of rotor failure is small, if rotor fails then it takes more time to repair, has more production cost. There is lot of work for rotor faults, broken rotor faults, end-ring bar faults. Condition monitoring and fault detection of induction motors is based on the signal processing techniques. The signal processing techniques leads that these are not computationally expensive and these are simple to implement. Therefore fault detection depends on the signal processing techniques is suitable for an automated on-line condition monitoring system. Rotor faults in the stator current of induction motor operating at different load conditions. Most of the researchers it has been found that, stator current get affected due to various faults and maximum information can be extracted from stator current to diagnose various faults. For that purpose signal processing is done. Now a day's digital signal processor has been occupied important place in many areas of engineering including condition monitoring. So, now a day's DSP is being widely used technique to analyze the motor signals to identify the faults at their incipient stage.

2.2 Scope of Work

Problem is identified in the last Chapter and in this Chapter scope of the work is presented. Induction motors are widely used in the industrial drives because of rugged, reliable and economical. While operating induction motor various stresses in the motor such as thermal stress, electrostatic stress, electromagnetic stress and mechanical stress therefore windings get affected. There is possibility to damage stator, rotor winding and bearing. To detect such motor faults are essential to reduce revenue loss and shutdown time. As per literature survey stator faults are 30%, rotor faults are 10%, bearing faults are 40%.The researchers are concentrated on stator and bearing related faults because they are comparatively frequent. Though rotor related faults are low in percentage very few work is done on rotor related faults. There are various traditional methods to monitor the rotor

related faults such as MCSA, FFT and discrete wavelet transform. But there are some drawbacks of the above traditional methods. Such as it is difficult to distinguish broken rotor bar related frequency for measured data using on FFT algorithm. The objective of this seminar is to detect rotor fault using DSP. DSP has real-time digital signal processing capabilities. DSPs commonly have to process data in real time it means the regularity of the operation depends heavily on the time when the data processing is completed. A DSP based architecture for detection of rotor fault allows machine monitoring to be carried out on-line. Stator current of induction motor operating at different load conditions to achieve these two types of fault broken rotor bar fault and unbalance rotor fault are replicated in laboratory and their effects on the spectrum of motor current studied. This supports better understanding the behavior of rotor faults in induction motor.

2.3 Methodology

The following assumptions are made to model the three-phase induction machine

- Space harmonics of the stator and rotor magnetic flux are negligible.
- High permeable iron.
- Stator and rotor windings are sinusoidal assigned time and replaced by an equivalent concentrated winding.
- Magnetic saturation, anisotropy effect, core loss and skin effect are negligible.
- Windings resistance and reactance do not vary with the temperature.
- Currents and voltages are sinusoidal terms.

The motor fault can occur due to various reasons as stator insulation can fail due to different reasons. Initially these are high stator core or winding temperatures, slack core lamination, cut blocks, and joints, loose stimulating for end winding, corruption due to oil, moisture, and dirt, electrical discharges. The reasons for rotor bar and end ring breakages are several. They can be caused by the thermal stresses due to thermal overload and unbalance, hot spots, or excessive losses, sparking mainly found in fabricated rotors, magnetic stresses caused by electromagnetic forces, unbalanced magnetic pull, and electromagnetic noise, and vibration, residual stresses due to manufacturing problems.

There are several main reasons of rotor faults

- During the fixing process in manufacturing the non uniform metallurgical stresses may be constructing into cage assembly and these can also lead to failure during operation.
- A rotor bar may be unable to move linear slots it occupies, when thermal stresses are imposed upon it during starting of machine.
- Heavy end rings can result in large centrifugal forces which can cause dangerous stresses on the bars.

In online condition monitoring method, DSP is used for signal processing to detect the various faults very accurately and at incipient stage. For that purpose different algorithms are used in DSP processor like FFT, WT, etc. so by using the algorithm we can develop the program to monitor the status of online IM.

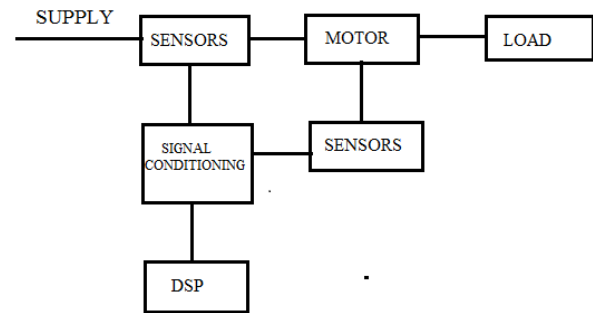


Fig 1: Basic block diagram of induction motor for fault detection using DSP

Figure shows the experimental setup for rotor fault detection method by using DSP. It consists of induction motor, sensor, anti-aliasing filter and DSP controller. In the given fault detection method, the current signal is taken from rotor supply by current sensor. The AC current signal is fed to ADC of DSP through anti-aliasing filter. A sensor is a device that detects events or changes in quantities and provides a corresponding output, generally as an electrical or optical signal. An anti-aliasing filter is a filter used before a signal sampler to restrict the transmission frequency of a signal to approximately satisfy the sampling theorem. A realizable anti-aliasing filter will commonly allow some aliasing factor to occur; the amount of aliasing factor that does occur depends on a design trade-off between reduction of arising and maintaining signal up to the Nyquist frequency and the frequency content of the input signal. The sensor is used to step down current signal. Then the dc signal is fed to ADC of DSP controller. The LCD display is used to monitor the status of three phase induction motor. For that purpose programming should developed for interfacing of DSP with LCD display. We have to also select the algorithm for programming in DSP. According to the programming of DSP. LCD will monitor the status of induction motor.

3. CONCLUSION

In this paper, rotor faults of induction motor based on current analysis using Digital Signal Processing is presented.

4. ACKNOWLEDGMENTS

It is privilege for me to have been associated with Prof. S. S. Dhamal my guide, during this project work. I am thankful to him, for his constant inspiration and valuable guidance, carefully reading and editing my work and always boosting my confidence to complete my work. I would be failing in my duties if I do not make a mention of my family members including my friend Prajakta Patil, my parents and my brothers for providing moral support, without which this work would not have been completely. This kind of work cannot be finished without many others help, even some of them have not aware of their contribution and importance in producing this project work. It is a great pleasure for me to take opportunity to express my gratefulness to all of them.

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Control of Permanent Magnet Synchronous Generator in Wind Energy Conversion System- A Review

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ABSTRACT

The world is now moving forward with an initiative to fasten the growth of renewable sources of energy and to improve the environment quality. Among various renewable sources of energy, wind energy is one of the popular sources which have the potential to fulfill our energy needs. This paper gives an idea about the past papers which provides various concepts about Wind Electric Conversion System using Permanent Magnet Synchronous Generator and to control various parameters like voltage, speed and pitch angle using power electronics converters

Keywords

Permanent Magnet Synchronous Generator, Power electronics converters, Control, Modelling, MATLAB Simulink.

1. INTRODUCTION

Nowadays fossil fuels are not among the attractive solutions to meet the ever increasing energy demand. The world is now moving forward with an initiative to fasten the growth of renewable sources of energy and to improve the environment quality. Among various renewable sources of energy, wind energy is one of the popular sources which can have the potential to fulfill our energy needs. The advantages of using wind energy include, it is green and renewable source of energy, has low energy production cost and is abundant in supply. The area required by the wind turbine is less as compared to other power stations. The wind turbines can be placed in distant locations such as off-shores, mountains and deserts. Wind Energy can prove to be suitable for the supply of electricity, when combined with other sources. The air in motion is called as wind and the kinetic energy associated with wind is called as wind energy. First, with the help of wind turbines, kinetic energy of the wind is converted into mechanical energy and then with suitable wind-energy conversion system, the obtained mechanical energy is converted to other useful forms of energy. When the mechanical energy is utilized to produce electricity, the system is called as wind-electric conversion system. Wind turbine extracts kinetic energy from wind and supplies to generator so as to produce electricity. When wind of high energy passes over specially shaped blades, it induces a lift force. The tangential component of the lift force makes the blade to rotate. In case of low speed wind turbines, low speed is transformed to high speed with the help of gear mechanism. A generator converts the mechanical energy obtained to electrical energy. Power produced by wind turbine is highly sensible to wind speed as wind speeds have high fluctuations with time. So, power produced will be highly fluctuating unless there is a suitable mechanism. Permanent magnet

synchronous generator (PMSG) is a type of synchronous

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generator in which permanent magnets are used in the rotor to create excitation field. The permanent magnets can be mounted on the rotor in various ways. It can be mounted on the surface of the rotor, embedded into the surface of the rotor or it can also be installed inside the rotor. To maximise the efficiency, air gap between the stator and rotor is reduced. Also reduced air gap minimises the amount of rare earth magnet material needed. Permanent magnet design for synchronous generators results in lower cost. It is also used in low power applications.

2. Wind Electric Conversion System

2.1 General description

A typical permanent magnet synchronous generator (PMSG) based wind electric conversion system consists of PMSG coupled with wind turbine through drive train. PMSG is connected to grid through power electronics interfaces, namely machine side converter and the grid side converter. Apart from this, the pitch angle of the rotor blade is controlled using pitch angle controller during the wind speed variation to obtain smooth power. The considered PMSG based WECS is shown using a single line diagram in Fig 1.

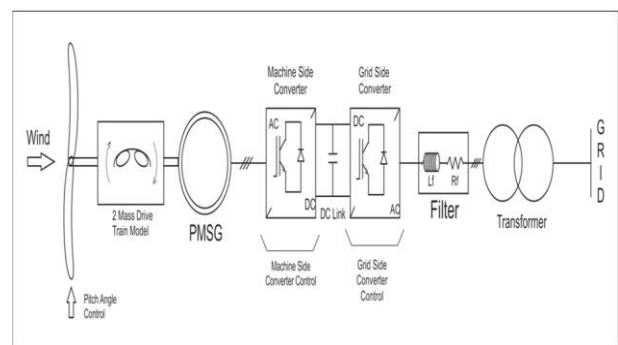


Fig 1: Single Line Diagram of the Wind Electric Conversion System

2.2 Components wise simulation models of PMSG based WECS

2.2.1 Wind Turbine Model

Today the most commonly used Wind Turbine is Horizontal Axis Win Turbine (HAWT). In the Horizontal Axis Wind Turbine, the axis of rotation is parallel to the ground. Wind Turbine control involves the balancing of the requirements like setting upper bounds on, limiting the torque, maximizing

the energy production. Figure 4.6 shows the subsystem used in the modelling the system. From the figure we can see that the input to the turbine is the wind speed and pitch angle due to wind speed variation. The other constructional parameters like the radius of the rotor blade and air density are assumed accordingly and are being fed to the model.

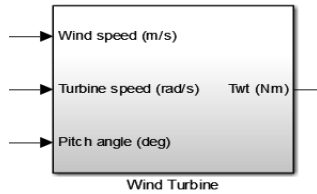


Fig 2: Wind Turbine Subsystem

2.2.2 PMSG Model

A multi-pole Permanent Magnet Synchronous Generator (PMSG) is used for the purpose of modelling the Wind Electric Conversion System. In MATLAB/Simulink, the permanent magnet synchronous machine block is used in the generator mode. The converted torque from the drive train is fed as the input to the input of the Permanent Magnet Synchronous Generator. The output bus of the Permanent Magnet Synchronous Generator includes the necessary signals required for the system modelling. The output signal includes the speed of the rotor in rad/sec, the rotor angle in radian and the electromagnetic torque in N-m. Figure 3 shows the Simulink block of the Permanent Magnet Synchronous Generator.

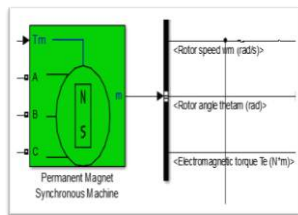


Fig 3: PMSG block in Simulink

2.3 Control Strategies

To analyse the performance parameters of the system, different approaches have been taken by different authors. The main objective is to obtain controlled and smooth voltage along with all the protections and the speed should also be within control.

3. LITERATURE REVIEW

Abedini and Nasiri [2] studied the effect of short circuits on a PMSG based wind electric conversion system using a back to back converter.

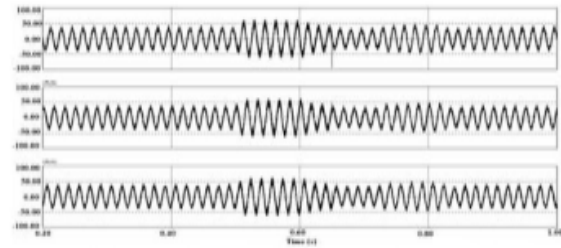


Fig 4: Output Current of the inverter during three phase short circuit with current control algorithm

A model of system was developed to simulate the short-circuit fault in order to evaluate the performance of the system during short circuit fault. Two control algorithms for grid side converter are modelled and their performance is compared.

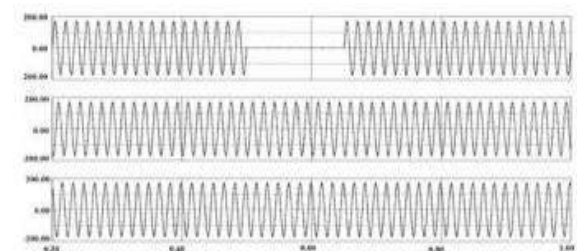


Fig 5: Output Voltage of the inverter during three phase short circuit with voltage control algorithm

Sanchez *et al.* [3] studied the control method and performed dynamic modelling of a wind farm. Variable-speed direct driven PMSG was considered for the study. Wind Turbine Generators (WTGs) that experienced similar wind velocities were all grouped together and was made into an equivalent aggregated WTG model. They introduced a simplified wind farm modelling approach. Simulation results demonstrate the effectiveness of the proposed simplified models and control systems for the individual WTGs and also for the entire wind farm, if the wind distribution across each WTG is regular.

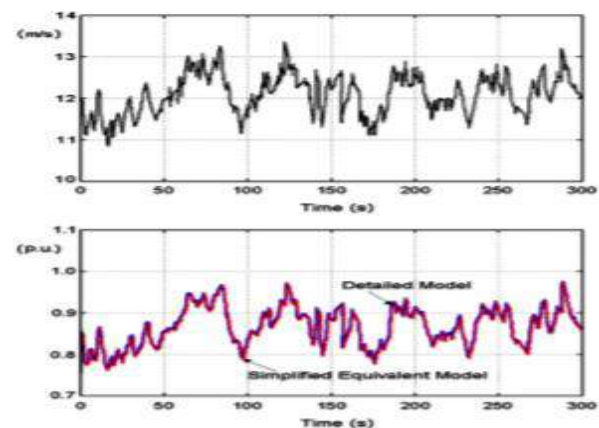


Fig 6: Comparison of wind farm detailed model and simplified equivalent model under real wind wind fluctuation

Jauch *et al.* [4] described the design of a Proportional, Derivative and Integral (PID) pitch angle controller for a fixed speed active-stall wind turbine using the root locus method. The controller functioned to enable an active-stall wind turbine and to perform power system stabilization. The transfer function of the wind turbine was derived from the wind turbine step response and with the help of that, controller was designed. The wind turbine model was connected to the pitch angle controller and then to a power system model. Then the performance of the designed controller was verified by simulation. In the example simulated here the power system oscillations to be damped are grid frequency oscillations. It is found that damping of grid frequency oscillations is possible in most of the wind speeds of the wind turbine's operating range, but not in all.

Busca *et al.* [5] implemented control technique on a PMSG with wind turbine. The control techniques were Direct Torque Control (DTC) and Field Oriented Control (FOC). Two control strategies were analyzed by considering the generator side converter. Results of the control technique showed similar behavior. The controllers were designed considering similar design requirements and same modulation technique was used.

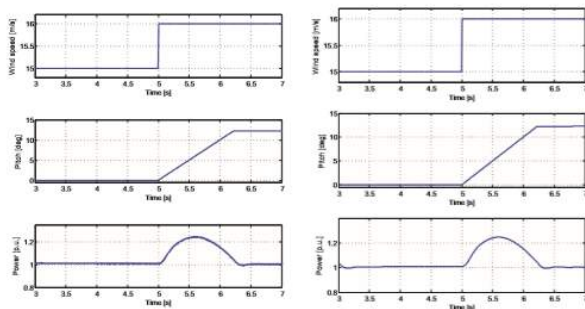


Fig 7: Comparison plot between the DTC Control and FOC control strategy

Results of the WTS simulation were shown for both FOC and DTC-SVM control strategies. Very similar results were obtained with both control strategies as they use the same modulation technique (SVM) and the controllers were designed considering similar design requirements.

Mary *et al.* [6] analysed wind turbine based PMSG system. In the analysed system, rotor shaft was directly coupled to the generator and no gearbox was used. The generator was connected to the grid. An AC/DC/AC converter was used which constituted of an uncontrolled diode rectifier, an internal and a PWM inverter. The DC-Link which was modelled comprises of a capacitor

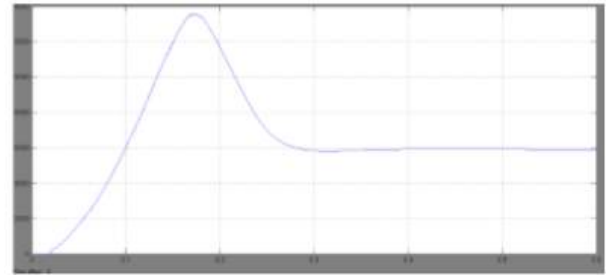


Fig 8: Variation of Power versus Time for Wind Turbine.

The inverter control uses SVPWM technique. The model has been implemented in MATLAB/Simulink in order to validate it. Power-time characteristics have been obtained.

López-Ortiz *et al.* [7] presented the implementation and simulation of a controlled PMSG wind turbine in the $dq0$ reference frame under Simulink environment. They considered a current control subsystem, a PMSG model, a mechanical subsystem, a pitch angle controller and a wind turbine model in their simulation.

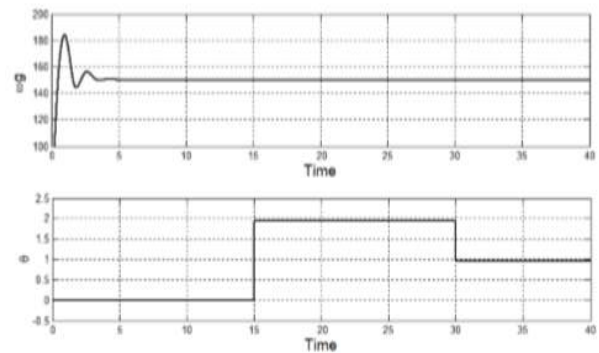


Fig 9: Generator speed and angle variation during wind speed variation

The results presented show that the speed and the pitch angle controller of the PMSG developed in this investigation produce satisfactory control actions and can be used to control a PMSG WT.

Mahersi *et al.* [8] presented the modelling of a wind power generation system based on PMSG. In the study, two control strategies, namely the vector control and the sliding mode control, were applied to a PMSG directly connected to the wind turbine. Simulation results show that the PMSG is suitably adapted for wind power generation systems with high performance of the speed, flux and torque with the vector control.

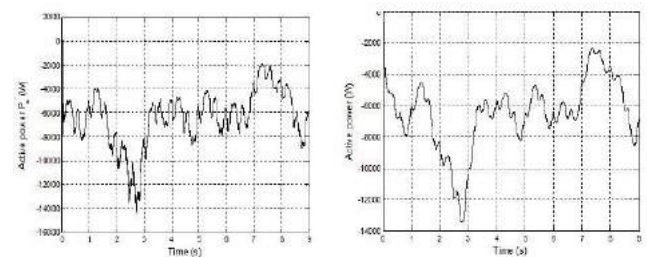


Fig 10: Comparison plot for stator active power using vector control and sliding mode control method

To show the validity of the mathematical analysis and to investigate the performance of the proposed nonlinear control scheme, simulations works are carried out for the drive system using MATLAB SIMULINK.

González-Longatt *et al.* [9] presented a simplified model of variable speed wind turbines for simulation.

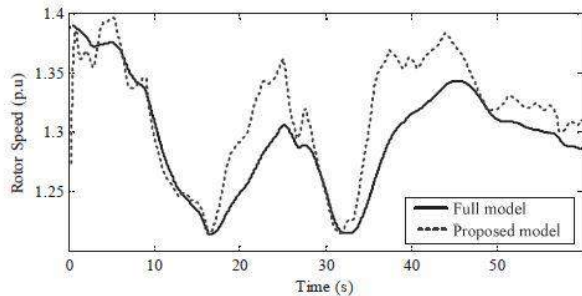


Fig 11: Rotor speed versus time of the proposed system theoretical results and simulation results

The model was prepared on the basis of the use of controls oriented system. It included permanent magnet synchronous generator for supplying voltage to bus system. The model also included torque/load properties. The flux linkage equations were used to model the system. The simulation of the PMSG was fast and was not complex. All the required parameters were obtained from the experimental results.

Kim *et al.* [10] presented variable-speed wind turbine equipped with a permanent-magnet synchronous generator. They presented the control scheme of the system. The system implemented full-scale back-to-back voltage source converter. Wind-turbine control and the power-converter control were both considered as control scheme to study the system. The detailed models of an industrial site with multiple wind turbines were developed and were used to perform simulation studies and evaluate alternative control solutions. To ensure reliable operation of the supervisory reactive power control scheme, can be applied to larger wind farms and network configurations.

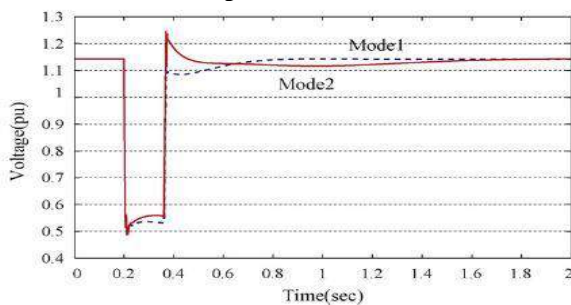


Fig 12: Voltage observed at the PCC due to Fault

Colak *et al.* [11] studied the modelling of a permanent magnet synchronous generator with wind turbine on LabVIEW. The voltage control of the model was done with artificial neural network. Considering the dynamic nature of the wind, the excitation circuit was controlled by artificial neural network.

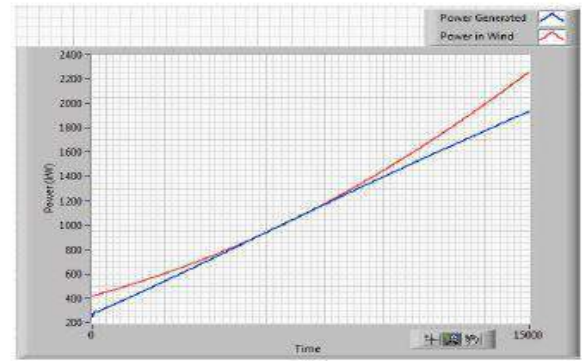


Fig 13: Power results

In this study modeling of a wind turbine with PMSG was carried out. The developed simulation includes a horizontal axis wind turbine, electrical and mechanical models of PMSG and power electronics circuits. As a result of the simulations performed, it is observed that in power control, ANN controller gives fast responses.

Sim *et al.* [12] presented a ride-through skill of PMSG based wind energy conversion system under the distorted and unbalanced grid voltage dips. To reduce the extracted power from wind during a grid fault, two methods were used, pitch control to reduce power coefficient and the blade speed control to change the tip speed ratio. In the proposed method, the grid voltage phase is detected with positive sequence voltages and current reference correction is used to reduce the harmonics of the active and reactive currents to the grid.

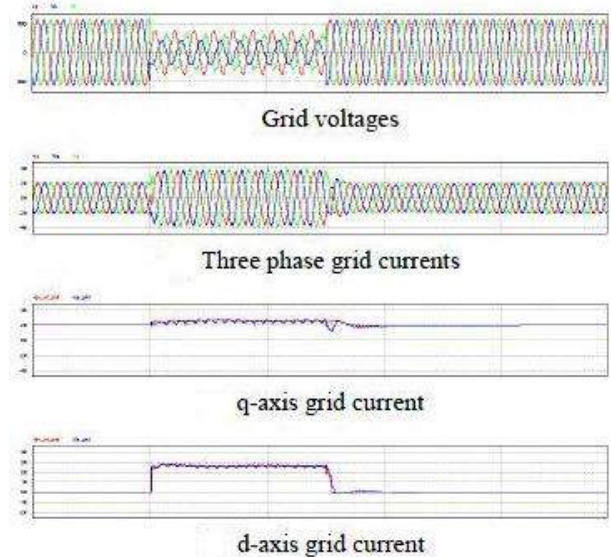


Fig 14: System performance results under distorted unbalanced grid conditions

4. CONCLUSION AND DISCUSSION

The main purpose of this paper is to give an idea on the research activities on permanent magnet synchronous generator (PMSG) based wind electric conversion system.

For voltage control, different techniques using several combination of power electronics converter are designed and tested and the results are hence compared.

For speed, Direct Torque control (DTC) and Field Oriented Control (FOC) techniques are compared and results for the two are analyzed.

Pitch regulated Techniques and Stall regulated techniques are compared for different power ratings and the results are analyzed.

From all the above studies, it is clear that Permanent magnet Synchronous Generator coupled with Wind turbines suitable for a range of power application with lower cost applications.

5. ACKNOWLEDGMENTS

My sincere thanks to the experts, scientists and research scholars, who have contributed towards development of this paper.

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DIRECT TORQUE CONTROL FOR DOUBLY- FED INDUCTION MACHINE BASED WIND TURBINES

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ABSTRACT

This paper proposes a control strategy for Doubly fed Induction machine based wind turbine by generating a rotor flux amplitude. It is designed to address disturbance, as voltage dips, by keeping the torque of the wind turbine in control, and considerably reducing the currents of stator and rotor during fault. The direct torque control provides fast dynamic control and also the overall control of wind turbine. The proposed control strategy does not totally eliminate the requirement of crowbar protection of wind turbines, but during low voltage dips it eliminates the activation of this protection. The main objective is to control the voltage dips and to reach the constant voltage by using direct torque control system. By using this control strategy we can generate power for different speed of wind to get a constant voltage.

1. INTRODUCTION

This paper is focused on the analysis on the control of doubly fed induction machine (DFIM) based high-power wind turbines operation under the presence of voltage dips. Wind turbines with a back-to-back converter sized to approximately 30% of the nominal power is being constructed by most of the wind turbine manufacturers. This reduced converter design stimulate that when a voltage dips affects the machine operation, a special crowbar protection is to be provided in order to avoid destruction in the wind turbine and fulfil the grid requirements. The main objective of the control strategy proposed in this paper is to abolish the necessity of the crowbar protection when low-depth voltage dips occur. Hence, by using direct torque control (DTC), with the generation of proper rotor flux, it is possible to maintain the grid connection of the machine during the fault and the power generation is unaffected. And it is also possible to decrease over currents, and remove the torque swing that causes such voltage dips.

1.1 Crowbar Protection

A crowbar circuit is a protection circuit, if the voltage or current violate the limits the crowbar circuit will short-circuits ("crowbars") the supply line. In general, which result in blow of fuse or triggers other protection effectively disconnecting the supply. It is achieved by a thyristor or other semiconductor device, or by a mechanical shorting device. It is operated by shorting the voltage source or providing a low resistance path across the voltage source. Crowbar circuits are generally implemented using a thyristor or a thyatron as the shorting device. As triggered, they depend on the current-limiting

circuitry of the power supply or, if it fails, the fuse connected to the line blows or opening the circuit breaker contacts.

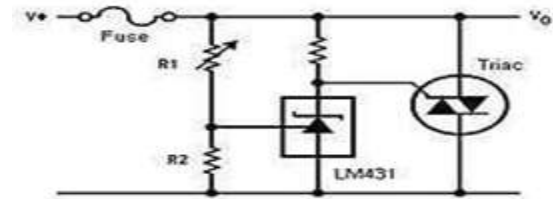


Fig-1 Equivalent Circuit of Crowbar Protection

A crowbar circuit is different from a clamp circuit, in clamp circuit once it is activated; it brings the voltage below the triggering level, usually close to ground. A clamp stops the voltage from overshooting a predetermined level. Thus, when the overvoltage condition is removed a crowbar will not automatically return to normal operation, the power must be removed entirely to stop its conduction.

An active crowbar is a crowbar that can remove the short circuit of the line when the transient condition is over thus allowing the device to regain normal operating condition. Active crowbars use a transistor, gate turn off (GTO) thyristor or forced commutated thyristors instead of a thyristor to short circuit the line. Active crowbars are commonly used to protect the frequency converter connected to the rotor circuit of doubly fed induction generators against Large voltage and current transients produced by the voltage dips in the power system network.

The advantage of a crowbar over a clamp circuit is that it carry the low holding voltage and higher fault current without dissipating much power (which could otherwise cause overheating). Also, a crowbar is more likely than a clamp to deactivate a device (by blowing a fuse or tripping a breaker), bringing attention to the faulty equipment. Although this power supply overvoltage protection circuit is widely used, it does have some limitations. Most of these are associated with the zener diode. The zener diode is not adjustable, and these diodes come with at best a 5% tolerance.

An over voltage crowbar protection circuit using a silicon controlled rectifier or SCR Power supplies are normally reliable, but if they fail then they can cause significant damage to the circuitry they supply on some occasions. The SCR overvoltage crowbar protection circuit provides a very simple but effective method of protecting against the certain types of power supply failure.

2. CONTROL OF DOUBLY-FED INDUCTION GENERATOR

Doubly-fed electric machines are electric motors or electric generators that have windings on both stationary and rotating parts, where both windings transfer significant power between shaft and electrical system. Doubly-fed machines are useful in applications that require varying speed of the machine's shaft for a fixed power system frequency.

As the penetration of large scale wind turbines into electric power grids continues to increase, electric system operators are placing greater demands on wind turbine power plants. One of the most challenging new interconnection demands for the doubly fed induction generator (DFIG) architecture is its ability to ride through a short-term low or zero voltage event at the point of common coupling (PCC), resulting from a fault on the grid. During extreme voltage sags high per unit currents and shaft torque pulsations occur unless mitigating measures are taken.

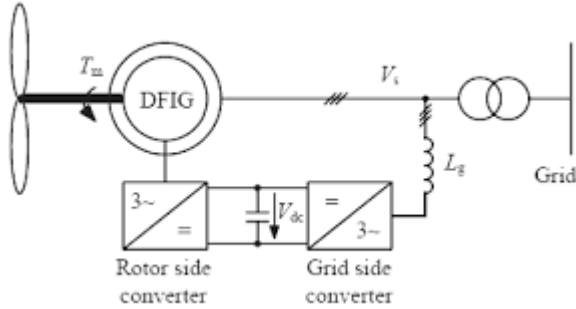


Fig-2 Double Fed Induction Generator

The wound-rotor doubly-fed electric machine is the only electric machine that operates with rated torque to twice synchronous speed for a given frequency of excitation (i.e., 7200 rpm @ 60 Hz and one pole-pair versus 3600 rpm for singly-fed electric machines). Higher speed with a given frequency of excitation gives lower cost, higher efficiency, and higher power density.

In practice, the classical wound-rotor doubly-fed "induction" electric motor or generator system has known issues of instability, high maintenance and inefficiency of an integral multiphase slip-ring assembly, and discontinuity about synchronous speed where induction ceases to exist. A practical wound-rotor doubly-fed electric machine system that does not rely exclusively on asynchronous (i.e. induction) principles while symmetrically motoring or generating over its entire speed range has never materialized from the electric machine establishment, despite years of research to find an evolutionary brushless, synchronous, and stable control technology. Consequently the wound-rotor doubly-fed induction electric machine has been forced into antiquity, except in large installations where efficiency and cost are critical over a limited speed range, such as wind turbines.

When the DFIG is connected to a network, connection must be done in three steps which are presented below the first step is the regulation of the stator voltages with the network voltages as reference. The second step is the stator connection to this network. As the voltages of the two devices are synchronized, this connection can be done without problem. Once this connection is achieved, the third step, is the power regulation between the stator and the network.

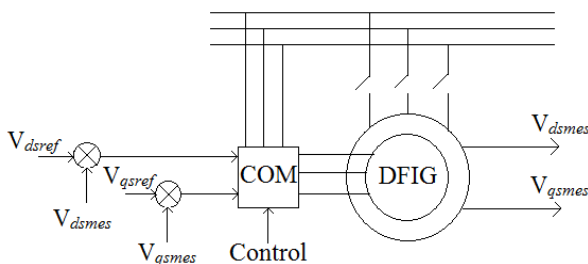


Fig-3: Without Stator Connection

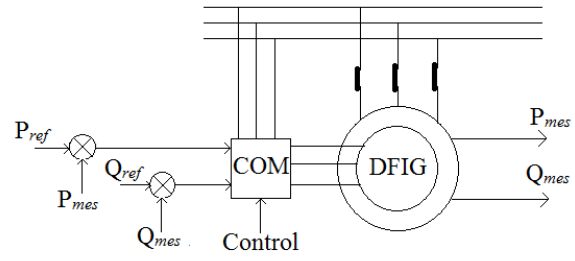


Fig-4: With Stator Connection

The electronic controller, a frequency converter, conditions bi-directional (i.e., four quadrant), speed synchronized, and multiphase electrical power to at least one of the winding sets (generally, the rotor winding set). Using four quadrant controls, which must be continuously stable throughout the speed range, a wound-rotor doubly-fed electric machine with two poles (i.e., The electronic controller, a frequency converter, conditions bi-directional (i.e., four quadrant), speed synchronized, and multiphase electrical power to at least one of the winding sets (generally, the rotor winding set). Using four quadrant controls, which must be continuously stable throughout the speed range, a wound-rotor doubly-fed electric machine with two poles (i.e., one pole-pair) has a constant torque speed range of 7200 rpm when operating at 60 Hz.

Due to the lack of damper windings used in synchronous machines, the doubly fed electric machines are susceptible to instability without stabilizing control. Like any synchronous machine, losing synchronism will result in alternating torque pulsation and other related consequences.

3. DIRECT TORQUE CONTROL (DTC)

Direct Torque Control (DTC) is a method that has emerged to become one of the possible alternatives to the known Vector Control of Induction Motors. This technique gives a good performance with a simpler structure and control. However, the evolution of AC variable speed drive technology has been driven partly by the desire to emulate the excellent performance of the DC motor, such as fast torque response and speed accuracy, while using rugged, inexpensive and maintenance free AC motors. DTC offers direct control the stator flux and the torque by selecting the appropriate inverter switching state.

A variety of techniques have been proposed to overcome some of the drawbacks present in DTC. Some solutions proposed are: DTC with Space Vector Modulation (SVM), the use of a duty-- ratio controller to introduce a modulation between active vectors chosen from the look-up table and the zero vectors, use of artificial intelligence techniques, such as Neuro-Fuzzy controllers with SVM. These methods achieve some improvements such as torque ripple reduction and fixed switching frequency operation. However, the complexity of the control is considerably increased.

A different approach to improve DTC features is to employ different converter topologies from the standard two-level VSI. Some authors have presented different implementations of DTC for the three-level Neutral Point Clamped (NPC) VSI. This paper presents a new control scheme based on DTC designed to be applied to an Induction Motor fed with a three-level VSI. The major advantage of the three-level VSI topology when applied to DTC is the increase in the number of voltage vectors available. This means the number of possibilities in the vector selection process is greatly increased and may lead to a more accurate control system, which may result in a reduction in the torque and flux ripples

4. WIND ENERGY GENERATION SYSTEM BASED ON THE DFIM

4.1 Proposed System

Fig-3 and fig-4 shows the wind turbine generation system together with the proposed control block diagram. The DFIM is supplied by a back-to-back converter through the rotor, while the stator is directly connected to the grid. This letter only considers the control strategy corresponding to the rotor side converter. The grid-side converter is in charge to keep controlled the dc bus voltage of the back-to-back converter and the reactive power is exchanged through the grid by this. As can be noticed from, the DFIM control is divided into two different control blocks. A DTC that controls the machine's torque (T_m) and the rotor flux amplitude ($|\psi_r|$) with high dynamic capacity, and a second block that generates the rotor flux amplitude reference, in order to handle the voltage dips. When the wind turbine is affected by a voltage dip, it will need to address three main problems:

- 1) From the control strategy point of view, the dip produces control difficulties, since it is a perturbation in the winding of the machine that is not being directly controlled (the stator).
- 2) The dip generates a disturbance in the stator flux, making necessary higher rotor voltage to maintain control on the machine currents.

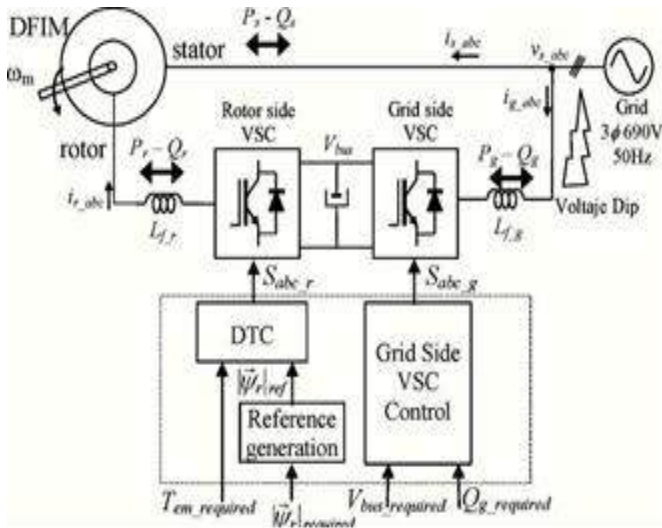


Fig-5: Wind Energy Generation System Based on the DFIM.

- 3) If not special improvements are adopted, the power delivered through the rotor by the back-to-back converter, will be increased due to the increase of voltage and currents in the rotor of the machine, provoking finally, an increase of the dc bus voltage.

Taking into account this, depending on the dip depth and asymmetry, together with the machine operation conditions at the moment of the dip (speed, torque, mechanical power, etc.), implies that the necessity of the crowbar protection is inevitable in many faulty situations. However, in this letter, a control strategy that eliminates the necessity of the crowbar activation in some low depth voltage dips is proposed. As depicted in the proposed rotor flux amplitude reference generation strategy, adds a term ($\Delta|\psi_r|$) to the required reference rotor flux amplitude according to the following expression:

$$\Delta|\vec{\psi}_r| = |\vec{\psi}_m| - \frac{|V_m|}{\omega_m}$$

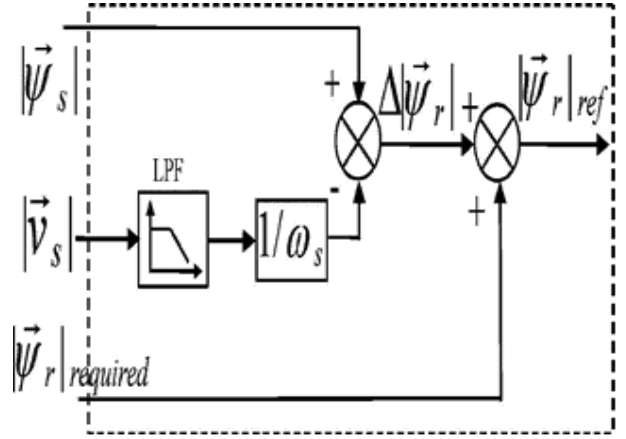


Fig-6: Rotor Flux Reference Generation Strategy

5. CONCLUSION :

The main objective is to show the DFIM behave or when a low depth [in this case 30%, as in symmetric voltage dip occurs with and without the proposed flux reference generation strategy and at nearly constant speed. During the dip, it is desired to maintain the torque controlled to the required value (20%), allowing to eliminate the stator flux amplitude. It must be pointed out that DTC during faults is a well-suited control strategy to reach quick flux control dynamics, as well as to dominate the situation, eliminating torque perturbations and avoiding mechanical stresses. Consequently, the proposed control schema maintains the stator and rotor currents under their safety limits, avoiding high over currents, either in the voltage fall or rise stresses to the wind turbine. This issue is achieved, as shown in only if the oscillatory rotor flux is generated. For this purpose, the rotor flux is generated according to the block diagram of, generating an equivalent oscillation to However, as predicted in theory, it is hard to avoid a deterioration of the quality of these currents. Nevertheless, if the rotor flux is maintained constant, the currents will go further till their limit values, as, provoking in a real case, a disconnection of the wind turbine or an activation of the crowbar protection. Moreover, by mitigating the over currents of the rotor, the back-to-back converter is less affected by this perturbation, producing short dc bus voltage oscillations. Finally, it can be said that the proposed control is useful at any operating point of the wind turbine, as well as at any type of faults (one phase, two phases, etc.). The performance will be limited only, when the rotor voltage required is higher than the available at a given dc bus voltage. The proposed control strategy mitigates the necessity of the crowbar protection during low depth voltage dips. In fact, the dc bus voltage available in the back-to-back converter, determines the voltage dips depth that can be kept under control.

6. ACKNOWLEDGMENTS

Fore mostly, I would like to express my sincere gratitude to my guide Prof. Dipti Patil, for his valuable support and guidance during this work. His presence and encouragement during "ups and downs" in this work, and his clarity and focus during the uncertainties have very helpful to me. I look forward to his guidance in future. I would like to thank Dr. S.R. Deore, Head of Electrical Engineering Department and Dr. D.G. Borse, Principal for his useful guidance and suggestions during this work. Finally, I am grateful to my classmates for supporting me in my studies, and for giving me their time when I needed during this work.

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THERMOELECTRIC CANDLE POWER

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ABSTRACT

Nowadays the world has been experiencing global warming due to excessive release of energy into atmosphere. Today, a lot of research is being conducted on ways in order to recover or reuse the energy losses. An experimental investigation has been carried out to identify the most suitable heat energy usage techniques to achieve a stable and sustainable power output. Suitable thermoelectric generator (TEGs) are available which convert waste heat energy into electricity. Testing was conducted using a candle flame as a heat source to produce temperature with the maximum temperature of around 200°C. An electronic circuit is used to provide a constant stable and sufficient power. The use of suitable cooling system and TEM was found by investigating the module parameters such as the temperature difference of hot to cold side, number of thermoelements and internal resistance. This research contributes in saving energy and reducing the dependency on primary energy sources (AC power or battery).

Keywords: Seebeck effect, Thermoelectric generation, Thermoelectric module, Booster circuit, Heat source.

1. INTRODUCTION

Typically thermoelectric generation is conversion of thermal to electric energy with no moving parts. Thermoelectric generators can be applied in a variety of applications. Frequently, thermoelectric generators are used for low power remote applications or **where** bulkier but more efficient heat engines such as Stirling engines would not be possible. Unlike heat engines, the solid state electrical components typically used to perform thermal to electric energy conversion have no moving parts. The thermal to electric energy conversion can be performed using components that require no maintenance, have inherently high reliability, and can be used to construct

generators with long service free lifetimes. This makes thermoelectric generators well suited for equipment with low to modest power needs in remote uninhabited or inaccessible locations such as mountaintops, the vacuum of space, or the deep ocean.

2. Principle

Seebeck effect-

The Seebeck effect is a phenomenon in which a temperature difference between two dissimilar electrical conductors or semiconductors produces a voltage difference between the two substances. The Seebeck effect is a classic example of an electromotive force (emf) and leads to measurable currents or voltages in the same way as any other emf. Electromotive forces modify Ohm's law by generating currents even in the absence of voltage differences (or vice versa)

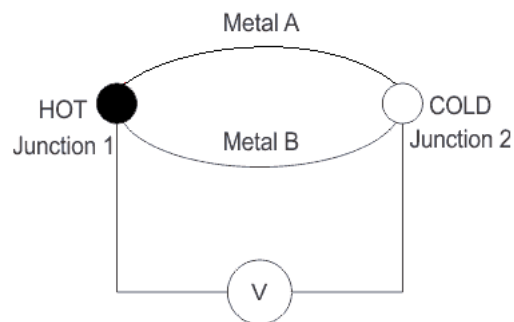


Fig.1:-Principle diagram

MODEL DESCRIPTION:

The prototype can be divided into three major parts:

PART 1 –

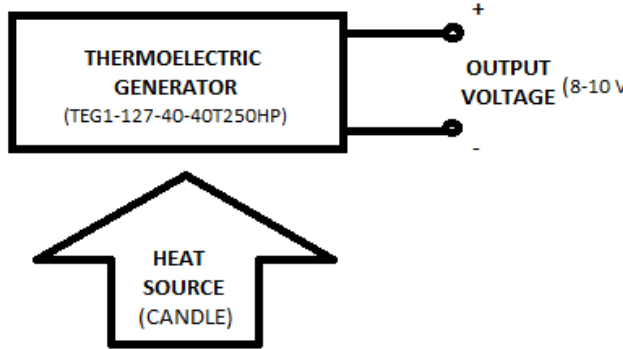


Fig.2 -Part 1 setup

Part 1 consists of complete assembly of heat source(candle), thermoelectric generator (TEG1-127-40-40T250HP) or equivalent, tripod stand, heat sink.

TEG requires hot(150-200°C) and cold(30-50°C) side to generate some voltage.

TEG is heated at one side by heat source(candle) and another side is maintained as cold side (using heat sink of suitable size).this assembly results in flow of electrons from hot side to cold side. This flow of electrons finally results into generation of potential difference. This potential difference results into open circuit voltage of 8-10 volts.

PART 2 – Booster circuit

A boost converter (step-up converter) is a DC-to-DC power converter with an output voltage greater than its input voltage.

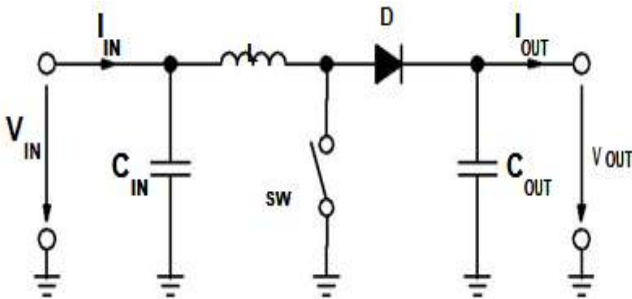


Fig.3 :- Boost converter

Necessary Parameters of the Power Stage

The following four parameters are needed to calculate the

power stage:

1. Input Voltage Range: $V_{IN(min)}$ and $V_{IN(max)}$
2. Nominal Output Voltage: V_{OUT}
3. Maximum Output Current: $I_{OUT(max)}$
4. Integrated Circuit used to build the boost converter. This is necessary, because some parameters for the calculations have to be taken out of the data sheet.

If these parameters are known the calculation of the power stage can take place.

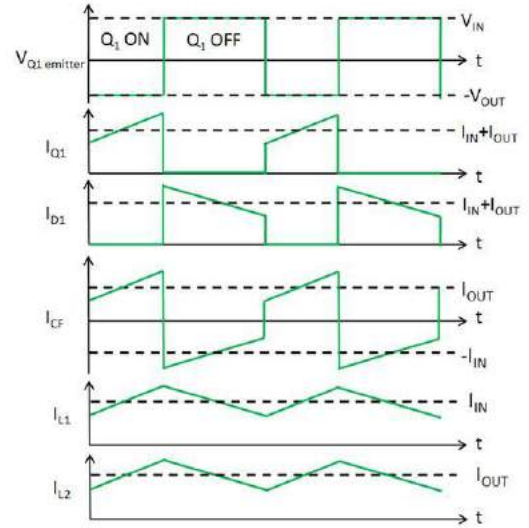


Fig.4 :-Booster circuit waveform

Calculation of maximum switch current:

The first step to calculate the switch current is to determine the duty cycle, D , for the minimum input voltage. The minimum input voltage is used because this leads to the maximum switch current

$$D = 1 - [(V_{IN(min)} * \eta) / V_{OUT}]$$

$V_{IN(min)}$ = minimum input voltage

V_{OUT} = desired output voltage

η = efficiency of the converter, e.g. estimated 80%

The efficiency is added to the duty cycle calculation, because the converter has to deliver also the energy dissipated. This calculation gives a more realistic duty cycle than just the equation without the efficiency factor.

The next step to calculate the maximum switch current is to determine the inductor ripple current. In the converters data sheet normally a specific inductor or a range of inductors is named to use with the IC. So either use the recommended inductor value to calculate the ripple current, an inductor value in the middle of the recommended range or, if none is given in the data sheet, the one calculated in the Inductor Selection section of this application note.

$$\Delta I_L = [V_{IN(min)} * D] / F_s * L.$$

$V_{IN(min)}$ = minimum input voltage

D = duty cycle calculated in Equation 1

f_s = minimum switching frequency of the converter

L = selected inductor value

Now it has to be determined if the selected IC can deliver the maximum output current.

$$I_{max\ OUT} = [I_{Lmin} - (\Delta I_L / 2)] * (1 - D)$$

$I_{LIM(min)}$ = minimum value of the current limit of the integrated switch (given in the data sheet)

I_L = inductor ripple current calculated in Equation 2

D = duty cycle calculated in Equation 1

Table.1 - booster circuit components

L1	RF Choke	100 micro Henrie
Q3	Power MOSFE	IRF510
C1	Capacitor	.01 micro Farads
D1	Diode	1N4148

PART 3 :

- The booster converter transforms the voltage according to the load requirement
- this power is fed to a load which can be an led or a fan.

3. ADVANTAGES

The following are the major advantages of this project.

- Thermoelectric Generators are primarily used as remote and off-grid power generators for unmanned sites. They are the most reliable power generator in such situations as they do not have moving parts (thus virtually maintenance free), work day and night, perform under all weather conditions, and can work without battery backup
- Global Thermoelectric (Canada) has Hybrid Solar-TEG solutions where the Thermoelectric Generator backs up the Solar-PV, such that if the Solar panel is down and the backup battery backup goes into deep discharge then a sensor starts the TEG as a backup power source until the Solar is up again. The TEG heat can be produced by a low pressure flame fueled by Propane or Natural Gas.
- Many space probes, including the Mars *Curiosity* rover, generate electricity using a radioisotope thermoelectric generator whose heat source is a radioactive element.
- Cars and other automobiles produce waste heat (in the exhaust and in the cooling agents). Harvesting that heat energy, using a

thermoelectric generator, can increase the fuel efficiency of the car.

- Environmentally friendly
- Recycles wasted heat energy
- Scalability, meaning that the device can be applied to any size heat source from a water heater to a manufacturers equipment.
- Reliable source of energy
- Lowers production cost
- Maintenance free

4. LIMITATIONS

The following are the major disadvantages of this project :

- Low energy conversion efficiency rate

Slow technology Progression

- Limited Applications
- Requires relatively constant heat source
- Lack of customer/industry education about thermoelectric generators

5. FUTURE SCOPE

- Automotive-An automotive thermoelectric generator (ATEG) is a device that converts some of the waste heat of an internal combustion engine (IC) into electricity using the Seebeck Effect
- Microprocessors generate waste heat. Researchers have considered whether some of that energy could be recycled
- Thermoelectric generator can be used to produce electric power on the deep-ocean offshore seabed using the temperature difference between cold seawater and hot fluids released by hydrothermal vents, hot seeps, or from drilled geothermal wells.
- The TEGS can be used to utilize the waste heat in factories (chimneys), thermal power plants (boilers , cooling towers).

6. CONCLUSION

The TEM which has large number of thermoelements (n-type and p-type) that are connected in electrical series and thermal parallel, the high generated voltage will produce. The generated voltage is proportional to the temperature different when multiple thermo elements are connected together to form a Thermoelectric Module (TEM). However, the current became low due to thermal losses between hot and cold side of the module. In this work, the good thermal reservoir is used to release and maintain the temperature difference. This study is presented to identify type of TEMs and system that can produce the higher, stable and efficient power energy. As the result, the TEM is the most stable performance and efficient because it has a large number of thermo elements, tall element type and has high thermal resistance.

Thus the goal of our project is to provide a reliable source of energy using a compact portable assembly having no maintenance cost as it doesn't possess any mobile part and they work day and night, perform under all weather conditions, and can work without battery backup. This is a reliable source of electricity for the remote areas where electricity has not yet reached and can be used as a backup source while power cuts. The most important part of the project is it utilizes the potential of a candle to produce electricity.

7. ACKNOWLEDGMENT

Our sincere thanks to our department and faculties whose constant help and support helped us in making this paper.

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PROTOTYPE OF THREE-PHASE FAULT DETECTION TECHNIQUE

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Abstract:

This paper is based upon the ideology of protection and detection of asymmetrical faults that occur in the power system. The faults that can be detected by this prototype are line to line fault (LL), line to ground fault (LG) and double line to ground fault (LLG). The entire setup of this prototype is based upon 3 major sections. The first section consists of a combination of relays, rectifiers, filters, regulators and fault switches. The second part consist logic gate network that take the output from the section 1 as its input and indicate what kind of fault is being occurred on the system. Also by this section of the system we provide a complete analogical approach towards the concept of fault detection. The third and the final section consist of a microcontroller that takes the output of the second section and provide protection to the circuit by triggering the protection relays connected to the input of the first section. Thus by this prodigy the protection to the circuit is provided and also successfully demonstrated.

Keywords:

protection and detection of asymmetrical faults, logic gate network, indicate kind of fault
analogical approach, microcontroller

1.INTRODUCTION:

Faults can be explained as a occurrence in the system that creates an abnormal condition or a unnecessary change in the equilibrium state of the system. The prospective of providing a necessitate approach to the existing system such that the normal and desired operation isn't affected and synonymous to that protection to the respective system is served is called as fault protection. The major reason for the protection to the power system is that the transmission and consumption of power is a never ending process and an interruption or malfunction to such a system would result in major technological and financial setback. When dealing with very high voltages protection to the system is an essential aspect, especially when the load demand is constantly consuming power and is increasing. When the

operating voltages are ranging is thousands even a slight fault would create a major mayhem and ultimately would be financially and economically undesirable. Hence in order to avoid such a condition in the system we require a prospective which ensures smooth operation of the power system and guarantees a safeguard to the system as and when required. The faults that occur in a three phase system are known as three phase faults. The three phase faults can be classified into two major types i.e. Symmetrical and Asymmetrical faults. The asymmetrical faults can be further classified into three types namely,

- ✓ Line to Ground fault (L-G Fault)
- ✓ Line to Line fault (L-L Fault)
- ✓ Double Line to Ground fault (LL- G Fault)

A fault can be termed as a Line to Ground fault when there's short circuit amongst an active line and the ground. Similarly a fault can be termed as a Line to Line Fault when two lines are shorted for an unnecessary contact. Also synonymous to that a fault is terms as Double Line to Ground Fault when two lines are shorted together to the ground terminal. This project deals with the above mentioned three faults and demonstrates a way of detecting it and providing protection from the same. The project concerns itself about the concept of fault detection and revolves around two kinds of approach. One is the analogical approach which consists of only analogical components like relays, transformers, rectifiers, filters and regulators. It serves us the major concept of fault detection. Whereas the second approach can be termed as a digital approach in which a microcontroller is being employed which deals with the protection of the system.

2.MAJOR SECTIONS

The following are the major sections of the proposed system:-

- ✓ The Start – Delta Input Circuit
- ✓ The Logic Network
- ✓ Microcontrollers Operated Indication & Protection

2.1 The Star-Delta Input Circuit:

This part deals with incoming of supply and the fact of stepping the voltage down to a voltage level suitable for operation. Also it consists of a combination of relays, rectifiers, filters, regulators and fault switches. This part takes in two kinds of input supplies i.e. Star connected and Delta connected. The fault switches are connected into this circuit in order to create the fore mentioned faults. The relays at the end of the circuit as shown below are used to detect the difference in the voltage levels occurred after the occurrence of the fault.

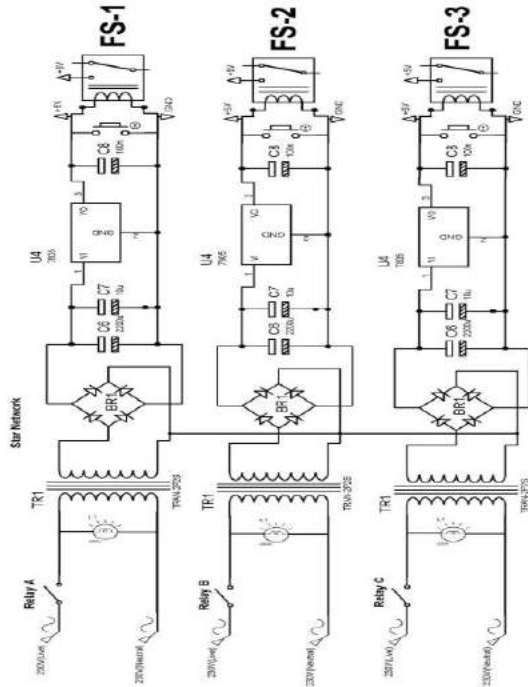


Fig 2.1.1 : Star Connected Input System.

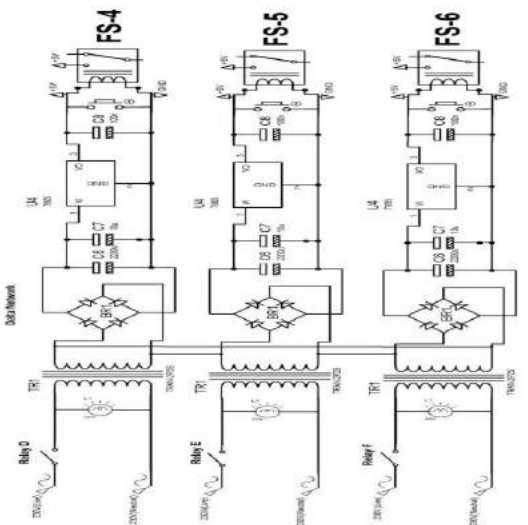


Fig 2.1.2 :Delta Connected Input System.

2.2 The Logic Network:

This part takes in the detection of the relays in the first part and feeds it to a network of logic gates designed specifically to detect the type of fault that has occurred. It consists of five logical networks shown to detect the possible five conditions. The output of this part is fed to the microcontroller in the third part of the project which shows digital which kind of fault is occurred and also provides protection to that line by giving the necessary signal to the relays connected for protection on the input side of the first section.

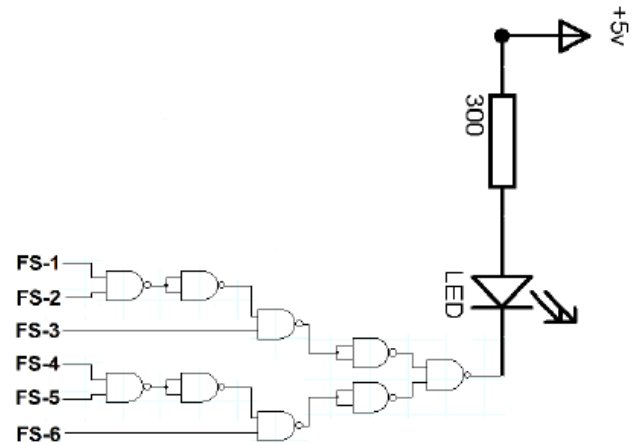


Fig 2.2.1 : Logic Gate Network For No-Fault Condition.

The output of this network will be high only when the system is healthy

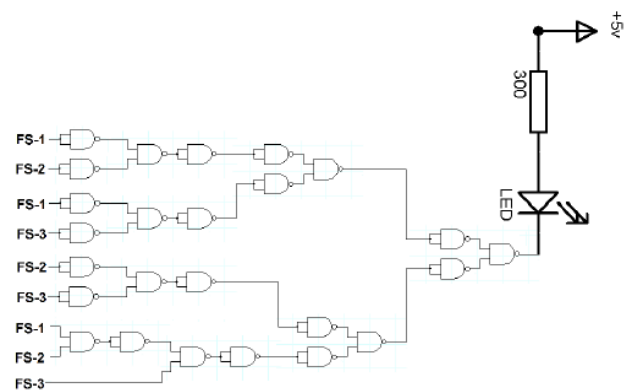


Fig 2.2.2 Logic Gate Network For L-G Fault

The output of this network will be high only when LG fault has occurred (only one amongst FS-1, FS-2 or FS-3 is high)

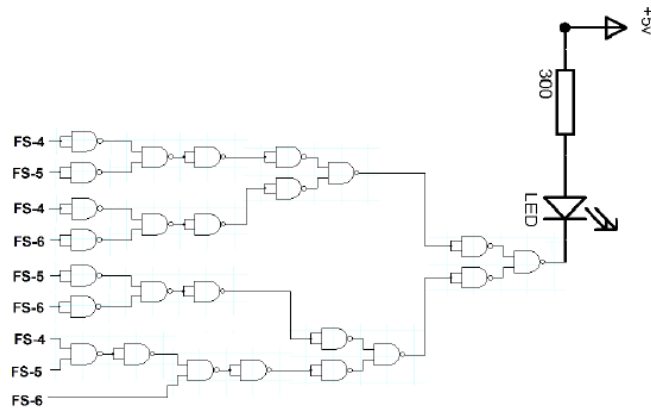


Fig 2.2.3 Logic Gate Network For L-L Fault

The output of this network will be high only when LL fault has occurred (only one amongst FS-4, FS-5 or FS-6 is high)

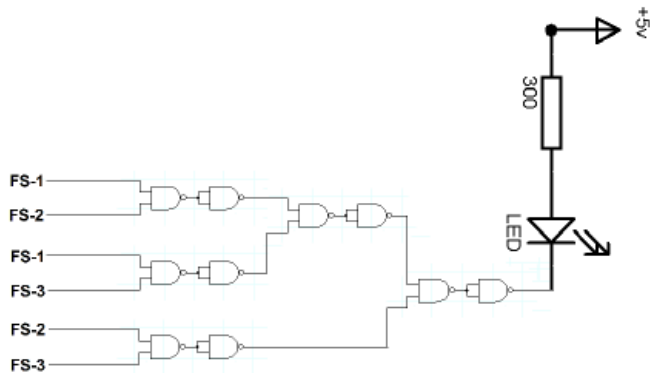


Fig 2.2.4 Logic Gate Network For L-L-G Fault

The output of this network will be high only when LLG fault has occurred (any two amongst FS-1, FS-2 or FS-3 is high)

2.3 The Microcontroller Operated Indication & Protection :

This part majorly is depended upon the microcontroller which is being connected into it. Also the microcontroller's sole purpose is to provide protection on the incoming side of the system and display the type of the fault on the segment display.

The microcontroller takes in the output of the logic gate network as its input the process the data required for the specific action required to be taken.

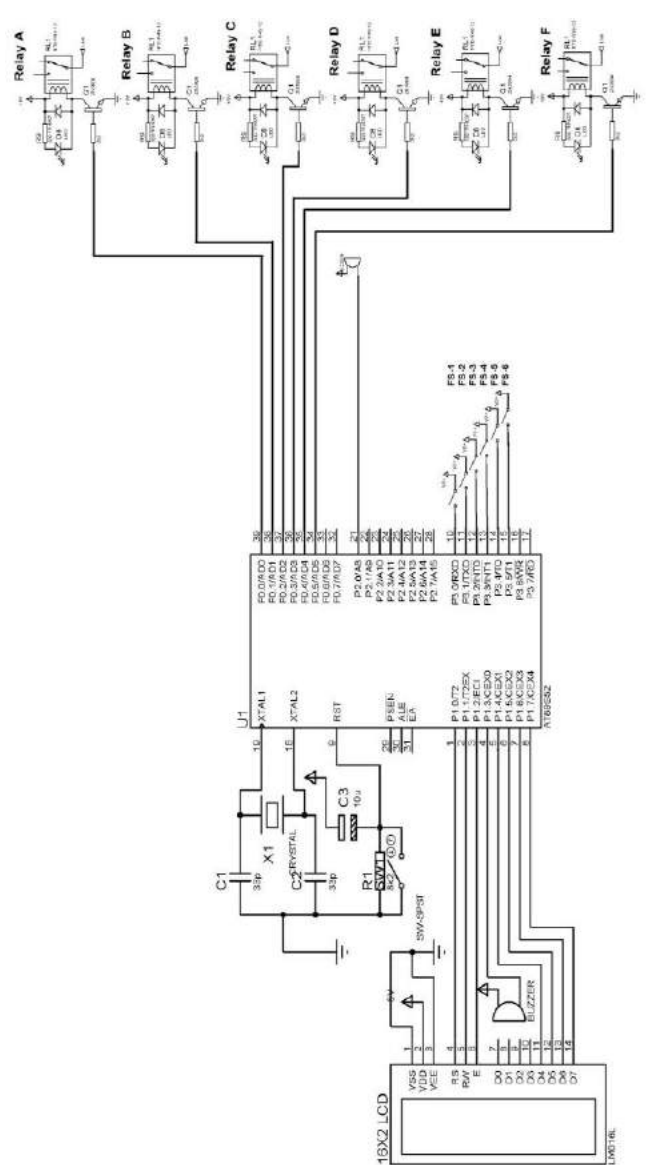


Fig. 2.3.1 Microcontroller Operated Indication & Protection

3. ADVANTAGES:

The following are the major advantages of this project.

- ✓ Protection from faults serves a major relief for those power systems which operates on
- ✓ Extra high voltages.
- ✓ The above prototype demonstrates the occurrence of faults and show casting a way of

- ✓ Successfully detecting them.
- ✓ Also displaying them on a segment display makes the entire prodigy a user friendly deal.
- ✓ An analogical approach is also shown in the above setup making it possible to detect the
- ✓ Type of fault by using simpler types of electrical components and making it an analogical
- ✓ Setup.
- ✓ The microcontroller is merely used for displaying the type of fault and giving the signals
- ✓ To the protection relays connected to the input side. Thus making preventing us from the
- ✓ Complexities that come with the usual microcontroller circuits.
- ✓ Continuous parameter monitoring provides information about the energy loss and hence
- ✓ Maximizes the profit of the system.
- ✓ Microcontroller based development provides major sophistications & flexibilities.
- ✓ The system used is cost effective.
- ✓ Minimizes human interface.

4. LIMITATIONS:

- ✓ The following are the limitations for the proposed project:
- ✓ The magnitude of the fault when occurred cannot be determined. As the creating a fault
- ✓ On the main line is not a feasible process. Secondly we are creating a fault after stepping
- ✓ Down the voltage level.
- ✓ The actual process of occurrence of fault on the transmission line is entirely different to
- ✓ The one shown in the given project.
- ✓ Implementation of the logical network is a bit complex compared to the practice of other
- ✓ Network.
- ✓ Microcontroller adds up to the financial part of the project.
- ✓ In single phase transformer (three single phase transformer) failure of one transformer,
- ✓ The other two, single phase transformer still supply the power, while it is not possible in
- ✓ Case of failing a three phase transformer

5. CONCLUSION

A new approach to detect the fault in three phase circuit has been presented in this project. A simple

and comparatively a less complex study has been shown in the project with elements of the logic network. A person with less thorough knowledge about power system faults can be able to inculcate the concept fault detection.

An analogical approach given to the process of fault detection requires mere and simple electrical components for its construction. The microcontroller part uses the output of the logical network for its operation and is used only for displaying and protection of the circuit.

6. ACKNOWLEDGMENT:

Our sincere thanks to our department and faculties whose constant help and support helped us in making this paper.

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A Review on Design Criteria and Efficiency Computation Methods for Desilting Devices of Small Hydropower

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ABSTRACT

Small hydropower (SHP) produces electrical energy by utilizing the kinetic energy of flowing water. Most of the SHP stations are installed in Himalayan Region where rivers have a high concentration of silt. Therefore, a sediment removing device is a crucial component of a run-of-river type SHP station as it ensures minimum erosion of other components. Most widely used desilting devices are settling basin and vortex chamber. In some stations vortex tubes are installed in the intake channel to improve the overall sediment removal efficiency of existing desilting device. Through the years, a lot of research has been done for improving the design criteria and formulating most appropriate method to compute sediment removal efficiency of different desilting devices. The paper reviews such kind of research work available for settling basin, vortex chamber and vortex tubes used in small hydropower.

General Terms

Design criteria and methods used for computing sediment removal efficiency of desilting devices used in SHP stations.

Keywords

Settling Basin, Vortex Chamber, Vortex Tube, Efficiency of sediment removal, Design criteria.

1. INTRODUCTION

Hydropower is a renewable, non-polluting and environmentally safe source of energy. In a hydropower station flowing water is made to strike blades/propellers of a hydro turbine. The shaft of the turbine is coupled with an electrical generator which on rotating gives electrical energy. This electricity produced is then conveyed to consumers via substations. Thus, hydropower stations produce electrical energy by simply utilizing kinetic energy of flowing water without producing environmental hazards. In India, the widely accepted definition of small hydropower is projects up to the station capacity of 25 MW. Small hydropower has advantages like- it provides more stable price regime over a long period of time; it has crucial capability of quick starting, stopping, load variations, etc. and is therefore well suited to meet peak demand; generation cost reduces with time; it can be constructed along with irrigation projects, drinking water projects; provides flood control; it has least environmental impacts and is ideally suited for electrification of remote areas. Immense untapped potential of hydropower in the country lies in the Himalayan region. However, Himalayan Rivers carry heavy sediment load during monsoon, which has to be managed efficiently to ensure long term sustainability of hydropower projects. Silt is a major concern of run-of-river type hydropower plants located in Himalayan region. During

rainy season sediment concentration in water reaches as high as 20,000 ppm and it becomes difficult to make water safe for turbine. The silt in many streams mainly consists of mineral quartz which causes severe damage to the components inlet valve seals, top and bottom ring liners, labyrinths, guide vanes, runner blades and erosion on civil structure. Erosion wear effect in hydraulic machines results in increased vibrations, fatigue damage, alteration of blade profile, inefficient operation and system failure. Besides heavy loss of material from runner and guide vanes, the erosive silt causes number of operation and maintenance problems and thus there is loss of electricity generation during replacement and repair of eroded components like turbines runner/blades, guide vanes etc. Moreover, sediment deposition in water conducting channels results in reduced capacity of channel. Therefore, there is need to remove silt from water and make it safer for turbines. One of the important components of SHP schemes is the sediment removing device, which protects the hydro mechanical equipment from the harmful silt carried by the conducting system. Desilting devices are used on water treatment plants and hydropower channels to remove objectionable sediment of a specified size and quantity [1]. For the successful functioning of hydropower plant, it is necessary that the water is free from suspended sediment particles as far as possible so that sediments do not erode turbine blades. Sediment ejectors are required to be provided for removal of suspended sediments. Most common desilting devices used in SHP stations are settling basin, vortex chamber and vortex tubes.

This review-paper focuses on the research work available in the fields of the design criteria and methods to compute sediment removing efficiency of a desilting device used in SHP stations.

The paper is organized as follows. Section 2 of this paper describes the three types of desilting devices involved in the study. Section 3 describes the literature review for design criteria and efficiency computation methods for settling basin, vortex chamber and vortex tube. Finally the paper is concluded with Conclusions and Discussions in Section 4.

2. CLASSIFICATION OF DESILTING DEVICES

2.1 Settling Basin

The underlying principle of a settling basin is to provide a section wide and long enough so that the resulting reduced flow velocity allows the sediment to settle out. The flow into the basin is regulated by gates at intake. The settled sediment is flushed out of the basin through the flushing conduit/tunnel back into the river. Gates are provided in flushing tunnel for the ease in approach, operation and maintenance. Normally settling basins are constructed in compartments. However, single chamber basins are not uncommon in the case of mini

and micro hydroelectric projects. The main aspect of their design to determine the dimensions, namely, length, breadth, and depth remains the same.

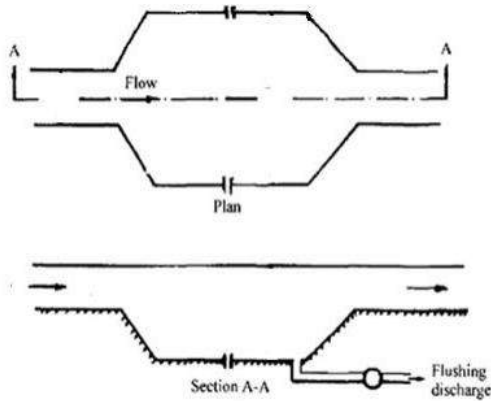


Fig 1: Settling Basin [16]

2.2 Vortex Chamber or Vortex Settling Basin

This type of extractor makes use of vortex flow in a basin as the sediment removal device. In vortex chamber a vortex motion along vertical axis is used to remove sediment from flow. Flow is introduced tangentially into a cylindrical tank with an orifice at its center; the flow pattern in the tank is a combination of free and forced vortices. The water flows in tangentially from opposite sides to keep the vertical axis of the motion more or less in the center of the cylinder, and flows out over the rim, except for the small amount (5 percent to 8 percent) that leaves through the central opening. Due to the secondary current that develops in the flow the sediment travels along a spiral path on the bottom towards the point of central discharge.

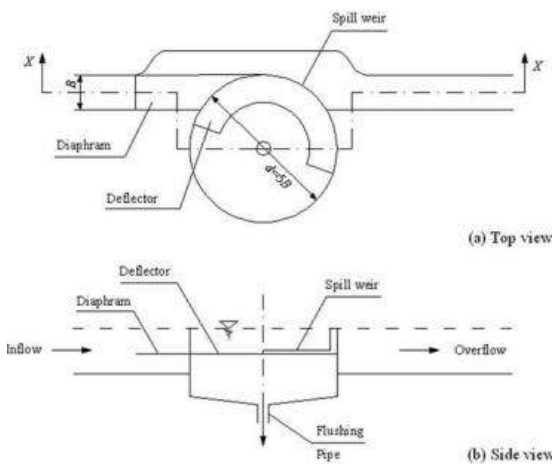


Fig 2: Vortex Chamber or Vortex Settling Basin [25]

2.3 Vortex Tubes

The vortex tube type ejector continuously extracts bed load of diverted flow by the utilization of vortex motion. It is a tube with longitudinal opening or slot at the top that is placed in the bed of the channel. The tube may be perpendicular to the flow or at a smaller angle down to 30°. The spiral current generated in the tube is by suitable combination of flow and sediment characteristics and efficient conveyor of sediment. The width of the slot is a function of the particle size. A wide slot is effective for coarse sediment moving over the bed. The slot should be narrower for fine sediment to minimize the

quantity of water required. Longer vortex tubes should be divided into sections, each with its own outlet, because long vortex tubes tend to choke at the outlet, particularly with fine sediments.

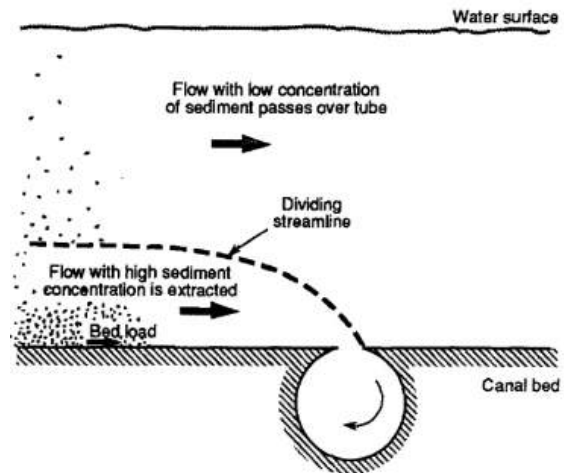


Fig 3: Vortex Tube [23]

3. LITERATURE REVIEW

A lot of research has been done on sediment removal and sediment impact on hydropower. Silt present in rivers/streams has always been a major concern of hydropower engineers. Efforts have been made to control the entry of sediment into power and irrigation channels. Moreover, methods of removal of sediment from water and making it less erosive for hydro turbines and structure are improved day by day. With the consultation of oldest and newest research, work has been carried out in the dissertation study. Such works are mentioned below:

3.1 Settling Basin

Schamber and Larock [2] prepared a mathematical model to study turbulent flow in sedimentation basins. It was solved numerically to predict concentration of suspension of particulate matter in rectangular and circular settling tanks. The effect of total or partial deposition was featured. Computed basin efficiencies were found to be satisfactory when were compared with the tanks operating at a lower surface loading rates. The computed flow patterns agreed qualitatively with the available experimental data. The model was capable of predicting the behavioral characteristics of settling basins.

Ostendorf and Botkin [3] the inlet zone was found to be a leading source of turbulence in settling basins. An individual estimate of the resulting turbulent diffusivity was carried out. An analytical model of sediment transport through the settling tank was derived. The resulting removal efficiencies were found out to be well-established functions of the design parameters of the settling tank. The predictions were successfully verified for the laboratory data without calibration. It was concluded that shallow tanks are the most economical and efficient.

Garde et al. [4] carried out experiments in laboratory regarding the sediment removal efficiency of settling basins. The results showed that the current methods of design of settling basin are not suitable. All the available data was analyzed and a new formula for the efficiency of settling tank was formulated. The parameters L/D and w/u were observed to govern sediment removal efficiency where L was length of

the settling basin, D was depth of flow in the settling basin, and u was shear velocity in the settling basin and w fall velocity of the sediment in clear water.

Develay et al. [5] studied settling basin of Dul Hasti hydroelectric project. Underground desilting basins were designed on the basis of a theoretical approach formed using hydraulic model tests to entrap higher percentage of coarse particles consisting of quartz. It was presented that with the increase in sediment concentration, the trapping efficiency increases. In case of intermittent flushing the trapping efficiency was found to decrease. The efficiency reduced from 91.5% to 75% at the end of 17.5 hours of operation without flushing with a sediment concentration of 600 ppm.

Vittal and Raghav [1] used available methods to estimate the length of a settling basin for a given reduced mean velocity of flow at its entrance. The mean velocity could be achieved by various combinations of width and depth of flow in the basin. The most suitable combination was predicted according to cost calculated on the basis of gravity design of floor and walls of the straight and prismatic portion of the basin. Based on the Garde et al. [4], equations were formulated for the estimation of the best length, width, and depth without any preceding knowledge of the mean velocity.

Ranga Raju et al. [6] modified the expression known for the determination of sediment removal efficiency of settling basin. It was also concluded that continuous flushing, by letting some water and sediment particles out from the bottom of the basin, improved the efficiency of settling basins.

Weerakoon and Rathnayake [7] observed entrance zone effect on trapping efficiency of sand of the settling tanks using a scaled model by varying the entrance expansion angles. The trapping efficiency was discovered to vary from 50 to 85 % with the reduction of expansion angle from 30° to 10°. The trapping efficiency of the tank increased with the reduction of the expansion angle of the entrance zone in the desilting tanks, the optimum expansion angle was found to be about 10°.

Hsu et al. [8] formulated a method for finding costs of the settling basin and the total annual costs which include the costs of land, operation and maintenance and capital. Transient situations of settling basin were simulated using the specific gravity of the sediment, the distribution of the sediment particle size, the kinematic viscosity of the fluid, Manning's roughness coefficient etc. The results showed that more the fine sediments the longer detention time is needed to achieve the required trap efficiency.

Shah et al. [9] reviewed the transitions of settling basins with open channels. Transitions were provided to slowly reduce the flow velocity of water entering into the basin. If the transition length is too long it was observed that medium and coarser sediments deposit on the transition bed. On the other hand, if transition length is too short, non-uniform flow was observed which caused uneven diffusion of flow and sediment at the inlet of the settling basin.

Tamayol et al. [10] numerically studied the effects of Reynolds and Froude numbers on the performance of desilting tanks. Results indicated that both Reynolds and Froude numbers are important to determine degree of importance of buoyancy forces in settling basins. Low buoyancy forces are due to short circuiting between the inlet and outlet, while in

highly stratified tanks, the problem was due to bottom density currents. Results revealed that a suitable position of baffle is related to buoyant forces. Where buoyancy forces are not significant a reflection baffle may be installed to improve the tank efficiency, whereas in tanks having strong buoyant forces and density currents, baffles should be installed at the bottom of the tank.

Heydari et al. [11] concluded that installation of baffles improves the trapping efficiency of a settling tank. Experiments were performed to examine the effects of positions of baffle and its angle on efficiency of settling basin. The results revealed that installation of a vertical baffle of height 40 % of the depth of flow, at bottom and middle of the basin improves the sediment removal efficiency by 4 %. It was observed that with baffle angle of 60°, the overall efficiency came out to be best with an increase of about 7 %. The calculated data showed that by increasing the Froude number and decreasing depth flow, efficiency of basin decreases irrespective of presence of baffle. Also, it was achieved that with increasing suspended sediment concentration at inlet by about 5 times, sediment removal efficiency of basin with baffle increases by 14.2%.

Singh [12] observed that site efficiency of settling basin in trapping particle up to 0.5 mm was very much less than its design efficiency. Designed dimensions of the settling basins were found out to be sufficient to trap less than 0.5 mm sized particles. The basins showed less efficiency may be due to wrongly designed flushing arrangement, improperly designed transitions, turbulence in water causing the sediment to remain in suspension.

3.2 Vortex Chamber or Vortex Settling Basin

Julien [13] examined the presence of fine sediment particles in a steady horizontal Rankine vortex. For fine sediment particles the viscous force were found to be dominant as compared to inertial and gravitational forces. It was witnessed that the tangential velocity of finer particles attains the velocity of the fluid quickly while coarser particles move towards the outside of the vortex.

Paul et al. [14] optimized vortex settling basin design for the extraction of sediments of sizes less than 0.5 mm by installing a diaphragm at the inlet canal and a deflector at the basin. Diameter of the flushing pipe and flushing discharge were observed to be dependent on the grade of sediments brought by the inlet canal. For different sediment fractions, diameter of flushing pipe, flushing discharge, trapping efficiency formulae were suggested to be adopted. Modeling criteria required the liquid and particle flows to be scaled in accordance with the Froude Law. The behavior of sediments in suspension was described by settling velocity of sediment particle.

Athar et al. [15] examined the sediment removal efficiency of vortex settling basin. A geometric configuration of the extractor was found that was able to remove finer sediments of diameter 0.055mm to 0.22 mm from flow with high efficiency. The available data was studied to formulate a new relationship. The existing relations were able to estimate the sediment removal efficiency reaching maximum to 64% for less than 55% of the total data but the recommended equation was found to deliver results with a maximum error of 64% for all the data.

Ranga Raju et al. [16] concluded that the vortex type settling basin provides high efficiency of sediment removal at small flushing discharges but have a limitation of more suitable for smaller inflow channels.

Chapokpour and Farhoudi [17] based on velocity analysis, it was noted that in the lower layers of flow the sediment particles took a longer helical path towards flushing orifice with a higher concentration of sediment around flushing orifice as compared to the upper layers. Comparing the velocity and streamlines path in horizontal sections with occurrence of secondary currents in circular sections, it was revealed that the flow in the main spiral direction plays a greater role on trapping efficiency.

Chapokpour et al. [18] it was observed that an increase in incoming velocity generate an influential centrifugal forced vortex causing a better formation of central air core with smaller flushing diameters which resulted in high hydraulic and extraction efficiency of the basin.

Naser et al. [19] carried out experiments to increase trap efficiency of a vortex settling basin. It was recommended to place a fully circular deflector upon the inlet jet. Sediments of sizes between 0.08 and 2.0 mm were considered. It was found that vortex settling basins need higher inlet velocity for removing finer sediment particles efficiently. Most suitable location of the deflector was observed to be between the inlet channel and the outlet overflow weir. The upper inlet jet vortex suspends the sediment and leads them to the overflow weir but the near bed vortex moves the deposited sediments towards the flushing outlet.

Ansari and Athar [20] The existing relations for sediment removal efficiency were found not to produce satisfactory results for a wide range of geometrical and hydraulic variables. It was concluded that in the design of vortex settling basins, knowledge of the effect of both diameter ratio and width ratio is important in selection of a suitable size of underflow outlet and size of settling basin as they are directly related to upstream channel width.

Singh [12] observed that the site efficiency of vortex settling basins was very close to the designed efficiency. These basins required less volume of water to flush and proved to be economical especially for sediment size 0.1mm to 0.2mm which is responsible for erosion in hydro turbines. It was also shown that the vortex settling basin was efficient and economical desilting device as compared to settling basin.

3.3 Vortex Tube

Robinson (1962) [21] predicted the effect of sediment size on efficiency of trapping of a vortex tube. The tube can be expected to remove approximately 80% of sediment with sizes greater than 0.5mm. The trapping efficiency of smaller sizes was considerable lower.

HRW-Design Manual for Canal Sediment Extractors (1993) [22] provides design and efficiency computation methods for vortex tube. Design and performance prediction methods are based on theoretical descriptions of sediment transport and hydraulic processes involved. Such operations can be done using tables or microcomputer programs. Performance of vortex tube was determined by using cumulative grain size distribution curve for canal bed material, mean width of channel, operating discharge, extraction ratio, flow depth in the channel. Field tests have shown that vortex tubes

perpendicular to the direction of flow are preferable as the swirl velocity is maximized and the length of tube is minimized.

Atkinson [23] a theory for prediction of the trapping efficiency of vortex tube type sediment extractors was portrayed. It required parameters like the mean velocity, depth of flow in the canal at the vortex tube locations and the sediment sizes. Field data for trapping efficiency was collected at six sediment extractors and was compared with the presented theory. A reasonable agreement between the theory and measurements was obtained. The paper gives a direction on vortex tubes location because the efficiency reduces if a vortex tube is located near to a canal head regulator or canal bends.

Atkinson [24] design recommendations were made based on the flow theory- the axis of the tube should be installed perpendicular to the direction of flow in channel; and the ratio of slit width to tube diameter should be in the range of 0.15-0.3. It was also concluded that an optimum efficiency of the vortex tubes is found at a low Froude number.

4. CONCLUSIONS AND DISCUSSIONS

The main objective of this paper is to give an overview on the research and developments on the design criteria and methods used for determining sediment removal efficiency of a desilting device (settling basin, vortex chamber and vortex tubes). Classification of the desilting devices and the literature review has been given.

Settling basin is a conventional desilting device and is commonly used in SHP stations. However, due to limitations owing to the topography of Himalayan Region, construction of settling basins large enough to achieve proper sediment removal becomes challenging. A vortex chamber or vortex settling basin is a convenient solution to such a problem. It can be constructed in steep slopes as it does not require large dimensions. With the continuous research work vortex chamber can efficiently remove finer sediment particles.

On the other hand, vortex tubes are installed in the inlet channel and thus can only be used with other desilting device. They are able to remove sediments of larger size. Not much literature is available for vortex tubes as well. However, it has been observed that the overall sediment removal efficiency increases when vortex tubes are installed prior to another desilting device viz. settling basin or vortex chamber.

It is concluded that vortex chamber is advantageous over a conventional settling basin while vortex tubes can be constructed in the conducting channel to improve overall sediment removal efficiency of the desilting system.

5. ACKNOWLEDGMENTS

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A NEW ERA OF ELEVATOR

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ABSTRACT

Elevator is a moving platform or cage for carrying passengers from one level to another, as in the building or for raising any mechanical devices, objects or materials. Elevators are generally powered by electric motors that either drive traction cables or counterweight systems like a hoist. Present concept of elevator has many disadvantages like use of counter- balancing system which occupy more space and it make use of 3 phase motors for elevation which consumes more power and also needs speed control devices and circuits. It requires machine room which stores large electric motors and controller cabinet, electronic microprocessor and mechanic relays. Use of rope and pulley adds more to the cost and Enormous amount of oil is used for lubricant purpose.

This paper presents a new concept which gives rise to a new implementation that uses elevator which is rope free and motor less. it is more Energy efficient than the other elevators as it does not use much power which is consumed by the motors, it does not require lot of oil and the operating panel works smoothly. It requires less space as it does not use electric motors and control room for its operation. Also counter balancing weight is not used which reduces the overall cost. Machine room is also not needed.

Biggest advantage of this concept is that it can be used for vertical as well as horizontal motion together, also cost efficient and safety precaution is taken wisely. In future, there is large scope for this elevator which will be constructed according to the design.

Keywords

Lift car, Electromagnet, Permanent magnet, Control circuit.

1. INTRODUCTION

Land in the world's largest cities is extremely expensive, which drives the expansion of rentable spaces into higher and higher buildings and underground areas. However, the larger and taller the buildings, the more elevators are required to keep acceptable waiting time for dispatching. Ultra high buildings pose new problems in constructing high speed elevator systems, i.e. vertical oscillations, horizontal swaying, car noise, cable length limitation, and low efficiency[1]. Therefore, conventional elevators with counterweight are improper for skyscrapers. However, rope less elevators with electromagnetic guiding system can be a proper solution for this problem.

In the conventional 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: low efficiency, more deterioration and requires frequent lubrication and regular maintenance, more car swaying and audible noise. Particularly, it is important to make the air gap of the linear motor constant, which affects the magnitude of the propulsion force. Therefore, magnetic levitation technologies with electromagnetic actuators are applied to elevators' guide shoes to restrain the car disturbance and vibration problems.

In this sense, conventional elevators with mechanical guiding systems come to their application limitations due to the very high requirements of these buildings. An improvement of the operational behavior of such high elevator systems can be achieved using wear and lubricant free electromagnetic guides instead of slide or roller guides. The presented work deals with different proposals for the electromagnetic guiding of vertical transportation systems. Benefits and disadvantages of the investigated guideway topologies are presented and discussed. It is also respond to the technique of rope less elevators as an application example for active magnetic guideways.

2. AIM OF THE PROJECT

Designing and implementation of rope-less with the aid of electromagnetic principle. To Make Energy Efficient Elevator. To Develop and Implement an Elevator Which Can Deal With Future Technology.

3. LITERATURE REVIEW

An elevator is a mechanism for moving people and object from level to level in a building or any other structure. According to the writings of Vitruvius, the Greek mathematician Archimedes created a primitive elevator in 236 B.C. that was operated by hoisting ropes wound around a drum and rotated by man power.

18th century 1743 King Louis XV- the **first ever elevator** was designed to lift a passenger in 1743. This was made exclusively for King Louis in France. Though this looked nothing like elevators of today, it was called a flying chair. Carefully placed outside King's balcony, the flying chair was used by the king to travel from one floor to another. It was operated manually on King's command.

The man who solved the elevator safety problem, making skyscrapers possible, was Elisha Otis, who is generally known as the inventor of the modern elevator. In 1852, Otis came up with a design that had a safety "brake." In the event that the cables broke, a wooden frame at the top of the elevator car would snap out and hit the walls of the shaft, stopping the elevator in its tracks.

While the cable elevator design has remained, many additional improvements have been made, the most obvious of which is that elevators now run on electricity rather than steam power, a change that came about starting in the 1880s. The electric elevator was patented by Alexander Miles in 1887, though one had been built by the German inventor Werner von Siemens in 1880. British electrical engineer William Sturgeon, a former soldier who began to dabble in the sciences at the age 37, invented the electromagnet in 1825.

According to the above given reference of developing the elevator in every century. In the Modern generation where every innovative creation of new technology is being developed, so due to such innovative ideas the present elevator is designed in a new way.

Since, every field has its own technical creation our idea is to utilize our field area into that elevator concept.

Due to increase in the electromagnet property in various application we implemented this principle in elevator to reach the new developing level which is energy efficient and less expensive. There is a large scope for this elevator in future.

4. DESIGN OF ELEVATOR

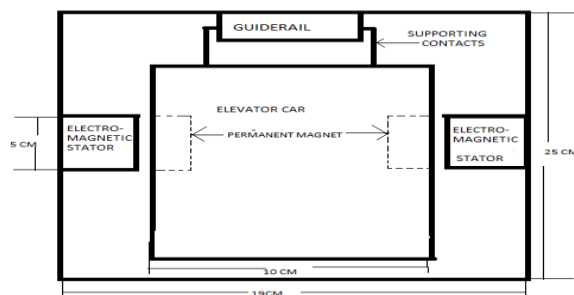
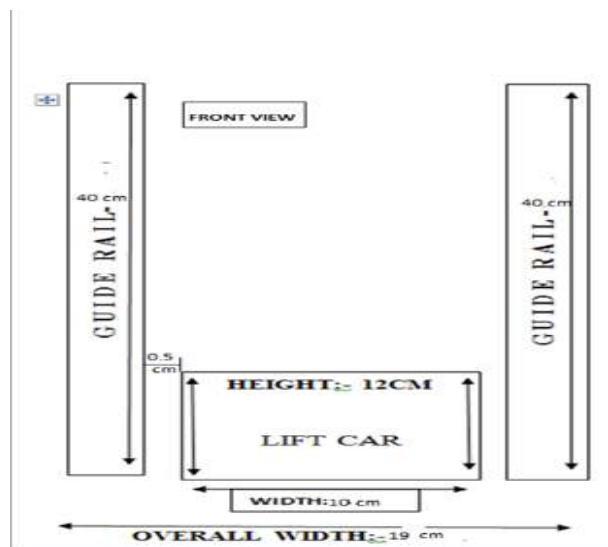


fig no. 1 FRONT VIEW AND TOP VIEW

5. COMPARISON BETWEEN ELECTROMAGNET AND PERMANENT MAGNET

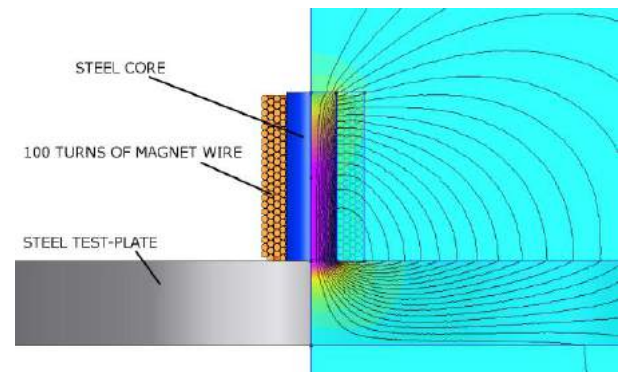


Fig no 2 comparison between electromagnet and permanent magnet

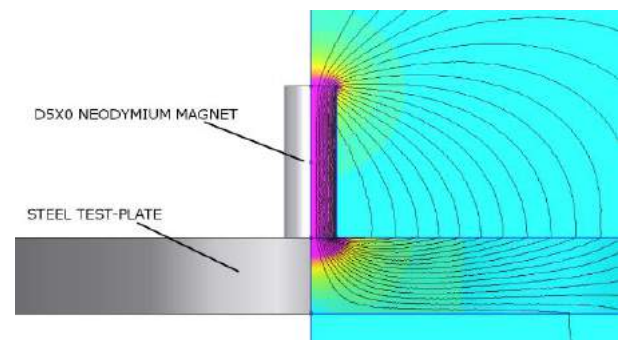


Fig no.3. comparison between electromagnet and permanent magnet

5.1 Magnetic Field Strength for Electromagnets

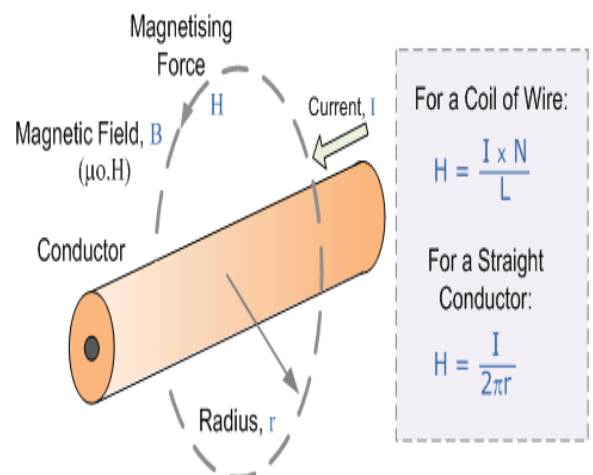


Fig 4 , CALCUTION OF MAGNETIC FLUX DENSITY

Where,

H – is the strength of the magnetic field in ampere-turns/metre, At/m

N – is the number of turns of the coil

I – is the current flowing through the coil in amps, A

L – is the length of the coil in metres, m

The degree of intensity of the magnetic field either by a hollow air core or by introducing ferromagnetic materials into the core is called **Magnetic Permeability**. cross-sectional area of the core:- $A = \frac{\pi D^2}{4}$ voltage per turn, $E = 4.44 \phi_m f = 4.44 A B_m f$ Where B_m is the maximum flux density of the core $= \frac{4.44 \pi D^2 B_m f}{4}$, E is proportional to D^2 .

5.2 Magnetic Core Design and its Properties

5.2.a) TYPES OF CORE

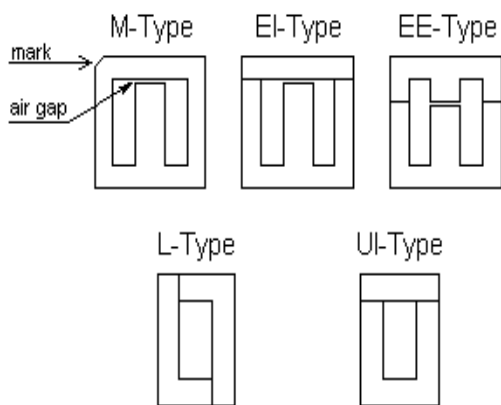
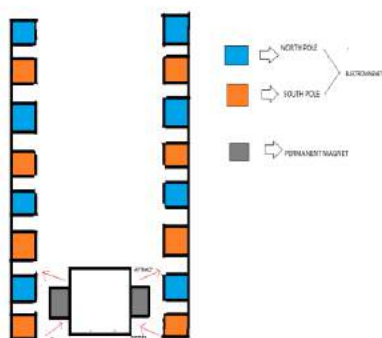


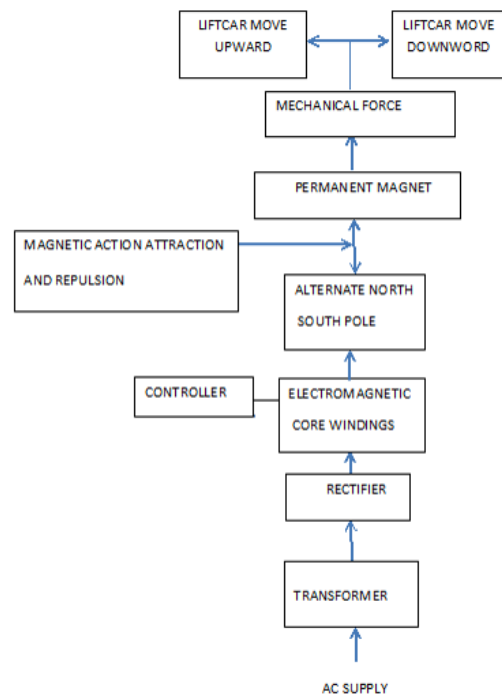
Fig 5 TYPES OF CORE

6. Proposed System

In this type of experiment lift car will carry permanent magnet and guiderail will be placed along with electromagnet. Electromagnets which carries winding on its core will be alternatively switched on and off to get a required a pole(north and south). Controlling circuit will be used to stop as per required position.



7. Block Diagram



8. Conclusion

Thus the goal of our project is to provide rope less electromagnetic elevator without using high power motor, to improve the energy efficiency.

so it is observed that after giving supply to a E-shaped electromagnet, middle pole becomes north and side pole becomes south depending upon a polarity of supply. Hence we conclude that implementation and development of this project can give rise to NEW ERA OF ELEVATOR.

9. Acknowledgments

We would like to thanks Prof. Chitrlekha Vangala for the thorough discussion and providing useful suggestions during the course of investigation. The whole project during the program would have been nothing without the enthusiasm and imagination of our faculty members.

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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..

1. 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 which 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 so as to reduce all the above drawbacks of tradition core generator their by providing good out at low input.

2. 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.

3. Generation Of emf By faraday's law

Electrical generators are devices that convert mechanical energy into electrical energy and are well known. The underlying operating principal of these generators can be found in Faraday's law which, in its most basic form, states that an electrical potential difference is generated between the ends of an electrical 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 at rest, so there is no deflection in the

galvanometer i.e needle of galvanometer is at the center or zero position. When the magnet is moved towards the coil, the needle of galvanometer deflects in one direction. When the magnet is held stationary, at that position, the needle of galvanometer returns back to zero position. Now when the magnet is moved away from the coil, there is some deflection in the needle but in opposite direction and again when the magnet becomes stationary, at that point with respect to coil, the needle of the galvanometer returns back to the zero position.

Similarly, if magnet is held stationary and the coil is moved away and towards the magnet, the galvanometer shows deflection in similar manner. It is also seen that, the 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 time 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.

.....1

Lenz's law states that when an emf is generated by a change in magnetic flux 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 sign used

in Faraday's law of electromagnetic induction, indicates that the induced emf (ϵ) and the change in magnetic flux ($\delta\Phi_B$) have opposite signs. Considering Lenz's Law.

.....2

3.1 Reason for opposing, cause of currents according to Lenz's Law-

Lenz's law obeys the law of conservation of energy and if the direction of the magnetic field that creates the current and the magnetic field of the current in a conductor are in same direction, then these two magnetic fields would add up and produce the current of twice the magnitude and this would in turn 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 field 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

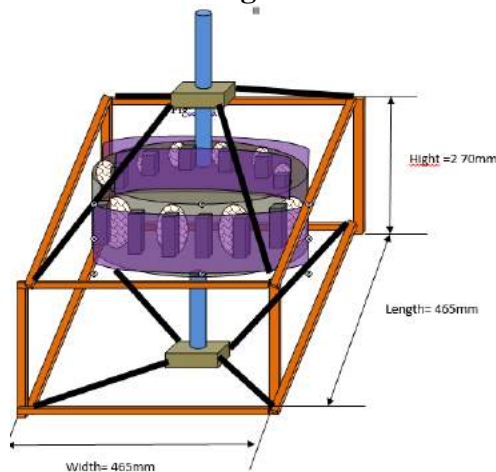
4. Proposed System

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.

5. Block Diagram



6. PARTS OF GENERATOR

6.1

Rotor



Fig:6.1 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.

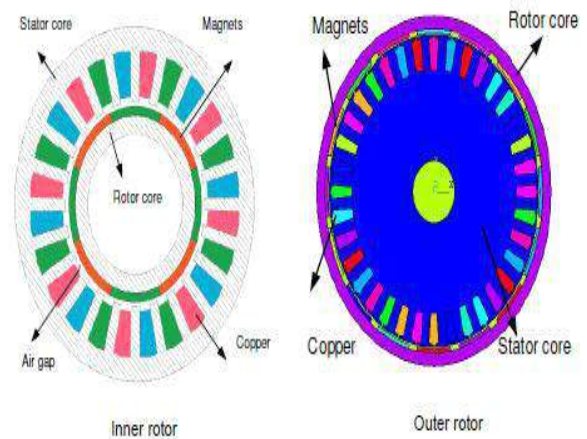


Fig 6.2 Inner and Outer rotor configurations

6.2 Permanent Magnet

The RFPM generator yokes have circumferential arrays of alternating polarity permanent Magnets. The magnets are equally spaced on each yoke's periphery.

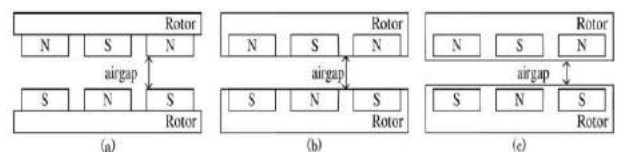


Fig:6.2 (a) Surface mounted, (b) partially embedded and (c) and fully embedded.

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. 1. 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 generator is 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.

6.3 COILS

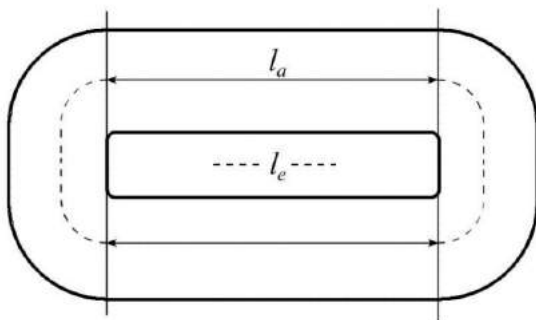


Fig 6.3.1. Coil profile in the air core generator

l_a = active length

l_e = end winding length Therefore, total length is $2l_a + l_e$

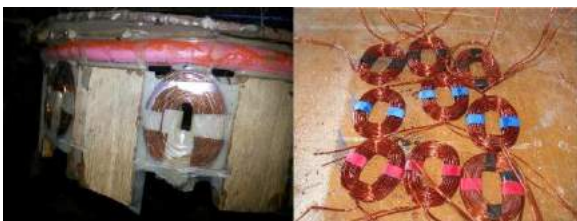


Fig: 6.3.2

In an alternator producing 3-phase power, then one group of coils is at peak current while the others are not. Therefore the magnets align with only one phase at a time. Instead of figuring out how this is done from scratch, here's the trick:

For every coil of wire in the 3-phase stator, there are 1.33 magnets.

No, don't go slicing a magnet in half. The absolute 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 complicated, and the first-time builder should beware. Similarly, varying the proportion of magnets and coils begs trouble, unless you know how to avoid the pitfalls of making single-phase alternators (but you wouldn't be a newbie).



Fig:6.3.3

If regular jacketed wire was used to wind coils, a lot of space would be wasted in plastic jackets. A solution was found a long time ago, and wire can be bought that is coated in a thin non-conductive enamel. When coils of enamelled wire are wound, each loop is isolated from the other, and the maximum compactness occurs. Connecting the coils of wire introduces an important question in the design of the Permanent Magnet Alternator: Will there be 3 separate phases or just 1? Single phase alternators are simple to hook up – all coils are wired in series with each other, and they all work together to make one large pulse at the same time.

While this is simple, the windmill experiences quite an abrupt "bump" for each pulse. It can hinder windmill performance and cause damaging vibration. Builders still use single phase when it's convenient, and adapt the design to resist the vibration. It is also more complicated to overcome the inefficiency when rectifying that voltage to put DC into a battery, but it can be done.

A more elegant solution is to wire up the coils for 3-phase operation. At any given point, only one third of the alternator

is at peak power, the other two are either dropping or rising to their next peak. Vibration is reduced not only by having peak currents 1/3 as intense, but also by having them 3 times more often. When rectifying the 3-phase power so that a DC battery can be charged, the current is also much smoother. The cost of extra rectifiers should not be considered an obstacle. They will last a long time if properly selected. 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 rotates). Builders usually arrange 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 encapsulated inside. All of the internal electrical connections were made in advance. Either they selected one particular 3-phase connection arrangement, or they have enough wires coming out to allow some external connection changes.

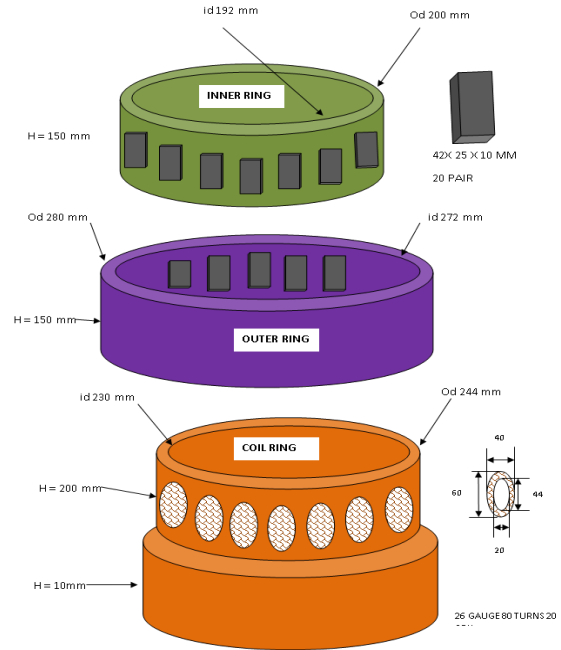
6.4 WINDINGS

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.



Fig 6.4.1. Concentrated winding

7. CONSTRUCTION



a)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

b)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 emf, 4 poles are required

8. 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.

9. CONCLUSION

We have propose a 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.

10. FUTURE SCOPE

The connecting coils in series and parallel arrangement the desire output can be obtain as per its application.

11. ACKNOWLEDGMENT

We would like to thanks Prof. AnojKumar Yadav for the thorough discussion and providing useful suggestions during the course of investigation. The whole project during the program would have been nothing without the enthusiasm and imagination of our faculty members.

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Solar Motor

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ABSTRACT

The Solar Motor is a solar powered electric Motor. It was prepared by Larry Spring in bell laboratory of Mendocino country in California. Its miles powered by solar cells mounted on rotating shaft, which causes flow of current through insulated conductor. Like many electric vehicles, the Solar Motor consists more often than not of magnets. One magnet is an everlasting magnet that gives a constant magnetic subject. In reality, that's why they are referred to as everlasting magnets, due to the fact, sector remains ON all the time. The second one magnet is a coil of insulated conductor which works as electromagnet, so that we can activate and rancid. As through the coil of insulated conductor, current is flowing which acts like another magnet, whole with the South Pole and North Pole. Simply consider a setting of permanent magnets surrounding to one another. One magnet is bounded to the shaft and another one is kept steady to produce magnetic field. The forces produced from magnetic field of the steady magnet will try to maintain the magnetic field of steady and rotating magnet. The load connected to the shaft also rotates with the shaft due to magnetic fields.

Keywords:- Solar Motor, Larry Spring, Rotating Shaft, Activate and Rancid, Insulated Conductor, Magnet Surrounding, Steady Magnetic Field, Load.

1. INTRODUCTION

The very first preparation of motor came from the Bells laboratories in the year 1962 with highly-powered by an alternative energy (solar energy) - inflicting magnetic force induction in its coils at intervals magnetic flux and hence its rotation. Its description was made by Daril Chapyn. That was later done by Larry Spring in 1994, and as his experimental laboratory was settled in Mendocino Coast, motor was named Larry Spring's Magnetic Levitation Mendocino Brushless star Motor" It had been most curious and solely an experimental device for presenting the sun as a source of power, hence in 1953 the trendy solar cell was simply developed by the scientists as a result of it But at that point the motor did not levitate on the magnetic cushion. But before the development of motor itself, there were many measure tasks to try and do so. Firstly, a dominant unit equipped with development kit is needed. Secondly, measurements of basic characteristics of solar powered cells got to be in deep trouble selecting adequate lamps and style of motor coils.

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There were the additional measured four side steps that were later represented with in the text. The motor was very difficult to develop technically but not laborious, however as a result of its little dimensions, to a small degree of patient and preciseness was needed. Planning of the motor ought to be created in step with laws of magnetic force induction for a far better performance. The key to success is that its dimension and choosing the acceptable materials.

Presently we are using ac or dc motor which uses conventional source of energy. Those conventional sources (natural sources) are limited or end after used. So here we are introducing a solar motor which works on the principle of dc motor but it uses (un-exhaustible source of light) source of energy as the name indicates this motor use solar energy as a non-conventional source of energy to rotate itself. In this motor the yoke is absent which is normally present in conventional motors. Because of this solar motor is free to rotate whenever there is sunshine on the solar panels which are placed on the armature of that motor.

2. DESIGN AND CONSTRUCTION OF THE MAIN PARTS

Principle of the solar motor with inner coil - every coil is connected to the opposite solar panel as shown in fig. Turning one of bulbs on creates voltage on desired solar panel. Current will start to flow through circuit, causing magnetic flux inside and outside of coil. The direction of current in the circuit decides the direction of magnetic field lines and these lines are parallel inside the coils. . If the lines of magnetic induction have same direction as lines of magnet, attractive force will appear, making motor to rotate clockwise (bulb 1 turned on). If the same lines have opposite direction, then repulsive force will come in action and try to switch sides of coil to the right direction (S pole of coil to N pole of magnet), making motor to rotate under clockwise (bulb 2 turned on). That allows us to spin Mendocino motor, create our wanted direction of rotation or simply slowing down motor to required speed.

Magnetic induction in case of coil with solenoid shape can be described as [7]:

$$B = \mu_0 \cdot \frac{N \cdot I}{l_{\text{solenoid}}} \quad (1)$$

Where μ_0 [H/m] is a magnetic constant, N is a number of turns of one coil, I[A] is a current in the circuit of one solar

panel and coil, and l_{solenoid} is a length of coil with solenoid shape.

The magnetic moment for coil with N turns is [7]:

$$M = N I S \times B \quad (2)$$

Where $M [A.m^2]$ is a magnetic moment and $S [.m^2]$ is a cross-section of the wire of coil. As we can see, magnetic induction, as well as a magnetic moment, is increasing with higher number of turns of the coil and the passing current. However, with increasing number of turns of the coil, coil's length is also increasing - therefore its resistance - and therefore, according to Ohm's law, current will be reduced.

And another important equation is wire resistance, equal to [7]:

$$R = \rho \cdot \frac{l_{\text{conductor}}}{S} \quad (3)$$

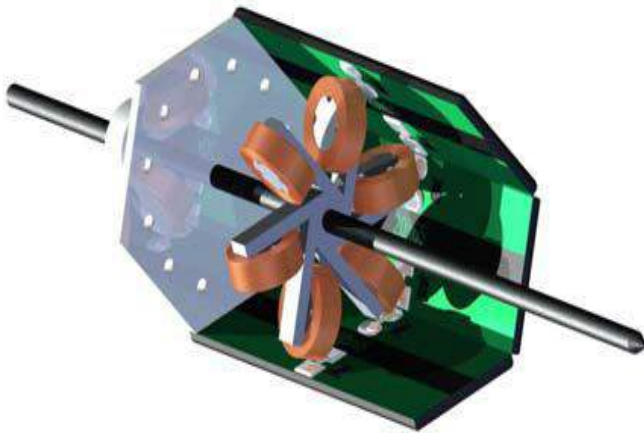


Figure 1. Inner structure of solar motor with hexagonal body shape

Since the production of coils was planned to carry out by hand in the laboratory, its shape can't be perfect. It is a multilayer type of coil; its inductance is a question of its geometry and can be described using Wheeler's formula for short cross-wound coil [8]:

$$L = \frac{0.315 \cdot r^2 \cdot N^2}{6r + 9a + 10b} \quad (4)$$

Where $L[\mu H]$ is a coil's inductance and dimensions r , a and b [cm] are dimensions of coil accordingly to Fig. 3 (left)

Thus, final dimensions for coil were chosen based on the limits of the real motor proportions (for example, hexagonal profile has its dimensions given by width of solar panel and space inside is limited by these dimensions) and optimizing parameters mentioned above. After choosing length, number of turns of the coil and diameter of the coil, Mendocino motor was built (Fig. 2)

The real winding of the coil is made of copper and is shown in Fig. 3 (right). Coil's core is made of aluminum (as same as the motor's structure) and even it has a slightly different magnetic constant μ_0 from the air - during the coil's design - the magnetic constant for the air was used. A very good description of choosing right proportions for coil in case of square motor design is written in already mentioned [4].

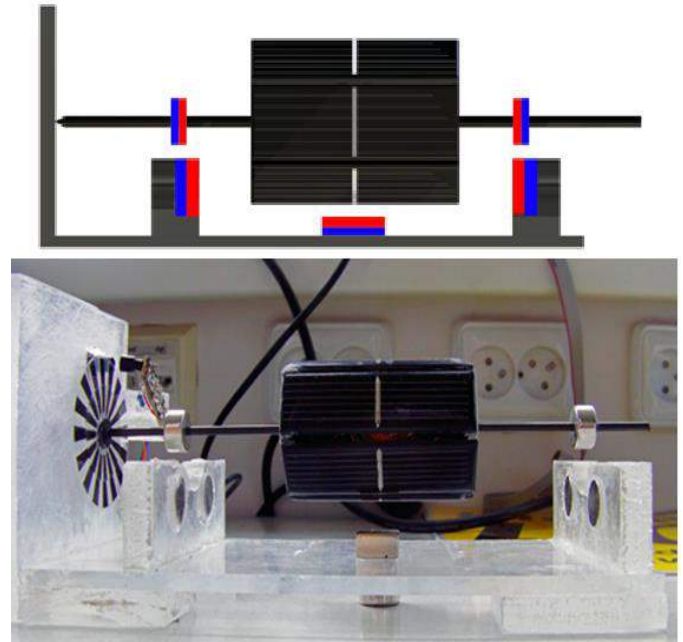


Figure 2. Top - Principle of levitation. Bottom – Real solar motor

The actual winding of the solar motor is made of copper as shown in the fig 3. Below and the core structure is made up by aluminum and also it has slightly different magnetic constant μ_0 from the air - during the designing of the coil the magnetic constant of for air was used.

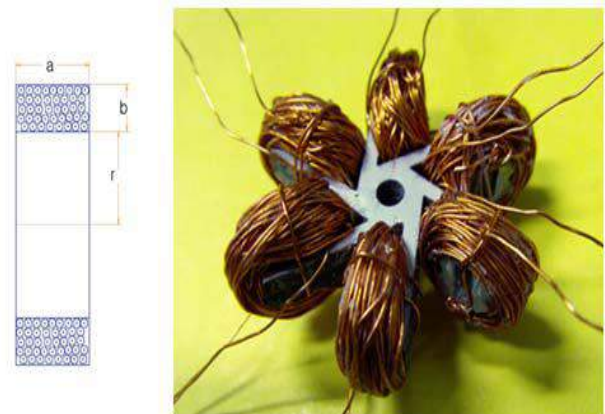


Figure 3. Left – dimension of short cross-wound coil. Right – real winding of coil

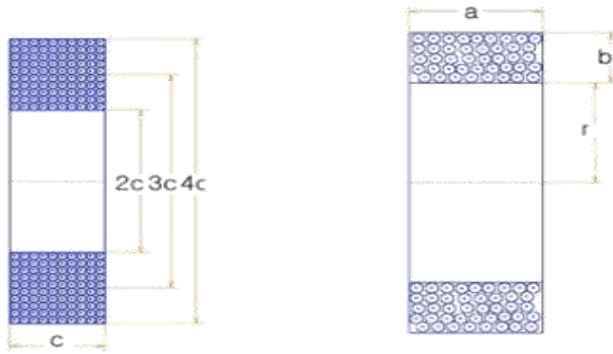


Figure 4. Brooks coil (left), Cross-wound coil (right)

These equations are required for designing optimal coil's length and cross-section; otherwise magnetic moment would not be large enough to spin motor. Also, light weight of its structure is necessary. That's why it should be made of light materials such as aluminum or Plexiglas.

However, solar panels are rotating and the lamp is shining on one or two of them (based on lamp's location), therefore voltage in circuit is not permanent. Also, transient phenomenon of RL circuit occurs. This part of theory requires more investigation.

3. CONCLUSION

Most of the brushless dc motors are constructed in different way, in which the coil is kept stationary and magnets spin. Since solar panel are able to rotate with the rotating component which is not possible for power source hence it's less difficult to assemble. They are functioning with the same concepts, although.

The torque is depends upon the magnetic field subjected to the coil of wire. Which means that the motor will rotate on higher rate if we able to make such a big object of magnetic field. For example if we take 2 everlasting magnets in such a way that one is above the spinning shaft and one is under it. This type of construction will make a stronger, more uniform magnetic field. This setup is also possible by using small magnets. By using verity of different magnet we choose the easier one to place a magnet below the spinning shaft.

The construction of this motor is able to balance it well, and to take tend of its oscillations out of control on time by the use of levitation principle for balancing this motor is the most impressive and challenging part of this solar motor.

The starting of this motor is totally depends upon the initial position the shaft. It may be possible that the motor does not get much torque to rotate itself and needs a hand start, it is because of its dead zones. For better self-starting hexagon shaped

motor with solar panel on each side and 3 coils of wire can be used.

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On this occasion of presenting our paper, we express our deep sense of gratitude and personal regards to few people who helped us during our project and shared their knowledge and precious time...

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POWER HARVESTING FROM RUNNING TRAIN BY HW GENERATOR

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ABSTRACT

India is a developing country demand of power is more than the generation capacity. In today's scenario our country trying to overcome this situation, now a day's our generation plant uses 72% of non-renewable sources and 28% of renewable sources for feeding this demand, we have to increase this ratio by more use of renewable sources. Our project is small contribution to that. As we know railway is a lifeline of our country in the huge transportation manner. Train brings not only the speed but also the huge wind power. if we can collect this wind power in any manner we can easily generate pretty much power to maintain the internal lighting and conditioning system (800kw) which now handled by axle generation (AG) system. This is more complicated and space consuming, as per standard. Our project is another option for this system, which is based on the wind power harvested by the train using Hetronix wind turbine technology (HWG).

Keywords

Hetronix turbine, axle generation, train lighting & conditioning, wind power, HW generator.

1. INTRODUCTION

As Indian railways consists very huge track network. The railway transportation is in every city, village of the country, as it is in every part of the country huge production of electricity and here in this report we have contributed some of our intelligence to make this as comfortable as possible so that anyone searching for this topic can get the data easily. Hetronix wind turbine technology is newly invented and highly efficient in wind power generation. The blades are obviously designed to rotate w.r.t. its central axis inside the cylindrical casing.

2. WHAT IS HW GENERATOR?

The HWG is a power generation device that harnesses wind energy as train's runs. This alternative form of wind energy produced by trains is very unique, as it is independent from any natural source of energy. Because, the energy generated from this device is produced due to result of human activity. The HWG generates energy without any interference of the normal train operation. The HW generator consist all the required elements for generating, storing and supplying converted power. Hence, the power generated from this

device can be supplied to internal lighting and conditioning system which now maintained by AG system. These make the system more reliable and more compact as compare to the older one, which is complicated and bulky, which tends to increase the train weight also.

3. LIST OF COMPONENTS OF HW GENERATOR.

3.1 Main Components

- i. Main Cover
- ii. Inside Cover
- iii. Turbine (Blades)

3.2 Internal Components

- i. Vents on Inside Cover
- ii. Side Cap :- 2
- iii. Axis:- 2
- iv. Flume :- 2
- v. Generator :- 2
- vi. Generation Device
- vii. Balancing Device
- viii. Hook :- 4

4. SPECIFICATION OF SYSTEM USED IN HW GENERATOR.

Originally this system was envisaged in a standstill facility along the track of very high speed train (Bullet trains) hence train moving at high speed of 125 mph which would generate a pretty enough wind power (50 feet/sec). Wind blowing with such high speed will results power about 3.5 W by a normal wind power generator. If a train is 656 feet in length, the maximum speed is 187mph, and it covers a distance of 0.62 mile in 18 seconds, then the power generated in this small period by the HW generator laid on the tracks will be 2.6Kwh.

5. DRAWBACKS OF TRACK INSTALLED SYSTEM

(INDIA SPECIFIC ORIENTATION).

To implement this system in India, we have to overcome its There drawback of being induced throughout the rail track since:

- i. Is a larger mesh of rail network which is also not uninterrupted, this is because tracks are physically open for free roam of humans and animals.

S.R. NO.	TYPE OF COACH	NO. OF COACHES	LOAD IN KW	TOTAL LOAD IN KW
1.	A.C. 3 T	8	40	320
2.	A.C. 2 T	6	34.75	208.50
3.	A.C. FIRST	1	15.75	15.75
4.	A.C. PANTRY	2	76.75	153.50
5.	A.C. POWER CAR(WORKING)	2	49	98
		Total- 19		795.75 Say 800



- ii. Moreover it is not economically feasible to install it on Indian tracks because of very low output ratio.
- iii. Also Indian railways cannot achieve high speeds of 125mph for effective track installed device.
- iv. There is also poor track infrastructure which will need total modification at very high cost for track installations of this device.
- v. Keeping the HW generator devices clean can pose great problem. As the train passes, quite a bit of dirt and debris will be accelerated, and will get saturated on the upper surface of the device. Also, grease and grime deposits escaping from underneath will contribute to contaminating the device.
- vi. Theft: the high value of scrap metal and the unguarded remote installations of this device is the very good signs for metal thieves.

Fig.1:-TRACK INSTALLED SYSTEM.

6. SYSTEM OF TRAIN LIGHTING CURRENTLY INSTALLED

Train lighting is one of the important passenger amenities which influence the image of railways. Following systems for train lighting are presently in use:-

- i. Axle driven system working on 110V DC supply.
- ii. Mid-on generation with 3 phase 415V and AC 110V utilization.
- iii. End on generation with 3 phase 415V generation and AC 110V utilization.
- iv. End on generation with 3 phase 750V generation and AC 110V utilization.

Out of the above four systems, the axle generation system is frequently use now a day's for train lighting.

Table.1:-connected load of typical rajdhani service (Mumbai-new Delhi)

Assuming the diversity factor of 0.7,

$$\begin{aligned} \text{Max demand KW} &= 800 \times 0.7, \\ &= 560 \text{ KW.} \end{aligned}$$

7 DARBACKS OF AXLE GENERATION SYSTEM

- i. Huge size of alternators required making it bulky.
- ii. High friction loss due to presence of V- belt.
- iii. Alternator rotor damages due to hiccups in train suspension since the rotor is coupled directly to the wheels through V-belt.
- iv. Extra ventilation and cooling system required for preventing damage to alternator due to excessive heat loss.

8. ROOF INSTALLED HETRONIX GENERATION TRAIN LIGHTING SYSTEM

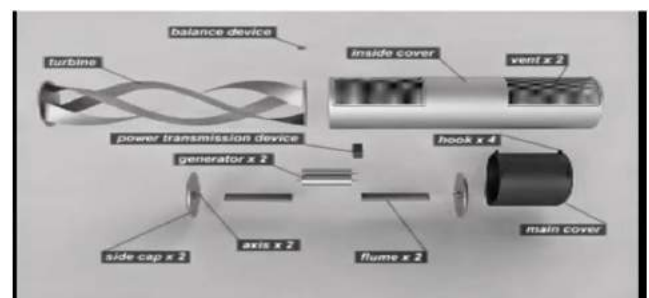


Fig.2:-Rooftop installed system

The device is installed on free space available on train roofs, and is partially buried under train structure. As the train starts running the turbine start rotating; the wind generated from the train spins the turbine inside the HW generator.

Fig.3:- Internal composition of HW generator device

Hetronix wind turbine is the newly invented compact device and the system is wind turbine generator system designed to provide electricity which can be used on several different type applications, such as train lighting, batteries charging, or standalone remote electrical power supply system. The Hetronix wind turbine system consists of a 2.5 meter rotor system and a generator which has diameter



of 35 cm. and weight of 58 kg. This is rated 2000 W at 12.5 m/s wind. The Hetronix wind turbine system features superior low wind-speed blade design which provides great performance, very high system efficiency, and less sound.

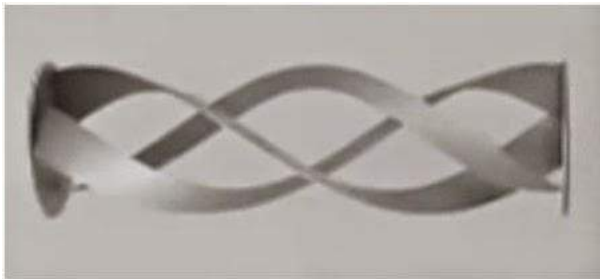


Fig.4:- Turbine of HW generator.

9. INSTALLATION

To fit the HW Generator on the rooftops, some work has to be done on them:

- i. Firstly, Concaves have to be constructed on the rooftop on each coach wherever availability of space.
- ii. Two brackets then have to be placed on two sides of the concaves
- iii. The brackets have to be examined to ensure that they are well fixed
- iv. The HW generator is then set upon the rooftops.

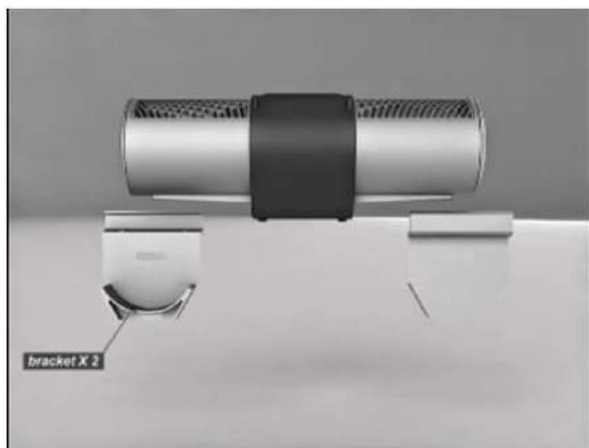


Fig.5:-Installation of HW generator.

10. ADVANTAGES OF HW GENERATOR

- i. It is Eco-friendly as, it does not emit any Carbon contents it does not pollute the atmosphere and also it helps in decreasing pollution if we use it instead of the Fossil Fuel sources.
- ii. It is Cheaper.
- iii. Construction of HW generator is very easy.
- iv. It is very easy to install.
- v. Needs less maintenance & has less chances of Failure.
- vi. It is Efficient.
- vii. Non-variable & continuous supply if regularly train runs.
- viii. Higher power to weight ratio.

- ix. No need of extra space for installation.
- x. No need of external power source.
- xi. Unlike innovations such as the Solar Roadways project and Solar Wind concept, the HW device wouldn't have to depend on a natural energy source.

11. FUTURE OF THE HW GENERATOR

As the hunger for alternative forms of energy continues, the HW generator has generated hope. This device presents a new technology of wind power generation, and created a base to research over new technologies. However, it is important to remember that the design is new and it is still in the developing stage and has not implemented anywhere hence, all of the preservation and maintenance issues that are producing any obstacles in the system work may affect the use of this device in future.

12. CONCLUSION

HW generator is a device which would increase the generation capacity from present level to a good ratio, but it not generates that much power generated by wind mills. But we also know that in the Setup of those large Wind Mills, we need huge capital investment. Also, they need a large working area because in Wind Farms they should be in large in numbers, and then only there will be production of energy. Also, one drawback is that they are variable and totally depends upon wind conditions and that is why there is no continuity in electricity generation.

The HW generator is to be setup on rooftops by giving only a concave shape to the installation area supported by two brackets it can be easily install. It is very small in size and hence required less working area as compared to Wind Mills and axle power generation system. So these can be really useful in those places where electricity is not available. This device need less capital investment compared to the solar panel installation of same capacity. Also, it produces more energy in terms of space taken by them. As, Indian railways consists very huge network. The railway transportation is in every city, village of the country, as it is in every part of the country then if this device can install on rooftops of train in India then there will be a huge production of electricity.

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MAGLEV WINDMILL

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ABSTRACT

In most Asian zone speed of wind is much lesser than 7 m/s, especially in cities. The conventional vertical axis wind turbine cannot start up when wind speed is not high enough and mechanical frictional resistance is also high. This limitation of turbine can be overcome by using magnetic levitation principle. This paper introduces structure and principle of magnetic levitation. The turbine does not have mechanical contact, hence it is frictionless. In this using pair of permanent magnet like neodymium magnet. By placing this two magnets on top of each other with like polarity facing each other, the magnetic repulsion is strong enough to keep magnet at distance away from each other so that rotor floating in air. Its result can be used for suspension purpose. This turbine is vertical axis wind turbine and consists of axial flux generator having permanent magnet on rotor periphery and coil on stator as wind hits the turbine blades, the turbine get rotate and according to faraday's law E.M.F. get induced in coil.

Keywords

Magnetic levitation, magnetic repulsion, flux generator, vertical turbine, neodymium magnet.

1. INTRODUCTION

Wind is energy resource powered by sun and approximate 3% of sun thermal energy is transformed into wind. Wind turbines converted wind kinetic energy into mechanical power then converted mechanical energy into electrical energy. The speed of wind in Asian zone is lower and mechanical frictional resistance of existing wind turbines is too big due to turbine not start up when the wind speed is not big enough. Our project introduces structure and principle of the proposed ma-

gnetic levitation wind turbine for better utilization of wind energy. Maglev Wind turbine has the advantage that no mechanical contact and no friction minimizing the damping in the maglev turbine, which start up with low speed of wind and work with breeze.

2. WIND POWER

Wind is an abundant energy resource ultimately powered by the Sun. Approximately 3% of the Sun's thermal energy is transformed into wind energy. Wind power is a natural power source that can be economical used to generate electricity. Wind is created is from the atmosphere of the sun causing areas of uneven heating. Due to uneven heating of the sun, rotation of the earth and the rockiness of the earth surface winds are formed. The terms wind power describes the process by which the wind is used to generate mechanical power or electricity.

3. TYPE OF WIND TURBINE

In general, there are two types of wind turbine: Horizontal axis wind turbine (HAWT) which has a main rotor shaft and electrical generator are placed at the top of tower and pointed to the direction of wind. These turbine blades receive the wind due to this blade lift and rotate. Depending on the speed of wind the controller will start up or shut off the turbine. If wind speeds are 8 to 16 miles per hour, the turbine start to operate but will shut off if speeds exceed about 55 miles per hour.

As for the Wind Turbine of Vertical axis consists of generator and gearbox which are placed at the ground and thus there is no requirement of tower to support them as in HAWT. The major difference is that the rotors and generator which are vertically arranged and usually on a shaft for support and stability. Their design makes them to utilize the wind power from every direction unlike the HAWTs that depend on lift forces from the wind is same to the lift off concept of an airplane.

Vertical axis wind turbines are further divided into two major types first the Darrius Vertical Axis model and second the Savonius Vertical Axis model. Darrius Model is best described as an egg beater with the blades. Two or three blades which bent into c-shape on the shaft. The functioning of this model is dependent on drag forces. This drag force produced is a differential of the wind hitting by the scoop inner part and the wind blowing against the back to that of scoops. Like the Darrius model, the Savonius turbines will work with winds any direction hitting on blade and also work well with lower wind speeds due to their very low clearance off the ground.

4. MANGNETIC LEVTATION

Magnetic levitation is also known as maglev is a method in which an object is suspended with no support other than magnetic fields. The magnetic force is used to oppose or reduce the effects of the gravitational force and lift up the object. By placing two magnets(Neodymium) on top of each other with same polarities facing each other, the magnetic repulsion will be strong sufficient to keep both magnets at a distance away from each other. The force created as a result of repulsion and this repulsion can be used for suspension purposes and is strong enough to balance the weight of an object depending on the magnet threshold .There are many advantage of magnetic levitation or maglev turbine that is to minimize friction.

5. MAGLEV WIND TURBINE

5.1 Block diagram

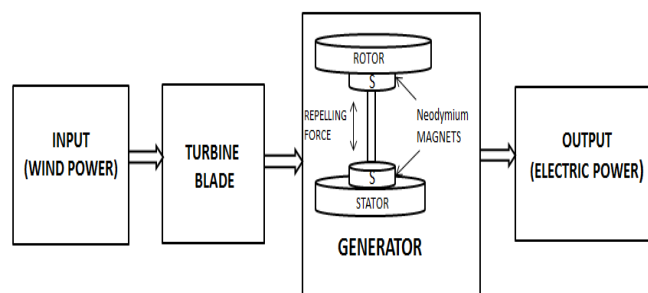


Fig 1: Block diagram of maglev windmill

5.2 Blade design

As compared to the standard design model of the Savonius, we are taken a bit of a different approach in our design. We are modifying the turbine blade with a curvature design from the top of the sails to the bottom. Aluminum Blades are light weight, flexible and high corrosion resistance. Due to this we made the blade by using Al sheet. Structure is made in such manner that the wind density to be increased in the bottom side. Surface is curved normally this will rise the total system stability.



Fig 2: Turbine design

5.2 Rotor Design

The rotor made of plywood. Rotor diameter Appr.8.0inch. Disc type magnets are arranged as alternate poles one after the other along the periphery Diameter of disc magnet Appr. 1.50 inch.

5.4 Stator Design

22 gauge wires of 360 to 450 turns each are used as coils for power generation. 6 sets of coils are used. These coils are placed in the periphery of the stator exactly in a line to the placed disc magnets.

The coils are raised to a certain height for maximum magnetic flux utilization. Each set of such coils are connected in series aiding to obtain maximum output voltage. The series connections of the coils over parallel connection of coil more preferred because it's optimizing a level between the output current and voltage.



Fig 1: Coil Placement

5.5 Magnet Selection

Some factors need to be evaluating in choosing the permanent magnet selection. This are very important factor to Design the maglev portion By understanding the characteristics of magnet materials and the different sizes, shapes and materials is critical.

There are many classes but mainly four classes. They are Alnico, Samarium Cobalt, Ceramic and Neodymium Iron Boron also known Nd- Fe-B. Neodymium Iron Boron is at room temperature reveals the highest properties of all of the magnetic materials. Neodymium Iron Boron has a high attractive magnetic characteristic due to this offers high flux density operation and they have the ability to resist demagnetized. Neodymium magnets are graded related to their maximum energy product and this maximum energy

product relates to the magnetic flux output per unit volume. The magnetic flux output per volume higher values shows power of magnets and range from N35 to N52.

5.6 Magnetic Properties

Compare permanent magnets some factor is evaluated which are:

Permanence (B_r): Indicated the strength of the magnetic field.

Coercivity (H_{ci}): The Resistance of Material to becoming demagnetized.

Energy product (BH_{max}): The Magnetic Energy Density.

Curie temperature (T_c): The temperature at which magnetism of the material are lose.

Neodymium magnets have higher permanence, much higher coercivity and energy product, but often lower Curie temperature than another types. At high temperatures to preserve its magnetic properties Neodymium is alloyed with terbium and dysprosium in order. The table below compares performance of magnetic properties of neodymium magnets with other types of permanent magnets.

Table 1. Properties of different permanent magnet

MAGNET	$B_r(T)$	H_{Ci} (kA/m)	BH_{Max} (kJ/m ³)
Nd ₂ Fe ₁₄ B(sintered)	1.0-1.4	750-2000	200-440
Nd ₂ Fe ₁₄ B(bonded)	0.6-0.7	600-1200	60-100
SmCo ₅ (sintered)	0.8-1.1	600-2000	120-200
Alnico(sintered)	0.6-1.4	275	10-88
Sr-ferrite(sintered)	0.2-0.4	100-300	10-40

5.7 GENRETOR

Basically generator converts mechanical energy to electrical energy. The AC flux generator design performance is based on permanent magnet and alternators where the concept of magnets and magnetic fields are the dominant factors in this form of generator operation. These generators have air gap surface parallel to the rotating axis and the air gap generates the magnetic flux which perpendicular to axis. The basic understanding of a generator is that it the axis.

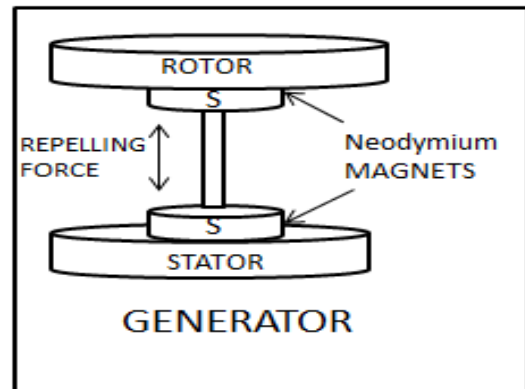


Fig 3: Generator

6. LAVITATION BETWEEN STATOR AND ROTOR

In this designed the stator and rotor are separated in the air using the principle of magnetic levitation. The rotor is lifted in air certain centimeters by the magnetic pull forces created by the ring type Neodymium magnets. This is main principal of a maglev windmill from a conventional one. Due to levitation the rotor is floating in air and mechanical friction is eliminated. Due to this advantage this make the rotation possible in very low wind speeds.



Fig 4: Magnetic levitation between stator and rotor

7. POWER GENRATION

When designing a generator it is important to have a firm grasp of the basic laws that govern its performance. In order to induce a voltage in a wire a nearby changing magnetic field must exist. The voltage induced not only depends on the magnitude of the field density but also on the coil area. The relationship between the area and field density is known as flux (Φ). The way in which this flux varies in time depends on the generator design the axial flux generator uses the changing magnetic flux to produce a voltage. The voltage produced by each coil can be calculated using Faraday's law of induction $V = -N (d\Phi / dt)$.

7.1. Power from wind

7.1.1Calculation

When wind is blowing the energy available is kinetic due to the motion of the wind so the power of the wind is related to the kinetic energy.

$$\text{Kinetic Energy} = 1/2 MV^2$$

Amount of Air passing is given by

$$m = \rho AV \dots\dots\dots(1)$$

Where,

m = mass of air transverse

Air Density (ρ) = 1.2 kg/ 3/2.33x 10⁻³ slugs/f 3

Area (A) = Area swept by the blades by the turbine

Velocity (V) = wind speed in m/s

$$K.E = \frac{1}{2} \rho AV^3 \text{ watts} \dots\dots\dots(2)$$

To convert the energy to kilowatts, a non-dimensional proportionality constant k is

Introduced where,

$$k = 2.14 \times 10^{-3}$$

Therefore,

$$\text{Power in KW (P)} = 2.14 \rho AV^3 \times 10^{-3}$$

With the above equation, the power being generated can be calculated, however one should note that it is not possible to convert all the power of the wind into power for generation.

The power harnessed from the wind cannot exceed 59% of the overall power in the wind.

8. ADVANTAGES

Maglev wind turbines are able to use wind speed with starting speeds as low as 1.5 m/s. Also, they could operate in winds exceeding 40 m/s. The rotor is floating in the air due to levitation, mechanical friction is totally eliminated. That makes the rotation possible in very low wind speeds currently; the largest conventional wind turbines in the world produce only 5 megawatts of power. One large maglev wind turbine could generate one GW of clean power, enough to supply energy to 750,000 homes.

9. LIMITATION

Vertical axis wind turbines are not suitable for large scale power production. Due to the overall complexity of structure the of the vertical axis wind turbine, to scale it up to a size where it could provide the amount of power to feed into the grid or to satisfy a commercial park would not be practical.

10. CONCLUSION

Overall, the magnetically levitated vertical axis wind turbine can be implementing efficiently. The rotors designed can harness enough air to rotate the stator at low and high wind. Rotors and Stator of the wind turbine levitated properly using permanent magnets which allowed for a smooth rotation with less friction. This design will have less friction and can operate at low speed.

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APPLICATIONS OF DATA MINING TECHNIQUES IN HEALTHCARE AND PREDICTION OF HEART ATTACKS

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ABSTRACT

The healthcare environment is usually perceived as being 'information rich' yet 'knowledge poor'. There is a wealth of data available in the healthcare systems. However, there is a lack of effective analysis tools to find out hidden relationships in data. Knowledge discovery and data mining have found numerous applications in business and scientific domain. Very useful knowledge can be discovered from application of data mining techniques in healthcare system. Largest-ever study of deaths show that heart diseases have emerged as the number one killer in world. About 25% of deaths in the age group of 25 to 69 years occur because of the heart diseases. If all age groups are included, heart diseases are responsible for approximately 19% of all deaths. It is the leading cause of death among males as well as females. It is also the leading cause of deaths in all regions although the numbers vary. The proportion of deaths caused by heart disease is the highest in south India and lowest 12% - in the central region of India. The prediction of heart disease survivability has been a really challenging research problem for many researchers. Since the early dates of the related research, much advancement have been noticed in several related fields. Therefore, the main objective of this paper is to report on a research project where available technological advancements are used to develop prediction models for heart disease survivability. The popular data mining algorithms are CART (Classification and Regression Tree), ID3 (Iterative Dichotomized 3) and decision table (DT) derived from a decision tree or rule-based classifier to develop the prediction model using a large dataset. 10-fold cross validation methods to measure the unbiased estimate is used in this paper.

Keywords:

Heart disease, Survivability, Data Mining, CART, ID3, Decision table.

1. INTRODUCTION

According to a recent case study by the Registrar General of India (RGI) and the Indian Council of Medical Research (ICMR), about 25 percent of death in the age groups of 25- 69 years occur because of heart diseases.

In 2008, five out of the ten causes for mortality worldwide, other than injuries, were non-communicable diseases; this will go up to 7 out of 10 by the year 2030. By then, about 76% of the deaths in the world will be due to non-communicable diseases (NCDs). Cardiovascular diseases (CVDs), is also on the rise, comprise a major portion of non-communicable diseases. In 2010, of all calculated

worldwide deaths, 23 million are expected to be because of cardiovascular diseases. In fact, CVDs would be the largest cause of death in the world accounting for more than a third of all deaths.

Cardiovascular disease includes such as coronary heart disease (CHD), cerebrovascular disease (stroke), Hypertensive heart disease, congenital heart disease, rheumatic heart disease, peripheral artery disease, inflammatory heart disease. The major causes of cardiovascular disease are use of tobacco, physical inactivity, an unhealthy diet and harmful use of alcohol. Several researchers are enforcing use of statistical and data mining tools to help health care professionals in the diagnosis of heart disease. Complex data mining advantage from the past experience and algorithms defined with existing software and packages, with certain tools gaining a greater reputation with different technique. This technique is routinely use in large number of industries like medicine, engineering, expert prediction, Web mining, crime analysis, and mobile computing, besides others utilize Data mining. Medical diagnosis is regarded as an important yet complicated task that needs to be executed more accurately and more efficiently. The automation of this system would be extremely advantageous. Data mining is an essential step of a knowledge discovery. In recent years it has attracted great deal of interest in Information industry. Data mining combines machine learning, statistical analysis, and database technology to extract hidden patterns and relationships from large databases. Data mining uses two strategies: supervised and unsupervised learning. In supervised learning, training set is used to learn a model parameters whereas in an unsupervised learning no training set is used. Each data mining technique serves different purposes depending on the modeling objective. The two most common modeling objectives are classification and predictions. Classification model predict categorical labels while prediction models predict continuous-valued functions. Several data mining techniques are used in the diagnosis of heart disease such as Naïve Bayes, Decision Tree, kernel density, neural network, bagging algorithm, and support vector machines showing different level of accuracies. This paper presents new model that enhances the Decision Tree accuracy in identifying heart disease patient. Decision Tree algorithms includes CART (Classification and Regression Tree), ID3 (Iterative Dichotomized 3) and C4.5. The rest of the paper is divided as follows: the background section investigates applying data mining techniques in the diagnosis of heart diseases; the methodology section explains the proposed methodology for enhancing the Decision Tree accuracies in diagnosing heart diseases, and the results section is followed by a summary section.

Sr. No.	Global Burden Of Diseases	Number Of Deaths
1	Cardiovascular Disease	23578
2	Cancer	12181
3	Diabetes	2229
4	HIV/AIDS	1731
5	Diarrhea	709
6	Chronic Respiratory Disease	7373

Data mining has been plays an important role in the intelligent medical systems. The relationships of disorder and the real causes of the disorders and the effect of symptoms that are spontaneously seen in patients can be calculated by the users via the constructed software easily. Large databases could be applied as the input data to the software by using the extendibility of the software. The effects of relationships that has not been evaluated adequately have been explored and the relationships of hidden knowledge laid among the large medical database has been searched in this study by means of finding frequent items using candidates generation. The set of sicknesses is simultaneously seen in the medical databases can be reduced by using our no candidate approach. Knowledge of the risk factor associated with heart disease helps health care professionals to identify patient at high risk of having heart disease. Statistical analysis and data mining techniques to help healthcare professionals in the diagnosis of heart disease. Statistical analysis has identified the disorders of the heart and blood vessel, and include coronary heart disease (i.e. heart attacks), cerebrovascular disease (stroke), peripheral artery disease, raised blood pressure (i.e. hypertension), rheumatic heart disease, congenital heart disease and heart failure. The some major causes of cardiovascular disease is use of tobacco, physical inactivity, an unhealthy diet and harmful use of alcoholic product. The three major cause of heart diseases are chest pain, stroke and heart attack. The data mining methods like ANN technique is used in effective heart attacks prediction system. First the datasets used for prediction of heart disease was pre-processed and also clustered by means of K-means clustering algorithm. Then only neural network is trained with the selected significant pattern. Multi-layer Perceptron Neural Network with Back propagations is used for training. The result indicate that the algorithm used is capable of predicting the heart disease more efficiently. The prediction of heart diseases significantly uses fifteen attributes, with basic data mining technique like ANN, soft computing approaches, Clustering and Association Rules, etc. The outcome shows that Decision Tree performance is more and few time Bayesian classification is having similar accuracies as of decision tree but other predictive methods like Neural Networks, K-Nearest Neighbor, Classification based on clustering would not perform well. By using the Weighted Associative Classifier (WAC), a small change has been made, instead of considering five class labels, only two class label are used. One for "Heart Diseases" and another one for "No Heart Diseases". The maximum accuracy (81.51%) has been achieved. When a genetic algorithm is applied, the accuracy of the Decision Tree and Bayesian Classification is improved by making the data size small. The datasets of 909 patient records with heart diseases has been collected and 13 attributes has been used for consistency. The patient records have been split equally as 455 records for training dataset and 454 record for testing dataset. After applying a genetic algorithm the attributes has been reduced to 6 and decision tree perform more efficiently with 99.2% accuracy when compared to other algorithms. In 2011, a researcher presented a efficient approach for the prediction of heart attacks risk level from the heart disease database. Firstly, the heart disease database is clustered by using the K-means clustering algorithm, which will extract the data Relevant to heart attack from the databases. This approach allow mastering the number of

fragments through its k parameter. Subsequently the frequent pattern is mined from the extracted data, relevant to heart disease, using the MAFIA (Maximal Frequent Item set Algorithm) algorithm. The machine learning algorithm is trained with selected significant pattern for the most effective prediction of heart attacks. They have employed the ID3 algorithm as the training algorithm to show level of heart attacks with the decision tree. The result showed that the designed prediction system is capable of predicting the heart attack effectively. A study was conducted on the prediction of heart attack risk levels from the heart disease databases. The prediction of heart diseases significantly uses eleven important attributes, with basic data mining technique like J48 decision tree ,Naïve Bayes and Bagging approaches. The outcome shows that bagging technique performance is more accurate than Bayesian classification & J48. The results show that the bagging prediction system is capable of predicting the heart attacks effectively.

2. DATA MINING TECHNIQUE

This paper use data mining algorithms CART (Classification and Regression Tree), ID3 (Iterative Dichotomized 3) & decision table (DT). These classification algorithm are selected because they are very often used for research purpose and have potential to yield good result. Moreover, they use different approaches for generating the classification model, which increases the chances for finding prediction model with high classification accuracy.

2.1 Cart

Decision trees are powerful classification algorithms that are becoming increasingly more popular with the growth of data mining in field of information systems. Popular decision tree algorithms include Quinlan's ID3, C4.5, C5 and Breiman et al.'s CART. As the name implies, these technique recursively separates observations in branches to construct a trees for the purpose of improving the prediction accuracy. CART builds classification and regression trees for predicting continuous dependent variable (regression) and categorical predictor variables (classification). The classic CART algorithm was popularized by Breiman et al. (Breiman, Friedman, Olshen, & Stone, 1984; see also Ripley, 1996). Although researchers are also investigating enhancing CART performance in classification problems, less research is done on enhancing CART performance in diseases diagnosis especially in diagnosis of heart diseases. In this paper, existing method (CART) is applied to detect heart diseases which take more time and more memory to produce the result. CART(Classification and Regression Tree) uses Gini index to measure the impurity of a partition or a set of training tuples. It can handle high dimensional categorical data. Decision Tree could also handle continuous data (as in regression) but they must be converted to categorical data. The CART decision tree algorithms can also be used to build both classification trees (to classify categorical response variables) & regression trees (to forecast continuous response variables). It can handle high dimensional categorical data. In most of cases, interpretation of results summarized in a tree is very simple. This simplicity is useful not only for purposes of rapid classification of new observation (it is much easier to evaluate just one or two logical conditions, than to calculate classification scores for each possible group, or predicted values, based on all predictors and using possibly some of complex nonlinear model equation), but can also often yield a much simpler "model" for explaining why observation are classified or predicted in a particular manner. The final result of using tree method for classification or regression can be summarized in series of (usually few) logical if-then condition (tree nodes). Therefore, there is no implicit assumption that the underlying relationships between the predictor variables & the dependent

variable are linear, follow specific non-linear link function, or sometime they are even monotonic in nature. Thus, tree methods are particularly well suited for data mining task, where there is often little prior knowledge nor any coherent set of theories or predictions regarding which variables are related & how. In such types of data analyses, tree methods can often reveal some simple relationships between just a few variable that could have easily gone unnoticed using other analytic techniques.

2.2 ID3

Itemized Dichotomized 3 algorithm better known as ID3 algorithm was first introduced by J.R Quinlan in the late 1970's. The basic concept of information theory is applied in field of data mining. As in the algorithm of data mining, the broad classification is an essential step, for using an information theoretic measure in ID3 algorithm, one of the key algorithm of decision tree algorithm, they had discussed the different steps of the development of decision tree so that the suitable classification criteria could be developed which is helpful in making good decisions. From the data under consideration having set of values, property on the basis of calculation is selected as the root of the tree and the process is repeated to develop a complete decision tree. ID3, Iterative Dichotomized 3 is a decision tree learning algorithm which is used for the complete classification of the object with the iterative inductive approach. In this algorithm the top to down approach has been used. The top node is called as the root node and others are the leaf nodes. So it's a traversing from root nodes to leaf nodes. Each node requires some test on the attributes which decide the level of the leaf nodes. These decision tree are mostly used for the decision making purpose. Data mining techniques basically use the ID3 algorithm as it is the basic algorithm of classification. In the medical field ID3 were mainly used for the data mining.

2.3 Decision Table

Decision tables (DTs) provide an alternate way of representing rule-based classification model which is generally known as tabular representation used to describe and analyze decision situations. Decision tables are easy to explain and interpret to virtually all users, there has been little study of whether such simple models are powerful enough to use for data mining's. Much research have concentrated on abstracting accurate models for prediction (or classification) from a given data set. However, sophisticated technique may remain unused if the model it derives is not comprehensible. For a data mining technique to be really useful, the resulting models should be explainable as well as accurate. Many decisions for example medical treatment cannot be made based on predictions only. Easily interpretable models can give users confidence in the results which are obtained. The choice of a model affects not only accuracy but also users understanding and confidence in the results.

2.4 Heart Disease Data

The data that are used in this study is the Cleveland Clinic Foundation. Heart disease data set are available at <http://archive.ics.uci.edu/ml/datasets/Heart+Disease>. The data set has 11 raw attributes. Consequently, to allow the comparison with the literature, it has been suggested to restrict testing to these same attributes .The data set contains 303 rows.

Name	Type	Description
Age	Continuous	Age in years

Sex	Discrete	1 = male 0 = female
Cp	Discrete	Chest pain type: 1 = typical angina 2 = atypical angina 3 = non-anginal pa 4 =asymptomatic
Tesrbps	Continuous	Resting blood pressure (in mm Hg)
Chol	Continuous	Serum cholesterol in mg/dl
Fbs	Discrete	Fasting blood sugar > 120 mg/dl: 1 = true 0 = false
Restecg	Discrete	Resting electrocardiographic results: 0 = normal 1 = having ST-T wave abnormality 2 =showing probable or define left ventricular hypertrophy by Estes' criteria
Thalach	Continuous	Maximum heart rate achieved
Exang	Discrete	Exercise induced angina: 1 = yes 0 = no
Slope	Discrete	The slope of the peak exercise segment : 1 = up sloping 2 = flat 3= down sloping
Diagnosis	Discrete	Diagnosis classes: 0 = healthy 1= possible heart disease

Table I: SELECTED CLEVELAND CLINIC FOUNDATION

2.5 Data Mining Model

In the described survey CART, ID3 and decision table have been used to predict attributes such as sex, age, blood pressure and blood sugar for chances of a patient getting heart disease. The data is analyzed and is implemented in WEKA ("Waikato Environment for Knowledge Analysis") tool. It is open source software which consists of a collection of machine learning algorithm for data mining tasks. Data mining finds out the valuable information which is hidden in huge volumes of data. Weka tool is a collection of machine learning algorithms for data mining techniques, written in Java. 10 folds cross validation is used to minimize any bias in the process and improve the efficiency of the process. The 3 classifiers like CART (Classification and Regression Tree), ID3 (Iterative Dichotomized 3) and decision table (DT) were also implemented in WEKA. The results show clearly that the proposed method performs well compared to other similar methods listed in the literature, taking into the fact that the attributes taken for analysis are not direct indicator of heart diseases.

3. CONCLUSION

In this paper, different types of classifiers are studied and the experiment are conducted to find the best classifier for correctly predicting patient of heart disease. An approach to predict the heart diseases using data mining techniques has been proposed. Three

classifiers such as ID3, DT and CART were used for diagnosis of patients with heart diseases. Observation has shown that CART performance is having higher accuracy, when compared with other two classification methods. The best algorithm that is based on the patients data is a CART Classification having accuracy of 83.49% and the total time taken to build the model is at 0.23 sec. CART classifier have the lowest average error at 0.3 compared to other. These results also suggest that among the machine learning algorithms tested, CART classifier has the potential to significantly improve over conventional classification methods which is used in the study. It has also been shown that the most important attribute for heart diseases are *cp* (i.e. Chest pain), *slope* (i.e. The slope of the peak exercise segment), *Exang* (i.e. Exercise induced angina), and *Restecg* (i.e. Resting electrocardiographic). These attributes were found using three test for the assessment of input variables: Chi-square test, Info Gain test and Gain Ratio test. The empirical results also show that short but accurate prediction list can be produced for the heart patients by applying the predictive model to the record of incoming new patients. This study would also work to identify those patients who needed special attention.

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“A review of Microgrid”

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ABSTRACT

The demand for high quality electrical energy and growing electricity consumption has been caused by increasing electrification of daily life and also due to rising number of sensitive or critical loads. Due to the rapid increase in global energy consumption and the depletion of fossil fuels, the consumer demand for new generation capacities and efficient energy production, transmission and utilization keeps rising. The micro grid concept has the potential to solve major problems arising from large scale use of distributed generation in distribution systems. Microgrids are emerging as a flexible approach to aggregate diverse distributed and renewable energy sources with the electric grid. In this paper, the work done in the field of Microgrid has been reviewed.

Keywords

Microgrid, Distributed Generation, Electric Grid

1. INTRODUCTION

The total capacity of distributed energy generation and storage devices connected to a typical electrical service network today generally contribute a small fraction of the total local electrical load. In order to improve the reliability and richness of the electrical supply, there is a trend toward installing more distributed energy resources, particularly renewable generation. Also special care is required in design and operation of local grid when integration of such renewable energy sources is made. It is also desirable to aggregate the distributed energy resources in a way that they can serve the loads either in cooperation with a larger utility grid or independently in a small grid, and this type of operation is enabled by microgrids. While renewable/distributed generation and electrical storage devices may be interconnected in a normal grid, there are three defining properties that distinguish a microgrid from a normal grid:

- Ease of integration of new resources;
- Ease of scaling up or down the size; and
- Equitable role for each resource in determining the operation of the microgrid.

2. THE MICROGRID CONCEPT

A microgrid may be defined as a local electrical network that (1) comprises power generation units, power consumption units, and act as a means of delivering power from the generation units to the consumption units, (2) may be connected to a larger utility based power system, and (3) operates to balance the power delivered and demand within

the microgrid. [1]

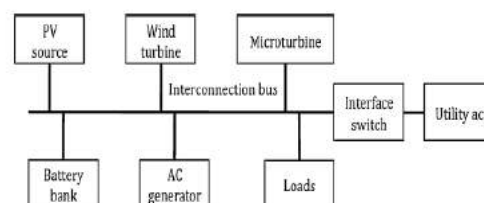


Figure 1: A simplified diagram of microgrid

The network would include electric power generation units such as conventional internal combustion driven alternators, fuel cell generators, microturbines, solar thermal power generators, solar photovoltaic installations, wind turbine generators, and induction generators, combined heat and power generators, etc. The network would also contain power consumption units including electrical motors, lighting and heating loads, industrial process loads as well as recently emerged bidirectional loads like electric vehicles (with V2G capabilities). Furthermore, the network would contain appropriate feeder and branch circuits, transformers, switchgear, grounding, and protection elements to provide a safe and reliable means of providing electrical energy to the power consumption units from the power generation units, while possibly importing and/or exporting electrical power from a large-scale electric utility that may be connected to the network. However, the capability to independently balance supply and demand within the local network, particularly in the absence of a normal electric utility grid is the defining feature of the microgrid. Such a capability to operate in the absence of the normal utility grid is salient, since the utility grid is normally understood to have virtually infinite capability to source as well as sink energy relative to the aggregate supply and demand capabilities of the microgrid. This notional feature of a microgrid is defined by the control features of the generating sources that are located within. Figure 1 illustrates a schematic of a notional microgrid integrating several generating sources, load, and the main electric utility.

3. OPERATING MODES

The operating modes of a microgrid define the high-level functionality of microgrids, which must then be implemented in appropriate system configurations through system design and control [1]. A microgrid has two distinct steady-state operating modes and also two distinct transitional operating modes as described in this section.

3.1 Grid-Interactive Steady State Mode

A microgrid that is electrically connected to the main electric grid is said to be in a grid interactive mode. In a grid interactive mode, the microgrid does not necessarily have to balance its supply and its demand because any difference between supply and demand can be accommodated by the utility grid.

3.2 Grid-Independent Steady State Mode

A microgrid which is not connected to any utility grid is said to be in grid-independent mode. In a grid independent mode, the microgrid must balance the internal supply and demand. Any difference between supply and demand will should be accommodated through appropriate provision of energy storage within the microgrid.

3.3 Seamless Transition Mode

A microgrid which is capable of transitioning between grid-interactive and grid independent modes of operation without any interruption in service to the loads within the microgrid is said to be capable of seamless mode transitions. This mode of transition will be useful in facilities that require high levels of power quality.

3.4 Transfer Transition Mode

A microgrid that requires a finite discontinuity in service to the loads within the microgrid in order to transition between grid-independent and grid-interactive modes of operation is said to be capable of performing transfer mode transitions. This mode of transitions would be useful in facilities that require high levels of reliability, but may be able to ride-through finite loss of supply.

4. ELECTRICAL CONFIGURATIONS

There are three configurations of microgrid

- DC microgrid
- AC microgrid
- Hybrid AC/DC microgrid

4.1 DC Microgrids

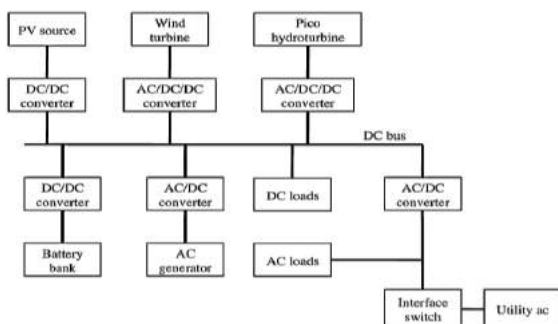


Figure 4.1: A simplified diagram of DC microgrid

[Source- Power Electronics for Renewable and Distributed Energy System]

A DC microgrid is one which uses direct current (DC) as the means of delivering power from the generation units to the consumption units. They may be configured as systems conductors with positive and negative polarity, with a grounded conductor at neutral potential, or as systems with positive or negative polarity, with the other conductor grounded. A DC microgrid typically consists of power converters to interface sources and loads, special protection elements, and an interface to AC grid. A DC microgrid decouples the frequency, voltage, and phase of the various AC generating and consuming elements in the microgrid by the use of proper power converters. It is challenging to build robust protective systems for DC microgrids, and it often requires the integration of protection functions into the converters themselves. Figure 4.1 illustrates a DC based microgrid. The interface among each energy source and the DC bus has a power electronic converter (a DC/DC converter, or an AC/DC converter). Each of the converters may be centrally dispatched in order to regulate the energy flow in or out of the DC bus, or they may be droop controlled in order to share power in a distributed manner.

4. 2 AC Microgrids

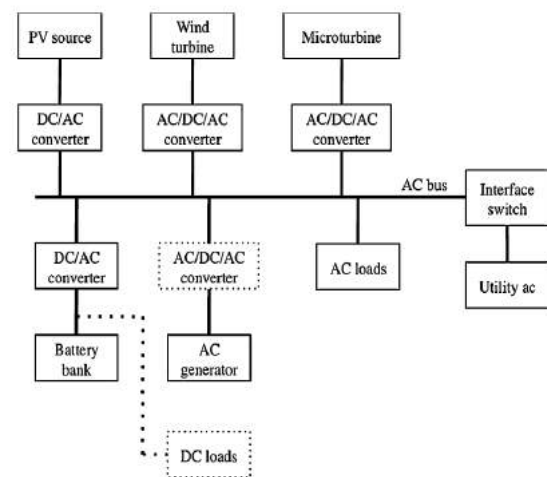


Figure 4.2: A simplified diagram of AC microgrid

[Source- Power Electronics for Renewable and Distributed Energy System]

An AC microgrid is one which uses alternating current (AC) as the means of delivering power from the generation units to the consumption units [1]. Types include single-phase, three-phase, and multi-phase with different grounding options. Networks with fixed elements and well-defined operating characteristics do not fall under the purview of AC microgrids. An AC microgrid typically consists of transformers and power converters to interface sources and loads as well as protection devices. The operation of an AC microgrid is analogous to that of a large-scale utility system; it is relatively easy to achieve power flow control, and one can use conventional protection elements. In an AC microgrid, power conversion interfaces is needed to be modified to handle fault scenarios under different operating modes. Figure 4.2 illustrates AC based microgrid. The interconnection among the AC bus and each of the energy sources is realized using power electronic converters (DC/AC or AC/AC). Each of the converters may be centrally dispatched in order to

regulate the energy flow in or out of the AC bus, or they may be droop controlled in order to share power among them in an autonomous or distributed manner [1]. Installations of these systems have found application in remote locations where access to a central electric utility grid is unreliable and the power quality is poor.

4.3 Hybrid microgrid

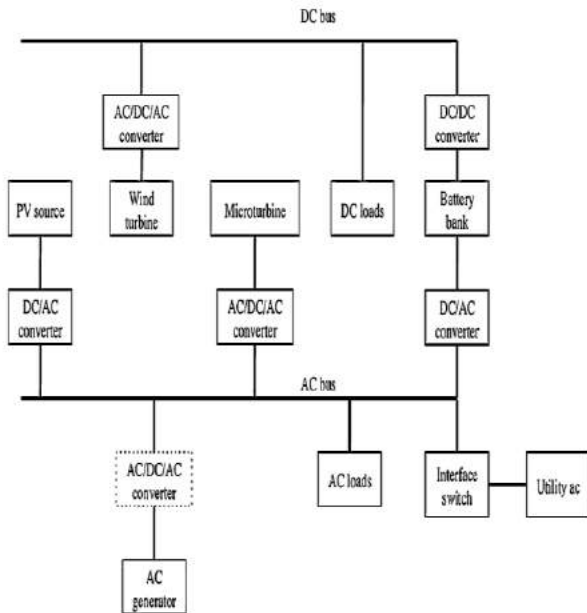


Figure 4.3: A simplified diagram of Hybrid AC/DC microgrid

[Source- Power Electronics for Renewable and Distributed Energy System]

Figure 4.3 illustrates a hybrid microgrid based on a DC bus and an AC bus with the appropriate power electronic converters. Each of the converters may be centrally dispatched in order to regulate the energy flow in or out of the DC and/or AC bus, or they may be droop controlled in order to share power among them in a distributed manner[2]. Similar to the AC microgrid, these systems have found application in remote locations where access to a central electricity grid is unreliable and the power quality is poor.

5. CONTROL STRUCTURES

Each source in a microgrid must have an equitable role in determining the operation of the microgrid. If the physical characteristics of the source themselves do not naturally provide such a feature, then an overriding controller must regulate the operation of the source in a manner that enables such a feature. The type of controller selected would depend on the nature of the source. Each source has a local controller that typically consists of two parts: (1) an inner controller that regulates the terminal quantities like voltage and frequency, and (2) an outer controller that provides the references to the inner controller. In addition to the local controller, the microgrid may have a supervisory controller that updates set points for the individual local controllers depending on the

state of the overall microgrid. This section describes the two chief types of local control structures:

- Grid-forming control
- Grid-following control.

5.1 Grid-Forming Control

A source with a grid-forming control structure, called a grid-forming source, is a source that actively regulates the voltage and frequency of the grid. In grid independent mode, there must be at least one source with grid-forming control in the microgrid. Grid-forming sources must be dispatchable. A fully dispatchable source is one that can deliver any amount of power up to its rated power at any time. A partially dispatchable source is one that has some flexibility in the amount of power it can deliver. Dispatchable sources are always some form of stored energy: chemical (fuels, which interface microgrids through diesel gensets or fuel cells), mechanical (flywheels, which interface microgrids through electrical machines), electrochemical (batteries, which interface microgrids through power converters), or electromagnetic (superconducting magnetic energy storage, which interface microgrids through power converters). Equitable roles for the grid-forming sources are ensured by controlling them to share the load power in proportion to their rated powers. The method to ensure power sharing is slightly different for DC and AC power systems.

5.2 Grid-Following Control

A source with a grid-following control structure, called a grid-following source, is a source that injects power into the microgrid at a voltage and frequency that are regulated by other sources. Most renewable power sources do not regulate their output voltage and frequency, because they are power-constrained sources. A photovoltaic panel connected to a microgrid through a power converter is an example of a grid-following source. As a final note, any grid-following source can be supplemented with energy storage and then controlled to be grid-forming.

6. CONCLUSION

This paper has presented an overview of microgrids as they pertain to power electronic interfaces between distributed and renewable energy resources. In particular, the concept of microgrids exploits the capabilities of power electronic interfaces through appropriate control to improve the flexibility in aggregating diverse resources. The focus of the discussion here has been on the power electronic interfaces, but in order to exploit the versatility and flexibility of the microgrid concepts, it can also be employed in aggregating resources that do not have power electronic interfaces, such as synchronous generators, induction generators, etc. with appropriate generation control, as well as storage systems and loads. Such an environment would allow increased penetration of renewable and distributed generation systems to serve the energy needs without compromising levels of reliability and power quality. It is also compatible with various intelligent communication and decision systems that

are being considered under the rubric of ‘smart grid’. The technical features of the conceptual microgrids have been demonstrated in multiple scenarios in laboratory and field installations around the world. However, widespread adoption of the conceptual features would require innovations in commercial, economic, and business frameworks in the provision of electrical service to customers, steering away from the one-size-fits-all type of electric utility model that is common today

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ABSTRACT

Gas Insulated Substations (GIS) are based on the concept of complete encapsulation of all the high voltage energized parts in a grounded enclosure and compressed SF₆ gas is used as the insulating medium between the two. GIS technology is typically of modular design and filled with a minimum of SF₆. It has low- LCC cost and can be used for indoor and outdoor application. At these days the GIS technology started based on extensive fundamental research and since then the service experience together with innovative development work has brought this technique forward to a safe and environmental compatible, a most reliable and available element of the energy supply. The tremendous progress of development can be seen as an example of the classic three phase enclosure of a 72.5-170 kV GIS. Reliable and economical power transmission and distribution are key functions for the future electric power supply. High-voltage switchgear and equipment for voltages above 1 kV up to 800 kV are safety elements within the electrical energy supply and therefore subjected to a very high standard of availability and reliability. Gas insulated switchgear is used in industrial areas to fulfill high-energy demands by space saving design with a minimum of cost. Only SF₆ insulated switchgear is able to fulfill these requirements.

General Terms :

Working of GIS system, operation of equipment's, fault isolation process, need of GIS, future trends in GIS, conclusion.

Keywords :

Circuit Breaker, Disconnectors, LCC-Local Control Cubicle, Earthing Switch, Voltage Transformer, Current Transformer, Cable Compartments, SF₆.

1. INTRODUCTION

Conventional substations requires, small installation size, protection against atmospheric pollution and moisture, noiseless operation, non-explosive and flame resistant, reduced maintenance, minimal radio interference, but totally enclosed substations using SF₆ gas as insulation that are also known as GIS is now in widespread use in the

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It consist of Bus bars, Circuit breakers, Disconnecting switches, Earthing switches, Current transformers, Voltage transformers Cable and boxes, Gas supply and gas monitoring equipment Local control

2. ELEMENTS OF GIS

• *Circuit Breaker;*

Circuit Breaker Under short circuit conditions, however, the current may reach tens of thousands of amperes at a power factor as low as 0.1. It is duty of a circuit breaker to interrupt such currents as soon as possible to avoid equipment damage.

• *Disconnectors :*

Disconnectors or isolators are used for electrical isolation of circuit parts They are slow acting and operating at off load Disconnectors must be carefully designed and tested to be able to break small charging current without generating too-high over voltage.

• *Local Control Cubicles "LCC":*

Local Control Cubicles "LCC" LCC is the interface cubicles to all secondary systems of a substation which are represent a station control and protection. LCC includes control and alarm functions as well as the correct distribution of auxiliary power supply for the relevant GIS bay.

• *Earthing Switch;*

Earthing Switch Slow-operating earthing switch are used for protection purpose when work is being done in the substation, but are operated only when it is certain that the high-voltage system is not energized. The fast-closing earthing switch can close against full voltage and short

circuit power. The high speed earthing switch is achieved by means of a spring-closing device.

- **Voltage Transformer:**

Voltage Transformer Variable location on feeder and busbars. Integrated disconnecting facility for GIS and power cable testing without dismantling and gas handling. • Flexible gas compartment allocation for optimal service oriented gas supervision.

- **Current Transformer:**

Current Transformer in the single phase enclosed Core of CT is located outside the enclosure inside for three phase Gas compartment to reduce access of moisture and to suppress gas-tight bushings for secondary connections. •

- **Cables Compartment:**

1. Optimized solution for plug-in type power cable connection.
2. Adjustable support structures for minimum requirements for the GIS floor.
3. Fixation to the GIS floor by cemented anchor bolts, no need for special foundation (steel beams....etc)

3. **Service condition of GIS :**

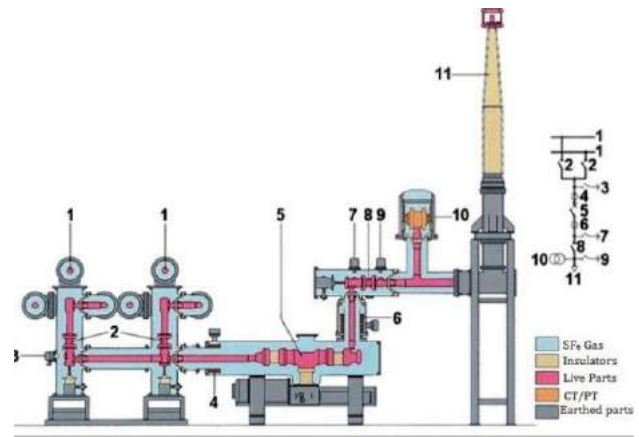
Indoor or outdoor is depend upon customer requirement or Elevation above sea level - As per site location and design
Ambient temperature: 40°C and Maximum ambient temperature : 105°C

4. **Service offered by GIS :**

For User and GIS supplier User:

- GIS should be completed under the supervision of the supplier to ensure correct installation.
- Concrete foundations, Power transformers or reactors, including bushings, Surge arresters outside the GIS The station ground grid, below ground, and vertical connection risers of adequate length.
- Ac and dc auxiliary power to furnished equipment, Supervisory control and data handling equipment.
- Batteries and battery chargers equipment.

5. **CIRCUIT DESCRIPTION:**



1. Bus bar
2. Disconnectors
3. Maintenance Earthing Switch
4. Current Transformer
5. Circuit Breaker
6. Current Transformer
7. Maintenance Earthing Switch
8. Disconnectors
9. Earthing Switch
10. Voltage Transformer
11. Bushings

6. **NEEDS FOR GIS :**

- Non availability of sufficient space. It is very much required to establish a substation at load center. Establishing a substation at load center is quite economical and profitable in following ways:
- Reduction in length of feeders
- Improvement of the quality of voltage regulation due to short length feeders
- Generally main load center of any place is situated at very congested place where, sufficient land for establishing conventional AIS is very hardly available. This problem can be solved by using gas insulated switchgear technology. Total space required for a GIS is 10% of that needed for a conventional substation
- Difficult climatic and seismic conditions at site, like high altitude and atmospheric pollution.
- "superior" to air insulated substations
- The higher the voltage, the more favorable gas insulated technology becomes. The footprint of 765kV conventional substation is enormous, and GIS technology allows a significant size reduction.
- GIS technology can be used for installations in areas where the cost of real estate is appreciable.
- Overcomes or decreases the magnitude of limitations of AIS site selection.

7. **ADVANTAGES:**

- Economic efficiency
- High reliability
- Safe encapsulation
- High degree of gas-tightness
- Long service life
- Low life-cycle and maintenance costs
- Good accessibility and ergonomics
- High availability
- Safe operation even under extreme environmental conditions
- Environment-compatible design
- In addition to gas-insulated switchgear, we also supply gas-insulated transmission lines (GIL) for transmitting high
- Capacities of power over long distances.

8. DISADVANTAGES :

- GIS installations tend to be much more expensive than air-insulated installations with the same rating.
- Very Fast Transient Over voltage (VFTO) during switching operations or earth faults and transient enclosure voltages and particle contamination

9. APPLICATIONS :

- Power transmission
- Integration of renewable power generation units to the grid
- In Railways :
One of today's main challenges in power transmission is to bring high voltage levels right into the centers of urban areas. This requires switchgear that features a small footprint, the utmost reliability, and very low noise and electromagnetic emissions. GIS are ideally suited to meet these requirements.
- Due to this compact design, GIS need very little space.
- The benefits of Gas-insulated switchgear :

High reliability, availability, gas tightness, and high degree of safety

- Economic efficiency, long service life, little maintenance requirements, and low life cycle costs
- Compact design, good accessibility and ergonomics, high degree of adaptability to individual requirements

10. FUTURE TRENDS IN GIS:

- Small quantities of SF6 in N2 can improve dielectric strength.
- All of the dielectric strength of SF6, nearly, can be achieved by adding less than 20% SF6 into N2. SF6/N2 mixtures less susceptible to effects of field non uniformity than pure SF6.
- Compact design of switch gear by using three phase encapsulated design for higher voltages
- Development of DC GIS for incorporating into expanding national/international HVDC systems.
- Compact design of switchgear by using three phase modules
- Use of vacuum circuit breaker cells in the medium high voltage GIS and fewer breakers per pole in high voltage circuit breakers

11. CONCLUSION

Generate no noise & have no radio interference, being located close to load centers, easy solution for mountain areas where ice & snow are major problems and also in coastal area, cosmopolitan cities and industrial township etc. due to many other advantages described in this presentation GIS is necessary for Extra HV & Ultra HV substations.

12. ACKNOWLEDGMENTS

We are truly thankful to Mr. Umesh Kamath and Mr. Onkar Salvi for elaborating our knowledge.

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- Jean Louis Habert “GIS substation design and execution for HV and EHV application”
- Wilson Harles “Maintenance of GIS system”

A Literature Review: Improvement of Power Quality by Unified Power Quality Conditioner (UPQC)

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ABSTRACT

This paper represents the power quality improvement with a comprehensive review on the unified power quality Conditioner (UPQC). In this paper a broad overview on the different possible intelligent controls is given which is used with UPQC. In this paper a new control method to compensate the power quality problems is presented with a three-phase unified power quality conditioner (UPQC) under balanced and unbalanced load conditions. The performance of proposed control system was studied with Matlab Simulink program. The proposed UPQC system can improve the power quality at the point of common coupling (PCC) on power distribution system under balanced and unbalanced load conditions.

Keywords

Active power filters, ANN, Fuzzy logic controller, Power quality, Unified Power Quality Conditioner (UPQC).

1. INTRODUCTION

For improving power quality of electrical distribution system, Unified power quality control was widely studied by many researchers as an eventual method [1-3]. The function of unified power quality conditioner is to compensate supply voltage flicker and unbalanced, reactive power, negative-sequence current, and harmonics. In other words, on power distribution systems or industrial power systems, the UPQC has the capability of improving power quality at the point of installation. Therefore, the UPQC is expected to be one of the powerful solutions to improve the power quality under unbalanced condition [4]. The UPQC consisting of the combination of a series active power filter (APF) and to compensate the voltage interruption shunt APF can also use, if it has some energy storage or battery in the dc link [5]., Power electronics converters which is non-linear device, increase overall reactive power which is demanded by the equivalent load, and it will inject harmonic currents into the distribution grid. It is known that the reactive power demand causes a drop in the feeder voltage and increases the losses. The presence of harmonic currents can cause additional losses and voltage waveform distortions, and so cause poor

sensitive loads that require ideal sinusoidal supply voltages for their proper operation. The use of electronic equipment sensitive to power variations drives increases with the interest in power conditioning technologies. So, it is necessary to include some sort of compensation in order to keep the power quality within limits proposed by standards [7-8]. The power conditioning devices based on power electronic can be effectively utilized to improve the quality of power supplied to customers [3]. The Unified Power Quality Conditioner (UPQC) is One of the modern solution that deals with both load current and supply voltage imperfections [9], which was first presented in 1995 by Hirofumi Akagi. Different power quality phenomena can compensate with the use of UPQC, such as: sags, swells, voltage imbalance, flicker, harmonics and reactive currents. Series and shunt active filters are coalesces and connected in cascade via a mundane dc link capacitor form UPQC. At the point of the prevalent voltage coupling (PCC) The series active filter inserts a voltage such that the load side voltage is impervious to any voltage perturbation. Emolument of the load reactive power demand and unbalance, to eliminate the harmonics from the supply current, and to regulate the prevalent dc link voltage are the main objectives of the shunt active filter.. The paper is organized as follows. The structure of the UPQC is presented in Section 2. Then, in Section 3, the control principles are described in detail. The simulation model is presented in Section 4. Simulation results in this section demonstrate the efficacy and multifariousness of the proposed design technique. Determinately, Section 5 gives the conclusion.

2. UPQC CONTROL ALGORITHM

The UPQC consists of two voltage source inverters connected back to back with each other sharing a prevalent dc link. One inverter is controlled as a variable voltage source in the series APF, and the other as a variable current source in the shunt APF. Fig. 1 shows a rudimental system configuration of a general UPQC consisting of the amalgamation of a series APF and shunt APF. The main aim of the series APF is harmonic isolation between load and supply; it has the capability of voltage flicker/ imbalance emolument as well as voltage

regulation and harmonic emolument at the utility-consumer PCC. The shunt APF is utilized to absorb current harmonics, compensate for reactive power and negative-sequence current, and regulate the DC link voltage between both APFs. The operating principle of the UPQC is twofold. The purport of the APF is to amend the quality of the load voltage by injecting the emolument voltage u_2 , whose amplitude is identically tantamount and phase antithesis to the failures of the supply voltage u_s . On the other hand, the purport of the APF is to ameliorate the quality of the supply current by injecting the emolument current i_b , whose amplitude is identically tantamount and phase antithesis to the failures of the load current i_o . Both SAPF and APF have their own control systems. The control systems are predicated on the space vector calculation in the rotating reference frame, where the angular speed of the reference frame corresponds to the fundamental frequency, i.e in the synchronous reference frame.

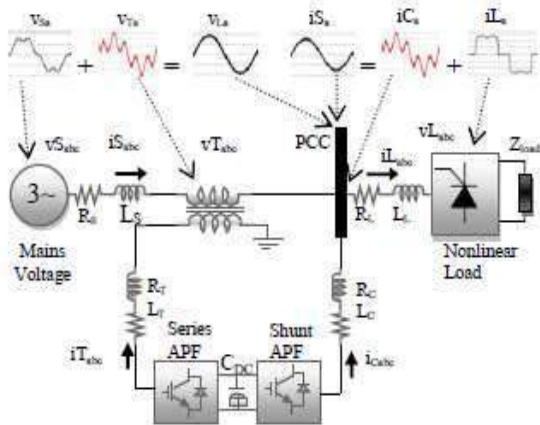


Fig 1. Unified power quality conditioner configuration.

The UPQC is a custom power contrivance that integrates the series and shunt active filters, connected back-to-back on the dc side and sharing a mundane DC capacitor, as shown in Fig.2. It employs two voltage source inverters (VSIs) that are connected to a prevalent DC energy storage capacitor. One of these two VSIs is connected in series with the feeder and the other is connected in parallel to the same feeder.

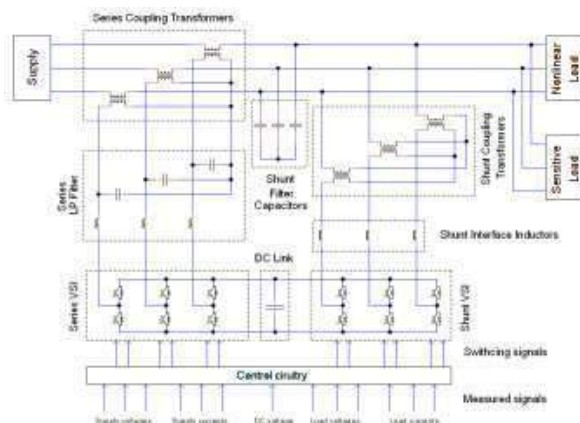


Fig.2. Power circuit diagram of a three-phase UPQC

The shunt active filter is responsible for power factor correction and compensation of load current harmonics and unbalances. Also, it maintains constant average voltage across the DC storage capacitor. The shunt part of the UPQC consists of a VSI (voltage source inverter) connected to the common DC storage capacitor on the dc side and on the ac side it is connected in parallel with the load through the shunt interface inductor and shunt coupling transformer.

The shunt interface inductors, together with the shunt filter capacitor are habituated to filter out the switching frequency harmonics engendered by the shunt VSI. The shunt coupling transformer is utilized for matching the network and VSI voltages.

The series active filter emolument goals are achieved by injecting voltages in series with the supply voltages such that the load voltages are balanced and undistorted, and their magnitudes are maintained at the desired level. This voltage injection is provided by the dc storage capacitor and the series VSI. Predicated on quantified supply and/or load voltages the control scheme engenders the congruous switching signals for the series VSI switches. The output voltages of the series VSI do not have the shape of the desired signals, but contain switching harmonics, which are filtered out by the series low pass filter. The amplitude, phase shift, frequency and harmonic content of injected voltages are controllable. The proposed UPQC control algorithm block diagram in Matlab/Simulink simulation software is shown in Fig.3.

A. Reference Voltage Signal Generation for Series APF

The function of the series APF is to compensate the voltage disturbance in the source side, which is due to the fault in the distribution line at the PCC. The series APF control algorithm calculates the reference value to be injected by the series APF transformers, comparing the positive-sequence component with the load side line voltages. Supply voltages are transformed to d-q-0 coordinates.

$$\begin{matrix} V_{s0} & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & \\ V_{sd} & \sin(\omega t) & \sin(\omega t - 2\pi/3) & \sin(\omega t + 2\pi/3) & V_{sa} \\ V_{sq} & \cos(\omega t) & \cos(\omega t - 2\pi/3) & \cos(\omega t + 2\pi/3) & V_{sb} \\ & & & & V_{sc} \end{matrix}$$

B. Reference Current Signal Generation for Shunt APF

The shunt APF described in this paper used to compensate the current harmonics and reactive power generated by the nonlinear load. The shunt APF reference current signal generated. The instantaneous reactive power (p-q) theory is used to control of shunt APF in real time. In this theory, the instantaneous three-phase currents and voltages are transformed to α - β -0 coordinates.

$$\begin{matrix} V0 & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & Vsa \\ Va & 1 & -\frac{1}{2} & \frac{\sqrt{3}}{2} & Vsb \\ V\beta & 0 & \frac{\sqrt{3}}{2} & -\frac{1}{2} & Vsc \end{matrix}$$

In UPQC-P case the series compensator does not compensate for any part of the reactive power demand of the load, and it has to be entirely compensated by the shunt compensator.

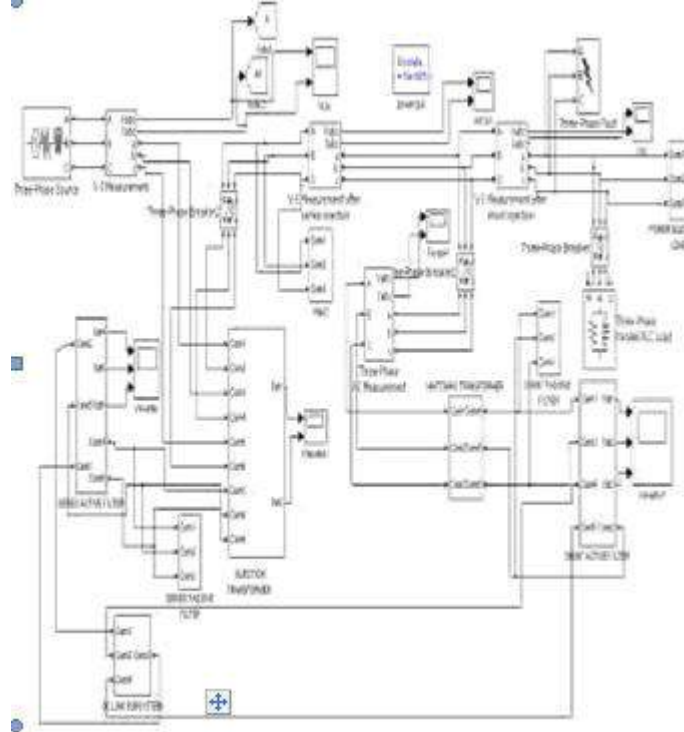


Fig.3. UPQC Simulation

Also the shunt compensator must provide the active power injected by the series compensator. Thus, in this case the VA rating of the shunt compensator increases, but that of the series compensator decreases.

In the case when the UPQC-P control strategy is applied, the injected voltage is in phase with the supply voltage; hence the load voltage is in phase with the supply voltage and there is no need for calculating the angle of the reference load voltage. Thus, the reference load voltage is determined by multiplying the reference magnitude (which is constant) with the sinusoidal template phase-locked to the supply voltage. Then, the reference series filter voltage is obtained.

Comparing the techniques for calculating the reference voltage of the series compensator, presented above, it can be concluded that the UPQC-P algorithm has the simplest implementation (it involves very little computation). In the UPQC-P case the voltage rating of the series compensator is considerably reduced.

Also, the UPQC-Q compensation technique does not work in the case when the load is purely resistive. Therefore, the UPQC-P control strategy has been used in the UPQC

simulation model. PI controller has been used for dc link voltage control in the UPQC simulation model.

3. SIMULATIONS AND RESULTS

A UPQC simulation model (Fig.4) has been engendered in MATLAB/Simulink so as to investigate UPQC circuit waveforms, the dynamic and steady-state performance, and voltage and current ratings. The following typical case studies have been simulated and the results are presented.

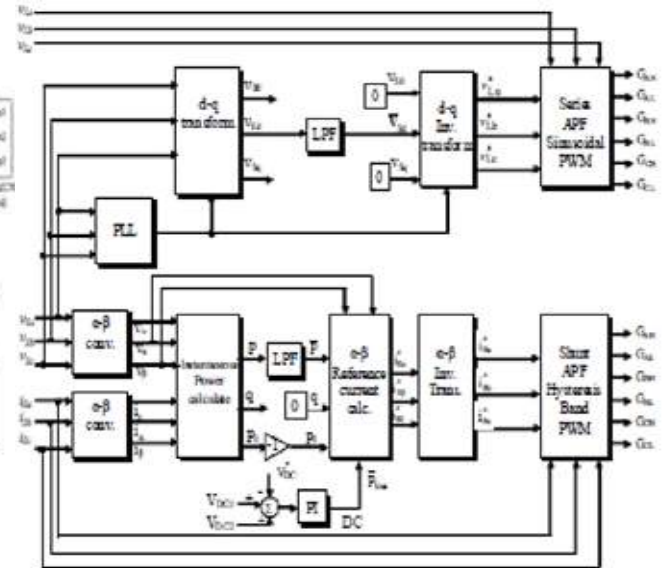


Fig 4. Series APF reference voltage and shunt APF reference current signal generation block diagram

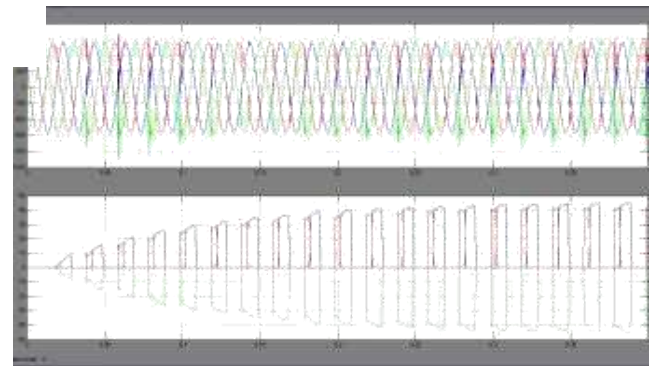


Fig 5. Steady state source voltage and load current waveforms (without UPQC) THD of source voltage:25.9% ;THD of load current:63%

1. Short duration three phase fault conditions.
2. Long duration three phase fault conditions.
3. Dynamic load and three phase fault conditions.
4. Harmonic compensation
5. DC link voltage regulation for the above conditions is also verified.

DC link voltage dips marginally during fault condition but is Maintained constant by UPQC. Simulation results show that UPQC mitigates deeper sags, harmonic emolument is preponderant, does better load regulation and balancing for dynamic loads and can abide long duration fault conditions efficaciously. Thus it gives enhanced performance when compared to DSTATCOM and DVR. Results show that it gives good steady state and transient performance. The proposed control scheme is feasible and simple to implement albeit further work is needed to optimize the parameters of the UPQC.

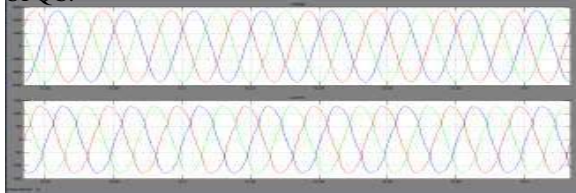


Fig 6. Steady state source voltage and load current waveforms (with UPQC) THD of source voltage:0.98% ;THD of load current:1.03%

Fig.5 shows the simulation results for the case where the system is in steady state. Due to power electronic load the current waveform is distorted and is unbalanced. Voltage waveform is additionally distorted. Figure 6 shows the results after UPQC is connected to the system. The waveforms are balanced and THD is greatly reduced .This substantiates that UPQC compensates harmonics to a great extent.

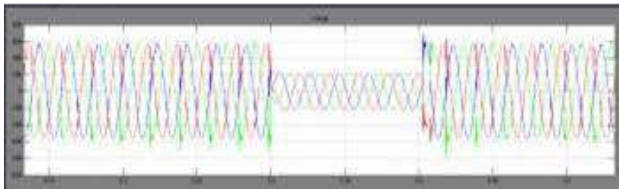


Fig 7. Source voltage when a three phase fault is introduced from 0.3 to 0.4 seconds. (without UPQC) (THD:27%)

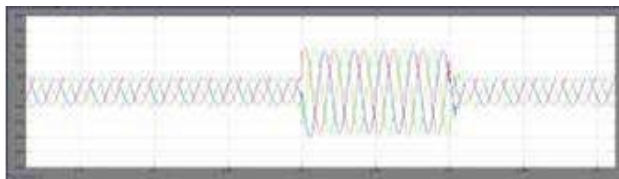


Fig 8. Compensating voltage injected by series active filter

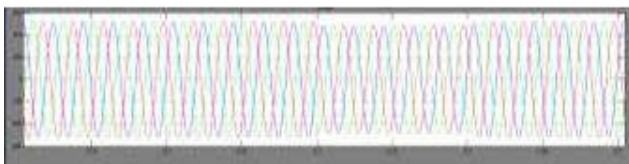


Fig 9. Source voltage when a three phase fault is introduced from 0.3 to 0.4 seconds. (with UPQC)

(THD: 0.50%)

Figure 8-10 shows the simulation results when a three phase fault is introduced, the series active filter(DVR) injects the compensating voltage so that the source voltage is maintained constant. This shows that voltage imperfections are compensated by the series part of UPQC.

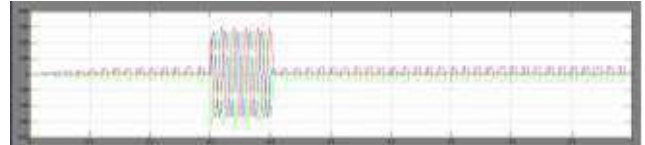


Fig 10. Load current when a three phase fault is introduced from 0.3 to 0.4 seconds. (without UPQC)

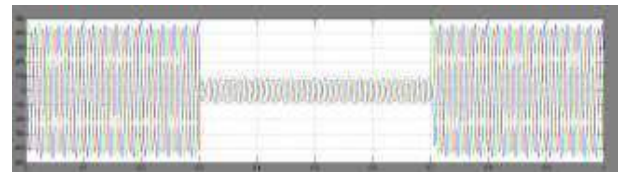


Fig 11. Compensating current injected by shunt active filter

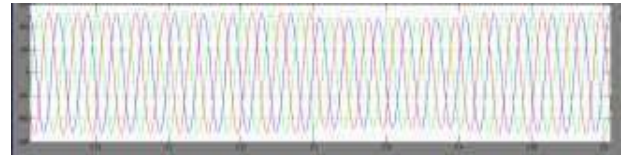


Fig 12. Load current when a three phase fault is introduced from 0.3 to 0.4 seconds. (with UPQC)



Fig 13. Source voltage when a three phase fault is introduced from 0.3 to 0.7 seconds. (without UPQC)

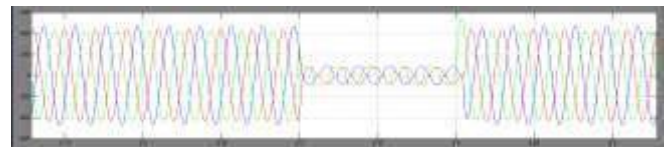


Fig 14. Compensating current injected by shunt active filter.

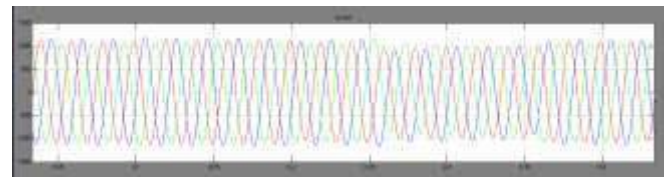


Fig 15. Load current when a three phase fault is introduced from 0.1 to 0.2 seconds and an RLC load from 0.25 to 0.35 seconds. (with UPQC)

4. CONCLUSIONS

This paper describes an incipient control strategy utilized in the UPQC system, which mainly compensate reactive power and voltage and current harmonics in the load under non-ideal mains voltage and unbalanced load current conditions. The proposed control strategy use only loads and mains voltage quantifications for series APF predicated on the synchronous reference frame theory. The instantaneous reactive power theory is utilized for shunt APF control algorithm by quantifying mains voltage and currents. The conventional methods require quantifications of the load, source and filter voltages and currents.

The simulation results show that, when unbalanced and nonlinear load current or unbalanced and distorted mains voltage conditions, the above control algorithms eliminate the impact of distortion and unbalance of load current on the potency line, making the potency factor unity. Meanwhile, the series APF isolates the loads voltages and source voltage, the shunt APF provides three-phase balanced and rated currents for the loads. The experimental results obtained from a laboratory model of 10 kVA, along with a theoretical analysis, are shown to verify the viability and efficacy of the proposed UPQC control method.

Table 1: UPQC System parameters

Parameters		Value
Source	Voltage	V_{sabc} 380 V _{rms}
	Frequency	f 50 Hz
Load	3-Phase ac Line Inductance	L_{Labc} 2 mH
	1-Phase ac Line Inductance	L_{Lal} 1 mH Ω
	3-Phase dc Inductance	L_{dcl} 10 mH
	3-Phase dc Resistor	R_{dcl} 30 Ω
	1-Phase dc Resistor	R_{dcl} 87.5 Ω
	1-Phase dc Capacitor	C_{dcl} 240 μ F
dc-link	Voltage	V_{DC} 700 V
	Capacitor 1/2	$C_1 C_2$ 2200 μ F
Shunt APF	ac Line Inductance	L_{CabC} 3.5 mH
	Filter Resistor	R_{CabC} 5 Ω
	Filter Capacitor	C_{CabC} 10 μ F
	Switching Frequency	f_{gwm} ~15 kHz
Series APF	ac Line Inductance	L_{TabC} 1.5 mH
	Filter Resistor	R_{TabC} 5 Ω
	Filter Capacitor	C_{TabC} 20 μ F
	Switching Frequency	f_{gwm} 12 kHz

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CONGESTION MANAGEMENT IN TRANSMISSION LINE USING FACT DEVICE(UPFC).

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ABSTRACT

Congestion management is one of the technical challenges in Power system. In electricity market transmission congestion happens when there is not enough transmission ability to transmit the power without any restrictions for transmission of a line. Flexible different current transmission system (FACTS) devices can be another choice to reduce the flows in heavily loaded lines , resulting in an increased loadability, low system losses, improved of the network, reduced cost of production by controlling the power flow in the network.

General Terms

Your general terms must be any term which can be used for general classification of the submitted material such as Pattern Recognition, Security, Algorithms et. al.

Keywords

UPFC, FACTS, MATLAB SIMULINK, BUS SYSTEM

1.INTRODUCTION

The main objective of the power system operation is to match supply/demand, provide compensation for transmission loss, voltage and frequency regulation, reliability provision etc. The need for more efficient and fast responding electrical systems has given rise to innovative technologies in transmission using solid-state devices. These are called FACTS devices which enhance stability and increase line loadings closer to thermal limits. Flexible AC transmission systems (FACTS) have gained a great interest during the last few years, due to recent advances in power electronics. FACTS devices have been mainly used for solving various power system steady state control problems such as voltage regulation, power flow control, and transfer capability enhancement. The development of power semiconductor devices with turn-off capability (GTO) opens up new perspectives in the development of FACTS devices. FACTS devices are the key to produce electrical energy economically and environmental friendly in future. The latter approach has two inherent advantages over the more conventional switched capacitor- and reactor- based compensators. Firstly, the power electronics-based voltage sources can internally generate and absorb reactive power without the use of ac capacitors or reactors. Secondly, they can facilitate both reactive and real power compensation and thereby can provide independent control for real and reactive power flow. Its main objectives

are to increase power transmission capability, voltage control, voltage stability enhancement and power system stability improvement

2.OPERATION OF UPFC

From the conceptual viewpoint, the UPFC is a generalized synchronous voltage source (SVS), represented at the fundamental (power system) frequency by voltage phasor V with controllable magnitude V^* ($0 = V_{pq} \leq V_{pq}^*$) and angle p , in series with the transmission line, as illustrated for the usual elementary two-machine system (or for two independent systems with a transmission link intertie) in Figure . In this functionally unrestricted operation, which clearly includes voltage and angle regulation, the SVS generally exchanges both reactive and real power with the transmission system. Since, as established previously, an SVS is able to generate only the reactive power exchanged, the real power must be supplied to it, or absorbed from it, by a suitable power supply or sink. In the UPFC arrangement the real power exchanged is provided by one of the end buses (e.g., the sending-end bus), as indicated in Figure.

In the presently used practical implementation, the UPFC consists of two voltage sourced converters, as illustrated in Figure 8.4. These back-to-back converters, labeled Converter 1" and "Converter 2" in the figure, are operated from a common dc link provided by a dc storage capacitor. As indicated before, this arrangement functions

as an ideal ac-to-ac power converter in which the real power can freely flow in either

direction between the ac terminals of the two converters, and each converter can independently generate (or absorb) reactive power at its own ac output terminal. Converter 2 provides the main function of the UPFC by injecting a voltage V_{oo} with controllable magnitude V_{ro} and phase angle p in series with the line via an insertion transformer. This injected voltage acts essentially as a synchronous ac voltage.

2.1 Modeling of UPFC

The control system described in the previous chapter was derived by assuming that the series and parallel converters are treated as ideal controllable voltage sources, that the values of the fundamental components of the line currents are locally available. The UPFC is modeled by combining the shunt and series branches coupled by the DC voltage control branch . Local load is added at port 1 of the UPFC. The Organization of UPFC modeling blocks are shown in below figure.

2.2 Control Of Power Systems

When discussing the creation, movement, and consumption of electrical power, it can be separated into three areas, which traditionally determined the way in which electric utility companies had been organized. These are illustrated as;

- Generation
- Transmission
- Distribution

2.3 Power System Constraints

As noted in the introduction, transmission systems are being pushed closer to their stability and thermal limits while the focus on the quality of power delivered is greater than ever.

The limitations of the transmission system can take many forms and may involve power transfer between areas (referred to here as transmission bottlenecks) or within a single area or region (referred to here as a regional constraint) and may include one or more of the following characteristics:

- Voltage Stability Limit

- Dynamic Voltage Limit
- Steady-State Power Transfer Limit
- Transient Stability Limit
- Short-Circuit Current Limit
- Power System Oscillation Damping Limit
- Thermal Limit
- Short-Circuit Current Limit

Each transmission bottleneck or regional constraint may have one or more of these system-level problems.

2.4 Benefits of Control of Power Systems

Once power system constraints are identified and through system studies viable solutions options are identified, the benefits of the added power system control must be determined. The following offers a list of such benefits.

- Improved Power System Stability
- Increased System Reliability
- Increased System Security
- Increased Loading and More Effective Use of Transmission Corridors
- Added Flexibility in Siting New Generation

The advantages in this list are important to achieve in the overall planning and operation of power systems. However, for justifying the costs of implementing added power system control and for comparing conventional solutions to FACTS controllers, more specific metrics of the benefits to the power system are often required.

2 Facts Applications

FACTS controllers can be used for various applications to enhance power system performance. One of the

greatest advantages of using FACTS controllers is that it can be used in all the three states of the power system, namely: (1) Steady state, (2) Transient (3) Post transient steady state.

However, the conventional devices find little application during system transient or contingency condition.

2.1 steady state application

Various steady state applications of FACTS controllers includes voltage control (low and high), increase of thermal loading, post-contingency voltage control, loop flows control, reduction in short circuit level and power flow control. SVC and STATCOM can be used for voltage control while TCSC is more suited for loop flow control and for powerflow control.

2.2 Congestion management

Congestion management is a serious concern for Independent System Operator (ISO) in present deregulated electricity markets as it can arbitrarily increase the prices and hinders the free electricity trade. FACTS devices like TCSC, TCPAR (Thyristor Controlled Phase Angle Regulator) and UPFC can help to reduce congestion and to increase the social welfare by redirecting power from congested interface to under utilised lines.

3 Subsections

2.4.1 Subsubsections

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3. ACKNOWLEDGMENTS

Our thanks to the experts who have contributed towards development of the template.

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**[5] Implementation of Unified Power Flow Controller
(UPFC) for Power Quality Improvement in IEEE 14-Bus
System**

Arup Ratan Bhowmik, Champa Nandi

STUDY OF PRIME NUMBERS

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ABSTRACT

In this paper an attempt has been made to prove that there exist infinitely many prime numbers by assuming that Goldbach's conjecture is true. Using this result it will be proved that if A is a collection of all prime numbers then A is countably infinite and if x_n is a number of distinct prime factorization of n then for any k in \mathbb{N} (set of natural numbers), there exist a subsequence $\{x_{n_p}\}$ of $\{x_n\}$ such that $\{x_{n_p}\} \rightarrow \infty$, as $p \rightarrow \infty$.

KeyWords: Prime numbers, Even numbers, Fundamental Theorem of Arithmetic, Division Law of Integers, Countable Set.

1.INTRODUCTION

The first proof of the theorem "There Exist Infinitely Many Prime Numbers" is given by Euclid's, who proved it by using contradiction method. Another proof is given by Euler's, who proved this by using "Fundamental Theorem of Arithmetic". Paul Erdos's gave the third proof that also relies on the "Fundamental Theorem Of Arithmetic". In the 1950s, Hill Furstenberg's introduced a proof by "Point-Set-Topology". Some recent proofs; in 2010, Junho Peter Whang proved this by "Contradiction Method". Pinasco proved this by using the "Inclusion-Exclusion Principal". Thus, in this paper an attempt has been made to prove the theorem that there exist infinitely many prime numbers by assuming that Goldbach conjecture is true.

Goldbach conjecture is one of the oldest and the best known unsolved problem in Number Theory. The statement of Goldbach conjecture is that "Every even integer greater than 2 can be expressed as sum of two primes". This conjecture has been shown to hold up to through 4×10^{18} .

2.CONTENT:

Prime Number: An integer n is said to be prime number if it divisible by 1 and n itself.

Even Integer: An integer n is said to be even if it is divisible by 2.

Fundamental Theorem of Arithmetic: Every integer n , ($n > 1$) either is prime number or is the product of prime numbers, this product is unique up to the order of the factor.

Division Law of Integers: If $a|b$ and $a|c$ then $a|(b-c)$.

Countable Set: A set S is countable if there exist an one-to-one f from S to the set of natural numbers $\mathbb{N} = \{1, 2, 3, \dots\}$.

Theorem: There exist infinitely many prime numbers.

Proof: First we assume that Goldbach conjecture is true.

Suppose there exist finite numbers of primes say

$$p_1 = 2, p_2 = 3, p_3 = 5, p_4, \dots, p_n, n \geq 3.$$

$$\therefore 2 \cdot 3 \cdot 5 \cdot p_4 \cdot \dots \cdot p_n \text{ is even number.}$$

By Golbach conjecture

$$2 \cdot 3 \cdot 5 \cdot p_4 \cdot \dots \cdot p_n = P + Q,$$

where P and Q are prime numbers such that

$$2 \leq P, Q \leq p_n$$

$$\therefore P / 2 \cdot 3 \cdot 5 \cdot p_4 \cdot \dots \cdot p_n.$$

$$\therefore P / P + Q$$

so, $P/P + Q$ and P/P

$\therefore P/P + Q = P$ by division law of integers.

$\therefore P/Q$

But P and Q are prime numbers.

$\therefore P = Q$.

$\therefore 2.3.5p_4 \dots p_n = 2P$(I)

$\therefore 2.3.5p_4 \dots p_n$ is product of atleast three primes

as $n \geq 3$.

But, R.H.S of equation (I) is product of two numbers as 2 and P are prime numbers.

which is not possible(Fundamental theorem of arithmetic)

Hence, there exist infinitely many primes.

APPLICATIONS:

Corollary(1.1) If A is a collection of all prime numbers, then A is countably infinite.

Proof: Since A is the collection of all prime numbers

$\therefore A$ is a subset of natural numbers $N = \{1, 2, 3, \dots\}$.

$\therefore A$ is countable set, as a subset of countable set.

Also A is infiniteby above theorem.

Hence, A is countably infinite.

Corollary(1.2)

Let x_n be the number of distinct prime factorization of n ,

$n \geq 2$. then

For any k in N , \exists a subsequence x_{n_p} of sequence x_n

such that $x_{n_p} \rightarrow \infty$, as $p \rightarrow \infty$.

Proof: -

x_n = numbers of distinct prime factorization of n

$x_2 = 1, x_3 = 1, x_4 = 1, x_5 = 1, x_6 = 2, \dots$

By above theorem, \exists infinitely many prime numbers.

Let $p_1 p_2 p_3 \dots$, be all primes.

We take $x_{p_1}, x_{p_2}, x_{p_3}, \dots, x_{p_k}, \dots$

For $k = 1$, we get a subsequence $\{x_{p_k}\}$ such that $x_{p_k} = 1$.

So, for k in N

We are going to construct a subsequence of $\{x_n\}$

the subsequence is a constant subsequence.

Fix $k \in N$

$x_{p_1 p_2 p_3 \dots p_k}$ is prime factorization of $p_1 p_2 p_3 \dots p_k$

Denote $y_1 = p_1 p_2 p_3 \dots p_k$

$\therefore y_1 = k$

Since the prime numbers are infinite we can find y_2

such that

$y_2 = x_{p_{k+1} p_{k+2} p_{k+3} \dots p_{2k}}$ as y_2 has k prime factorization

$y_2 = k$

Similarly,

such that $y_m = k$, for all $m \in N$.

In particular,

$z_1 = x_{p_1} = 1$

$z_2 = x_{p_2} = 2$

$z_3 = x_{p_3} = 3$

$$\begin{aligned} & \dots & \dots \\ & \dots & \dots \\ & \dots & \dots \\ & z_s = x_{p_s} = s. \end{aligned}$$

$$As \rightarrow \infty, z_s \rightarrow \infty$$

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STUDY OF CONFORMAL MAPPING AND ITS APPLICATION IN ENGINEERING

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ABSTRACT

Study of Conformal Mapping and its application is an important effort to enhance understanding and application for real problem of science and engineering. Conformal mapping is a marvelous tool which serves many opportunities in different segment of science and engineering. This is a very important Tool which uses to transform from Z-Plane to W-plane and Vice-Versa. This transforms significant for symmetric or conservative system which directly involves with real problems. The geometrical structure in Z-plane, W-plane and its transforms are analyzing and interpreting of real complex problem in very easy way.

Keywords

Conformal Mapping, Z-Plane, W-Plane Symmetric, conservative system.

1. INTRODUCTION

A conformal mapping, also called a conformal map, conformal transformation, angle-preserving transformation or holomorphic map is a transformation $w=f(z)$ that preserves local angles. An analytic functions is conformal at any point where it has a non-zero derivative, conversely, any conformal mapping of complex variable which has continuous partial derivatives in analytic conformal mapping is extremely important in complex analysis, as well as in many areas of physics and engineering. A mapping the preserves the magnitude of angle but not there orientation is called an isogonal mapping. A rectangular grid (top) and its image under a conformal map f (bottom). It is seen that f maps pairs of lines intersecting at 90° to pairs of curves still intersecting at 90° .

In Riemannian geometry, two Riemannian metrics g and h on smooth manifold M are called conformally equivalent if $g=uh$ for some positive function u on M . The function u is called the conformal factor.

A diffeomorphism between two Riemannian manifolds is called a conformal map if the pulled back metric is conformally equivalent to the original one. For example, stereographic projection of a sphere onto the plane augmented with a point at infinity is a conformal map.

One can also define a conformal structure on a smooth manifold, as a class of conformally equivalent Riemannian

metrics. The Riemann mapping theorem, states that any non-empty open simply connected proper subset of \mathbb{C} admits a bijective conformal map to the open unit disk (the open unit disk around P (where P is a given point in the plane), is the set of points whose distance from P is less than 1) in complex plane \mathbb{C} ie if U is a simply connected open subset in complex plane \mathbb{C} , which is not all of \mathbb{C} , then there exists a bijective ie one-to-one mapping f from U to open unit disk D . $f:U \rightarrow D$ where $D = \{z \in \mathbb{C} : |z| < 1\}$. As f is a bijective map it is conformal. A map of the extended complex plane (which is conformally equivalent to a sphere) onto itself is conformal if and only if it is a Mobius transformation ie a transformation leading to a rational function of the form $f(z) = \frac{az+bcz+d}{cz+dz+e}$. Again, for the conjugate, angles are preserved, but orientation is reversed.

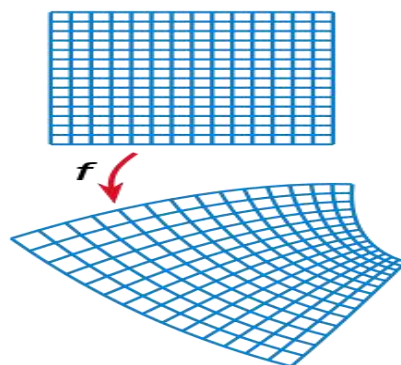


FIG. 1: Mapping of graph

2. BASIC THEORY

Let us consider a function

$$w = f(z) \quad (1.1)$$

where $z = x + iy$ and $w = u + iv$. We find that $dz = dx + idy$,

$$\text{and } dw = du + idv, |dz|^2 = dx^2 + dy^2 \quad (1.2)$$

$$\text{and } |dw|^2 = du^2 + dv^2 \quad (1.3)$$

$$\text{Then the square of the length element in } (x,y) \text{ plane is } ds^2 = dx^2 + dy^2 \quad (1.4)$$

$$\text{and square of the length element in } (u,v) \text{ plane is } dS^2 = du^2 + dv^2 \quad (1.5)$$

From equations (2), (3), (4), (5) we find that,

$$\frac{ds}{ds'} = |dw/dz| \quad (1.6)$$

ie the ratio of arc lengths of two planes remains essentially constant in the neighborhood of each point in z plane provided $w(z)$ is analytic and have a nonzero or finite slope at that point. This implies the linear dimensions in two planes are proportional and the net result of this transformation is to change the dimensions in equal proportions and rotate each infinitesimal area in the neighborhood of that point. This implies the linear dimensions in two planes are proportional and then etresult of this transformation is to change the dimensions in equal proportions and rotate each infinitesimal area in the neighborhood of that point. Thus the angle (which is represented as the ratio of linear dimensions) is preserved although shape in a large scale will not be preserved in general as the value of $|dw/dz|$ will vary considerably at different points in the plane. Due to this property such transformations are called conformal. This leads to the following theorem.

Theorem: If $w=f(z)$ is an analytic function and $f'(z) \neq 0$ in a region R of Z-plane then the mapping $w=f(z)$ is conformal at all points of R.

Proof: Let $P(z)$ be a point in the region R of Z-plane and $P'(w)$ be the corresponding point in the region R' of W-plane. Let $O(z+\delta z)$ be a neighboring point on a curve C in R. We ask that authors follow some simple guidelines. In essence, we ask you to make your paper look exactly like this document. The easiest way to do this is simply to download the template, and replace the content with your own material.

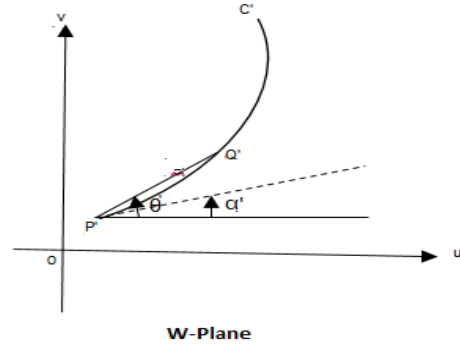
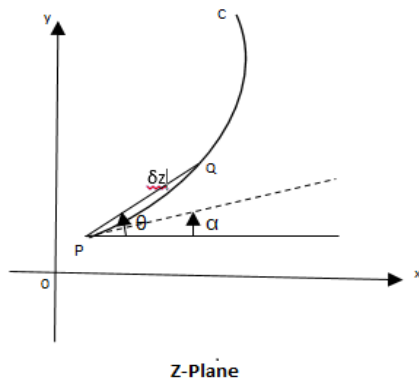


FIG. 2

Let the complex number δz and δw be expressed on exponential form as $\delta z = r e^{i\theta}$ and $\delta w = r' e^{i\theta'}$, hence $\frac{\delta w}{\delta z} = \frac{r'}{r} e^{i(\theta' - \theta)}$.

Let the tangents at P and P' make angles α and α' with the x-axis and u-axis respectively. Hence, as $\delta z \rightarrow 0$, $\theta \rightarrow \alpha$, $\delta w \rightarrow 0$ and $\theta' \rightarrow \alpha'$.

$$\therefore f'(z) = \frac{dw}{dz} = \lim_{\delta z \rightarrow 0} \frac{\delta w}{\delta z} = \lim_{\delta z \rightarrow 0} \frac{r'}{r} e^{i(\theta' - \theta)}$$

Since $f(z)$ is analytic and $f'(z) \neq 0$. Let $f'(z) = R e^{i\phi}$. Then $R = |f'(z)|$ and $\phi = \text{amplitude of } f'(z)$

$$\therefore R e^{i\phi} = \lim_{\delta z \rightarrow 0} \frac{r'}{r} e^{i(\theta' - \theta)}$$

$$\therefore R = \lim_{\delta z \rightarrow 0} \frac{r'}{r} \text{ and } \phi = \lim_{\delta z \rightarrow 0} (\theta' - \theta) = \alpha' - \alpha$$

Let us consider another curve C1 through P and let C1' be the corresponding curve in the W-Plane through P'. If the tangent to the curve C1 makes an angle β with the x-axis and the tangent to the curve C1' makes an angle β' with the y-axis then as above.

$$\phi = \beta' - \beta$$

$$\therefore \alpha' - \alpha = \beta' - \beta \quad \therefore \beta - \alpha = \beta' - \alpha' = \gamma \text{ (say)}$$

Thus, the angle between the curve C, C1, in Z-Plane is equal to the angle between the curve C', C1', in the W-Plane in the magnitude and sense.

Hence, the mapping by an analytic function $W=f(z)$ is conformal at each points where $f'(z) \neq 0$.

Ex. Find the image of the region founded by $x=0$, $x=2$, $y=0$, $y=2$ in the z-plane under transformation $w=(1+i)z$.

Solution: Since $1 + i = \sqrt{2} \left(\cos \frac{\pi}{4} + i \sin \frac{\pi}{4} \right) = \sqrt{2} e^{i\frac{\pi}{4}}$

$\therefore w = cz$ becomes $R = e^{i\theta} \sqrt{2} e^{i\frac{\pi}{4}} \cdot r e^{i\theta} = \sqrt{2} r e^{i(\theta + \frac{\pi}{4})}$

The square in Z-Plane is transformed into a square in the w-plane but its sides are magnified by square $\sqrt{2}$ and it is rotated through an angle of $\frac{\pi}{4}$

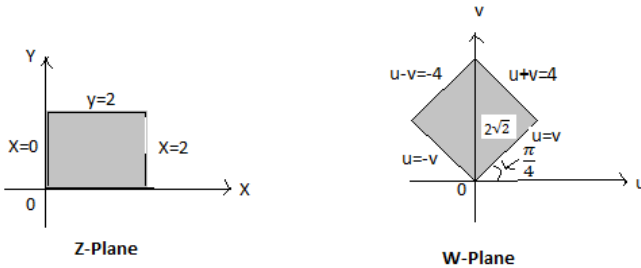


FIG. 3

Theorem: Assume that $f(z)$ is analytic at z_0 and that $f'(z) \neq 0$. Then $f(z)$ is univalent in the neighborhood of z_0 . More precisely, f has a unique analytic inverse F in the neighborhood of $w_0 \equiv f(z_0)$; that is, if z is sufficiently near z_0 , then $z = F(w)$, where $w \equiv f(z)$. Similarly, if w is sufficiently near w_0 and $z \equiv F(w)$, then $w = f(z)$. Furthermore, $f'(z) F'(w) = 1$, which implies that the inverse map is conformal. This uniqueness and conformal property of inverse mapping allows us to map the solution obtained in w- plane to z-plane.

Critical Points: If $f'(z_0) = 0$, then the analytic transformation $f(z)$ ceases to be conformal. Such a point is called a critical point of f . Because critical points are zeroes of the analytic function f' , they are isolated.

3. APPLICATIONS

A large number of problems arising in fluid mechanics, electrostatics, heat conduction, and many other physical situations can be mathematically formulated in terms of Laplace's equation. ie, all these physical problems reduce to solving the equation

$$\Phi_{xx} + \Phi_{yy} = 0. \quad (1.7)$$

in a certain region D of the z plane. The function $\Phi(x, y)$, in addition to satisfying this equation also satisfies certain boundary conditions on the boundary C of the region D . From the theory of analytic functions we know that the real and the imaginary parts of an analytic function satisfy Laplace's equation. It follows that solving the above problem reduces to finding a function that is analytic in D and that satisfies certain boundary conditions on C . It turns out that the solution of this problem can be greatly simplified if the region D is either the upper half of the z plane or the unit disk.

Example: Consider two infinite parallel flat plates, separated by a distance d and maintained at zero potential. A line of charge q per unit length is located between the two planes at a distance 'a' from the lower plate. The problem is to find the electrostatic potential in the shaded region of the z plane. The conformal mapping $w = \exp(\pi z/d)$ maps the shaded strip of the z plane onto the upper half of the w plane. So the point $z = ia$ is mapped to the point $w_0 = \exp(i\pi a/d)$; the points on the lower plate, $z = x$, and on the upper plate, $z = x + id$, map to the real axis $w = u$ for $u > 0$ and $u < 0$, respectively. Let us consider a line of charge q at w_0 and a line of charge $-q$ at \bar{w}_0 . Consider the associated complex potential

$$\Omega(w) = -2\log(w - w_0) + 2q\log(w - \bar{w}_0) = 2q \log \left(\frac{w - \bar{w}_0}{w - w_0} \right) \quad (1.8)$$

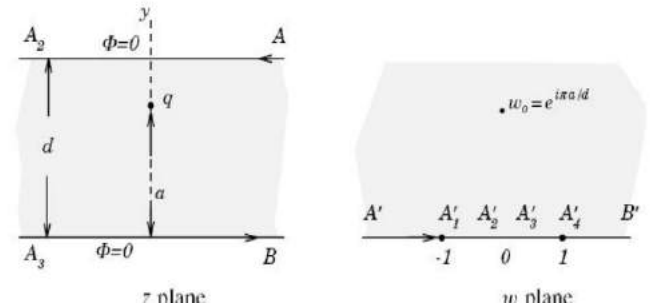


FIG 4

FIG. 3: Mapping of two infinite parallel conducting plate with a charge in between

Calling C_q a closed contour around the charge q , we see that Gauss law is satisfied,

$$\oint_{C_q} E_n ds = \text{Im} \oint_{C_q} \bar{E} dz = \text{Im} \oint_{C_q} -\Omega(w) = 4\pi q \quad (1.9)$$

where \bar{C}_q is the image of C_q in the w -plane. Then, calling

$\Omega = \Phi + i\Psi$, we see that Φ is zero on the real axis of the w plane. Consequently, we have satisfied the boundary condition $\Phi = 0$ on the plates, and hence the electrostatic potential at any point of the shaded region of the z plane is given by

$$\phi = 2q \log \left(\frac{w - e^{-iv}}{w - e^{iv}} \right) \quad (2.1)$$

where $v = \pi a/d$. Conformal mappings are invaluable for solving problems in engineering and physics that can be expressed in terms of functions of a complex variable, but that exhibit inconvenient geometries. By choosing an appropriate mapping, the analyst can transform the inconvenient geometry into a much more convenient one. For example, one may be desirous of calculating the electric field, $E(z)$, arising from a point charge located near the corner of two conducting planes making a certain angle (where z is the complex coordinate of a point in 2-space). This problem is quite clumsy to solve in

closed form. However, by employing a very simple conformal map- ping, the inconvenient angle is mapped to one of precisely pi radians, meaning that the corner of two planes is transformed to a straight line. In this new domain, the problem, that of calculating the electric field impressed by a point charge located near a conducting wall, is quite easy to solve. The solution is obtained in this domain, $E(w)$, and then mapped back to the original domain by noting that w was obtained as a function (viz., the composition of E and w) of z , whence $E(w)$ can be viewed as $E(w(z))$, which is a function of z , the original coordinate basis. Note that this application is not a contradiction to the fact that conformal mappings preserve angles, they do so only for points in the interior of their domain, and not at the boundary.

FIG. 4: Two semiinfinite plane conductors meet at an angle $0 < \alpha < \pi/2$ and are charged at constant potentials Φ_1 and Φ_2

$$\Phi = \Phi_2 + \left(\frac{\Phi_1 - \Phi_2}{\alpha} \right) \theta, \quad E_\theta = \frac{\Phi_2 - \Phi_1}{\alpha r}, \quad E_r = 0,$$

$$\text{where } z = re^{i\theta}, \quad 0 \leq \theta \leq \alpha.$$

FIG. 4: Two semiinfinite plane conductors meet at an angle $0 < \alpha < \pi/2$ and are charged at constant potentials Φ_1 and Φ_2

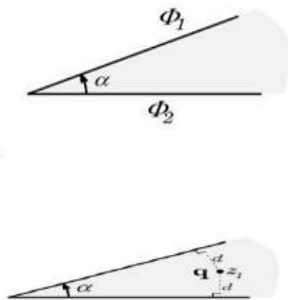


FIG. 5: Two inclined plates with a charge in between

The above fundamental technique is used to obtain closed form expressions of characteristic impedance and dielectric constant of different types of wave guides. A series of conformal mappings are performed to obtain the characteristics for a range of different geometric parameters¹. Conformal mapping has various applications in the field of medical physics. For example conformal mapping is applied to brain surface mapping. This is based on the fact that any genus zero (The genus of a connected, orientable surface is an integer representing the maximum number of cuttings along closed simple curves without rendering the resultant manifold disconnected; a sphere, disk or annulus have genus zero) surface can be mapped conformally onto the sphere and any local portion thereof onto a disk². Conformal mapping can be used in scattering and diffraction problems. For scattering and

diffraction problem of plane electromagnetic waves, the mathematical problem involves finding a solution to scalar wave function which satisfies both boundary condition and radiation condition at infinity. Exact solutions are available for such problems only for a few cases. Conformal map- pings are used to study far field expressions of scattered and diffracted waves for more general cases.

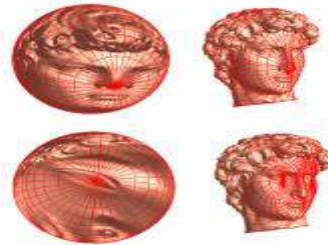


FIG. 6: Mobius transformation.

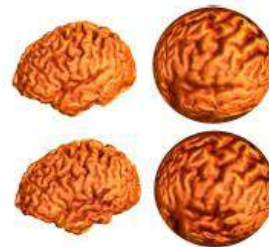


FIG. 7: Reconstruction of brain onto sphere

4. CONCLUSION

There are different aspects of conformal mapping that can be used for practical applications though the essence remains the same: it preserves the angle and shape locally and mappings of harmonic potentials remains harmonic. These properties of conformal mapping make it advantageous in complex situations, specifically electro- magnetic potential problems for general systems. Various conformal techniques such as genus zero conformal map- ping is also used to complex surface mapping problems. However the conformal mapping approach is limited to problems that can be reduced to two dimensions and to problems with high degrees of symmetry. It is often impossible to apply this technique when the symmetry is broken.

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STUDY OF LYAPUNOV'S FUNCTION

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ABSTRACT

In this paper we review the concept of stability and Lyapunov's direct methods for analysing the stability of a system around an equilibrium point. These Direct methods are based on stability, instability and asymptotic etc. Further we study of its application based on nonlinear system of differential equation.

KEYWORDS

Lyapunov's function, Lyapunov's stability, Stable, Unstable, Completely Unstable, asymptotic, trajectory, positive definite function.

1.INTRODUCTION

In the theory of ordinary differential equations (ODEs), Lyapunov functions are scalar functions that may be used to prove the stability of an equilibrium of an ODE. Named after the Russian mathematician "Aleksandr Mikhailovich Lyapunov, (1857-1918)". Lyapunov functions are important to stability theory and control theory. A similar concept appears in the theory of general state space Markov Chains, usually under the name Foster-Lyapunov functions.

For many classes of ODEs, the existence of Lyapunov functions is a necessary and sufficient condition for stability. Whereas there is no general technique for constructing Lyapunov functions for ODEs, in many specific cases, the construction of Lyapunov functions is known. For instance, quadratic functions suffice for systems with one state; the solution of a particular linear matrix inequality provides Lyapunov functions for linear systems; and conservation laws can often be used to construct Lyapunov functions for physical systems.

Informally, a Lyapunov function is a function that takes positive values everywhere except at any stasis in question, and decreases (or is non-increasing) along every trajectory of the ODE. The principal merit of Lyapunov function-based stability analysis of ODEs is that the actual solution (whether analytical or numerical) of the ODE is not required.

There are two Lyapunov's Methods- Indirect method or first method and Direct or second Method. In this paper we learn about Direct method which based on Stability, Unstability and Asymptotic. Lyapunov's pioneering work on stability is based on finding a "energy-like" function with special features.

"An equilibrium point for a conservative mechanical system is stable or unstable depending on whether the potential energy has a local minimum or maximum"

DEFINITION

POSITIVE DEFINITE FUNCTION

A function $V: \mathbb{R}^n \rightarrow \mathbb{R}$ is positive definite (PD) if

- $V(z) \geq 0$ for all z
- $V(z) = 0$ if and only if $z=0$
- all sublevel sets of V are bounded

OR

POSITIVE FUNCTION

We say that $V(x, y)$ is positive definite, if $V(x, y) \geq 0$ at all points and if equality holds only at the origin.

STABILITY

There is no single concept of stability, and many different definitions are possible.

We shall consider only the following fundamental statements.

Definition : An equilibrium state $x = 0$ is said to be :

(a) **STABLE**- if for any positive scalar ϵ there exists a positive scalar δ

Such that $\|x(t_0)\| < \delta$ implies $\|x(t)\| < \epsilon$ for all $t \geq t_0$.

(b) **ASYMPTOTICALLY STABLE**- if it is stable and if in addition $x(t) \rightarrow 0$

as $t \rightarrow \infty$.

(c) **UNSTABLE**- if it is not stable; that is, there exists an $\epsilon > 0$ such that

for every $\delta > 0$ there exists an $x(t_0)$ with $\|x(t_0)\| < \delta$, $\|x(t_1)\| \geq \epsilon$

for some $t_1 > t_0$

(d) **COMPLETELY UNSTABLE**- if there exists that is an $\epsilon > 0$ such that

for every $\delta > 0$ there exists an $x(t_0)$ with $\|x(t_0)\| < \delta$, $\|x(t_1)\| \geq \epsilon$

for some $t_1 > t_0$

LYAPUNOV FUNCTION

Let $f \in C^1(E)$, $V \in C^1(E)$ and ϕ_t the flow of the differential equation $\dot{x}(t) = f(x(t))$. then for $x \in E$ the derivative of the function $V(x)$ along the solution $\phi_t(x)$ is,

$$\begin{aligned}\dot{V}(x) &= \frac{d}{dt} V(\phi_t(x)) \\ &= \frac{\partial V(\phi_t)}{\partial \phi_t} \cdot \frac{d\phi_t(x)}{dt}\end{aligned}$$

$$=DV(x)f(x)$$

OR

LYAPUNOV FUNCTION

Suppose that $V(x,y)$ is continuous and positive definite. Then we say that V is a Lyapunov function for the system

$$\mathbf{x}'(t) = \mathbf{f}(x,y), \mathbf{y}'(t) = \mathbf{g}(x,y),$$

if $\dot{V} = V_x f + V_y g$ is such that $\dot{V}(x,y) \leq 0$ in some open region around the origin. We say that V is a strict Lyapunov function, if we also have $\dot{V}(x,y) = 0$ only at the origin.

ASYMPTOTIC STABLE

An equilibrium point $\mathbf{x}^* = 0$ is Asymptotically stable OR Hurwitz at $t = t_0$ if

1. $\mathbf{x}^* = 0$ is stable, and
2. $\mathbf{x}^* = 0$ is locally attractive; i.e., there exists $\delta(t_0)$ such that $x(t_0) < \delta \Rightarrow \lim_{t \rightarrow \infty} x(t) = 0$.

THEOREM (Lyapunov's Direct Method)

Let E be an open subset of \mathbb{R}^n containing \mathbf{x}_0 . Suppose $\mathbf{f} \in C_1(E)$ and that $\mathbf{f}(\mathbf{x}_0) = 0$. Suppose further that there exists a real valued function $V \in C_1(D)$ satisfying

$V(\mathbf{x}_0) = 0$ and $V(x) > 0$ if $x \neq \mathbf{x}_0$. Then

- (a) if $\dot{V}(x) \leq 0$ for all $x \in E$, \mathbf{x}_0 is stable;
- (b) if $\dot{V}(x) < 0$ for all $x \in E \setminus \{\mathbf{x}_0\}$, \mathbf{x}_0 is asymptotically stable;
- (c) if $\dot{V}(x) > 0$ for all $x \in E \setminus \{\mathbf{x}_0\}$, \mathbf{x}_0 is unstable;

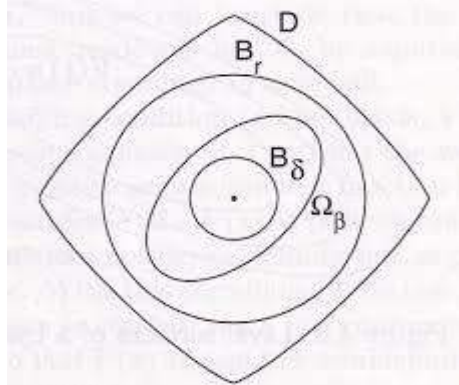


Fig 1

PROOF:- Without loss of generality, we assume that $\mathbf{x}_0 = 0$.

Part(a)- We want to show that

“for all $\epsilon > 0$, there exists a $\delta > 0$ such that for all $x \in N_\delta(0)$ and $t \geq 0$, we have $\phi_t(x) \in N_\epsilon(0)$.”

Outline:-

1. Construct a closed set (ball) $B_r \subset N$, such that $B_r \subset E$ (i.e., a technicality to make sure we remain in the domain)
2. Construct $\Omega_\beta = \{x \in B_r | V(x) \leq \beta\}$ (i.e., a subset of the β sublevel set of V) such that Ω_β lies in the interior of B_r

• Can show that condition (a) implies that $x \in \Omega_\beta \Rightarrow \phi_t(x) \in \Omega_\beta$

3. Construct $N_\epsilon(0) \subset \Omega_\beta$

Then since $N_\epsilon(0) \subset \Omega_\beta \subset B_r \subset N_\epsilon(0)$, we have that $x \in N_\epsilon \subset \Omega_\beta \Rightarrow \phi_t(x) \in \Omega_\beta \Rightarrow \phi_t(x) \in N_\epsilon(0)$.

Details:

1. Given any $\epsilon > 0$, choose $0 < r \leq \epsilon$, such that

$$B_r = \{x \in \mathbb{R}^n | |x| \leq r\} \subset D.$$

2. Let $\alpha = \min_{|x|=r} V(x)$ (i.e., the minimum of V in the boundary of B_r).

Take $0 < \beta < \alpha$, $\Omega_\beta = \{x \in B_r | V(x) \leq \beta\}$.

Then it can be easily shown that Ω_β lies in the interior of B_r (if a point a is in the boundary, then $V(a) \geq \alpha > \beta$).

Notice that for $x = \phi_0(x) \in \Omega_\beta$, and for all t

$$V(\phi_t(x)) - V(\phi_0(x)) = \int_0^t \frac{d}{ds} V(\phi_s(x)) ds \leq 0$$

$$(\text{since } \frac{d}{ds} V(\phi_s(x)) \leq 0)$$

$$\Downarrow V(\phi_t(x)) \leq V(\phi_0(x)) \leq \beta$$

and therefore $\phi_t(x) \in \Omega_\beta$ (ϕ_t cannot exit B_r since it would mean going through the boundary of B_r).

3. Since V is continuous, $V(0) = 0$ then there exists a $\delta > 0$ such that $|x| < \delta \Rightarrow V(x) < \beta$. Therefore for

$$x \in N_\delta$$

$$\Rightarrow x \in \Omega_\beta$$

$$\Rightarrow \phi_t(x) \in \Omega_\beta$$

$$\Rightarrow \phi_t(x) \in B_r$$

$$\Rightarrow \phi_t(x) \in N_\epsilon(0).$$

So for any $\delta > 0$ we constructed a δ such that for all $x \in N_\delta(0)$ and $t \geq 0$, we have $\phi_t(x) \in N_\epsilon(0)$, and therefore the origin is stable.

Part (b) Note:- Intuitively, condition $\dot{V}(x) < 0$, $x \neq 0$ (i.e., $V(x)$ is strictly decreasing along the trajectories of 1) implies that as t increases, the trajectory moves into lower level sets of $V(x)$. We just need to show that it eventually goes to 0. In part (a) we showed that the origin is stable. What we need to show is that

“there exists a $\delta > 0$ such that for all $x \in N_\delta(0)$ we have $\lim_{t \rightarrow \infty} \phi_t(x) = 0$ ”, i.e., “there exists a $\delta > 0$ such that for all $\epsilon > 0$, there exists a $T > 0$ such that for all $x \in N_\delta(0)$ and $t > T$, $|\phi_t(x)| < \epsilon$ (or $\phi_t(x) \in N_\epsilon(0)$)”.

But since we showed that for all $\epsilon > 0$ we can construct β such that $\Omega_\beta \subset N_\epsilon(0)$, i.e.,

$$\phi_t(x) \in \Omega_\beta \Rightarrow \phi_t(x) \in N_\epsilon(0).$$

Therefore, it is sufficient to show that for all $x \in N_\delta(0)$

$$\lim_{t \rightarrow \infty} V(\phi_t(x)) = 0$$

(why? because this means that for all $\beta > 0$ there exists a $T > 0$, such that for $t > T$, $V(\phi_t(x)) < \beta$, i.e. $\phi_t(x) \in \Omega_\beta \subset N_\epsilon(0)$.)

Since V is a decreasing function along the trajectories (condition (b)) and bounded below, then

$$\lim_{t \rightarrow \infty} V(\phi_t(x)) = c \geq 0.$$

Assume $c > 0$. Let $\Omega_c = \{x \in B_r | V(x) \leq c\}$. By continuity of V and $V(0) = 0$, there exists a $d > 0$, such that $B_d = \{x \in \mathbb{R}^n | |x| \leq d\} \subset \Omega_c$. Since $\lim_{t \rightarrow \infty} V(\phi_t(x)) = c$,

then $\phi_t(x)$ lies outside of B_d , i.e., $\phi_t(x)$ lies in the compact set $d \leq |x| \leq r$, \dot{V} achieves its maximum in this set.

$$\text{Let } \alpha = - \max_{d \leq |x| \leq r} \dot{V}(x) > 0.$$

We have for $t > 0$

$$\begin{aligned} V(\phi_t(x)) &= V(\phi_0(x)) + \int_0^t \frac{d}{ds} V(\phi_s(x)) ds \\ &\leq V(\phi_0(x)) - \alpha t \\ &\Downarrow \text{eventually} \\ V(\phi_t(x)) &< 0 \\ &\Downarrow \\ c &< 0 \end{aligned}$$

But we assumed $c > 0$, we have a contradiction.

Part(c)-Reverse time (i.e., take $t = -t$) then one gets part (b)

Remarks:

•V satisfying the conditions of the theorem is called a Lyapunov function.

•The theorem allows to determine the stability of the equilibrium point without explicitly solving the differential equation. In a sense,

Since $\dot{V}(x) = D V(x) f(x)$

the method converts a dynamics problem (i.e. determining the behavior of the trajectories over time), into a algebraic one (i.e., verifying inequalities of the form $F(x) > 0$, where F is some continuous function $F: \mathbb{R}_n \rightarrow \mathbb{R}$)

•One can think of the Lyapunov function as a generalization of the idea of the “energy” of a system. Then the method studies stability by looking at the rate of change of this “measure of energy”.

•See [1] for a more detailed treatment of Lyapunov functions and nonlinear stability.

•The method does not show how to find a Lyapunov function V .

Lyapunov’s direct method (also called the second method of Lyapunov)

allows us to determine the stability of a system without explicitly integrating

the differential equation $\dot{x} = f(x, t)$, $x(t_0) = x_0$, $x \in \mathbb{R}_n$. The method is a generalization

of the idea that if there is some “measure of energy” in a system, then we can study the rate of change of the energy of the system to ascertain stability. To make this precise, we need to define exactly what one means by a “measure of energy.”

2.APPLICATION

Lyapunov formalized the idea:-

If the total energy is dissipated, then the system must be stable.

Some common applications of Lyapunov functions are in the area of: Assessing the importance of non-linear terms in stability and instability Estimating the domain of attraction of an equilibrium point Designing control laws that guarantee global asymptotic stability A Gentle Introduction to Lyapunov Functions Applications Rate control for communication networks, Kelly et al (1998) Proposed optimization framework Larger system problem decomposed into a User and a Network problem Proposed rate control algorithm System of differential equations in the rate/capacity allocated to each user With the correct choice of Lyapunov function, it is shown that: The found equilibrium point is asymptotically stable The Lyapunov function closely approximates the Network’s optimisation problem

Main benefit:-

By looking at how an energy-like function V (a so called Lyapunov function) changes over time, we might conclude that a system is stable or asymptotically stable without solving the nonlinear differential equation.

Note:

The Lyapunov’s direct method can be used to judge the local stability of an equilibrium point when the linearized system matrix A is either asymptotically stable or unstable, the direct method gives at least some conservative estimate of the domain of attraction.

EXAMPLES

(1)EXAMPLE:- In this example, we find that the origin is locally asymptotically stable. We cannot conclude global asymptotic stability of the origin due to the presence of more than one equilibrium point ; but , using **Lyapunov's direct method** ,we can find these to finital conditions for which the system trajectories will eventually end up at the origin (this ball is called the region of attraction).

Consider the auto\nomous (time-invariant) system described by the differential equations:

$$\dot{x}_1 = (x_1 - x_2)(x_1^2 + x_2^2 - 1)$$

$$\dot{x}_2 = (x_1 + x_2)(x_1^2 + x_2^2 - 1)$$

This system has an innite number of equilibrium points: one at the origin and the rest on the unit circle. Since there are multiple equilibria, none of the equilibria can be globally asymptotically stable; furthermore, since the points on the unit circle are not isolated, none can be locally asymptotically stable. We wish to examine the equilibrium point at the origin. Linearizing the system about the origin, we find that that the linearized dynamics have eigen values at $-1 \pm j$, so we can conclude, via the indirect method, local asymptotic stability (L.A.S.) of the origin.

Now,using the direct method , we can find these to finital conditions for which the system trajectories converge to 0.

Consider $V(x) = -ax_1^2 + bx_2^2$, with a , b > 0, which is positive denite for all x_1 and x_2 (in \mathbb{R}^2). Now,

$$\begin{aligned} \dot{V}(x) &= [2ax_1 \ 2bx_2] \begin{bmatrix} (x_1 - x_2)(x_1^2 + x_2^2 - 1) \\ (x_1 + x_2)(x_1^2 + x_2^2 - 1) \end{bmatrix} \\ &= (2ax_1^2 + 2bx_2^2 + 2x_1x_2(b - a))(x_1^2 + x_2^2 - 1) \end{aligned}$$

Note that $x_1^2 + x_2^2 - 1 < 0$ when $\|x\|_2 < 1$, $x \neq 0$.

If b = a =1/2,

Then $\dot{V}(x) = (x_1^2 + x_2^2)(x_1^2 + x_2^2 - 1) < 0$ for all nonzero x in the open unit circle. Thus the origin is L.A.S. within the region $\|x\|_2 < 1$.

(2)EXAMPLE:- Determine the stability of the system.

$$\dot{x} = -y - x^3, \dot{y} = x - y^3$$

We consider the function

$$V(x, y) \triangleq x^2 + y^2$$

and notice that $V(x, y) = \text{constant}$,

gives circles in the phase plane, that is closed curves. This is a consequence of the property positive definite that the function V(x, y) has. To be convinced about this, transform to polar coordinates. Moreover if we take the derivative of V(x, y) along a trajectory, that is

$$\begin{aligned} \dot{V}(x, y) &\triangleq \frac{d}{dt} V(x, y) \\ &\triangleq \frac{\partial V(x, y)}{\partial x} \dot{x} + \frac{\partial V(x, y)}{\partial y} \dot{y} \\ &= 2x\dot{x} + 2y\dot{y} \\ &= 2x(-y - x^3) + 2y(x - y^3) \\ &= -2(x^4 + y^4) \leq 0 \end{aligned}$$

then along every trajectory, we observe that V(x, y) will decrease, as long as we stay outside the equilibrium point (x, y) = (0, 0).

During the course of motion we will be crossing circles that become smaller and smaller. This leads to the conclusion that every motion is directed inward towards the equilibrium point. This will be true wherever we start in the phase plane. Thus every motion is stable. Notice that the function V(x, y), which we call the Lyapunov function, comes from nowhere so

to speak, and there is no general recipe for how to construct it. But there are two important properties that we made use of:

(1) $V(x, y) > 0$ for $(x, y) \neq (0, 0)$. ($V(x) = \text{const.}$ resulted in closed orbits).

(2) $\frac{d}{dt}V(x, y) < 0$ for $(x, y) \neq (0, 0)$. (Give the directions for the solution curves, inward).

Before we start the general formulation of **Lyapunov's direct method** we shall clarify the concept positive / negative definite functions.

(3)EXAMPLE:-Consider the nonlinear system,

$$\dot{x} = f(x) = \begin{bmatrix} f_1(x) \\ f_2(x) \end{bmatrix} = \begin{bmatrix} -x_1 + 2x_1^2x_2 \\ -x_2 \end{bmatrix}$$

and the candidate Lyapunov function

$$V(x) = \lambda_1 x_1^2 + \lambda_2 x_2^2$$

With $\lambda_1, \lambda_2 > 0$. If we plot the function $V(x)$ for some choice of λ 's we

Obtain the result in Figure 2. This function has a unique minimum over all

the state space at the origin. Moreover,

$$V(x) \rightarrow \infty \text{ as } \|x\| \rightarrow \infty$$

Calculate the derivative of V along the trajectories of the system

$$\begin{aligned} \dot{V}(x) &= 2\lambda_1 x_1(-x_1 + 2x_1^2x_2) + 2\lambda_2 x_2(-x_2) \\ &= -2\lambda_1 x_1^2 - 2\lambda_2 x_2^2 + 4\lambda_1 x_1^3 x_2 \end{aligned}$$

Therefore, if $\dot{V}(x)$ is negative, V will decrease along the solution of $\dot{x} = f(x)$.

(4)EXAMPLE:-(Recall Example-3)

The derivative of the Lyapunov function candidate was given by

$$\dot{V}(x) = -2\lambda_1 x_1^2 - 2\lambda_2 x_1^2 + 4\lambda_1 x_1^3 x_2$$

For simplicity, assume that $\lambda_1 = \lambda_2 = 1$. Then

$$\dot{V}(x) = -2x_1^2 - 2x_1^2 g(x)$$

Where $g(x) \triangleq 1 - 2x_1x_2$.

Then the the derivative of V is guaranteed to be negative whenever $g(x) > 0$. The level sets of V , where $\dot{V}(x) < 0$ will be invariant, or equivalently when $g(x) > 0 \Leftrightarrow x_1x_2 < 1/2$.

So we conclude that the origin is locally asymptotically stable.

(5)EXAMPLE:-

We show that the zero solution is a stable solution of the system

$$x'(t) = xy^2 - x; \quad y'(t) = -2x^2y$$

Note that $V(x, y) = ax^2 + by^2$ is positive definite for any $a, b > 0$. If we can choose a, b such

That $V^*(x, y) \leq 0$, then stability will follow by the theorem above. Noting that

$$\begin{aligned} V^*(x, y) &= 2axx' + 2byy' \\ &= (2a-4b)x^2y^2 - 2ax^2; \end{aligned}$$

We can thus take $a = 2b$ for any $a > 0$, in which case $V^*(x, y) = -4bx^2 \leq 0$, as needed.

∴ Stable.

3.CONCLUSION

Lyapunov functions are useful in assessing the stability of systems and in particular the method can be used

For exploring non-linear systems For time varying systems, ie $\dot{x}(t) = f(x(t))$

To determine Stability, Unstability and Assymptotic stability. Drawback is that to find a Lyapunov function is often more of an art than a science.

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Life Is Now

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ABSTRACT

The word inner peace sounds very familiar but yet very abstract in reality. In our very busy schedules we are quite unaware of the fact that this very inner peace is the thing behind which the whole world is after. Peace is the very thing for which we see all the happening around the world from a farmer farming a plant to an engineer designing a robot to a terrorist bombing the nation. This paper reveals a very simple truth or secret to break the bonds of every other truth which seems secondary in front of this truth. Living the life in the now and being one with true reality is the only goal and it will help you satisfy every other goal. This paper is aimed at knowing this simple truth not only logically but experientially. The truth will not only give you peace but also a sensation of your true identity.

Keywords

Consciousness, Present Moment, Mind.

1. INTRODUCTION

Every individual being on earth has his own definition of life. For some people life means living their dreams, for some it is family, for some its money, for some it's ruling the country or bombing a nation but main question we need to ask here is what is life in real? Is it common for everyone? If yes than how? The only thing in common we find is that no matter what an individual definition of life is, every being wants to be peaceful and happy. Each being here sets his own definition of happiness and suffering.

2. FUTURE AND PAST: TIME DELUSION

We all, no matter where we live or how we live, we live because we have a very unhappy or dissatisfied past and hence seeking a better future. It's not our fault anyways; we are habituated to live like this. Our life always fluctuates between anticipation of what will be and depression of what was. The truth by the way says that the only thing real and existing is what is. There was never a time where there is no what is or precisely the present moment. In short the only thing existing is the NOW. Do we think there is any other thing? Life is filled with present moment. There is no other thing pervading the universe except the present moment. Is there?

Whatever we say past is nothing but a moment of life that happened in the now [1].

Whatever we say future is nothing but a moment of life that will happen in the now [1].

Life is NOW [1].

Hence future and past are just unreal time projections. In order to know the root of this truth we need to know how future and past is created by an illusionist popularly called as EGO

3. EGO: THE CREATOR OF PAIN AND TIME

Bhagwat gita says "Mind is a friend of the conditioned soul as well as his enemy "[2] very truly said. Mind is the creator of past and future. Whatever we had experienced in the now or will experience in the now all are stored in your mind. The question here is what is mind? Mind means thoughts flowing inside your head. The past and future are nothing but mind projections. Ego is a very well-known term but when I talk about life in the now, ego here purely means our past and hence in result our future mental projections. We have identified with your ego and hence there is time. There is no future or past. They are purely an incident which happened in the present moment and has no relevance whatsoever in the now except for using it for dealing with your life situations. The irony here is that the past and future normally controls our life. Mind is nothing but thought which a projection of past or future. When we are totally present there is no time. When I say time here we should know that time means psychological time called past and future not clock time. Clock time can be effectively used only when you are completely present. In order to demonstrate this truth we need to ask our self-one question "Is there any problem we have in the now? Not after or before 2 seconds but right now? We won't get an answer because there is no problem in the now only situations to deal with or to be left alone. All your problems are mind projection of what was and what will be.

4. LIVE HERE AND NOW

So now it is very clear that the NOW is the only portal to live life at ease and peace. The fact which is very obvious now is

that all suffering are nothing but mind or brain produced subjective thoughts which whatsoever has no relevance to reality. Living in the life is the ultimate art of living. The quality of life and our consciousness at this moment is responsible for our future. Let's analyze this fact. Let's ask our self whatever thought situation or idea or even the future desire all arises when and where? It arises in the now. So let us be completely present in the now. Use senses to the fullest. Once we become present, hear what you hear as it is, see what you see as it is, feel what you feel as it is. Don't judge in polarities of good or bad, right or wrong. Those are just mind judgements. As we are totally present we feel connected and peaceful. We don't judge things rather we see things as they are. This means that we see things more clearly. Our judgement, creativity and problem solving techniques improve. Most importantly we act through peace rather than acting for peace. The thing we need to do is just realize that this moment is what we have and to put our total attention towards this moment. For this we need to get aware of what is happening around us right now. The feeling level, the depth of your being increases. A sense of spaciousness arises within you. All these things may seem philosophical but it's a thing to be experienced rather than analyzed. When we are totally present in the now and living life each moment, we really enjoy life no matter what. Whatever we do we feel alive.

4. ACCEPTANCE AND SURRENDER

There are several ways by which you can enter the now. The most important way by which you can is to accept the present moment as it is. Acceptance here doesn't mean accepting the outer conditions and not doing anything. Acceptance just means that accepting the NOW unconditionally and without any resistance. The reason you need to do this is that this moment is as it should be. When we resist the moment the power of responsive change cannot come. Our mind always resist the now by wanting a better now. The point here is that Life is now and it is as it is. In order to get aware of this fact we need to just get aware of the present moment and see the happening. When we see this moment, we come to know that anything, be it change or passivity can only come by accepting the moment. As whatever that happened in then NOW has happened and to change it you need to accept the fact that it has happened and the power of change can only come from accepting and observing the now. As we accept this moment, we surrender. Surrender term may make you feel defeated but when you just surrender yourself to what is a yielding action comes. Surrender is never to the situation or circumstance that you are dealing with. Surrender is to accept the now as it is, the present moment. It is creating a gap between your rigid expectations and the present moment. It is saying yes to life within and taking responsive actions. When true surrender comes we work like a judo artist who uses the opponent power to beat him. Similarly we also use the conditions when we accept and use those to create a change.

5. CONCLUSION

From this study we can clearly see that all suffering is nothing but our mind in the form of thoughts and the only way out of it is the present moment that is the NOW.

6. ACKNOWLEDGMENTS

At last we pay our sincere gratitude to Mr. Eckhart Tolle for his wonderful work in his book [1].

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STUDY OF CARBON NANOTUBE AS A GAS SENSOR

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ABSTRACT

Carbon Nano-tube is a most popular material in Nano-scale dimension .Carbon Nano-tubes are having interesting and peculiar properties which serves new opportunities for its potential applications in different branches of science and technology. This study is focus on the interaction of different gas molecules with carbon Nano-tube. These interactional behavioral properties of carbon Nano-tube with gases molecules use as sensing parameter for designing of gas sensors for sensing various gases.

Keywords: Carbon Nano-tube, Gas sensor, Nanoscale, Behavioral properties.

1. INTRODUCTION

CNT is one of the most fascinating allotrope of carbon in nanoscience and nanotechnology. CNTS has extraordinary physical, chemical electrical, mechanical and electronic properties. These properties of CNT make it important material for various applications in different branches of engineering fields. CNT having high surface to volume, hollow and this property of CNT is ideal for adsorption of gas molecule. When functionalized CNT exposed to certain gases CNT properties changes. Hence CNTS based gas sensor and their mechanism needs to study widely .Various research group have studied the structural changes in CNT when pristine and functionalized nanotube exposed to various gases. Recent development of nanotechnology has created huge potential to build high sensitive, low cost, portable sensors with low power consumption.

2.STRUCTURE OF CARBON NANOTUBE

Carbon nanotubes (CNTs) are a group of one-dimensional nanoscale materials composed of carbon atoms with fullerene structure, in which each carbon atom is sp^2 hybrid and every carbon atom is covalently bonded to another three adjacent carbon atoms. According to the number of their wall layer, they can be single-walled carbon nanotubes (SWCNTs) and multiwall carbon nanotubes (MWCNTs). A single-walled carbon

Nanotube can be considered as being formed by rolling a piece of graphene to create a seamless cylinder with diameters of 0.4–2 nm. MWCNT comprise of several layers of graphene cylinders that are concentrically nested like rings of a tree trunk, with an interlayer distance close to that of graphite (0.34 nm). Based on rolling carbon nanotube is Zig-Zag(fig1), Armchair(fig2) and Chiral(fig3).



Fig(1)



Fig(2)



Fig(3)

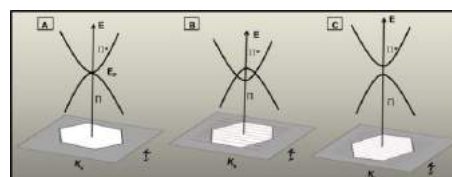


Fig.(4) Electronic properties of carbon

3. CARBON NANOTUBE AS A SENSOR

A.A.EL Barbary, KHM Eid and others in their study of effect of chirality's and diameter of SWCNT on gas sensing behavior they obtained that the adsorption of CO and CO₂ are enhanced with increasing the diameter of Zigzag CNT the adsorption of NO and NO₂ gas molecule is independent on the chirality and diameter of CNT. Pristine CNT is inactive so different research group have studied doped CNT as sensor for sensing gas molecules. Nguyen Thanh Cuong, Ayumu sugiyama and co workers 2009 (physical review) structural change in Pt₄ cluster on (10,0) SWNT under CO gas environment. They obtained high adsorption energies (2.83eV) of CO molecule on Pt₄ cluster on SWNT support. Thus (10,0) SWNT with Pt₄ cluster is highly reactive for CO molecules. Ngangbam, Bedamani, Singh and others in Soft nanoscience letter, 2013 studied the nickel decorated SWCNT as CO sensor in their study they used (5,0) SWNT of diameter 4.17 Å. The binding energy of the CO molecule on the pristine CNT is -11.70eV and binding energy on Ni₄ decorated CNT is -16.44eV. It is observed that binding energy of CO is enhanced when CNT is decorated with Ni₄ cluster. It is a favorable feature for sensors. They also observed that the pristine CNT and Co adsorbed CNT have zero magnetic moment on placing Ni₄ cluster at the surface of nonmagnetic CNT the structure has net magnetic moment 4.00 μ_B. This magnetic moment is contributed by the Nickel cluster. When Co is adsorbed on the cluster decorated CNT we observe that net magnetic moment suddenly decreases to 0.10 μ_B.

Xiaong Zhang, Ziqiang Dai and others studied gas sensing properties of Pt decorated CNT. In this study the adsorption of three gases on the surface of Pt-SWCNT calculated using DFT. They used (8,0) single wall CNT and decorated Pt atom is adsorbed on vacancy defect of SWCNT they obtained that when CO is adsorbed on Pt-SWCNT, Co provides electrons to p-type CNT decreasing the number of hole carriers. The frontier orbital energies and E_g are increased decreasing conductivity. The adsorption energy of Co pristine SWCNT is -0.157eV and binding energy of Co enhanced to -1.386eV on Pt decorated SWCNT. They also studied the adsorption energy of the reaction between Pt-SWCNT and SO₂ is large and numerous electrons are transferred from CNT to SO₂ gases E_g are decreased and electrical conductivity of Pt-SWCNT is enhanced. Binding energy of pristine CNT for SO₂ is -0.830eV which change to Pt-SWCNT to -1.2254eV.

E. Tetik in condensed matter physics 2014 studied the electronics properties of doped single walled carbon nanotubes and obtained the binding energy of BN-CNT (8,0) zigzag CNT they obtained the adsorption energy and binding distance are -6.284eV, -5.591eV, -0.131eV, -0.121eV and 1.63Å, 1.71Å, 1.85Å, 2.23Å for NO, CO, H₂S and CO₂ gas

respectively and the outcome suggest that BN-CNT can be used as gas sensor for sensing few gases.

M.R. Sonawane and others study the interaction of gases on Si doped CNT they obtained the binding energy of oxygen molecule on Si-CNT for stable configuration -2.627eV band gap reduces to 0.31eV thus conductivity of nanotube gets increased. The binding energy of most stable configuration system is found to be -1.787eV due to CO₂ gas adsorption band gap reduces to from 0.549eV to 0.316eV. The reduction in band gap suggest significant increase in conductivity of Si-CNT and it is turned out to be p-type conducting. The binding energy for stable configuration of SO₂ adsorption is -1.811eV reducing the band gap of Si-CNT to 0.310eV. Conductivity of Si-CNT is changed due to adsorption of SO₂.

STUDY OF CARBON NANO TUBE WITH Pt, Ni, Si DECORATED

Functionalized CNT	Binding energy for CO gas
Pt ₄ cluster on (10,0) CNT	-2.83eV
Ni ₄ cluster on (5,0) CNT	-16.44eV
Pt decorated on (8,0) CNT	-1.386eV
Si doped (8,0) CNT	-5.5911eV

4. CONCLUSION

The drawbacks of conventional sensors can be somewhat overcome by the incorporation of CNTs in sensors. This will give high sensitivity, quick response time and good recovery time compared to commercial sensors and also can be operated at low power and even at room temperature. Various research group have studied the significant changes in functionalized CNT when exposed to CO gas as CO gas is very harmful for environment and major gas in causing global warming and also cause several disease. In human being early and accurate detection of CO is needed and functionalized CNT is most accurate sensor to sense CO gas. Above table gives adsorption energy of CO on various functionalized CNT.

5. ACKNOWLEDGMENTS

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IMPACT OF MOTIVATION ON STUDENTS' LEARNING

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Abstract

Motivation is undoubtedly the only essential element of learning. Learning is a very hard working process and thus, it can be possible with motivation. If students are motivated, they will learn easily and willingly, and teaching activity becomes interesting. The various research proves that the teacher can motivate their students to learn. It is said that motivation is a vital element of good teaching and learning process. The teacher, who is an expert in the subject matter, is only in the position to show the students why and how much the subject matter is important, interesting, and valuable for them to learn. This is the main goal of an effective teacher to convey the message and how can the teachers motivate the students to learn? Thus, the present research article tries to focus on the different aspects of teaching-learning process to motivate students to learn.

Keywords- Motivation, Teaching-Learning Process, Teaching, Learning.

1. Introduction

Motivation is undoubtedly the only essential element that teacher can focus with the aim to improve learning of the students. Regarding the students, if students are motivated on a regular basis, their learning will be at the high level. The various components are effecting on students motivation like

teaching methods, content knowledge of teachers and classroom environment. Motivation is defined as the action of conveying or exchanging; a motivating force, stimulus, or influence; incentive; drive; something that induces a person or student to act and the collective effort to accomplish results.

2. Impact of Motivation on Students' Learning

Motivation is an essential element in quality education. We come to know about the students motivation to learn when they are attending the class properly, working on tasks enthusiastically, participating eagerly in questions and answers session. For that, the student should have access, ability, interest, and value and quality education. The teacher must be knowledgeable, master in the pedagogical process, be dedicated and responsible to his or her students, and be motivational. The subject content must be accurate, appropriate, stimulating, and relevant to the current and future needs of the students. The teaching and learning process must be innovative, inspiring, stimulating, constructive, implementing and applying in the real life situations. The environment needs to be pleasant, safe, conducive and empowering. Motivation is enhanced when teachers creating various sources of motivation in students learning experience in each classroom on a consistent basis.

In education, the role of students is very important and extended beyond the traditional view as knowledge gainer. “Students are the raw materials for education and the primary products of educational transformations; and most important...students are key members of the labor force involved in creating education” (Lengnick-Hall and Sanders, 1997, p. 1335). As such teachers are in the position to produce the environments which motivate students to improve learning as much as possible and educational organizations must become learning homes where relationships among students are cherished and exposed their own potentials.

Students’ active participation is a key to academic performance. Teachers should encourage the students’ active participation in classroom activities and should change their attitude towards learning by providing 24-7 access and fulfilling immediate satisfaction of students. It will help in finding a connection between students learning and teachers teaching. Through interactions in groups, discussions, projects, and group presentations with their peers or teachers, they can be more involved in learning activities effectively

The role of teachers is shifted from knowledge transformer to facilitator in student learning and classroom environment. By expanding their role, the teacher should support students for peer interaction to share their ideas and views effectively. Being a facilitator of learning, the teacher should have an immediate and visible impact on student motivation.

In order to enhance students’ learning and motivation to learn, the teacher should present the content and conduct the activities in an organized and interesting way, to maintain student attention. Students should be recognized for the hard work and their efforts with constructive and timely feedback. If teachers don’t provide feedback on their performance, it is often difficult for the students to know whether or not they are reaching expectations and learning the content.

The teacher should be more an enthusiastic about the content, then only the students will be more eager to believe that the topic has value for them. That is, enthusiastic behavior of teacher can motivate students. The teacher should express his/her enthusiasm through facial expressions, gesture, posture, depicting personal remarkable experiences, facts, and creating humor in the classroom environment. The teacher should focus on the approach which is supporting and cultivating motivation by creating a structured classroom and helping the student to be self-regulated. The quality environment is the most important factor that contributes to student’ motivation to learn. An environment of freedom to learn from own mistakes can foster motivation to learn but in an unsafe and unhealthy environment, it is difficult to focus on learning.

3.Conclusion

There is no significant connection between teacher’s qualification and student assessment results for teachers’ effectiveness. Teachers must acquire new abilities for continuous development and present themselves as role models for the students. These new ideas can transform the classroom into an effective unique classroom environment. Through Content knowledge, effective teaching methods and conducive classroom environment we can create situations that will encourage participation and motivation to learn on different levels.

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STUDY OF NANO-MATERIALS AS A CATALYST AND ITS BEHAVIORS

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ABSTRACT

Study of catalyst in the domain of chemical science is an important material agent which modifies the rate of chemical reaction without changing its own chemical constituents, when catalyst is present in the form of nanomaterial. We use Nano-material as catalyst for increasing or decreasing the rate of chemical reaction under the controlled parameters of environment. Same catalyst for same reactants under different environmental conditions produces different yields.

KEYWORDS: Domain, Catalyst, Nano-materials

1.INTRODUCTION

Nanomaterials also called as nanocrystalline materials, possess grain size of the order of a billionth of a meter. All materials are composed of grains which are usually invisible to the naked eye, varying in size somewhere from 100's of microns (μm) i.e. (10^{-6}) to 100 millimeters (mm).

Since nanomaterials possess unique, beneficial, physical, chemical and mechanical properties, they show a wide variety of applications which includes -1) Applications in medicines.2) Applications in Nano electronics.3) Applications in Nano mechanics.4) Applications in environmental technology.5) Applications in catalyst.

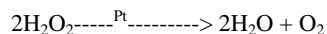
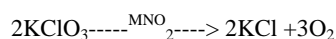
But, are not limited to the above points.

To continue with let us discuss about nanomaterials as a catalyst with its behavior.

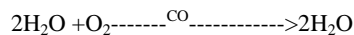
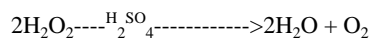
Catalyst is basically that substance which alters (increases or decreases) the velocity of reaction when taken on nanoscale, without itself undergoing any change in mass and composition at the end of reaction and this phenomenon of altering reaction is called as catalysis.

Catalyst are of two types:

1) Positive catalyst: A catalyst which increases the rate of reaction, for example,



2) Negative catalyst: A catalyst which retards the rate of reaction, for example,



2.Characteristics of catalyst:

1. A catalyst remains unchanged chemically at the end of the reaction.
2. A small amount of catalyst is sufficient to change rate of reaction.
3. A catalyst has no influence on equilibrium point.
4. It cannot initiate a reaction.
5. It has a selective action.

6. Efficiency of a catalyst depends upon its physical state.

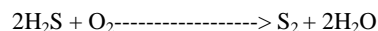
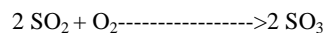
3.Nanomaterial in catalytic concepts:

Both organic and inorganic carbons play very important role in nanomaterial catalytic concept. The physical and chemical properties of carbon materials, such as their porosity and surface chemistry make them most useable for application in many catalytic processes, they are generally used as supports for catalysts in heterogeneous catalytic processes. Many carbon materials have been studied of which activated carbon (AC) and carbon black (CB) are commonly used carbon supports. Activated carbons also called as activated charcoal comprises a group of substance having high porous internal surface area and hence absorbing chemical reactants from liquid and gases state. The adsorption is due to Vander Waal's forces. Whereas Carbon blacks, a very pure form of soot is that materials that have spherical carbon particles of average aggregate size is in the range of 100-800 nm or above. High porous nature and larger surface area of activated carbon and carbon black catalysts favor the dispersion of active phase on support and hence increases its resistance to sintering at high metal loadings. A carbon material are generally water hating substances i.e. hydrophobic in nature and shows low affinity towards polar solvent such as water and has high affinity towards solvents such as acetone. Other advantages of carbon materials are as follows: a) metals on the support can be easily reduced, b) structures of carbon are resistant to acids and bases, c) structure is stable at high temperatures (above 1023K under inert atmosphere), d) porous carbon materials can be prepared in different physical forms as granules, cloth, fibers, pellets, etc. e) cost of carbon supports is usually lower than that of other supports such as alumina and silica.

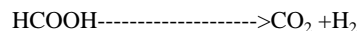
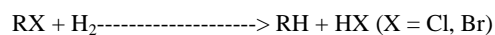
4. Carbon Materials in the role of catalysts:-

The reactions catalyzed by carbon materials are classified in following groups (along with examples):

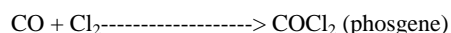
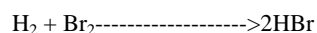
Oxidation reduction:



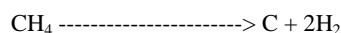
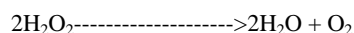
Hydrogenation-dehydrogenation:



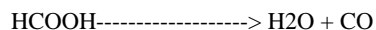
Combination with halogens:



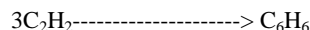
Decomposition:



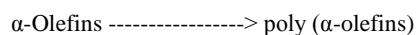
Dehydration:



Isomerization:

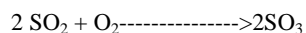


Polymerization:



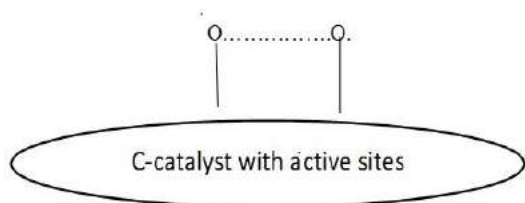
Mechanism of Catalytic Action:-

For explaining the mechanism let us consider the first reaction of oxidation-reduction i.e.



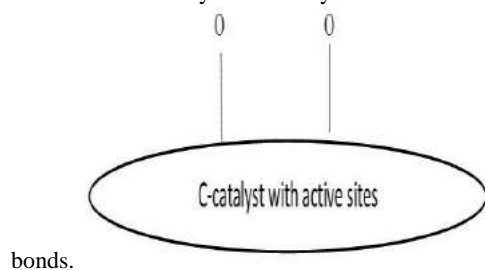
Step I:

Adsorption of oxygen molecules on the catalyst surface due to residual valence bonds of Carbon atom



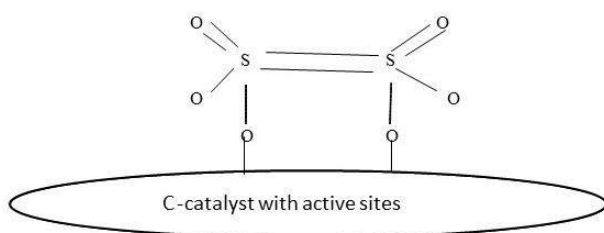
Step II:

Since the bond length of O-----O bond, is lesser than the bond length of C-----C bond, the O-----O bond is stretched, weakened and hence broken into atoms which are held to the catalyst surface by chemical



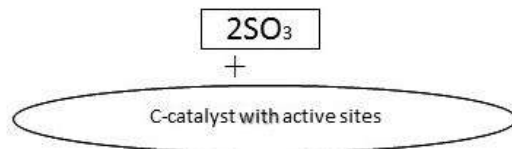
Step III:

The chemically adsorbed O atoms are attached to Sulphur dioxide molecules by partial chemical bonds, thus forming an unstable activated complex.



Step IV:

The unstable activated complex is decomposed to yield the product (Sulphur trioxide) and the catalyst surface is released for a fresh cycle of the above steps.



Other carbon substances which also have a wide variety of applications as catalyst on nanoscale are as follows:

Carbon nanotubes and nanofibers:- These are produced by the catalytic decomposition of certain hydrocarbons. By careful manipulation of various parameters we can be able to control its crystalline order. They can be either single-walled (SWCNTs) (diameter close to 1nm) or multi-walled (MWCNTs) (distance between graphene layers approx. 3.4Å⁰). When wrapped SWCNTs form a one atom thick layer of graphite into a seamless cylinder whereas MWCNTs constitute to be multiple rolled layers or concrete tubes of graphene and hence the nanoscale tubular morphology of CNTs offer a unique combination of low electrical resistivity and high porosity. It also offers the advantage of doping giving rise to P-doping and N-doping which also have high catalytic properties.

Propane----CNTs (773K) -----> Propene

Butane-----P-Doped CNTs (723K) -----> Butene

Propane ---N-Doped CNTs (673K) ----->Propene

Graphene and Few-layer Graphene (FLG):- It provides a two dimensional model of catalytic support of sp² hybridized carbon atoms, the parent material of CNTs. Inculcation of catalyst particles onto FLG can provide a great variety in carrying out catalytic processes and is a new upcoming of the carbon – supported catalyst family.

Iso-Butane ----FLG (673K) -----> Iso-Butene

5.Applications of Nanocatalysts:-

Catalysts of nano size are used in several chemical processes which are useful for human beings. These

applications of nanocatalyst are reported within last few years:-

- 1) In water purification (Ag, Al₂O₃, C catalyst)
- 2) In bio-diesel production (KF, CaO catalyst)
- 3) In fuel cell application (Pt catalyst)
- 4) In drug delivery (CNTs catalyst)
- 5) In solid rocket propellents (Al catalyst)
- 6) TiO₂ in energy application (TiO₂ catalyst)
- 7) In photochemical activity of TiO₂ (TiO₂ catalyst)
- 8) In Thin film solar cell (CdS and TiO₂ catalyst)
- 9) In waste water treatment (Pd catalyst)
- 10) In environment protection (Fe-Co mixed oxide nanocatalyst)
- 11) In preparation of fuels (Ni catalyst supported on nano-particles of ZrO₂)
- 12) In oxidation of alcohol (Pt-Pd/C catalyst)

6.CONCLUSION:-

Explosive growth has been undergone in the field of nanocatalysis i.e. nanoparticles to catalyze reactions in homogeneous and heterogeneous catalysis during the past decade. Compared to bulk material nanoparticles have a large surface to volume ratio and hence are attracted to be used as catalysts. Thousands of chemical reactions are daily accelerated and boosted by catalyst which forms the basis of worldwide spread chemical industry. The ability to control materials on nanoscale will ensure a rational and cost efficient development of more capable catalysts for chemical reactions. Research in nanotechnology and nanoscience is expected to open a new era in environmental protective technologies.

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STUDY OF THE MOLECULAR MOTOR AND ITS APPLICATIONS

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ABSTRACT

In this Present study of the MOLECULAR MOTOR AND ITS APPLICATIONS is an effort to develop the understanding of mechanisms and transfer of molecular states (shape) in a controlled manner with the aid of external source of energy. Molecular motors are very important concept under the domain of Nano-technology that design devices in spacing 0.12-0.15nm while the most present working motors is in meter and centimeters scales. This study of Molecular motor is very challenging problem of engineers to build the device in atom to molecules level and perform the tasks of traditional world. This Kind of motors working on the principle of Quantum mechanics that serves new domain of research in new fields of Nano-electronics, Nano-mechanics, Nano-photonics, Nano -Ionics ,Biomaterials and surface science.

Keywords Molecular motors, Nano-electronics, Nano-mechanics, Nano-photonics, Nano -Ionics, Biomaterials

1.INTRODUCTION

Molecular motor is a fascinating concept for designing of the motor in Nano –scale. Scientists are inspire from the most of activity in the bio-cell is driven by three classes of molecular motors: the kinesin and dynein families that move toward the plus-end and minus-end of microtubules, respectively, and the unconventional myosin motors that move along actin filaments. Each class of motor has different properties, but in the cell they often function together.

Fast-growing body of nanotechnology research is dedicated to nanoscale motors and molecular machinery. For the visionary goals of nanotechnology, functional and perhaps autonomous molecular motors will play an essential part, just like electric motors can be found in many appliances today. These Nano machines could perform functions similar to the biological molecular motors found in living cells, things like transporting and assembling molecules, or facilitating chemical reactions by pumping protons through membranes. Although applications of molecular motors are still in the future, the results of early-day studies are already

spectacular: well-designed molecules or supramolecular show different kinds of motion – fueled by different driving forces

such as light, heat, or chemical reactions – resulting in molecular shuttles, molecular elevators and rotating motors.

2.Designing of Molecular motors

New design of molecular motor based on electric field actuation and electric current detection of the rotational motion of a molecular dipole embedded in a three-terminal single-molecule device.

The use of an electric field to drive molecular dipole motor provides unidirectionality and complete control over the speed of rotation, while the conductance provides a real-time measure of the motion. The design of the motor consists of anchoring groups connecting the conjugated backbone to the leads, allowing the measurement of the low-bias conductance, and a dipole rotor which can be driven by the oscillating gate field underneath. The rotating moiety is equipped with a permanent electric dipole moment and is part of a conjugated molecule, which is suspended between two metallic contacts above a gate electrode.

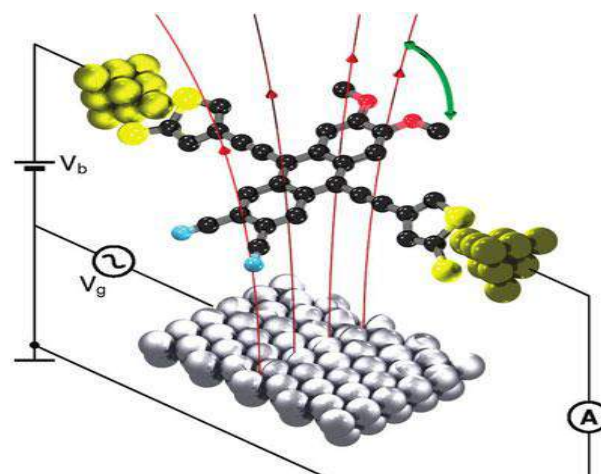


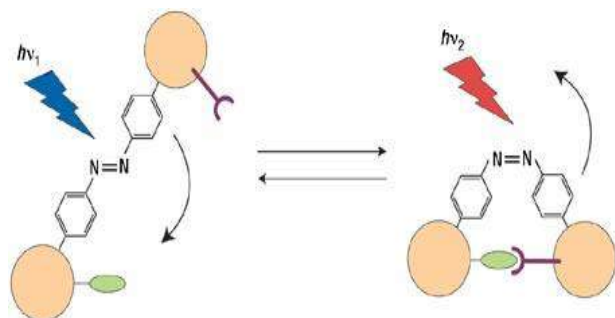
Fig-1 Design of a molecular motor with a permanent electric dipole moment.

Just to be clear, though, at the moment this design for an all-electrical single-molecule motor exists only on paper. However, certain parts have already been verified experimentally – the possibility of exerting a force on a molecular dipole with an electric field, and the angular dependence of the conductance of a conjugated molecule.

He points out that, although the proposed motor uses an external gate electrode to drive the molecule, the team has shown that the charging or discharging of a neighboring molecule should also provide an electric field large enough to drive the motor. This should make it in principle easier to incorporate our motor in a molecular machine than the light or heat-driven motors. Apart from making and measuring the motor, the main challenge ahead is control over the direction of rotation. This is true for almost all molecular motor designs thus far. "We have shown that, once it's coupled to the electrodes, our molecule should only rotate in one direction" notes Seldenthuis. "However, which direction that is depends on how it is positioned in the junction, something over which we do not have control. We are currently looking into ways to make the molecule always prefer one direction over the other. The main challenge after that would be to combine the motor with other components in order to create a functional machine. However, this is one of the biggest challenges in the entire field of molecular electronics." An important aspect of the design is the versatility offered by chemical synthesis. In particular, the barrier height, the dipole moment, and the moment of inertia of the rotor can all easily be changed.

"Our motor therefore constitutes a well-defined nanoelectromechanical system suitable for studying molecular motion over a wide range of temperatures, encompassing both the classical and quantum regime".

Present working machines, devices and appliances exist in this example of a molecular machine we are able to switch between two molecular states (shapes) in a controlled manner as part of a repetitious mechanical cycle. An azobenzene molecule can exist in two forms (left: *trans* with the bulky groups on opposite sides of the double bond, and right: *cis* with the bulky groups on the same side). As shown in fig no 2.



In this example of a molecular machine we are able to switch between two molecular states (shapes) in a controlled manner as part of a repetitious mechanical cycle. An azobenzene molecule can exist in two forms (left: *trans* with the bulky groups on opposite sides of the double bond, and right: *cis* with the bulky groups on the same side). The bulky groups

can be moved closer together or further apart by switching between the *cis* and *trans* forms

Molecular motors are protein molecules that convert chemical energy to mechanical force. They are responsible for essentially all active biological motions. An important class of molecular motors is transport proteins capable of moving processively and unidirectionally along linear, periodically structured and polar track filaments. They are divided into three superfamilies: kinesin, dynein, and myosin. These motor proteins perform such tasks as intracellular transport, cell division, bacterial motion, and muscle contraction [1-9]. Up to now, a comprehensive understanding of the microscopic mechanism of molecular motors is still challenging. But with the extensive investigations using different experimental methods, such as biochemical, biophysical, and single-molecular approaches, many aspects of the movement behavior of different molecular motors have been gradually elucidated, and a large amount of data been gathered. In the case of kinesin, for example, the rapid development and progress of single-molecule manipulation and detection techniques in recent years have improved significantly our knowledge of its dynamic and mechanistic properties in vitro. In particular, in Ref. detailed single-molecular observations of the mechanical behavior of kinesin moving along microtubules in vitro under low load or under controlled loads have been reported. Important parameters such as stall force, velocity, mean run length, and dwell time have been measured systematically. In proportion with experimental studies, molecular motors have also been extensively studied theoretically. Theoretical modeling of the motion of motor proteins involves mainly two * Project supported by the National Natural Science Foundation of China approaches.

One of the approaches uses the traditional chemical kinetic descriptions. The other approach is based on thermal ratchet models in which the molecular motor is treated as a Brownian particle. The processivity of molecular motors such as the average attachment time to the filament and the mean run length has been studied in the frame of one-dimensional two-state model. With periodic sequential kinetic models the probability of detachment of the molecular motors from the filament has been considered. The aim of this Letter is to provide a simple two-dimensional model to describe the dynamics of molecular motors and give comparisons of our theoretical results with previous experimental results. In order to study both the processive movement of the molecular motor along a periodic and polar track filament and its dissociation from the filament, we consider an overdamped Brownian particle in two spatial dimensions, with x-axis along the filament and y-axis perpendicular to the filament.

Summary, we propose a two-dimensional model to describe the dynamics of molecular motors, including both processive movement and dissociation. Even though this model is simple, it can give essential features of the motility of molecular motors. The good agreement between theoretical and previous experimental results for kinesin implies that this model represents a tenable theoretical approach to molecular motors.

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CERTAIN ASPECTS OF UNIVALENT FUNCTIONS WITH NEGATIVE COEFFICIENT DEFINED BY FRACTIONAL DIFFERENTIAL OPERATOR

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ABSTRACT

In this paper we have introduced a new subclass of univalent analytic functions and derived various properties like coefficient inequality, distortion theorem, radius of starlikeness and convexity, Hadamard product, extreme points, closure theorems for functions belonging to this class with the help of fractional differential operator.

Keywords Univalent functions, fractional derivative operator, Hadamard product.

1. INTRODUCTION

Let S be the class of analytic and univalent function of the form $f(z) = z + \sum_{k=2}^{\infty} a_k z^k$ $a_k \geq 1$

Let S_k denote the subclass of functions $f(z)$ of the form

$$f(z) = z - \sum_{k=2}^{\infty} a_k z^k \quad a_k \geq 1 \quad (1.1)$$

which are analytic and univalent in the unit disc

$$U = \{z: |z| < 1\}.$$

$$\text{Let } g(z) = z - \sum_{k=2}^{\infty} b_k z^k \in S_k, \quad b_k \geq 1 \quad (1.2)$$

which also analytic and univalent in U

We recall the following definitions which are used for working in the classes of analytic functions

Definition (i): A function $f(z) \in S_k$ is said to be starlike of order α , $0 \leq \alpha < 1$ if

$$\operatorname{Re} \left(\frac{zf'(z)}{f(z)} \right) > \alpha, \quad z \in U \quad (1.3)$$

Definition (ii): A function $f(z) \in S_k$ is said to be convex of order α , $0 \leq \alpha < 1$ if

$$\operatorname{Re} \left(1 + \frac{zf''(z)}{f'(z)} \right) > \alpha, \quad z \in U \quad (1.4)$$

Definition (iii): If $f(z), g(z) \in S_k$ then their Hadamard product is $f(z) * g(z) = z - \sum_{k=2}^{\infty} a_k b_k z^k \in S_k$ (1.5)

$$\text{for } f(z) = z - \sum_{k=2}^{\infty} a_k z^k, \quad g(z) = z - \sum_{k=2}^{\infty} b_k z^k$$

Definitions(iv): (Fractional integral operator)

The fractional integral of order α , is defined for a function $f(z)$ by

$$D_z^{-\delta} f(z) = \frac{1}{\Gamma(\delta)} \int_0^z \frac{f(\psi)}{(z-\psi)^{1-\delta}} d\psi, \quad \delta > 0 \quad (1.6)$$

where $f(z)$ is an analytic function in a simply connected region of the z -plane containing the origin, and the multiplicity of $(z - \psi)^{1-\delta}$ is removed by requiring $\log(z - \psi)$ to be real when $z - \psi > 0$.

Definitions(v): (Fractional derivative operator)

The fractional derivatives of order α , is defined for a function $f(z)$ by

$$D_z^{\delta} f(z) = \frac{1}{\Gamma(1-\delta)} \frac{d}{dz} \int_0^z \frac{f(\psi)}{(z-\psi)^{\delta}} d\psi, \quad 0 \leq \delta < 1 \quad (1.7)$$

where $f(z)$ is constrained, and the multiplicity of $(z - \psi)^{-\delta}$ is removed as in definition (iv).

Definitions(vi): (Extended fractional derivative operator)

Under the hypothesis of definition (v) The fractional derivative of order $n + \delta$ is defined, for a function $f(z)$, by $D_z^{n+\delta} f(z) = \frac{d^n}{dz^n} D_z^{\delta} f(z)$ where $0 \leq \delta < 1; n \in \mathbb{N}_0$

Using the above definition Srivastava and owa [2] introduced the operator

$$\Omega^{\lambda} f(z) = \Gamma(2 - \lambda) z^{\lambda} D_z^{\lambda} f(z)$$

$$\Omega^{\lambda} f(z) = z - \sum_{k=2}^{\infty} \Phi(k, \lambda) a_k z^k \quad (1.8)$$

where

$$\Phi(k, \lambda) = \frac{\Gamma(k+1)\Gamma(2-\lambda)}{\Gamma(k+1-\lambda)}$$

Using the definition ,S.M.Khairnar and Meena More [1] we say that a $f(z)$ is in the class $S(\alpha, \beta, \gamma, \mu)$ if and only if,

$$\left| \frac{z \frac{\Omega^{\lambda+1} f(z)}{\Omega^\lambda f(z)} - 1}{2\gamma \left(z \frac{\Omega^{\lambda+1} f(z)}{\Omega^\lambda f(z)} - \alpha \right) - \mu \left(z \frac{\Omega^{\lambda+1} f(z)}{\Omega^\lambda f(z)} - 1 \right)} \right| < \beta$$

for $|z| < 1$ (1.9)

Where $0 < \beta \leq 1, \frac{1}{2} \leq \gamma \leq 1, 0 \leq \alpha \leq \frac{1}{2}, \frac{1}{2} < \mu \leq 1$.

In this paper all the investigated results are motivated by S.M.Khairnar and S.M.Rajas[1], G.Murugusundaramoorthy And R. Themangani[2], M.Darus [3],

Next, we characterize the class $S(\alpha, \beta, \gamma, \mu)$ by proving the coefficient inequality.

2. Coefficient Estimates

Theorem1.:Let $f(z) = z - \sum_{k=2}^{\infty} a_k z^k \in S_k$. Then $f(z) \in S(\alpha, \beta, \gamma, \mu)$ if and only if

$$\sum_{k=2}^{\infty} [1 - k + 2\beta\gamma(k - \alpha) - \beta\mu(k - 1)] \Phi(k, \lambda) a_k \leq 2\beta\gamma(1 - \alpha)$$

(2.1)

where $0 \leq \alpha < \frac{1}{2}, 0 < \beta \leq 1, \frac{1}{2} \leq \gamma \leq 1$,

$$\Phi(k, \lambda) = \frac{\Gamma(k+1)\Gamma(2-\lambda)}{\Gamma(k+1-\lambda)}$$

The result is sharp for the function

$$f(z) = z - \frac{2\beta\gamma(1 - \alpha)}{[1 - k + 2\beta\gamma(k - \alpha) - \beta\mu(k - 1)]\Phi(k, \lambda)} z^k$$

Proof: Assume that the inequality (1.9) holds true and

$|z| = 1$. Then we obtain

$$\begin{aligned} & |z\Omega^{\lambda+1}f(z) - \Omega^\lambda f(z)| \\ &= \beta |2\gamma\{z\Omega^{\lambda+1}f(z) - \alpha\Omega^\lambda f(z)\} - \mu\{z\Omega^{\lambda+1}f(z) - \Omega^\lambda f(z)\}| \\ &\leq \left| \sum_{k=2}^{\infty} (1-k)\Phi(k, \lambda) a_k z^k \right| \\ &\quad - \beta \left| 2\gamma \left[(1-\alpha)z \right. \right. \\ &\quad \left. \left. + \sum_{k=2}^{\infty} (\alpha-k)\Phi(k, \lambda) a_k z^k \right] \right| \\ &\quad \left. + \sum_{k=2}^{\infty} (k-1)\mu \Phi(k, \lambda) a_k z^k \right| \end{aligned}$$

$$\leq \sum_{k=2}^{\infty} [1 - k + 2\beta\gamma(k - \alpha) - \beta\mu(k - 1)] \Phi(k, \lambda) a_k$$

$$\leq 2\beta\gamma(1 - \alpha)$$

by hypothesis. Hence by maximum modulus principle, we have $f(z) \in S(\alpha, \beta, \gamma, \mu)$

Conversely, let $f(z) \in S(\alpha, \beta, \gamma, \mu)$.

Then

$$\left| \frac{z \frac{\Omega^{\lambda+1} f(z)}{\Omega^\lambda f(z)} - 1}{2\gamma \left(z \frac{\Omega^{\lambda+1} f(z)}{\Omega^\lambda f(z)} - \alpha \right) - \mu \left(z \frac{\Omega^{\lambda+1} f(z)}{\Omega^\lambda f(z)} - 1 \right)} \right| < \beta$$

$z \in U$

$$\text{i.e. } \left| \frac{\sum_{k=2}^{\infty} (1-k)\Phi(k, \lambda) a_k z^k}{2\gamma[(1-\alpha)z + \sum_{k=2}^{\infty} (\alpha-k)\Phi(k, \lambda) a_k z^k] + \sum_{k=2}^{\infty} (k-1)\mu \Phi(k, \lambda) a_k z^k} \right| < \beta$$

(2.2)

Since $|Re f(z)| \leq |f(z)|$, for all z we have

$$\left| Re \left\{ \frac{\sum_{k=2}^{\infty} (1-k)\Phi(k, \lambda) a_k z^k}{2\gamma[(1-\alpha)z + \sum_{k=2}^{\infty} (\alpha-k)\Phi(k, \lambda) a_k z^k] + \sum_{k=2}^{\infty} (k-1)\mu \Phi(k, \lambda) a_k z^k} \right\} \right| < \beta$$

(2.3)

Since $\frac{z\Omega^{\lambda+1}f(z)}{\Omega^\lambda f(z)}$ is real and upon clearing the denominator of the above expression, we choose the value of z on real axis and allowing $z \rightarrow 1$ through real values.

$$\frac{\sum_{k=2}^{\infty} (1-k)\Phi(k, \lambda) a_k z^k}{2\gamma[(1-\alpha)z + \sum_{k=2}^{\infty} (\alpha-k)\Phi(k, \lambda) a_k z^k] + \sum_{k=2}^{\infty} (k-1)\mu \Phi(k, \lambda) a_k z^k} \leq \beta$$

$$\begin{aligned} & \sum_{k=2}^{\infty} [1 - k + 2\beta\gamma(k - \alpha) - \beta\mu(k - 1)] \Phi(k, \lambda) a_k \\ & \leq 2\beta\gamma(1 - \alpha) \end{aligned}$$

(2.4)

which obviously is required assertion (2.1)

Finally, sharpness follows if we take

$$f(z) = z - \frac{2\beta\gamma(1 - \alpha)}{[1 - k + 2\beta\gamma(k - \alpha) - \beta\mu(k - 1)]\Phi(k, \lambda)} z^k$$

, $k = 2, 3, 4, \dots$ (2.5)

Corollary: If $f(z) \in S(\alpha, \beta, \gamma, \mu)$ then

$$a_k \leq \frac{2\beta\gamma(1 - \alpha)}{[1 - k + 2\beta\gamma(k - \alpha) - \beta\mu(k - 1)]\Phi(k, \lambda)}$$

, $k = 2, 3, 4, \dots$ (2.6)

3. Growth and Distortion Theorem

Theorem 2.: if the function $f(z) \in S(\alpha, \beta, \gamma, \mu)$ then

$$|z| - \frac{2\beta\gamma(1 - \alpha)}{[1 - k + 2\beta\gamma(k - \alpha) - \beta\mu(k - 1)]\Phi(k, \lambda)} |z|^2$$

$$\begin{aligned} &\leq |f(z)| \\ &\leq |z| + \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}|z|^2 \end{aligned}$$

The result is sharp for

$$f(z) = z - \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}z^2$$

Proof: we have $f(z) = z - \sum_{k=2}^{\infty} a_k z^k$

$$\begin{aligned} |f(z)| &\leq |z| + \sum_{k=2}^{\infty} a_k |z|^k \\ &\leq |z| + \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}|z|^2 \end{aligned} \quad (3.1)$$

Similarly,

$$\begin{aligned} |f(z)| &\geq |z| - \sum_{k=2}^{\infty} a_k |z|^k \\ &\geq |z| - \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}|z|^2 \end{aligned} \quad (3.2)$$

Combining (3.1) and (3.2), we get

$$\begin{aligned} &|z| - \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}|z|^2 \\ &\leq |f(z)| \\ &\leq |z| + \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}|z|^2 \end{aligned}$$

Theorem: If the function $f(z) \in S(\alpha, \beta, \gamma, \mu)$ then

$$\begin{aligned} &1 - \frac{4\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)} \\ &|z| \leq |f'(z)| \\ &\leq 1 + \frac{4\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}|z| \end{aligned}$$

The result is sharp for

$$f(z) = z - \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}z^2$$

4. Radius of Starlikeness and Convexity

Theorem 3.: If the function $f(z) \in S(\alpha, \beta, \gamma, \mu)$ then $f(z)$ is a starlike of order α , $0 \leq \alpha < 1$ in $|z| < R$ where

R

$$= \inf_k \left\{ \frac{(1-\alpha)[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)(k-\alpha)} \right\}^{\frac{1}{k-1}}$$

The estimate is sharp for the function

$$f(z) = z - \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}z^k$$

Proof: We know by definition (i)

$$R\left(\frac{zf'(z)}{f(z)}\right) > \alpha$$

$$\text{That is if } \left| \frac{zf'(z)}{f(z)} - 1 \right| \leq 1 - \alpha \quad (4.1)$$

$$\left| \frac{zf'(z) - f(z)}{f(z)} \right| \leq 1 - \alpha$$

$$\left| \frac{z - \sum_{k=2}^{\infty} a_k n z^k - z + \sum_{k=2}^{\infty} a_k z^k}{z - \sum_{n=0}^{\infty} a_n z^n} \right| \leq 1 - \alpha$$

$$\left| \frac{-\sum_{n=2}^{\infty} (k-1)a_k z^k}{z - \sum_{k=2}^{\infty} a_k z^k} \right| \leq \frac{\sum_{k=2}^{\infty} (k-1)|a_k||z|^{k-1}}{1 - \sum_{k=2}^{\infty} |a_k||z|^{k-1}} \leq 1 - \alpha$$

$$\sum_{k=2}^{\infty} (k-1)|a_k||z|^{k-1} \leq (1-\alpha) \left(1 - \sum_{k=2}^{\infty} |a_k||z|^{k-1} \right)$$

$$\frac{\sum_{k=2}^{\infty} (k-\alpha)|a_k||z|^{k-1}}{(1-\alpha)} \leq 1 \quad (4.2)$$

By (2.6), we have

$$a_k \leq \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)} \quad (4.3)$$

Using (4.2) and (4.3), we get

$$|z|^{k-1} \leq \frac{(1-\alpha)[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)(k-\alpha)}$$

Thus

$$|z| < R = \inf_k \left\{ \frac{(1-\alpha)[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)(k-\alpha)} \right\}^{\frac{1}{k-1}}, \quad k=2,3,- \dots \quad (4.4)$$

Theorem 4.: Let $f(z) \in S(\alpha, \beta, \gamma, \mu)$ then $f(z)$ is convex of order α , $0 \leq \alpha < 1$ in $|z| < R$ where R

$$= \inf_k \left\{ \frac{(1-\alpha)[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)k(k-\alpha)} \right\}^{\frac{1}{k-1}}$$

,The estimate is sharp for the function

$$f(z) = z - \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)} z^k$$

Proof: Let $f(z) \in S(\alpha, \beta, \gamma, \mu)$ is convex of order $\alpha, 0 \leq \alpha < 1$ if

$$\operatorname{Re} \left[1 + \frac{zf''(z)}{f'(z)} \right] > \alpha$$

That is

if

$$\left| \frac{zf''(z)}{f'(z)} \right| < 1 \quad (4.5)$$

which simplifies to

$$\sum_{k=2}^{\infty} \frac{k(k-\alpha)a_k|z|^{k-1}}{(1-\alpha)} \leq 1 \quad (4.6)$$

By equation (4.6) we have

$$a_k \leq \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)} \quad (4.7)$$

Using equation (4.6) and (4.7), we get

$$|z|^{k-1} \leq \frac{(1-\alpha)[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)k(k-\alpha)} \quad (4.8)$$

Thus $|z| < R$

$$= \inf_k \left\{ \frac{(1-\alpha)[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)k(k-\alpha)} \right\}^{\frac{1}{k-1}}$$

5. Extreme Points

Theorem 5.: Let $f_1(z) = z$,

$$f_k(z) = z - \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)} z^k, \text{ then}$$

$f(z) \in S(\alpha, \beta, \gamma, \mu)$ iff it can be expressed In the form of $f(z) \in S(\alpha, \beta, \gamma, \mu)$

Proof: Suppose

$$f(z) = \sum_{k=2}^{\infty} \lambda_k f_k(z)$$

$$\sum_{k=2}^{\infty} \lambda_k \left(z - \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)} z^k \right)$$

$$= z - \sum_{k=2}^{\infty} \lambda_k \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)} z^k \quad (5.1)$$

Now $f(z) \in S(\alpha, \beta, \gamma, \mu)$ since

$$\sum_{k=2}^{\infty} \frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)}.$$

$$X \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)} \lambda_k$$

$$= \sum_{k=2}^{\infty} \lambda_k = 1 - \lambda_1 \leq 1$$

Conversely, suppose that $f(z) \in S(\alpha, \beta, \gamma, \mu)$ then by theorem 1.

$$a_k \leq \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}$$

Setting

$$\lambda_k = \frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)} a_k$$

, $k=2,3,\dots$

And $\lambda_1 = 1 - \sum_{k=2}^{\infty} \lambda_k$ we notice that

$$f(z) = \sum_{k=1}^{\infty} \lambda_k f_k(z).$$

Hence the result.

6. Hadamard Product

Theorem 6.: Let $f(z), g(z) \in S(\alpha, \beta, \gamma, \mu)$ then

$$(f * g)(z) = z - \sum_{k=2}^{\infty} a_k b_k z^k \in S(\alpha, \beta, \gamma, \mu)$$

$$\text{for } f(z) = z - \sum_{k=2}^{\infty} a_k z^k, \quad g(z) = z - \sum_{k=2}^{\infty} b_k z^k$$

where

$$\varphi \geq \frac{2\beta^2\gamma(1-\alpha)(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]^2\Phi(k,\lambda)+2\beta^2\gamma(1-\alpha)[k-1-2\gamma(k-\alpha)]}$$

Proof: Let $f(z), g(z) \in S(\alpha, \beta, \gamma, \mu)$ then

$$\sum_{k=2}^{\infty} \frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)} a_k \leq 1 \quad (6.1)$$

$$\sum_{k=2}^{\infty} \frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)} b_k \leq 1 \quad (6.2)$$

we need to find a smallest number φ such that

$$\sum_{k=2}^{\infty} \frac{[1-k+2\varphi\gamma(k-\alpha)-\varphi\mu(k-1)]\Phi(k,\lambda)}{2\varphi\gamma(1-\alpha)} a_k b_k \leq 1 \quad (6.3)$$

By Cauchy Schwarz inequality, we have

$$\sum_{k=2}^{\infty} \frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)} \sqrt{a_k b_k} \leq 1 \quad (6.4)$$

Thus it is enough to show that

$$\sum_{k=2}^{\infty} \frac{[1-k+2\varphi\gamma(k-\alpha)-\varphi\mu(k-1)]\Phi(k,\lambda)}{2\varphi\gamma(1-\alpha)} a_k b_k$$

$$\leq \sum_{k=2}^{\infty} \frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)} \sqrt{a_k b_k}$$

That is

$$\sqrt{a_k b_k} \leq \frac{\varphi[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]}{\beta[1-k+2\varphi\gamma(k-\alpha)-\varphi\mu(k-1)]}$$

(6.5)

From (6.4)

$$\sqrt{a_k b_k} \leq \frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}$$

(6.6)

Therefore, in view of the (6.5) and (6.6) it is enough to show that

$$\frac{2\beta\gamma(1-\alpha)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}$$

$$\leq \frac{\varphi[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]}{\beta[1-k+2\varphi\gamma(k-\alpha)-\varphi\mu(k-1)]}$$

Which simplifies to

$$\varphi \geq \frac{2\beta^2\gamma(1-\alpha)(1-k)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]^2\Phi(k,\lambda)+2\beta^2\gamma(1-\alpha)[k-1-2\gamma(k-\alpha)]}$$

7. Closure Theorems

Theorem 7.: Let $f_j \in S(\alpha, \beta, \gamma, \mu)$, $j=1,2,\dots,m$ then

$$g(z) = \sum_{j=1}^m c_j f_j(z) \in S(\alpha, \beta, \gamma, \mu)$$

Where $\sum_{j=1}^m c_j = 1$ and $f_j(z) = z - \sum_{k=2}^{\infty} a_k z^k$.

Proof: we have

$$g(z) = \sum_{j=1}^m c_j \left(z - \sum_{k=2}^{\infty} a_k z^k \right)$$

$$= z \sum_{j=1}^m c_j - \sum_{j=1}^m \sum_{k=2}^{\infty} c_j a_{k,j} z^k$$

$$= z - \sum_{k=2}^{\infty} \left(\sum_{j=1}^m c_j a_{k,j} \right) z^k$$

(7.1)

$$= z - \sum_{k=2}^{\infty} e_k z^k$$

(7.2)

$$\text{where } e_k = \sum_{j=1}^m c_j a_{k,j}$$

Since $f_j \in S(\alpha, \beta, \gamma, \mu)$ by Theorem 1,

$$\sum_{k=2}^{\infty} \frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)} a_{k,j} \leq 1$$

(7.3)

In view of (7.2), $g(z) \in S(\alpha, \beta, \gamma, \mu)$

$$\sum_{k=2}^{\infty} \frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)} e_k \leq 1$$

Now

$$\sum_{k=2}^{\infty} \frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)} e_k$$

$$= \sum_{k=2}^{\infty} \frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)} \sum_{j=1}^m c_j a_{k,j}$$

$$= \sum_{j=1}^m c_j \sum_{k=2}^{\infty} \frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)} a_{k,j}$$

$$\leq \sum_{j=1}^m c_j$$

using (7.3)

=1.

Therefore $g(z) \in S(\alpha, \beta, \gamma, \mu)$

Theorem 8.: Let $f(z), g(z) \in S(\alpha, \beta, \gamma, \mu)$ then

$$h(z) = z - \sum_{k=2}^{\infty} (a_k^2 + b_k^2) z^k$$

is in $S(\alpha, \varphi, \gamma, \mu)$

where

$$\varphi \geq \frac{4\beta^2\gamma(1-\alpha)(1-k)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]^2\Phi(k,\lambda)+4\beta^2\gamma(1-\alpha)[k-1-2\gamma(k-\alpha)]}$$

Proof: Let $f(z), g(z) \in S(\alpha, \beta, \gamma, \mu)$ and so

$$\sum_{k=2}^{\infty} \left[\frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)} \right]^2 a_k^2$$

$$\leq \left[\frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)} a_k \right]^2 \leq 1$$

(8.1)

And

$$\sum_{k=2}^{\infty} \left[\frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)} \right]^2 b_k^2 \leq \left[\frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)} \right]^2 b_k^2 \leq 1 \quad (8.2)$$

Adding (8.1) and (8.2), we get

$$\sum_{k=2}^{\infty} \frac{1}{2} \left[\frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)} \right]^2 \leq 1 \quad (8.3)$$

we must show that $h(z) \in S(\alpha, \varphi, \gamma, \mu)$, that is

$$\sum_{k=2}^{\infty} \frac{1}{2} \left[\frac{[1-k+2\varphi\gamma(k-\alpha)-\varphi\mu(k-1)]\Phi(k,\lambda)}{2\varphi\gamma(1-\alpha)} \right]^2 \leq 1 \quad (8.4)$$

In view of (8.3) and (8.4) it is enough to show that

$$\frac{[1-k+2\varphi\gamma(k-\alpha)-\varphi\mu(k-1)]\Phi(k,\lambda)}{2\varphi\gamma(1-\alpha)} \leq \frac{1}{2} \left[\frac{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]\Phi(k,\lambda)}{2\beta\gamma(1-\alpha)} \right]^2$$

which simplifies to

$$\varphi \geq \frac{4\beta^2\gamma(1-\alpha)(1-k)}{[1-k+2\beta\gamma(k-\alpha)-\beta\mu(k-1)]^2\Phi(k,\lambda)+4\beta^2\gamma(1-\alpha)[k-1-2\gamma(k-\alpha)]}$$

CONCLUSION:

We derived the basic properties like coefficient inequality, distortion theorem, radius of starlikeness and convexity, Hadamard product, extreme points, closure theorems of univalent and analytic functions with negative coefficient belonging to the class $S(\alpha, \beta, \gamma, \mu)$ with the help of fractional differential operator.

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Study of the Linear and Non-Linear Differential Equation for physical system

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ABSTRACT

Present research paper “**Study of the Linear and Non-Linear Differential Equation for physical system**” is an attempt to improve and develop the skill in science and engineering for solving the real problems. Here studying the application of differential equation for various branch of science and technology such as applied mathematics, physics, chemistry and biology, how it can be apply in the field of engineering and population dynamics. This is an important and powerful tool for analyzing the relationship among various dynamical parameters.

Keywords

Dynamical parameters, real problems, physical system and non-linear.

1.Introductions

Most of the laws of physics, science, mechanics and classical mechanics are of the form of differential equations and these law totally devote on the differential equations of dependent variables i.e. the rate of change of dependent variables with respect to time .A differential equation plays a very important role for deriving the formulae and making the laws. An equation which involves some derivatives of the function is called a differential equation. or simply an equation which contains a differential coefficient is called a differential equation. Study of differential equations are great thing there are many types of differential equations from which discussed only two subdivisions of them i.e. linear and non-linear differential equations. An equation which involves derivative of a unknown function only of a first order is called a linear differential equation. Otherwise, it will be known as non-linear differential equation. Thus, if $\frac{dy}{dx}$ or y' denotes the first order derivative of

the unknown function $y = f(x)$, then the equation $\frac{dy}{dx} = y$ is linear, while the equation $\frac{dy}{dx} = y^2$ is non- linear. In other word, a differential equation is called linear if there is no terms like y^2 , $(y')^3$, $y \cdot y'$, $\sin y$, $\log y$ or e^y for examples

$\frac{dy}{dx} + 2y = 2x$, $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0$ are linear differential equations and

$\frac{d^2y}{dx^2} + y^2 \frac{dy}{dx} + y = 0$, $(y')^2 + 2y = x$, $y'' + \log y = 0$ are non-linear differential equations.

A solution to a differential equation is a function whose derivatives satisfy the equation. The order of a differential equation is the order of highest derivatives occurring in differential equation. The degree of the differential equation is the power of highest order derivatives when differential coefficients are rational and free from fractional power.

2.Applications

Many engineering problems that are time dependent are often described in terms of differential equations with conditions imposed at single point. Here, we are going to list a few of them motivational examples that encountering in many fields of engineering, science and technology, where and how it can be apply in the field of engineering problems and population dynamics are shown below:

1. Example on Simple pendulum's
2. Energy conservation
3. Radioactive decay in nuclear physics
4. RC-Circuit and Coupled L-R electrical circuits
5. Newton's law of cooling in thermodynamics
6. Newton's second law in dynamics

7. Motion of a particle under a variable force field

Some of the motivational examples also encountering in population dynamics such as growth of population in the country and growth of bacteria in the fields etc.

3.Motivational examples

Assume that a simple pendulum consists of a weight suspended on a string, with gravity the only force acting on the weight. If α is the angle the pendulum's string makes with a vertical line, then horizontal force on the weight toward the vertical is directly proportional to sine angle α .

$$\text{i.e. } \frac{d^2\alpha}{dt^2} \propto \sin \alpha$$

If we remove proportionality constant. We have to multiply some constant known as proportionality constant say C_0 where $C_0 > 0$ therefore, we have $\frac{d^2\alpha}{dt^2} = -C_0 \sin \alpha$

$$\text{hence } \frac{d^2\alpha}{dt^2} + C_0 \sin \alpha = 0 \quad (1.1)$$

This is a non-linear second order differential Equation and this differential Equation can not be solved exactly for the function $\alpha(t)$.

However, if angle of suspension is very small i.e. if sine of α is nearly equal to α , then the differential Equation (1.1) converts into the linear second order differential equation

$$\frac{d^2\alpha}{dt^2} + C_0 \alpha = 0 \text{ and this can be solved as follows:}$$

$$\therefore D^2 \alpha + C_0 \alpha = 0, \text{ where } D = \frac{d}{dt}$$

$$\therefore (D^2 + C_0) \alpha = 0$$

$$\therefore D^2 + C_0 = 0$$

$$\therefore D = +\sqrt{C_0} \text{ and } D = -\sqrt{C_0}$$

$$\text{Hence, } \alpha(t) = C_1 e^{\sqrt{C_0}t} + C_2 e^{-\sqrt{C_0}t}$$

which is a required solution of the linear second order differential equation.

Another way to write the solution to a second order differential equation whose characteristic polynomial has two real and distinct roots $\sqrt{C_0}$ and $-\sqrt{C_0}$ is $\alpha(t) = a \cosh(\sqrt{C_0}t) + b \sinh(\sqrt{C_0}t)$ where $\cosh(\sqrt{C_0}t)$ and

$\sinh(\sqrt{C_0}t)$ are hyperbolic cosine and hyperbolic sine functions in t .

Initially, if $\cosh(0) = 1$ and $\sinh(0) = 0$. Then $\cosh(t) > 0$ for all t and so, the hyperbolic cosine will never be zero likewise we can see that $\sinh(t) = 0$ only if $t = 0$. Now, however if $\alpha(t) = 1$ for all values of t , then you have $a = 1$ and hence $\alpha(t) = \cosh(\sqrt{C_0}t)$ as desired solution.

Energy conservative

Consider a particle of mass 'm' is moving along a straight line. If the force acting at a point x , then $F(x)$ is conservative which means that there exists a function $V(x)$, known as the potential energy (P.E), such that $F(x) = -\frac{dV}{dx}$ where F is only a function of x and assume that there is no friction. From the lower class physics, since we know that the kinetic energy (K.E) of a particle of mass 'm' is given by

$$K.E = \frac{1}{2} m v^2 \text{ and the velocity of the particle } (v) = \frac{dx}{dt} \text{ i.e. the rate of change w.r.t time } t.$$

But total energy of the particle of mass 'm' is given by

$$E = K.E + P.E$$

$$\therefore E = \frac{1}{2} m v^2 + V(x)$$

$$\therefore E = \frac{1}{2} m \left(\frac{dx}{dt}\right)^2 + V(x)$$

$$\therefore m \left(\frac{dx}{dt}\right)^2 = 2(E - V(x))$$

$$\therefore \left(\frac{dx}{dt}\right)^2 = \frac{2}{m}(E - V(x)) \quad (1.2)$$

This is a non-linear differential equation of first order which can be solved by variables of separation method as we can see below:

$$\therefore \frac{dx}{dt} = \pm \sqrt{\frac{2}{m}(E - V(x))}$$

$$\therefore \frac{dx}{\pm \sqrt{\frac{2}{m}(E - V(x))}} = dt$$

Now, variables are separated, we can integrate them. therefore we have

$$\pm \int \frac{dx}{\sqrt{\frac{2}{m}(E - V(x))}} = t - t_0 \text{ which is a required solution of non-linear differential equation (1.2).}$$

Note that square root is there, so minus sign will be suitable for constant t_0 .

Radioactive Decay

Carbon 14 is a radioactive isotope of stable carbon 12. If $Q(t)$ denotes the amount of carbon C14 at time t , then Q is known to satisfy the differential equation.

$$\frac{dQ}{dt} = -\lambda Q \text{ where } \lambda \text{ is constant.}$$

$$\text{Now, } \frac{dQ}{dt} = -\lambda Q$$

$$\therefore \frac{dQ}{Q} = -\lambda dt$$

$$\therefore \log Q = -\lambda t + c', \text{ where } c' \text{ is an integrating constant.}$$

$$\therefore Q = e^{-\lambda t + c'}.$$

$$\text{Thus, } Q = Ce^{-\lambda t}, \text{ where } C = e^{c'}.$$

This shows that the Radioactive Decay decreases exponentially at time t .

RC- Circuit

In an RC circuit, the applied e.m.f is a constant E . Given that $\frac{dQ}{dt} = i$ where Q is the charge in the capacitor, i is the current in the circuit, R the resistance and C the capacitance the equation for the circuit is $Ri + \frac{Q}{C} = E$. Given initial charge is zero.

Now, given that the equation for the circuit is $Ri + \frac{Q}{C} = E$

$$\therefore R \cdot \frac{dQ}{dt} + \frac{Q}{C} = E$$

$$\therefore \frac{dQ}{dt} + \frac{Q}{CR} = \frac{E}{R}$$

$$\therefore DQ + \frac{Q}{CR} = \frac{E}{R}, \text{ where } D = \frac{d}{dt}$$

$$\therefore (D + \frac{1}{CR}) Q = \frac{E}{R}$$

The auxiliary equation is given by $(D + \frac{1}{CR}) = 0$.

$$D = -\frac{1}{CR}$$

The complimentary function is $Q(t) = k e^{-t/CR}$ where k is an arbitrary constant.

The particular integral is given by

$$P.I = \frac{1}{D + \frac{1}{CR}} \cdot \frac{E}{R} = e^{-t/CR} \int e^{t/CR} \cdot \frac{E}{R} \cdot dt = e^{-t/CR} \cdot \frac{E}{R} \cdot \frac{1}{\frac{1}{CR}} = CE.$$

Therefore, the charge in the capacitor is given by

$$Q(t) = k e^{-t/CR} + CE.$$

But, initial charge is zero i.e. $Q(0) = 0$.

$$0 = Q(0) = k + CE$$

$$\therefore k = -CE$$

Hence, the charge in the capacitor is given by

$$Q(t) = -CE e^{-t/CR} + CE.$$

i.e. $Q(t) = CE (1 - e^{-t/CR})$ which is required charge in an RC- Circuit.

Newton's Law of Cooling in thermodynamics

Suppose an object has temperature $T(t)$ at time t . Newton's law of cooling states that

$T' = -k(T - E)$, where E is the environment temperature and k is the constant

$$\text{Now, } T' = -k(T - E)$$

$$\therefore \frac{dT}{dt} = -k(T - E)$$

$$\therefore \frac{dT}{(T - E)} = -k dt$$

By integrating we get

$$\log(T - E) = -kt + c \text{ where } c \text{ is an integrating constant.}$$

$$\therefore (T - E) = e^{-kt + c}$$

$$\therefore T = E + t_0 e^{-kt} \text{ which is a required temperature.}$$

Application to population dynamics

The rate of change of unemployed of the country in certain year t directly proportional to the number of unemployed people.

i.e. $\frac{dU}{dt} \propto U$, where $U(t)$ is the number of unemployed in the country in year t .

If we remove proportionality content we have to multiply some constant therefore we have $\frac{dU}{dt} = \lambda U$

Where λ is a proportionality constant and U(t) is the number of unemployed in the country.

$$\frac{dU}{dt} - \lambda U = 0$$

$$\therefore DU - \lambda U = 0, \text{ where } D = \frac{d}{dt}$$

$$\therefore (D - \lambda) U = 0$$

$$\text{So, } D = \lambda$$

Hence, $U(t) = C e^{\lambda t}$ where C is a constant to be determined.

Initially, $U(0) = 1$ hence $C = 1$

$$\therefore U(t) = e^{\lambda t}$$

This shows that unemployment of the country grows exponentially.

The population of a certain organisms at time t is assumed to satisfy the first order linear differential equation $\frac{dP}{dt} = \lambda P(1 - \frac{P}{E})$, where P(t) is the number of population at time t, λ and E are positive constants.

$$\text{Given differential equation } \frac{dP}{dt} = \lambda P(1 - \frac{P}{E}) \quad (1.3)$$

$$\therefore \frac{dP}{P(1 - \frac{P}{E})} = \lambda dt$$

$$\int \frac{dP}{P(1 - \frac{P}{E})} = \lambda t + t_0 \text{ where } t_0 \text{ is an integrating constant}$$

$$\text{Now, consider } \frac{1}{P(1 - \frac{P}{E})} = \frac{A}{P} + \frac{B}{(1 - \frac{P}{E})}$$

$$\therefore 1 = A(1 - \frac{P}{E}) + B.P$$

$$\text{when } P = E, B = \frac{1}{E} \text{ and when } P = 0, A = 1.$$

$$\therefore \int \left(\frac{1}{P} + \frac{\frac{1}{E}}{(1 - \frac{P}{E})} \right) dP = \lambda t + t_0$$

$$\therefore \int \left(\frac{1}{P} + \frac{1}{(E - P)} \right) dP = \lambda t + t_0$$

$$\therefore \log P - \log (E - P) = \lambda t + t_0$$

$$\therefore \log \frac{P}{(E - P)} = \lambda t + t_0$$

$$\therefore \frac{P}{(E - P)} = e^{\lambda t + t_0}$$

$$\therefore P = E e^{\lambda t + t_0} - P e^{\lambda t + t_0}$$

$$\therefore P + P e^{\lambda t + t_0} = E e^{\lambda t + t_0}$$

$$\therefore P(1 + e^{\lambda t + t_0}) = E e^{\lambda t + t_0} \text{ as required solution of linear differential equation (1.3).}$$

Growth of bacteria

A certain species of bacteria grows according to

$$\frac{dN}{dt} = \lambda N \text{ with } N(0) = N_0 \quad (1.4)$$

where N(t) is the amount of bacteria at time t, λ is a positive constant is the growth rate and N_0 is the initial amount when time t = 0.

$$\text{Now } \frac{dN}{dt} = \lambda N$$

This is a first order linear differential equation and it can be solved by variables of separation method, hence $\frac{dN}{N} = \lambda dt$.

By integrating on both side, we have $\log N = \lambda t + c'$,

$$\text{therefore, } N = c e^{\lambda t} \text{ where } c = e^{c'}.$$

$$\text{But } N_0 = N(0) = c e^0 = c \text{ i.e. } c = N_0.$$

Hence, $N = N_0 e^{\lambda t}$ which is the required solution of the linear differential equation(1.4).

3.Conclusion

From the above motivational examples one can see that a linear differential equation and non-linear differential equation has wide range of applications for solving engineering problems, population dynamics as well as other branch of scientific problems of the physical system.

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STUDIES ON NANO GEL POLYMER ELECTROLYTE BASED SUPERCAPACITORS

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ABSTRACT

In the present work, nano gel composite polymer electrolyte comprising of poly(vinylidene fluoride-co-hexafluoropropylene) PVdF(HFP) - propylene carbonate (PC) - magnesium perchlorate $\text{Mg}(\text{ClO}_4)_2$ - aluminium oxide (Al_2O_3) as an inert nano filler has been synthesized which exhibits ionic conductivity of $5.9 \times 10^{-3} \text{ S cm}^{-1}$, showing good mechanical and dimensional stability which is suitable for their application in electrochemical devices like supercapacitors. The synthesized electrolyte material has been successfully checked in supercapacitors using activated charcoal as an electrode material. The electrochemical evaluation of EDLCs has been carried out by using cyclic-voltammetry, impedance spectroscopy and charge-discharge techniques. The maximum capacitance of 153 mF cm^{-2} which is equivalent to single electrode specific capacitance of 44.0 F g^{-1} achieved from the fabricated EDLCs.

Keywords

Nano Gel Polymer electrolyte, Nano filler, activated charcoal, charge- discharge.

1. INTRODUCTION

Nano composite polymer electrolyte (NCPE) is a new and emerging class of materials that combines the properties of inorganic particles with the processibility and flexibility of an organic polymer matrix. The resulting synthesized composite materials offer the possibility of a new generation of nano-structured materials with various promising electrochemical applications such as batteries, supercapacitors, sensors etc. Since solid polymer electrolytes have some drawbacks such as low ionic conductivity at room temperature, poor interfacial stability between the electrodes, poor mechanical strength etc [1-3]. In order to overcome these drawbacks, several approaches were adopted by different researchers such as blending of polymers, addition of plasticizers and addition of

inorganic ceramic fillers such as TiO_2 , Al_2O_3 , SiO_2 , MgO , MnO_2 , SnO_2 , ZrO , ZnO , CuO , etc. have been used to prepare the plasticized blended polymer electrolytes [4-5], gel polymer electrolytes [6] and nano composite solid polymer electrolytes etc.

In nano composite polymer gel electrolytes, the matrix polymers are normally related to poly(ethylene oxide) (PEO), poly(acrylonitrile) (PAN), poly(methyl methacrylate) (PMMA), poly(vinyl chloride) (PVC), poly(vinylidene fluoride) (PVdF) (or its copolymer). Amongst them, poly(vinylidene fluoride-co-hexa fluoro propylene) (PVdF-HFP) is widely used because of its excellent mechanical and chemical stability.

In the present work, we report the effect of nano-aluminium oxide (Al_2O_3) on the electrical and electrochemical properties of Mg^{2+} ion conducting polymer electrolyte systems: PVdF(HFP)- $\text{Mg}(\text{ClO}_4)_2$ and also checked its suitability in energy storage devices, especially supercapacitors using activated charcoal as electrode materials.

2. EXPERIMENTAL

2.1 Electrolyte Preparation

The gel polymer electrolyte PVdF(HFP)-PC- $\text{Mg}(\text{ClO}_4)_2$ - Al_2O_3 was prepared by using standard solution cast technique. Poly (vinylidene fluoride-hexa fluoro propylene) PVdF-HFP (Mol. Wt. = 400,000, Aldrich) as polymer, magnesium perchlorate $\text{Mg}(\text{ClO}_4)_2$ (Aldrich) as salt, aluminium oxide as nano filler, propylene carbonate (PC) (Loba Chemie) and THF (Merck) as solvent were used as received without further treatment. First of all the liquid electrolyte was prepared by dissolving the salt $\text{Mg}(\text{ClO}_4)_2$ in solvent PC and it was found to be optimized at a concentration of 0.3 M of the salt in PC. The host polymer PVdF-HFP was separately dissolved in THF using magnetic stirrer at $\sim 60^\circ \text{C}$ and thereafter its different amount was mixed in the optimized liquid electrolyte. To prepare composite gel polymer electrolyte, nano-aluminium oxide in different weight ratios (from 0 to 10 wt % with respect to the weight of polymer) were dispersed. In the composite gel polymer electrolyte, the ratio of polymer with respect to the liquid

electrolyte was maintained at 15:85 weight percent throughout the synthesis as this is the optimized composition of liquid electrolyte to polymer ratios. Finally the mixtures were poured in glass Petri dishes and allowed to evaporate volatile solvent, THF to obtain solid-like free-standing composite gel films of thickness ~250 μm .

2.2 Electrode Preparation

The electrodes were prepared by making slurry of activated charcoal powder (Loba Chemie) and PVdF-HFP in the ratio 90:10 (w/w) in a common solvent acetone by thorough mixing. Fine films of electrodes were coated by spraying the slurry on carbon cloth (Ballard, USA) and kept in oven at 70 $^{\circ}\text{C}$ for 10-12 h.

2.3 Electrochemical measurements

To study the conductivity behaviour of the polymer electrolytes, impedance spectroscopy was performed using LCR Hi TESTER (3522-50, Hioki, Japan). The samples were cut into proper size and sandwiched between two stainless steel electrodes. The conductivity (σ) was calculated using the equation $\sigma_0 t / R_b A$ where, t is thickness of the electrolyte, A is electrolyte contact area, and R_b is the bulk resistance obtained from the plots of real impedance Z_r against imaginary impedance Z_i . Electrochemical measurements of capacitor cell were carried out by impedance spectroscopic technique using a computer-controlled CHI 608C, CH Instrument, USA in the frequency range from 1 mHz to 100 kHz.

3. RESULTS AND DISCUSSION

3.1 Electrical Conductivity

The method of synthesis, optimization and electrical characterization of PVdF(HFP)-PC-Mg(ClO₄)₂ were mentioned elsewhere [7]. [PVdF(HFP) (15 wt%)-PC-Mg(ClO₄)₂ (0.3M)] composition of gel polymer electrolytes having free standing film, exhibits maximum ionic conductivity of $5.0 \times 10^{-3} \text{ S cm}^{-1}$ at room temperature, hence this composition has been chosen to make nano composite polymer electrolyte by dispersing nano aluminium oxide filler. The variation of room temperature ionic conductivity of nano composite polymer electrolytes with respect to the content of nano-alumina is shown in Fig. 1. The enhancement of ionic conductivity is expected due to the addition of Al₂O₃ which interacts with either or both the anion and cation thereby reducing ion pairing and increases the concentration of charge carriers. The interaction of Al₂O₃ nano-particles with PVdF(HFP) segments and ClO₄⁻ anions results in the structural modification of the

polymer chain, thereby providing a favorable conduction path for the faster migration of magnesium ion on the surface of the loaded Al₂O₃.

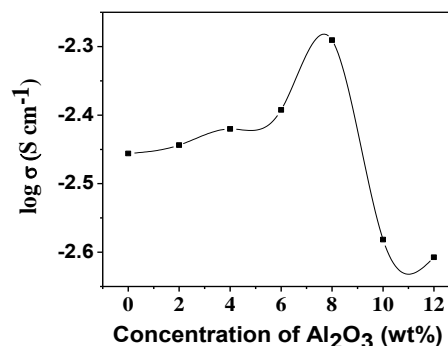


Figure 1: Variation of ionic conductivity of nano-composite polymer electrolyte as a function of different weight percent of Al₂O₃ concentration

A further increase (beyond 8 wt%) in the Al₂O₃ content leads to a fall in conductivity. This drop in conductivity may be attributed to an aggregation of nano particulate Al₂O₃ that can strongly interact with the polymer chains and immobilizing the polymer chains in the process.

3.2 Temperature Dependent Studies

Fig. 2 shows the temperature dependence ionic conductivity behavior of composite gel films. As can be seen from the plot there exist two temperature range above room temperature for which the variation of σ is different from one another. These are the characteristics of semi-crystalline to amorphous phase transition in the conductive polymeric films. The presence of these two distinct and well defined regions in the plots also suggests that the transport properties of Mg²⁺ are fundamentally controlled by two different mechanisms. The temperature dependence of the conductivity follows Vogel-Tammann-Fulcher (VTF) model, which describes the transport properties in a viscous matrix. The activation energy for the system is found to be 0.046 eV which decreases as conductivity of sample increases which shows that the ions in highly conducting sample require less energy for migration. This is possibly due to the smaller size of nano filler and plasticizer molecule as compared to host polymer molecules [8]. This in all may reduce the cohesive forces operating between the polymer chains, thereby resulting to an increase in chain segmental motion. Here the role played by filler needs a special consideration. The addition of filler to the polymer complex can contribute to the lowering of T_g by increasing the volume fraction of amorphous phase caused by the modification of the host of polymer structure. A dominant contribution to the conductivity

enhancement due to the filler at temperature below T_m should possibly due to this effect. According to Vogel-Tammann-Fulcher (VTF) model [9], the migration of ions is mainly due to the segmental motion of polymer chain in the amorphous region and the temperature of the conductivity of the nano gel polymer electrolyte films is given as:

$$\sigma = AT^{-1/2} \exp(-B / T - T_0)$$

where, the parameter B has the dimension of energy and is related to the critical free volume for ion transport, A is the pre-exponential factor, i.e. the conductivity at infinitely higher temperature and T_0 is equilibrium glass transition temperature close to the T_g values. The parameters have been evaluated by non-linear least square fitting of the data.

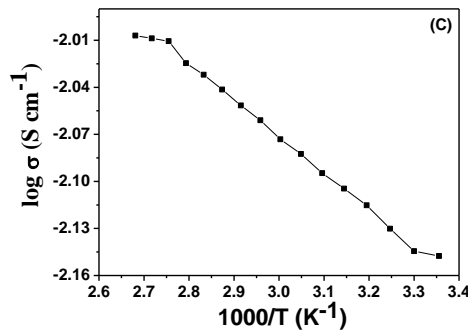


Figure 2: Variation of ionic conductivity as a function of temperature for [PVdF(HFP)(15 wt%)-{PC-Mg(ClO₄)₂(0.3M)}(85 wt%)] - nano Al₂O₃ (8 wt% of the polymer) based electrolyte system

It may be noted that the optimized magnesium ion based composite gel polymer electrolyte exhibits ionic conductivity of the order of $\sim 10^{-3}$ S cm⁻¹ at 25 °C and $\sim 10^{-2}$ S cm⁻¹ at 80 °C.

3.3 Dielectric spectra analysis

The dielectric relaxation behavior of the polymer electrolyte brings about important insights into ionic transport phenomenon [10]. The measured impedance data were used to calculate the real and imaginary parts of the complex permittivity using the relation:

$$\epsilon^* = \epsilon'(\omega) - \epsilon''(\omega) = 1 / j\omega C_0 Z^*$$

where real $\epsilon'(\omega)$ and imaginary $\epsilon''(\omega)$ components are the storage and loss of energy in each cycle of the applied electric field [11]. Frequency dependence plot of $\epsilon'(\omega)$ and $\epsilon''(\omega)$ for 8 wt% nano Al₂O₃ dispersed in PVdF-HFP at eight different temperatures are shown in Fig 3. From the figure it is clear that the values of $\epsilon'(\omega)$

are very high at low frequency region. Such high values of dielectric permittivity at low frequencies have been explained by the presence of space charge effects, which is contributed by the accumulation of charge carriers near the electrodes [12-13]. At higher frequencies, $\epsilon'(\omega)$ has been found to be relatively constant with frequency. This may be due to the periodic reversal of the field that takes place so rapidly that the charge carriers will hardly be able to orient themselves in the field direction resulting in decrease of dielectric constant [14]. The large values of $\epsilon''(\omega)$ with log f clearly indicates the existence of \square -relaxation due to some local movement of side group dipoles [15].

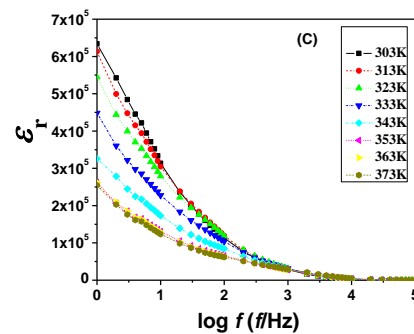


Figure 3: Variation of dielectric constant of [PVdF(HFP)(15 wt%)-{PC-Mg(ClO₄)₂(0.3M)}(85 wt%)] - nano Al₂O₃ (8 wt% of the polymer) of polymer electrolyte system as a function of frequencies at various temperature

At higher temperature, there is an increase in the value of dielectric constant and dielectric loss and is attributed to the higher charge carrier density. As temperature increases, the degree of salt dissociation and re-dissociation of ion aggregates increases, resulting in the increase in number of free ions or charge carrier density.

3.4 Modulus Spectra

In order to understand the bulk properties of the material, analysis of modulus spectroscopy has been carried out, it is also complementary to impedance spectroscopy which basically explains the electrode and grain boundary effect. The complex electric modulus can be evaluated from the following relations:

$$M^*(\omega) \cdot \epsilon^*(\omega) = 1$$

Where,

$$M^*(\omega) = M_r(\omega) + iM_i(\omega)$$

$$M_r(\omega) = \epsilon'(\omega) / \epsilon'^2(\omega) + \epsilon''^2(\omega)$$

$$M_i(\omega) = \varepsilon''(\omega) / \varepsilon'^2(\omega) + \varepsilon''^2(\omega)$$

Fig. 4 shows the real part (M_r) and imaginary part (M_i) of electrical modulus as a function of frequency at various temperatures for nano gel polymer electrolyte. The modulus spectrum for filler free electrolyte has been shown somewhere else [7]. It has been observed that both M_r and M_i tends to increase in the higher frequency region and are giving long tail at lower frequency region. At high frequencies the formation of peak shows that the polymer electrolyte films are predominantly

ionic conductors [16]. At higher frequencies peak curve is may be due to bulk effect.

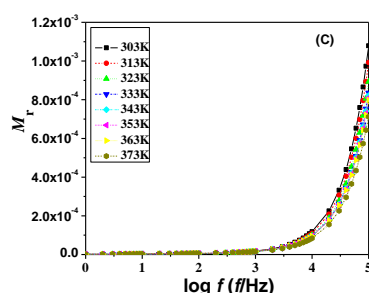


Figure 4: Variation of real part of electrical modulus of [PVdF(HFP)(15 wt%)-{PC-Mg(ClO₄)₂(0.3M)}(85 wt%)] - nano Al₂O₃ (8 wt% of the polymer) of polymer electrolyte system as a function of frequencies at various temperature

3.4 Impedance Spectra of Supercapacitor Cell

In order to check the suitability of the nano gel polymer electrolyte for its application in energy storage devices, supercapacitor cell has been fabricated using activated charcoal as electrode material and nano gel polymer electrolyte has been sandwiched in between the two electrodes. Impedance spectroscopy technique has been adapted in order to rate the supercapacitor performance. The configuration of the supercapacitor cell is as follows:



The impedance plot of the above capacitor cell has been shown in Fig. 5. Impedance spectra technique is one of the reliable techniques which is used to characterize any supercapacitor cell. It gives an idea about the various electrical parameters which are associated with the bulk properties of electrolyte, equivalent resistance, electrode-electrolyte interface of the overall cell. Ideally, the impedance response of a capacitor is a straight line parallel to the imaginary axis of the complex impedance

plots. But in the real capacitor, the steep rising capacitive impedance response is observed in low-frequency region accompanied with high-frequency semicircular features owing to the bulk and interfacial properties. The impedance response of a capacitor cell shows a small semicircular spur in the higher frequency region followed by a straight line in a lower frequency region. Current impedance pattern also resembles the real capacitor characteristics. The steep rising behaviour indicates

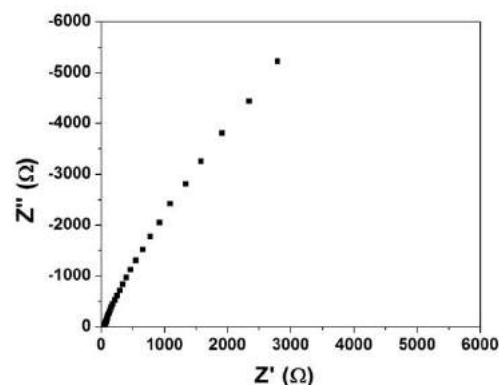


Figure 5: Impedance Spectra of Supercapacitor Cell

the capacitive behaviour in lower frequency region and depressed semicircular spur shows the bulk properties of the electrolytes and the interfacial charge transfer processes. The capacitance values (C), charge transfer resistance (R_{ct}), bulk resistance (R_b) and overall resistance (R) at 1 mHz for the fabricated cell is found to be 153 mF cm⁻² (which is equivalent to single electrode specific capacitance of 44 F g⁻¹), 4.0 Ω cm², 8.0 Ω cm² and 555 Ω cm² respectively.

4. CONCLUSION

Nano composite polymer electrolyte has been successfully synthesized by using solution cast technique which exhibits a maximum room temperature conductivity of 5.0 x 10⁻³ S cm⁻¹. The polymer gel electrolyte film is flexible and free standing with good mechanical strength. The temperature variation of the conductivity plot shows the VTF behavior of the electrolyte system. The activation energy of the electrolyte system is found to be of the order of 0.046 eV. Preliminary studies on supercapacitor have been carried out by using activated charcoal as an electrode material. The overall capacitance has been found to be of the order of 153 mF cm⁻² which is equivalent to single electrode specific capacitance of 44 F g⁻¹. In conclusion, synthesized electrolyte material shows promising results and it can be successfully used in energy storage devices.

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Motivation- A key for improving productivity

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ABSTRACT

Motivation is a powerful driving force which accelerates willingness to work. Motivation force could be internal or external. Highly motivated people have been observed as sincere, punctual, action oriented, creative, productive, proactive, corrective, accepting challenges etc. Some people like to work because of external factors such as money, incentive, bonus, awards, prizes, medals etc. Some people work because of internal factors such as responsibility, accountability, acceptance, curiosity, honor, independence, social contacts, social status, job rotation, job enlargement, job enrichment etc. This paper highlights that internal motive force is more powerful than external one.

Keywords

1. INTRODUCTION

In the beginning, generally, people accept terms and conditions of the organization for getting job. After joining the organization, on passage of time, their mind set, psychological behavior, style of working, satisfaction level, expectation, level of needs change. Due to change in these factors their performance levels change. Research studies show that people at work place can be categorized in two classes. One class of people having willingness to work without any external influence is termed as self-motivated employee. Second class of people show willingness to work because of external influence and termed as extrinsically motivated employee. External influences are: promotions, social recognition, money, bonus, fringe benefits, etc. External factors are dynamic in nature. A time will come, these factors will stop. At that point of time, people fall down to demotivated level. Such things can no longer be for permanent motivation.

2. PROBLEM DEFINITION/ STATEMENTS

Problems at workplace vary from organization to organization.

Self-motivated employees believe in their positive actions for achieving goal of the organization where unmotivated employees put less/no effort in their work, produce low quality of work, neglect the work. Most of the unmotivated employees believe in extrinsic motivation which will end at some point of time. Productivity level of unmotivated employees decreases drastically. Such pattern of behavior of employees affects work culture in the organization.

3. BARRIERS INMOTIVATION

In any organization, people differ in following aspects-

1. Different education level.
2. Different family background and culture.
3. Different cast, creed, religion, language, locality.
4. Different personal situations, problems, needs, desires etc.
5. Different approaches and attitude.
6. Different esteem value in the society.
7. Different satisfaction level.
8. Different priority, short term and long term goals.
9. Different perception power and understanding.

Because of above factors, it becomes challenge for a leader or manager to motivate employees at work place. Common approach cannot be applied for motivation. Motivation approach has become dynamic in nature. Same person behave in different ways in different point of the time ie. morning afternoon, evening and night. Therefore, same theory/principal/ method cannot be applied to motivate employees. In motivation process, sometime new problems crop and situation starts deteriorating. Problem looks very simple but working environment becomes complex. Thereby, if one person is motivated others get demotivated.

4. LITERATURE REVIEW

Many researchers attempted to understand psychology of human resource, situations at workplace and developed various means and theories for motivating human being. Major views and theories are presented there.

Rensis and Likert (1953) highlighted the importance of style of supervision. According to him a supervisor should try to treat human resource with dignity. When an individual feels that his boss sees him only as an instrument of production, he is likely to be a poor producer. However, when he feels that his boss is genuinely interested in him, his problem, his future and his well-being, he is more likely to be a high producer. If a supervisor wants to motivate his sub ordinates, he should be employee centered rather than job-centered. Such supervisor not only trains people to do their present job well but also tends to train them for the next higher job [1].

Fredrick Herzberg (1959) has reached at two factors. [2]

Hygiene factors: are necessary to maintain current status. Absence of these factors causes much dissatisfaction but do not provide strong motivation.

These factors are also known as maintenance factors.

These factors are:

- a. Company policy and administration.
- b. Technical supervision
- c. Interpersonal relations with supervisor.
- d. Interpersonal relations with peers.
- e. Interpersonal relations with subordinates.
- f. Salary.
- g. Job Security.
- h. Personal life.
- i. Work condition.
- j. Status.

Motivational Factors: These factors build high levels of motivation and job satisfaction, but absence of these factors does not cause much dissatisfaction.

These factors are:

- a. Achievement.
- b. Recognition.
- c. Advancement (Creative and challenging work).
- d. Work itself.
- e. Possibilities of personal growth.
- f. Responsibility.

McClelland proposed achievement theory [3]. According to him, the motives are:

- a. The need for achievement: the drive to excel, to achieve in relation to a set of standards, to strive to succeed.
- b. The need for application: The drive for friendly and closely interrelated relationships.
- c. The need for power: need to make others behave in a way that they would not behave otherwise.

Mc Gregor proposed theory X and theory Y [4] Theory X offers a management an easy rationalization for ineffective organizational performance, welfare, close supervision, pension and other benefits.

Theory Y says that workers will do far more than expectation if treated like human beings and permitted to experience personal satisfaction on the job. It puts emphasis on consultation, participation, motivation, communication, opportunities in formulating various policies.

Vroom's expectancy theory argues that the strength of a tendency to act in a certain way depends on the strength of an expectation that the act will be followed by a given outcome and on the attractiveness of the outcome of the individual [5].

Adams inequity theory states that a major input into job performance and satisfaction is the degree of equity that people perceive in their work situation. He states that inequity exists for person whenever he perceives that the ratio of his outcomes (Pay, status, promotion etc.) to inputs (efforts) and

the ratio of others outcomes to others inputs are unequal. Both the inputs and outputs of person and others are based on person's perceptions. If the person's perceived ratio is not equal to the others, he will strive to restore the ratio to equity. The strength of this motivation is in direct proportion to the perceived inequity that exists. [6] Maslow's theory of motivation states that people have a hierarchy of needs. Once the lower level needs are satisfied, higher level needs emerge immediately. It has been observed that satisfied needs is no longer a motivator. [7]

5. METHODOLOGY

Methods for Motivation works best where your motivation for achieving the goal is internal rather than external. Motivation will be faster and effective if one resists temptation. Internal motivation develops lot of power to prevent temptation. People ready to change mindset can be motivated faster.

Motivation level of people depends on the happiness of the people. But problem is that many people do not understand the real meaning of happiness. They focus on materialistic thing and search happiness. A people behaviour patterns are very uncertain, unpredictable, time dependent, one motivating theory may not be suitable for everybody. Following attempts may be given.

5.1 Change Management:

People can be molded through change process. Gradual change in mindset of people may be helpful to understand the policy and expectation of the organization. Not only mindset, style of supervision, assignments, place of work, simplification of work, empowerment concept, faith understanding, belief, individual perception etc. should be given due importance.

5.2 Self-Command:

It can also be termed as self-suggestion for example if a person is afraid and wants to be courageous. Under such situation he should give the self-command "be courageous" with rapidity several times and efforts should be active to become courageous.

One should not do any work if there is no value addition. Here, self-command plays very important role for not engaging in unproductive work. This concept will be also useful in minimizing / eliminating negative emotions, feelings and thoughts which are harmful to individual.

5.3 Rationalization:

It can be easily understood by the statement "Bringing moon on the earth". It is not rational. One should not apply right method and energy for irrational work. It happens when people over estimate themselves for getting fulfilled their desire. At the same time they underestimate their superior as well as management. They start treating themselves more valuable in comparison to others.

5.4 Healthy relations at work place:

It can do wonder in achieving the common goal of the organization. Healthy relation can be early achieved by participative (involvement) management. Such practice

improves contacts of people at various levels. Simply issuing order and dictating terms may spoil healthy relations. Healthy and cordial atmosphere energize people from within and things move faster. People will be self-motivated.

5.5 Goal Setting:

Top level management should facilitate in goal setting for various units. This will develop a sense of supportive effort among the employees. Without goal, employee may apply energy aimlessly.

Confidence and Trust: Proper team building develops confidence and trust in all the matters. Superior should not have trust on the subordinates. This trust will develop high level of confidence. By doing so employees gets motivated. Such motivation will last long.

6. CONCLUSION

Intrinsic motivation has been found more powerful and long lasting in comparison to extrinsic motivation. Every Individual understands this truth. But due to over estimation, ego problem, comparison of one's value with others value, influence of colleagues, friends and some external source, social problem, personal problem etc. people get inclined towards extrinsic motivation. Thereby, they focus on money only. At the end of the day, they realize money is not the ultimate motivation and get dissatisfied. Finally, such approach leads to frustration, tension and health problems. Thus, people should focus on their work, responsibility, accountability and external motivation will follow automatically.

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A Survey on Security Issues and Primary User Emulation Attack Detection Techniques in Cognitive Radio Network

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ABSTRACT

With the improvement in wireless technology and services, unlicensed, Industrial, Medical and Scientific (ISM) band is getting overloaded, which leads to spectrum shortage problem. On the other hand, several part of fixed allocated spectrum is underutilized. Cognitive Radio is new and fascinating technology that enables a more flexible and efficacious usage of the radio spectrum. Basically, this technology allows unlicensed users to access licensed spectrum, without interfering with the incumbent transmission. As Cognitive radio networks are wireless in nature, they suffer from all the classic threats present in traditional wireless networks. This paper focuses on an attack that poses a threat to spectrum sensing function of CR, known as Primary User Emulation Attack (PUEA). In this attack is a malicious secondary user mimics signal characteristics of a primary user to acquire channel resources without sharing with other secondary users, thus reducing spectrum usage probability and efficiency. The objective of this paper is to highlight various security issues related to dynamic spectrum access then discuss the PUEA with the existing countermeasures to mitigate it. In addition, future security challenges are addressed.

General Terms

Cognitive Radio Network, Primary User Emulation Attack, spectrum sensing, Primary User (PU), Secondary User (SU)

Keywords

Radio spectrum, defense techniques, security issues, dynamic spectrum access

1. INTRODUCTION

RADIO spectrum is the heart of wireless technology and its efficacious usage is of uttermost significance. The distribution of this valuable and limited radio frequency resource, as decided by the Federal Communication Commission (FCC), is based on conventional fixed spectrum allocation policy. This conventional policy for spectrum assignment divides the

spectrum into licensed and unlicensed band [1]. In Licensed spectrum, exclusive right is provided to a selected user or

wireless services and other users are not permitted to access this band, even though it is free at a particular time and location. It has been observed by the Spectrum Policy Task Force. (SPTF) that several portion of licensed spectrum is highly utilized whereas some portions are very less or partially occupied at particular location and time [1]. Measurement were taken by Shared Spectrum Company (SSC) between Jan 2004 and Aug 2005 which shows that on the average only 5.2% of the spectrum between 30MHz and 3GHz is accessed at six different locations in the U.S.A. The highest value of accessed portion was 13% at New York City and lowest was 1% at the (NRAO) National Radio Astronomy Observatory. From all the measurements, it was concluded that large portion of licensed spectrum band remains underutilized. Due to this fixed nature of traditional spectrum allocation policy, unlicensed users are prohibited from accessing the spectrum band. This low frequency spectrum utilization as shown in Fig.1.

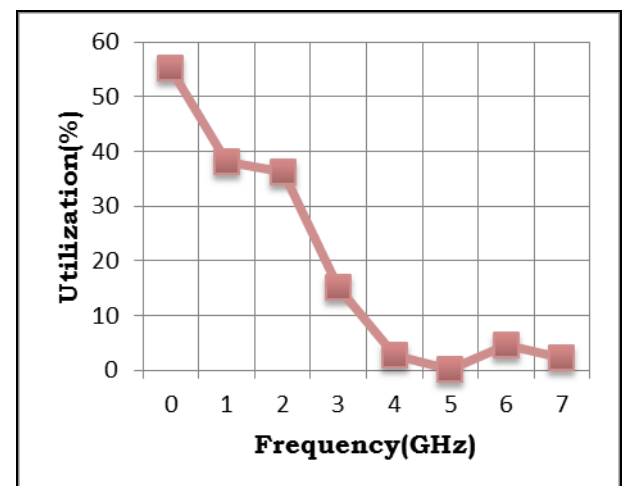


Fig 1: Spectrum underutilization

Unlicensed frequency spectrums are those portions of spectrum which is kept aside for users to access free of cost. The most widely used unlicensed bands are the 2.4 GHz Industrial, Scientific and Medical (ISM) band, used by IEEE 802.11b/g/n and Bluetooth devices and the 5GHz band Unlicensed National Information Infrastructure (UNII) are used by IEEE 802.11a and European HIPERLAN standard [1],[3].

On the other hand, due to new wireless services and technology like internet, smartphones, social networking sites,

these unlicensed bands are getting overcrowded which leads to a problem called spectrum scarcity. The problem is not the spectrum shortage; it is lack of the technology which can effectively access the spectrum.

This ineffective consumption of licensed spectrum and spectrum scarcity problem in unlicensed band forced Federal Communication Commission (FCC) to make modification in the existing conventional fixed spectrum allocation scheme. FCC decided to make the spectrum flexible by assigning permission unlicensed user to access licensed spectrum band when it is idle, without causing any interference to the licensed user transmission [2].

In comparison with traditional wireless networks, there are more chances open to attackers in cognitive radio technology. As a result, security in cognitive radio networks has become a challenging task. Many general techniques proposed in the past cannot satisfy such special network needs, since the spectrum is used dynamically in cognitive radio.

The rest of the paper is organized is as follows: In section 2, spectrum sensing in Cognitive Radio significance is explained. In section 3 security issues related with dynamic spectrum access is described. Section 4 explains the effect of primary user Emulation attack on smooth operation of spectrum sensing. In section 5 different defense techniques for PUEA detection and mitigation is discussed and explained with advantage and disadvantage of existing solutions in tabular form. Finally section 6 concludes the paper by mentioning future challenges in existing techniques

2. SPECTRUM SENSING

Spectrum sensing is basic function of cognitive radio technology. In spectrum sensing operation, secondary users monitor the spectrum continuously, to identify arrival of primary users. The spaces in licensed spectrum which are not occupied by primary users are called spectrum holes or white spaces [3]. The most efficient way to detect spectrum holes or white spaces is to detect the primary users that are receiving data within the communication range of a secondary user. Fig 2 shows spectrum holes or white space. Three techniques are used for spectrum sensing operation: Energy detection, matched filter detection and Cyclo-stationary detection

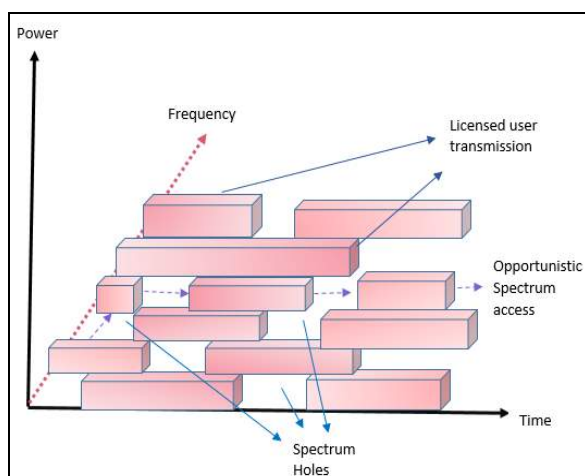


Fig 2: Spectrum Holes

3. SECURITY ISSUES

To date, security issues of cognitive radio networks have become a hotspot of research activities [4]. Some work has

engaged in this area which forecasts the potential susceptibilities on the structure, function and strategy of CR network that could be employed by the malicious or selfish users. Particularly, a selfish or malicious secondary user may obstruct a idle frequency band by imitating the primary user characteristics and thus prevents other secondary users from using that band

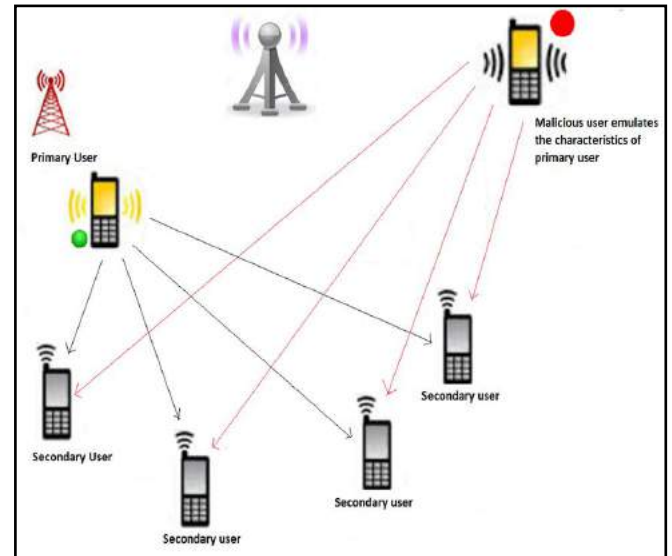


Fig 3: Primary User Emulation attack

4. PRIMARY USER EMULATION

Primary User Emulation (PUE) attack Fig.3 [11] [12] [13] is carried out by a malicious secondary user who mimics a primary user signal characteristics or behaving as a primary user to obtain the channel resources without having to share them with other cognitive users. As a result, the attacker is able to obtain full bands of a spectrum. This primary user emulation attack can be into two categories: Selfish Primary user emulation attack and Malicious Primary User Emulation attack. In the Selfish PUE attack, the attacker's objective is to increase its spectrum space from the available resources. In addition, this attack can be conducted by two attackers simultaneously to create a dedicated link between them. In the Malicious Primary User Emulation attack, the attacker's aim is to avoid genuine secondary users from using the holes found in a frequency spectrum band [5].

The task of differentiating genuine signals from secondary user signals becomes more difficult to implement when one considers the rule made by Federal Communication Commission (FCC) which states that no alteration to the primary user and its transmission system should be required to lodge opportunistic use of the frequency spectrum by secondary users. For this reason, conventional methods, such as implanting a signature in a primary user's signal or engaging in an interactive protocol between an incumbent signal transmitter and a verifier, cannot be used [17].

Physical layer is the lowermost and important layer of the OSI model and provides a transmission medium to the

communication system. The CR is considered to be an intelligent radio which can adapt the surrounding environment and access the spectrum in dynamic fashion, which makes the operation more challenging. PUEA is one of the stern physical layer problem and a great threat to spectrum sensing [5]. So, in the next section, the PUEA with its influence on wireless communication technology users are deliberated and a detailed summary of PUEA defense techniques is specified along with its almost all existing techniques for mitigation, and some proposed solutions are highlighted [16], [17], [18], [19], [20].

5. DETECTION SCHEMES

To defend against Primary User Emulation attack, transmitting source identity needs to be verified. The regular and best way of knowing the user identity is to apply cryptographic authentication mechanisms, such as digital signatures. But such an approach cannot be adapted because of the FCC policy that forbids modifying primary user transmission systems. With this restriction and knowing that primary users' locations are known ahead of time, researchers started finding effective ways of pin pointing the transmitting source location [18], [19], [20]. If primary user location is matching with the source location, the source is treated to be a primary user. Otherwise it is considered to be an attacker trying to mimic a primary user.

In [5], two Methods are suggested to figure out the location of the transmitting source: Distance Ratio Test (DRT) which is depends on received signal strength measurements and Distance Difference Test (DDT) which is based on signal phase difference. Both techniques rely on a transmitter verification procedure.

The procedure uses a location verification method to differentiate between primary and secondary signals impersonating as primary signals. Some assumptions are specified to create the environment where the attack is likely to occur. The primary users are TV broadcast towers with fixed locations, and there are several secondary user nodes within the transmission range of the towers' signals. There are trusted location verifiers (LVs) to execute DRT and DDT technique, and there are two types of LVs: master and slave LVs. A master Location Verifier has a database record with the coordinates of the TV towers. LVs know their location using a secure GPS system. Location Verifiers analyze the distances between them and the transmitters as they receive their signals. The received signal can be from the towers or an attacker behaving as a tower. Then the Location verifier task is to compare them to their database of towers' locations. If the result of verification fails, the signal's is considered to be an attacker [6]. For these techniques to work, the information exchanged between the verifiers must be encrypted and strictly authenticated to abstain eavesdropping, alteration or replay attacks implemented by the attacker. Different defense techniques, their advantages and disadvantages are explained in tabular form in Table 1. below

Table 1. Existing defense techniques

Sr.no.	Contribution	Methodology	Advantages	Disadvantage
1.	R. Chen and J. Park[5]	Distance ratio and difference test-cryptographic authentication mechanisms	They have identified the PUE attack problem and demonstrated its disruptive effects in CR networks.	DDT requires tight synchronization among the LVs that may be expensive to implement. Both DRT and DDT can be deceived if the attacker is transmitting from the vicinity of the TV tower.
2.	R. Chen, J. Park, and J. Reed[6]	Based on localization of the primary user	Signal Energy Level is considered. Simple approach. A separate sensor network is used for attack detection so secondary users are not loaded with detection responsibilities.	Does not work as it requires modification in the primary user transmission system which does not follow FCC regulations. (i) the separate sensor network increases the distribution and maintenance costs (ii) Received signal strength is used that is very erratic (iii) Transmission power of attacker is assumed to fixed, which is not valid for practical implementation

3.	Olga León, Juan Hernández-Serrano [7]	Localization strategy that applies TDOA then FDOA	This approach is does not violate FCC rule.	Major drawback of these methods is that it depends on many assumptions that make them very restrictive and not applicable to practical cognitive technology.
6.	Z. Jin and K. Subbalakshmi [8]	Wald's sequential probability ratio test	Use of analytical models for the received power for attack detection.	(i) WSPRT is used that can lead to limitless sampling and long sensing times, and its performance degrades under dynamic environment (ii) It is assumed that there is Uniform distribution between genuine users and malicious users (iii) Major drawback of this method is that it assumes that the transmission power of the attacker is immobile
7.	Z. Jin, S. Anand, and K. Subbalakshmi [9]	Mitigating primary user emulation attacks in dynamic spectrum access networks using hypothesis testing,	(i) The fading characteristics of the wireless environment are taken into account, (ii) multiple malicious users are considered.	(i) It is assumed that there is Uniform distribution between genuine users and malicious users (ii) it assumes that the transmission power of the attacker is immobile
9.	Y. Liu, P. Ning, and H. Dai [10]	Authenticating Primary Users' Signals in Cognitive Radio Networks via Integrated Cryptographic and Wireless Link Signatures,	(i) Use of a novel physical layer authentication technique, Simulations and real implementation (ii) use of a light weight authentication protocol.	An extra node (helper node) is required for every primary transmitter.
10.	Z. Chen, T. Cooklev, C. Chen [11]	"Modeling primary user emulation attacks and defenses in cognitive radio networks,"	(i) Attackers with a changing transmission power are also considered, (ii) the detection method proposed does not depend on sensing	(i) There is a need to know attacker position in advance. (ii) The distances between the Primary Users, the Secondary Users and the attacker have to be known in advance.
11.	C. Mathur and P. Subbalakshmi [12]	Digital signatures for centralized DSA networks,"	A simple public key cryptography mechanism between Primary Users and Secondary Users.	i) Does not work as it requires modification of the primary user system which breaks FCC regulations (ii) a certification authority is needed, (iii) the proposed mechanism for encryption/decryption has several weaknesses that can lead to severe Denial of Service attacks.

12.	Shaxun Chen; Kai Zeng [13]	Hearing is believing: This is the first work dealing with PUEA with mobile FM wireless microphone as PU.	Simulation as well as Real world experiment. First work on detection of primary mobile users. Then the same method is realized in noisy environment	Here, SUs must be equipped with extra sound sensors. This is a real world experiment.
13.	Zhou Yuan; Niyato, D.; Husheng Li; Zhu Han[14], [15]	Belief propagation: To identify the attacker, a defense strategy based on belief propagation (BP).	To make this detection process more accurate, the author proposes BP framework based on Markov random field	The transmission power and transmission range of the attacker are assumed to be within a certain limit. The location of the primary user must be known to all SUs. The mean of final belief is more when the distance between PU and PUE attacker is less.
14.	Zhou, Xiao; Xiao, Yang; Li, Yuanyuan [15]	Encryption and displacement method: Encryption	Encryption algorithm is useful for defending PUEA, but if the attacker can know the information by air interception, then displacement algorithm is useful.	Workflow of entire method is verified by NS2 software. The result shows that too many users lead to packet loss.
15.	Chandrashekar, S.; Lazos [17]	PU authentication: Primary user authentication system relies on the deployment of stationary helper nodes, which authenticate PU by link signature	More number of SUs can be accommodated without the need for repeated training, and can defend the attack successfully.	The system requires extra deployment of fixed helper nodes, which must be initialized with public key and certificate from a trusted authority.

6. CONCLUSION & FUTURE WORK

The awareness, consistency and flexibility nature of CR networks make it more precious to be organized successfully in nearby future. Along with this understanding, it has also unlocked the door for lots of threats, especially in security because of the presence of malicious nodes, who want to destroy the entire communication networks. A brief summary on safety threats, including physical, link, network and transport layer attacks is presented. Finally issues in cognitive Radio which needs further development are emphasized. The most important challenge till now is need of a technique which can evade interference to stationary as well as mobile primary users. Although, some of the defense mechanisms have been proposed, they can't completely fulfill the need of CR networks operation. This leads us to our future research work which will give the ultimate solution to PUEA by considering channel approximation error into the mechanisms

for detecting PUE attacker, which can support both stationary and a wireless microphone as the primary user.

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TOUCHLESS FINGERPRINT RECOGNITION BY MINUTIA MATCHING USING MATLAB

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ABSTRACT

Fingerprint recognition is the reliable and oldest biometrics used for personal identification. But due to the contact the input fingerprint from the same finger can be different and there can be fingerprint issues which can lead to forgery and hygienic problem. For this reason, touch less fingerprint recognition has been developed in which the fingerprint is acquired using a high resolution cam. The acquired images are subjected to pre-processing steps and the region of interest is extracted. Minutia features are extracted from the fingerprint image and matching is based on the number of minutia pairings among two fingerprints to be matched.

GENERAL TERMS

Fingerprint recognition, Minutia matching technique, Gabor filtering, Morphological processing.

KEYWORDS

Minutia, Gabor Filtering, Ridge and Valley, Fast Fourier Transform, Fingerprint.

1. INTRODUCTION

Human beings possess psychological and behavioural characteristics. The measure of these characteristics is called Biometrics. Biometrics is used for personal identification and verification. Voice, lip movements, hand geometry, face, odour, gait, iris, retina, fingerprint are the most commonly used authentication methods.

The driving force of the progress in this field is, above all, the growing role of the Internet and electronic transfers in modern society. Biometrics is actively growing area of research. The biometrics has a significant advantage over traditional authentication techniques namely passwords, PIN numbers, smartcards etc. Of all the biometric based recognition systems, fingerprint based recognition systems is one of the oldest and most reliable biometric used for personal identification.

The choice of Biometrics depends on accuracy, user acceptance, cost and implementation time and level of security required. A fingerprint is the pattern of friction ridges on a human finger, which provides increased friction for gripping. A fingerprint consists of ridges and valleys. No two persons, even identical twins do not have similar fingerprint Pattern. The probability of two fingers being same is 1 in 1.9×10^{15} . Fingerprints remain unchanged during a lifetime. Only a very deep cut would result in changes in a fingerprint. Fingerprint has general ridge patterns that permit them to be classified. Among the variety type of minutia, two are most significant and in heavy usage. One is called

termination, which is the immediate ending of a ridge the other is called bifurcation, which is the point on the ridge from which two branches derive.

2. LITERATURE SURVEY

Fingerprint recognition is the reliable and oldest biometrics used for personal identification. A comprehensive survey of the different techniques and growth in automated latent fingerprint matching technology is studied for understanding the fingerprint technologies evolving over the past years. The merits and drawbacks of both manual matching of latent prints and the automated system based matching are read and understood. The literature survey is focused on following areas- Image Enhancement, Feature Extraction and Matching.

3. METHODOLOGY

Images of the fingerprint can be acquired by using a good quality camera. The acquired images are subjected to processing steps and the region of interest is extracted. Minutia features are extracted from the fingerprint image and comparison can be done to obtain the rightful output.

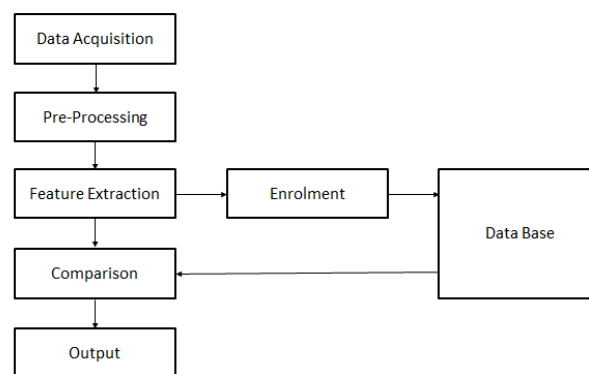


Fig 1: Flowchart

3.1 Data Acquisition

Sony Exmor IMX214 camera with f/2.0 aperture is used to capture the image of a finger. Then it is saved into a local directory.

3.2 Pre-Processing

The saved image is loaded into MATLAB. Then the image is converted into a gray scale image.

3.2.1 Image Enhancement

Enhancement can be used to improve an image's contrast and brightness characteristics, reduce its noise content or sharpen its details. Fingerprint images are rarely of perfect quality. They may be degraded and corrupted with elements of noise due to many factors including variations in skin and impression conditions. This degradation can result in a significant number of spurious minutiae being created and genuine minutiae being ignored. The quality of the ridge structures in a fingerprint image is an important characteristic, as the ridges carry the information of characteristic features required for minutiae extraction. Ideally, in a well-defined fingerprint image, the ridges and valleys should alternate and flow in locally constant direction. This regularity facilitates the detection of ridges and consequently, allows minutiae to be precisely extracted from the thinned ridges. However, in practice, a fingerprint image may not always be well defined due to elements of noise that corrupt the clarity of the ridge structures. This corruption may occur due to variations in skin and impression conditions such as scars, humidity, dirt, and non-uniform contact with the fingerprint capture device. Thus, image enhancement techniques are often employed to reduce the noise and enhance the definition of ridges against valleys. Thus, it is necessary to employ image enhancement techniques prior to minutiae extraction to obtain a more reliable estimate of minutiae locations.

Enhancement for image can make the following process easier:

3.2.1.1 Histogram Equalization

Histogram equalization is a technique of improving the global contrast of an image by adjusting the intensity distribution on a histogram. This allows areas of lower local contrast to gain a higher contrast without affecting the global contrast. Histogram equalization accomplishes this by effectively spreading out the most frequent intensity values.

3.2.1.2 Fast Fourier Transform

The frequency image defines the local frequency of the ridges contained in the fingerprint. In this method we divide the image into small processing blocks (32 x 32 pixels).

3.2.2 Binarization

Binarization is the process that converts a gray level image into a binary image. This improves the contrast between the ridges and valleys in a fingerprint image, and consequently facilitates the extraction of minutiae. 8-bit gray scale image can represent $2^8 - 1 = 255$ intensity or gray levels. Most of the fingerprint images are stored as 8-bit gray scale images usually in a bitmap image or as a TIFF image.

3.2.3 Image Segmentation

Segmentation is the process of separating the foreground regions in the image from the background regions. The foreground regions correspond to the clear fingerprint area containing the ridges and valleys, which is the area of interest. The background corresponds to the regions outside the borders of the fingerprint area, which do not contain any valid fingerprint information. When minutiae extraction algorithms are applied to the background regions of an image, it results in the extraction of noisy and false minutiae. Thus, segmentation is employed to discard these background regions, which facilitates the reliable extraction of minutiae. Only a Region of Interest (ROI) is useful to be recognized for each fingerprint image. The image area without effective ridges and furrows is first discarded since it only holds background information. To extract the region of interest, two steps are used- Block

Direction Estimation ROI Extraction By Morphological Methods.

3.3 Feature Extraction

After enhancement of the obtained image it is very important to extract features of the fingerprint from the image. Fingerprint features can be further classified into various levels namely

- Level 1
- Level 2
- Level 3

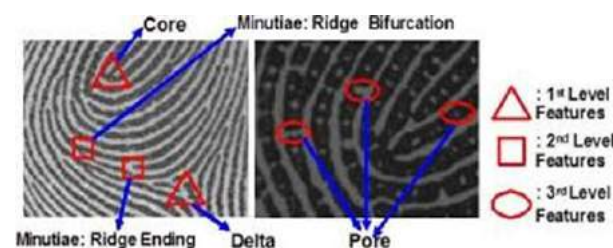


Fig 2: Different Types of Features

Level one includes macro details such as ridges flow and pattern types such as arch pattern, loop pattern, whorl pattern etc.

Level two includes minutiae points such as ridges bifurcations and ending.

Level three includes all dimensional attributes of a ridge, such as ridge path deviation, width, shape, pores etc.

3.3.1 Ridge Thinning

Thinning of the ridges is very first step in feature extraction. Ridge thinning is performed to eliminate the redundant pixels of ridges till the ridges are just one pixel wide.

Ridge Thinning can be done only after the image is Binarized. After thinning the image is filtered, some H breaks, isolated points and spikes are removed.

3.3.2 Enhanced Thinning

It may occur that the resultant ridges obtained after thinning may not always be one pixel broad to increase the efficiency and eliminate the chances of error the thinned ridges are further enhanced.

Steps:

1. Scanning the skeleton of fingerprint image row by row from left-top to right-bottom. Check if pixel is 1
2. Count its four connected neighbors.
3. If sum of them is greater than 2, mark it as erroneous pixel.
4. Remove the erroneous pixel.

Repeat above steps 1-4 till whole image is scanned and erroneous pixels are removed.

3.3.3 False Minutiae

False minutiae may be introduced into the image due to factors such as noisy images, and image artefacts created by the thinning process. The introduction of false minutia destroys the integrity of bridges and bifurcations. It exchanges the type of minutiae points and Introduces error in detection of true bifurcations. Hence, after the minutiae are extracted, it

is necessary to employ a post processing stage in order to validate the minutiae.

- 1) If $d(\text{bifurcation, termination}) < D$ & the 2 minutia are in the same ridge then remove both of them (case m1).
- 2) If $d(\text{bifurcation, bifurcation}) < D$ & the 2 minutia are in the same ridge then remove both of them (case m2, m3).
- 3) If $d(\text{termination, termination}) \approx D$ & the their directions are coincident with a small angle variation & no any other termination is located between the two terminations then remove both.
- 4) If $d(\text{termination, termination}) < D$ & the 2 minutia are in the same ridge then remove both of them (case m7) where $d(X, Y)$ is the distance between 2 minutia points.

3.3.4 Minutia Extraction

After the fingerprint ridge thinning, marking minutia Points is the next important step. If the number of minutiae is more the probability of accurate result increases. Most of the finger-scan technologies are based on Minutiae. Minutia-based techniques represent the fingerprint by its local features, like terminations and bifurcations.

3.3.4.1 Gabor Filtering

The configurations of parallel ridges and valleys with well-defined frequency and orientation in a fingerprint image provide useful information which helps in removing undesired noise. The sinusoidal-shaped waves of ridges and valleys vary slowly in a local constant orientation. Therefore, a band pass filter that is tuned to the corresponding frequency and orientation can efficiently remove the undesired noise and preserve the true ridge and valley structures. Gabor filters have both frequency selective and orientation- selective properties and have optimal joint resolution in both spatial and frequency domains.

3.4 Enrolment and Data Base

This extracted data with the image is saved in another local directory/cloud storage with the details of the person whose finger print is worked up on till now.

3.5 Minutia Matching (Comparison)

Here 2 sets of images are matched with each other. We use elastic match algorithm. Given two set of minutia of two fingerprint images, the minutia match algorithm determines whether the two minutia sets are from the same finger or not. It includes two consecutive stages: one is alignment stage and the second is match stage.

3.5.1 Alignment Stage

Given two fingerprint images to be matched, choose any one minutia from each image; calculate the similarity of the two ridges associated with the two referenced minutia points. If the similarity is larger than a threshold, transform each set of minutia to a new coordination system whose origin is at the referenced point and whose x-axis is coincident with the direction of the referenced point.

3.5.2 Match Stage

After the set of transformed minutia points is derived, the elastic match algorithm is used to count the matched minutia pairs by assuming two minutia having nearly the same position and direction are identical.

3.6 Tools Used

1. MATLAB R2010.

2. 13 megapixel Sony Exmor IMX214 camera with f/2.0 aperture.

4. RESULTS AND DISCUSSION

4.1 Fingerprint Image reading

The image of the Thumb is taken by the Camera and is read using “imread” command in MATLAB.



Fig 3: Original Image

4.2 RGB to GRAY Image

Read color image is converted into Gray scale image using “rgb2gray” command in MATLAB.



Fig 4: Gray Scale Image

4.3 Histogram Equalization

Gray Scale image is histogram equalized using command “histeq” in MATLAB.

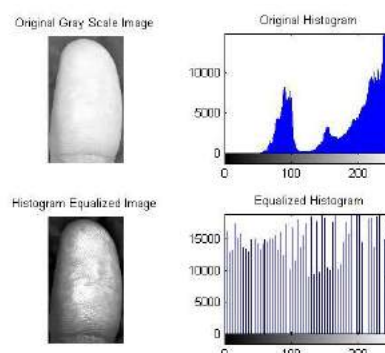


Fig 3: Histogram Equalization of the Image

5. CONCLUSION AND FUTURE SCOPE

Of all biometric technologies, whether biological or non-biological, Touchless Fingerprint verification offers most potential in terms of adaptability and implementation. This holds true from a number of perspectives i.e. ease of use, low implementation cost and the ease of embedding the system in an organization, without excessively affecting existing operations. Our project can be used in any Employee Management Attendance System. There is a scope of further improvement in terms of efficiency and accuracy which can be achieved by increasing the camera resolution to capture the image. Hence the project can be developed as an integrated android/ios platform for companies to increase the security and lessen the cost as smartphones are easily available.

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Towards Detecting Emotions from Real Time Speech

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ABSTRACT

Emotion comprises one of the most basic factors with respect to the communication between humans. It would be ideal to have human emotions automatically recognized by machines, mainly for improving human machine interaction. Research so far has mostly dealt with offline evaluation of vocal emotions, real-time high performance emotion recognition has hardly been addressed. Real-time high performance emotion recognition is, however, a necessary prerequisite for the realization of human-computer interfaces that analyze and respond to the user's emotions while he or she is interacting with an application. The proper choices of features and classifiers are important for a real-time high performance emotion recognition system. In this paper real time emotion recognition system is proposed which deals with audio segmentation to find appropriate units for emotions, extraction of emotion from prosody, quality and dynamic features, classification of emotions using Multidimensional SVM and testing real time speech samples with training databases with emotional speech in 'Native Marathi' language has been presented

Keywords

LPCC, MFCC, Prosody features, Quality features, Speech Emotion Recognition, Support Vector Machine

1. INTRODUCTION

Emotions are fundamental for humans, impacting perception and everyday activities such as communication, learning and decision-making. They are expressed through speech, facial expressions, gestures and other non-verbal clues. Speech emotion analysis refers to analyzing vocal behavior as a marker of affect, with focus on the non-verbal aspects of speech. Discovering which features are indicative of emotional states and consecutively capturing them can be a difficult task. It is known that emotions cause mental and physiological changes which also reflect in uttered speech. When processing the generated speech, one can calculate different features, which can be utilized to learn the relationship between features and emotions [1]. Once such relationship is learned, theoretically, one can calculate the features and then automatically recognize the emotions present in speech. One of the challenges is the identification of oral indicators (prosodic, spectral and voice quality) attributable to the emotional behavior. Many features for

emotion recognition from speech have been explored, but there is still no agreement on a fixed emotional state and some quantifiable parameters of speech [1]. As per the literature survey most of the researchers use standard databases for SER systems so it is needed to verify the variation in emotion recognition in the real time speech. The classifier performance plays important role in SER [8][9]. Therefore a system needed to develop which will extract powerful features and classification should also be accurate.

In this paper, real time speech emotion recognition system is proposed which uses combination of prosody features (i.e. pitch, energy, Zero crossing rate)[3], quality features (i.e. Formant Frequencies, Spectral features etc.)[3][5], derived features (i.e.) Mel-Frequency Cepstral Coefficient (MFCC) [7], for robust automatic recognition of speaker's emotional states. Multilevel SVM classifier is used for identification of six discrete emotional states namely angry, fear, happy, neutral, sad and surprise in 'native Marathi Language'. The overall experimental results can be demonstrated using MATLAB simulation.

2. The Nature of Emotion in Speech

An important issue in speech emotion recognition is the need to determine a set of the important emotions to be classified by an automatic emotion recognizer. Linguists have defined inventories of the emotional states, most encountered in our lives. A typical set contains 300 emotional states. However, classifying such a large number of emotions is very difficult. According to pallet theory, any emotion can be decomposed into primary emotions similar to the way that any color is a combination of some basic colors. Primary emotions are Anger, Disgust, Fear, Joy, Sadness, and Surprise. [1][2] These emotions are the most obvious and distinct emotions in our life. A highly qualitative correlation between emotion and some speech features is presented in Table 1.

Table 1 shows prosody and voice quality to be most important to distinguish between emotions according to human perception. In particular, pitch and intensity seem to be correlated to activation, so that high pitch and intensity values imply high, low pitch and intensity values low activation. The automatic recognition of emotion seems straight-forward when looking at Table 1 However, when examining closer different studies on acoustic correlates of emotions of multiple authors, often contradicting results can be found. This is partly due to different variants of certain emotions such as hot and cold anger, but as well to the intrinsically great variability

of emotional expressions. Thus, there is just no direct mapping between acoustics and emotions

Table 1. General correlates to emotion in speech.

	Anger	Happiness	Sadness	Fear	Disgust
Speech Rate	Slightly faster	Faster or Slower	Slightly Slower	Much faster	Very much slower
Pitch average	Very much higher	Much higher	Slightly slower	Very much higher	Very much slower
Pitch range	Much wider	Much wider	Slightly narrower	Much wider	Slightly wider
Intensity	Higher	Higher	Lower	Normal	lower
Voice quality	Breathy, chest tone	Breathy, blaring	Resonant	Irregular voicing	Grumbled chest tone
Pitch change	Abrupt on stressed syllables	Smooth upward inflections	Downward inflections	Normal	Wide downward terminal inflections
Articulation	Tense	Normal	Slurring	Precise	Normal

3. Real Time Emotion Recognition System

The speech emotion recognition system contains five main modules emotional speech input, Pre-processing, feature extraction, feature normalization, classification, and recognized emotional output with respect to training and testing phase [4].

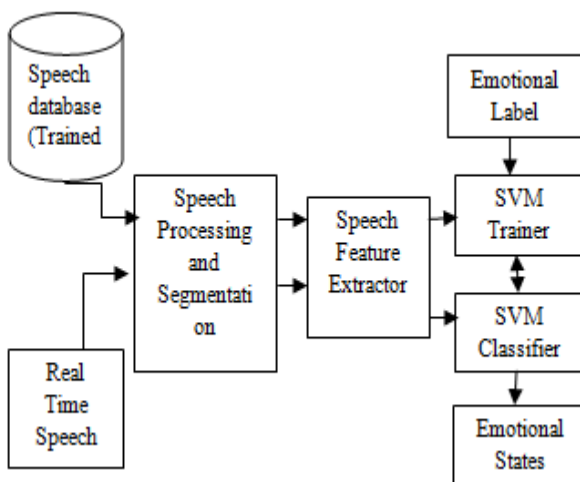


Fig 1: Emotion Recognition System.

3.1 Speech Acquisition

The evaluation of the speech emotion recognition system is based on the level of naturalness of the database which is used as an input to the speech emotion recognition system. The database as an input to the speech emotion recognition system may contain the real world emotions or the acted ones. It is more practical to use database that is collected from the real life situations [15] For real time speech emotion recognition system training set formed by speakers other than testing phase speakers.

3.2 Feature Extraction

Feature extraction is the process by which the measurements of the given input can be taken to differentiate among emotional classes. There are no established analytical methods in the field of voice analysis that can reliably determine the intended emotion carried by the speech signal. A possible approach in this paper as seen in research is performing a trial to apply different and known signal processing methods, and to combine their results in such a way that there is a possibility for their pointing in the right direction - towards the emotion "hidden" in the signal. Here in feature extraction process features can be extracted which is combination of prosody features (i.e. pitch, energy, Zero crossing rate), quality features (i.e. Formant Frequencies, Spectral features etc.), derived features ((i.e.) Mel-Frequency Cepstral Coefficient (MFCC), Linear Predictive Coding Coefficients (LPCC)) along with prosodic features like Pitch and Formants. Fig 2 shows the overall model for feature extraction that has been used for both training of classifier and testing the unknown speech samples.

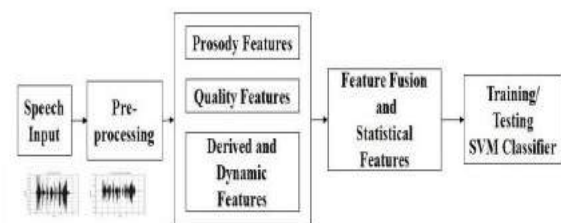


Fig. 3 Steps for feature extraction

Fig 2: Steps for feature extraction

3.2.1 Pre-processing

The speech samples which are going to be processed for emotion recognition should go through a pre-processing step that removes the noise and other irrelevant components of speech corpus for better perception of speech data. The preprocessing step involves three major steps such as pre-emphasis, framing and windowing. The pre-emphasis step is carried out on the speech signal using a Finite Impulse response (FIR) filter called pre-emphasis. The filter impulse response is given by

$$H(z) = 1 + a z^{-1}, \text{ where } a = -0.937$$

The filtered speech signal is then divided into frames of 25ms with an overlap of 10ms. A hamming window is applied to each signal frame to reduce signal discontinuity and thus avoid spectral leakage. Then speech emotion related features are extracted from the pre-processed speech data.

3.2.2 Prosody Features

Pitch, or fundamental frequency, is the acoustic correlative of the perceived tone height. The automatic estimation of pitch is a non-trivial task. Speech segment is preprocessed and then The signal is converted into frequency domain by using Fast Fourier Transform. The absolute values of the signal are considered and then the logarithm of the signal is obtained. The signal is then transformed into Cepstral domain by taking its IFFT. The very first signal peak represents the pitch frequency.

Features Estimated from pitch contour: Standard Deviation Of Pitch, Variance Of Pitch, Average Peak, Total Peak Count, Peaks At 20 Hz Away (Twenty Count), Peaks At 50 Hz Away (Fifty Count), Peaks At 70 Hz Away Seventy Count, Maximum Difference, Difference Between Local Minima.

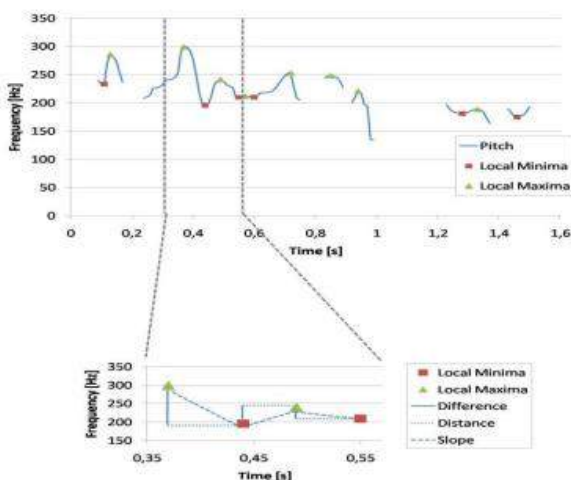


Fig 3: Feature Extraction from Speech

Zero-crossing rate is a key feature for identification of percussive sounds and information retrieval, and gives information related to change in frequency components of speech. The zero-crossing rate is the rate of sign-changes along a signal. The varying nature of speech signals insists for the use of energy related features which will show the variation of energy in the speech corpse associated with a short-term region. To form feature vector, zero crossing rate and energy of feature can be extracted.

3.2.3 Quality Features

Formants play an important role as feature and can be termed as the spectral peaks of the sound spectrum of voice; they are often measured as the amplitude peaks in the frequency spectrum of the sound. The first three formant frequencies can be taken as relevant features in the complete feature vector.

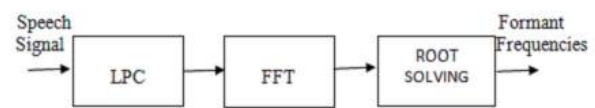


Fig 4: Formant Frequencies Extraction

In acoustics, formants are referred as a peak in the sound envelope and/or to a resonance in sound sources, as well as that of sound chambers. Extraction of Formant Frequencies is done using LPC Based Formants Estimation Technique. The vocal tract is modeled as a linear filter with resonances and resonance frequencies of the vocal tract are called formant frequencies [2]. Graphically, the peaks of the vocal tract response of speech signal correspond roughly to its formant frequencies. If the vocal tract is modeled as a time-invariant, all-pole linear system, then each of the conjugate pair of poles that corresponds to a formant frequency or resonance frequency [2].

3.2.4 Dynamic Features

Mel-frequency cepstral coefficients (MFCCs) are based on known variation of the human ear's critical bandwidth with frequency [8-10]. MFCC has two types of filter which are spaced linearly at low frequency below 1000 Hz and logarithmic spacing above 1000Hz. The Mel-frequency cepstrum is a representation of the short-term power spectrum of a sound, based on a linear cosine transform of a log power spectrum on a nonlinear Mel scale of frequency. For each speech frame of 30 ms, a set of Mel-frequency cepstrum coefficients was computed. Fig.5 shows the MFCC feature extraction process.

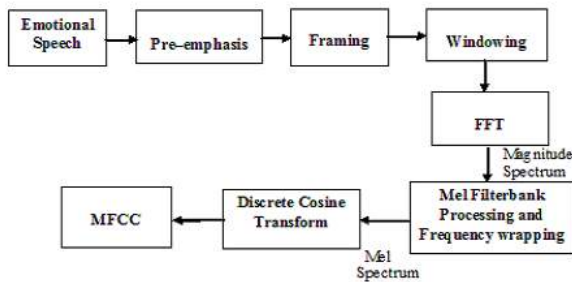


Fig 5: MFCC Feature Extraction from Speech

As described in previous text Preprocessing, Framing and windowing steps are performed. Next steps to be followed are as follows,

FFT

Fast Fourier Transform (FFT) algorithm is ideally used for evaluating the frequency spectrum of speech. The Fourier Transform is to convert the convolution of the input pulse and the vocal tract impulse response in the time domain. This statement supports the equation below:

$$Y(w) = \text{FFT} [h(t) * X(t)] = H(w) * X(w) \dots\dots\dots(11)$$

If $X(w)$, $H(w)$ and $Y(w)$ are the Fourier Transform of $X(t)$, $H(t)$ and $Y(t)$ respectively.

Mel Filter bank and Frequency wrapping

The mel filter bank [8] consists of overlapping triangular filters with the cut off frequencies determined by the center frequencies of the two adjacent filters. The filters have linearly spaced center frequencies and fixed bandwidth on the mel scale. The frequencies range in FFT spectrum is very wide and voice signal does not follow the linear scale. The bank of filters according to Mel scale is then performed. Triangular filters that are used to compute a weighted sum of filter spectral components so that the output of process approximates to a Mel scale. Each filter's magnitude frequency response is triangular in shape and equal to unity at the center frequency and decrease linearly to zero at center frequency of two adjacent filters [7, 8]. Then, each filter output is the sum of its filtered spectral components. After that the following equation is used to compute the Mel for given frequency f in HZ:

$$F(\text{Mel}) = [2595 * \log_{10} [1 + \frac{f}{700}]] \dots\dots\dots ()$$

Logarithm

The logarithm has the effect of changing multiplication into addition. Therefore, this step simply converts the multiplication of the magnitude in the Fourier transform into addition.

Discrete Cosine Transform

It is used to orthogonalize the filter energy vectors. Because of this orthogonalization step, the information of the filter energy vector is compacted into the first number of

components and shortens the vector to number of components.

4. Classification Using SVM

The input speech signal was divided into frames and all the features were calculated for each frame. Now, In order to draw one conclusion from all the features of several frames of the input signal, we need to consider some kind of statistics. Statistical features [16] like Mean, Standard Deviation, Max and Range were considered for each feature over all the frames, and a single feature vector was formed including all the statistical parameters, representing the input signal. Then, the normalized statistical feature vector was provided to the Support Vector Machine (SVM) classifier for training or testing. A single SVM is a binary classifier which can classify 2- category data set. For this, first the classifier is manually trained with the pre-defined categories, and the equation for the hyper-plane is derived from the training data set. When the testing data comes to the classifier it uses the training module for the classification of the unknown data. But, automatic emotion recognition deals with multiple classes. Two common methods used to solve multiple classification problems like emotion recognition are (i)one-versus-all [17], and (ii)one-versus-one [18]. Fig.6 demonstrates these two methods of multilevel SVM [19], [20] classification for two different classes. In the former, one SVM is built for each category, which distinguishes this category from the rest. In the latter, one SVM is built to distinguish between every pair of categories. The final classification decision is made according to the results of all the SVMs with the majority rule. In the one-versus-all method, the category of the testing data is determined by the classifier based on the winner-takes-all strategy. In the one-versus-one body method, every classifier assigns the utterance to one of the two emotion categories, then the vote for the assigned category is increased by one vote, and the emotion class is the one with most votes based on a max-wins voting strategy. This paper uses one versus all SVM classification method to recognize the emotional states.

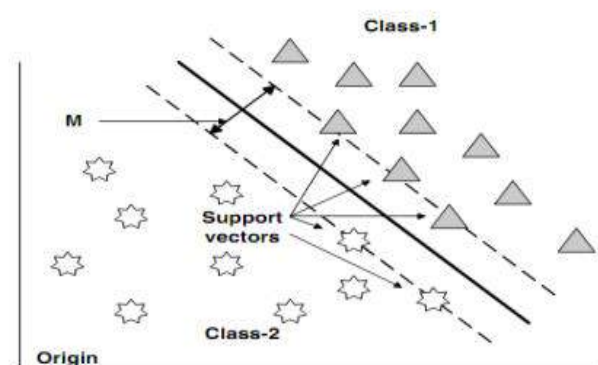


Fig 6: Hyperplane Decision Boundary.

5. CONCLUSION

The In this paper for recognition of emotion from real time speech the method is proposed which use combination of prosody, quality and dynamic features with the help of SVM

classifier. The database to be used for this work is from one of the regional language 'Marathi' speech corpus. As the Real time Emotion Recognition System utilizes method of selecting optimized parameters it will reduce the time complexity compared with common method and also maintains the recognition accuracy rate at the same time.

In future for recognition of emotion, a real time model for this application can be developed.

6. ACKNOWLEDGMENTS

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DCT Based Forgery Detection Technique in Digital Images

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ABSTRACT

Now a day's images are tampered easily because availability of powerful image processing software and improvement of human computer knowledge. Manipulation of digital images in different fields like court of law and medical imaging create a serious problem nowadays. With rapid advances in digital image processing software, there is a widespread development of advanced tools and techniques for digital image forgery. The most common types of forgery is Copy-move forgery which copies some part of the image and pastes it to another part of the same image to cover an important scene. In this paper, the proposed method to detect Copy-Move forgery is by matching the mean and DCT low frequency coefficient components of each block with remaining all blocks. The color image is converted from RGB color space to YCbCr color space. Y-component is partitions into fixed-size overlapping blocks and, features are extracted from each image blocks. The feature vectors obtained are then lexicographically sorted to make similar image blocks neighbors and duplicated image blocks are identified using Euclidean distance as similarity criterion. The experimental results prove that the proposed method works on reasonable time and works well for gray scale and color images. In this method by using the comparison of mean value and sorting technique helps to reduced the computational complexity.

General Terms

Pattern recognition, Security, Algorithms et. al.

Keywords

Copy move detection, Image forgery, Discrete cosine transform, Image tempering, duplication of region.

1. INTRODUCTION

Any image manipulation can become a forgery, based upon the context in which it is used. An image altered for fun or someone who has taken a bad photo, but has been altered to improve its appearance cannot be considered a forgery even though it has been altered from its original capture. On the other side, some people create a forgery for gain and prestige and to make the recipient believe that the image is real and not the fake one. Three types of forgeries can be identified:

- Using Graphical Software is one method in which a forged image can be created. It specially needs a skilful creator who can ensure that the image he is creating is realistic, e.g. that the fall of light on objects in an image is consistent right across the image, that shading is consistent, the absorption of light by an object etc. An image created using this method takes some time to

develop.

- Creating an image by altering its Content is another method. In this, the recipient is duped to believe that the objects in an image are something else from what they really are. The image itself is not altered, and if examined will be proven as so.
- Creating an image by altering its Context is the third method. In this, objects are removed or added from an image resulting in copy-move forgeries. E.g. a person can be added or removed. The easiest way is to cut an object from one image and insert it into another image by using various image / photo editing software's.

Digital image forgery categorized in three groups; Copy-Move, Image splicing and Image retouching. Copy-Move forgery or Region-Duplication forgery is the most important type of forgery, in Copy-Move some part of the image copies and pastes into another part of the same image to create a new thing or to hide an important scene [1]. Image splicing is the procedure of creating a fake image by cutting one part of an image and paste it to another image. It works on combining few images to create one tampered image. One of the problems is that, when the backgrounds in the images are different the objects in result may appear unclear [2]. Image Retouching doesn't obviously change the image, so it can be considered as the less corrupting type of digital image forgery, it just enhance some features of image. It is famous among magazine photo editors and most of magazine covers use this technique to change some features of an image but it is ethically wrong [2].

Detection of copy-move forgery invented to search the copied regions and their pasted ones, but detection may vary based on whether there has been any post-processing on copied part before paste it to another part. Usually attackers will do some operations such as rotation, filtering, JPEG compression, resizing and noise addition to the original part before pasting, and these operations make it difficult to detect copy-move forgery, therefore forgery detector should be robust to all manipulations. The Copy-Move image forgery is illustrated in the Fig 1.

The cloned regions can be of any shape and location, it is computationally impossible to search all possible image locations and sizes. Several methods have been developed to detect copy-move forgeries. In [3], Fridrich et al first described the exhaustive search indicating that its applicability is limited mainly because of its exponential complexity and the fact that it fails in case of any distortion.

In the same paper, they proposed a more effective approach, which uses a robust representation of the block that consists of quantized discrete cosine transform (DCT) coefficients. Popescu et al. proposed a resembling method [4], which used principal component analysis (PCA) instead of DCT to generate the block representation. They went further by reducing by half the numbers of features used in [3] and therefore improving the efficiency. Despite these improvements, their method has some weaknesses, among which its failure in case of slight rotation of the copied region. Later, Weiqi Luo et al. [5] presented a technique robust to various forms of post region duplication processing, including blurring, noise contamination and lossy compression. They represented each block by 7 characteristics extracted from both the RGB color image and the YCbCr corresponding image. Li Kang et al. [6] suggested to apply improved singular value decomposition to each image block to yield a reduced dimension representation and then lexicographically sort the feature matrix formed by the singular values. Their method was proven to be robust against noise distortion. Weihai Li et al. [7] proposed a rotation-robust algorithm based on the Fourier-Mellin Transform of image's blocks with features extracted along radius direction. Recently, Y. Huang et al. [8] proposed an improved DCT-based method. In their approach, DCT is applied to each block to represent its features and then truncating it yields a reduced dimension representation of the features. Their method has been proven to be robust to JPEG compression, blurring or AWGN distortions but they failed to consider the multiple copy-move forgery. Most recently, Yanjun Cao et al. [9] proposed an approach based on improved DCT that has the advantages to be robust to various attacks, such as multiple copy-move forgery, Gaussian blurring, and noise contamination; and also to have a lower computational complexity.

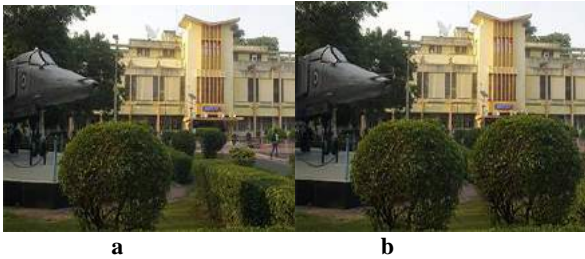


Fig 1: a) original image b) copy-move forgery image

The authors Popescu has [10] apply a principal component analysis (PCA) on small fixed size image blocks to yield a reduced-dimension representation. This representation is robust to minor variations in the image due to additive noise or lossy compression. Li et al. calculated the similarity of blocks based on discrete wavelet transform and singular vector decomposition (DWT-SVD) and Luo et al. measured block characteristics vector from each block [11,12].

In this paper, we propose a mean and DCT-based approach, which is not only robust to multiple copy-move forgery, noise contamination, but also to rotation with an angle up to 5 degrees. The rest of the paper is organized as follows: Section 2 described the proposed method and Section 3 presents the experimental results and finally conclusion is drawn in Section 4.

2. PROPOSED METHOD

In copy-move forgery, since the copied regions come from the same image, at the end of the process, we will have

relatively similar areas in the image. The detection of such forgery will therefore consist in finding wide relatively similar areas in an image. The easiest way to detect those areas is the exhaustive search but this can only be done for very small images because it is computationally costly. Moreover, it fails when the copied region is further processed. To make the detection more efficient, we will use the most common approach that starts by dividing the suspected image into overlapping blocks. Once the division is done, robust features must be extracted from the blocks in order to have an efficient detection rate. At last, the features are sorted to make a sufficiently reliable decision based on the similarity of consecutive pairs [13].

The different steps of our method are presented as follows:

1. Convert the RGB image to YCbCr color space. If the given image is grey image then keep it as it is.

$$Y = 16 + (0.299*R) + (0.587*G) + (0.114*B)$$

$$C_b = 128 - (0.168736 *R) - (0.331264*G) + (0.5*B)$$

$$C_r = 128 + (0.5*R) - (0.418688*G) - (0.081312*B)$$
2. Extract the Y-Component from the YCbCr color space.
3. Partition an Y plane image into blocks of each size 8 x 8 (Consider the pixel as top-left pixel of the corresponding block). For example a M x N is the size of Y plane, (M-7) x (N-7) blocks will be created by selecting overlap block with one pixel shift in horizontal and vertical direction..
4. Compute 2-Dimensional DCT for each and every block sequentially of Y plane image.
5. Consider the first 6 lowest frequency component values ((0,0),(0,1),(1,0),(2,0),(2,1),(0,2)) of each DCT block, as they contribute more information to the image.
6. Compute the Mean of each block in the Y plane.

$$Mean = \frac{1}{m * n} \sum_{i=0}^{m-1} \sum_{j=0}^{n-1} x(i, j)$$

7. Create a feature matrix (V) using 6 low frequency components star from (0,0) position of each block in zigzag manner and one mean value from step 6.
8. Search for the blocks with the absolute difference of the Mean within the Threshold Region ($0 < T_1$) lexicographically (carefully neglecting the comparison with the same block).
9. If the absolute difference of Means lies within the Threshold Region ($0 < T_1$) then compare the 6 lowest frequency values of both the blocks for matching (carefully neglecting the comparison with the same block).
10. The absolute difference of all these frequencies components are added and this value is checked for lying in the Threshold Region ($0 < T_2$).
11. If all the above mentioned conditions are met then it is decided that the particular block of the image is forged.
12. If the image is forged then copy the contents of the forged region in a blank image so that the forged region is highlighted.

3. EXPERIMENTAL RESULTS

In this section, we evaluate the performance of the proposed method on a set of forged images generated using Adobe Photoshop CS6 and it has been implemented using Matlab 7.9. The original images are generated from different sources. We have taken the gray scale and colored images with different size of duplication regions. Performance of this

method is evaluated by varying the both thresholds value and block size from 8x8 to 16x16. Fig 2 shows the tempered image and corresponding detection results with different block sizes.

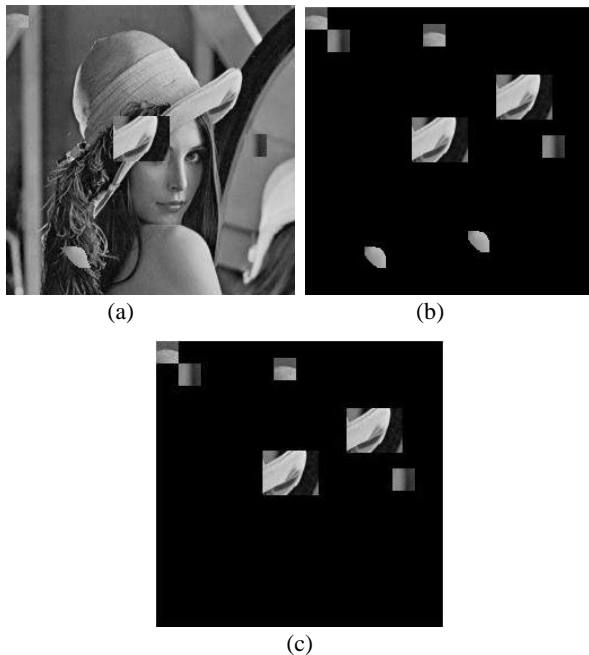


Fig 2: (a) Tempered image, (b) Detection result with 8x8 blocks and (c) Detection result with 16x16 blocks.

Fig 3 shows the color tempered image and its detection results with different block sizes. Fig 4 shows the quality of detection with various thresholds. If the size of forged portion is greater than or equal to block size then detection result is more accurate.

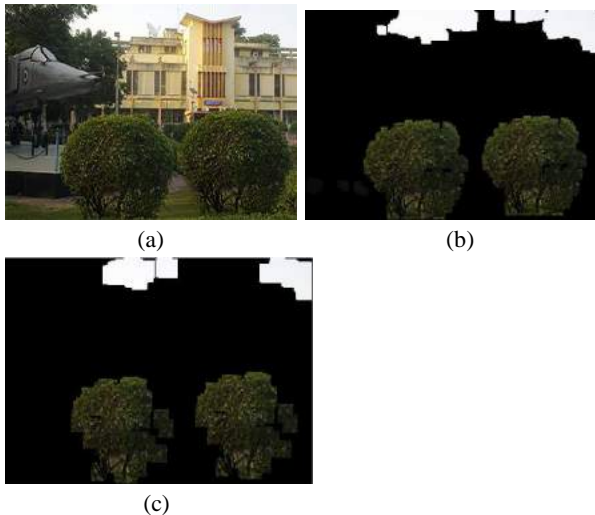


Fig 3: (a) Tempered color image, (b) Detection result with 8x8 blocks and (c) Detection result with 16x16 blocks.

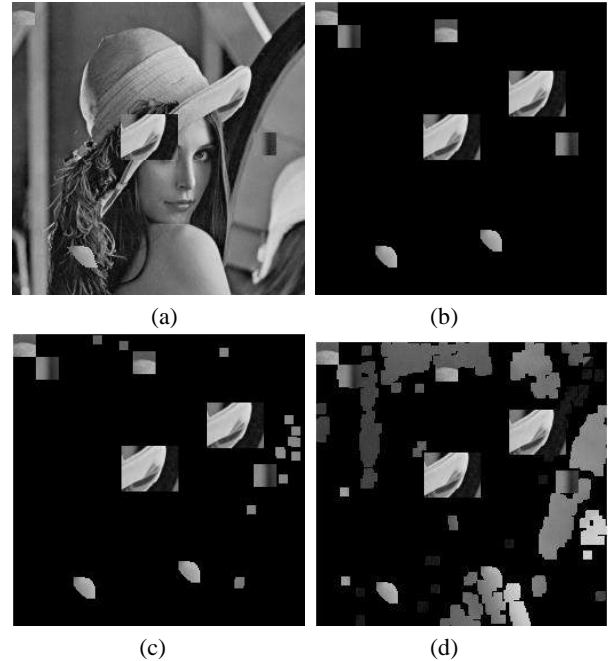


Fig 4: (a) Tempered image, (b) Result with $T_1=2, T_2=1$, (c) Result with $T_1=2, T_2=3$ and (d) Result with $T_1=3, T_2=7$

4. CONCLUSION

In this paper we present a algorithm for Copy-Move forgeries. Our algorithm falls under the category of passive methods because it does not require any prior information on the suspicious image to proceed. Moreover, experimental results show it can detect even multiple copy move forgeries in the same image and also is relatively robust to some common distortions. If the size of the forged part is less than that of the block used then the accuracy of this method is slightly degraded.

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BLIND NAVIGATION USING ULTRASONIC SENSORS

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ABSTRACT

This paper presents an electronic navigation system for visually impaired and blind people. Currently, most blind people use a traditional cane as a tool for directing them when they move from one place to another. Visually impairment is a factor that greatly reduces the mobility of people. Currently the most widespread and used mean by the visually impaired people are the white stick, however it has limitation. With the latest technology, it is possible to extend the support give to people with visual impairment during their mobility. This system can understands obstacles around the subject up to 300 cm in front, left and right direction using a network of ultrasonic sensors. It detects obstacles like potholes of the ground. It effectively calculates distance of the detected object from the subject and prepares navigation path accordingly and helps to avoiding obstacles. It uses speech feedback to aware the subject or person about the detected obstacle and its distance. This proposed system uses AT mega microcontroller based embedded system to process real time data collected using ultrasonic sensor network. Based on direction and distance of detected obstacle, relevant pre-recorded speech message stored in APR33A3 flash memory is invoked. Such speech messages are conveyed to the subject using earphone.

Keywords

Obstacle detection and Voice Alert by using Atmel microcontroller and ultrasonic sensors.

1. INTRODUCTION

According to survey conducted in 2011 by World Health Organization on disability, there are 285 million visually impaired and 45 million blind people worldwide . Ageing populations and lifestyle changes means that chronic blinding conditions such as diabetic retinopathy are projected to rise exponentially. Without effective, major intervention, the number of blind people worldwide has been projected to increase to 76 million by 2020 if current trends continue. There are many traditional and advanced navigational aids are available for visually impaired and blind people. Usage of all these travel aids for detecting obstacles for smooth navigation requires a good training. No one needs to be convinced that we are living in a revolutionary time. This is the age of technology. The power and capacity of computers doubles every eighteen months. For blind travelers this means that there are new tools, improved tools, and new hope coming in waves year after year, like never before in history.

Presently several electronic travel aids (ETA) are available for

visually impaired and blind people. These aids are designed using recent technological developments in automation. Some of these aids are sonic pathfinder ,Mowat-Sensor , Guide-Cane, Sonic Guide , NavBelt , VOICE , NAVI , SVETA ,CASBLIP and Electronic travel aid [2]. All these systems are either sensor (non-vision) based or vision based. In sensor based systems like sonic pathfinder, Mowat-Sensor, Guide-Cane, Sonic-Guide, NavBelt, ultrasonic or laser devices are used. In such a system, the device receives reflected waves, and produces either an audio (buzzer beep) or vibration in response to detected obstacles. Recent navigation systems use digital video cameras as vision sensor along with other multiple sensors. These systems are quite bulky and involves physical interface with the subject. In recent systems like VOICE, NAVI, SVETA and CASBLIP, images are captured using single or stereo video cameras mounted on a wearable system. Captured images are re-sized, processed further and converted to speech, audio beeps, musical sound or vibrations. In such systems frequency of sound shares some relationship with the orientation of pixels. Some advanced systems use Global Positioning System (GPS) integration with the main system. GPS receiver is useful for understanding the current location of the subject and nearby landmarks.

Although many advanced electronic navigation aids are available these days for visually impaired and blind people, very few of them are in use. Therefore user acceptability assessment of such systems is very important. The most influencing parameters in this regard are size, portability, reliability, useful functionalities, simple user interface, training time, system robustness and affordability in terms of cost. The scope of this paper is to develop a low-cost system capable of assisting the blind and visually impaired without the help of sighted person. Considering all these user expectations and requirements, reliable navigation system is proposed in this paper for visually impaired and blind people.

For future development [2], and as it is difficult to know where the blind is globally, it is then desirable to use the global positioning system (GPS) in order to get the user position information .

In Future Such implementation[8] can be done by improving

Certain system parameters of the system which are following:

- 1) We can add different system to alert person about blind person.
- 2) Detection of Multiple Objects

2. DESIGN METHODOLOGY

2. In order to achieve the goal of this project the work has been categorized as follows
3. Proposed system
4. Obstacle Detection

5. Distance Measurement
6. Basic working of the system
7. Flowchart

2.1 Proposed system

We propose a complete system to aid the blind in navigation which uses more efficiently the surrounding environment via several types of sensory elements. The system works under condition of low noise surroundings. The system also works under static as well as dynamic obstacles.

Portability, low cost, and above all simplicity of controls are most important factors which govern the practicality and user acceptance of such devices. The electronic travel aid (ETA) is a kind of portable device. Hence it should be a small-sized and lightweight device to be proper for portability. The blind is not able to see the display panel, control buttons, or labels. Hence the device should be easy to control: No complex control buttons, switches and display panel should be present. Moreover, the ETA device should be low-price to be used by more blind persons. Our system is developed for portable (small size and lightweight), in expensive and easy to use, and low-power consumption (supplied by battery). It consists of a microcontroller as processor, ultrasonic sensor to detect obstacle, guiding cane, voice module having pre-recorded speech messages

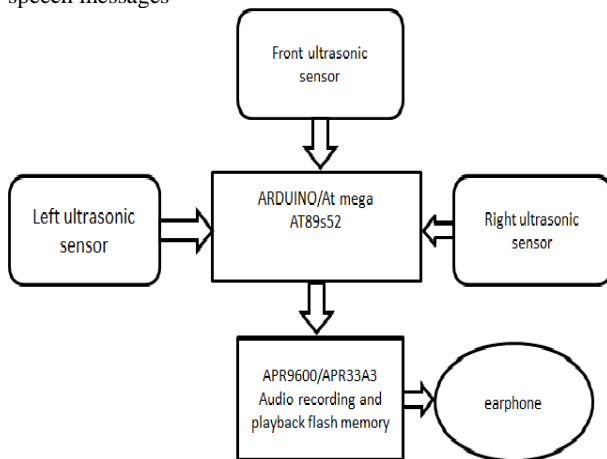


Fig 1: Block diagram of obstacle detection system

2.2 Obstacle detection

Ultrasonic sensors are used for obstacle detection and calculation of its adaptive distance from the visually impaired person. Ultrasonic sensors are used in pair as transceivers. One device which emits sound waves is called as transmitter and other who receives echo is known as receiver. These sensors work on a principle similar to radar or sonar which detects the object with the help of echoes from sound waves. An algorithm is implemented in C-language on AT89S52 microcontroller. The time interval between sending the signal and receiving the echo is calculated to determine the distance to an object. As ambient light conditions do not affect ultrasonic sensors, object detection and distance calculation can be performed accurately.

2.3 Distance measurement

The known relationship between distance, time and speed is used here (distance is the product of speed and time). Distance calculated is twice the actual distance because it includes

returning time also. Hence, only half of the distance is considered. Using equation 1 the distance is calculated.

$$D = [(EPWHT) * (SV) / 2]$$

Where D = Distance in cm and

EPWHT = Echo pulse width high time

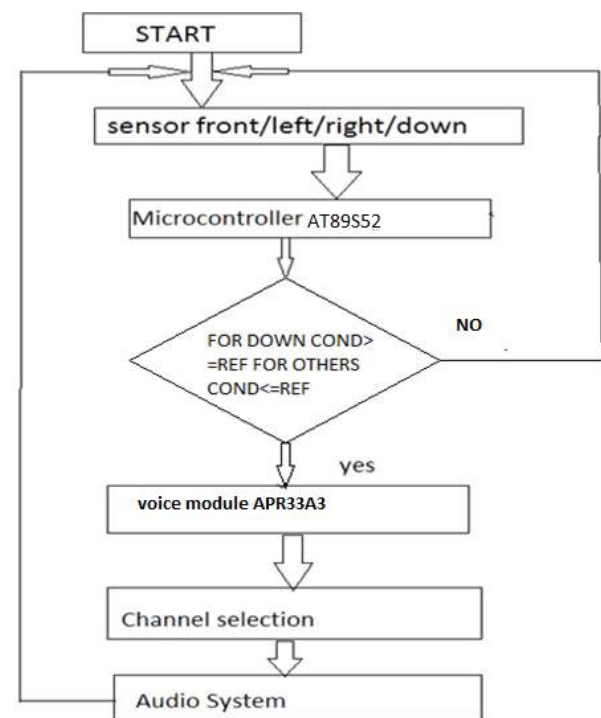
SV = Sound velocity in cm

2.4 Basic working of the system

Initially the two ultrasonic sensors will always sends the trigger pulses while the person is walking. The ultrasonic sensor connected in the front position is connected to the AT89S52 as an external interrupt. If any obstacle is detected, the AT89S52 detects an interrupt and executes the Interrupt Service Routine which operates the voice playback.

The ultrasonic module using for distance measurement is always analyses the distance from the object near by the person from back position which is in a range of ultrasonic sensor. If the distance is very less and object is too closer, immediately a voice playback will be out through the earphone

2.5 Flowchart



All sensors continue to check the obstacles which are attach to the microcontroller in their respective direction. If the detected object is below certain reference value than microcontroller At89S52 will send signal to module to select particular channel which Contain the particular audio signal and it is given to the audio system thus guide person.

8. CONCLUSION

The system proposed the design and architecture of a new concept of Smart Electronic Guiding Stick for blind people. The advantage of the system lies in the fact that it can prove to be very low cost solution to millions of blind person worldwide. The proposed combination of various working

units makes a real-time system that monitors position of the user and provides dual feedback making navigation more safe and secure.

The main objective of this project is to assist blind or visually impaired people to safely move among obstacles and other hazards faced by them in daily life. To investigate the performance of the whole strategy, several trials have been conducted on the multi-sensor structure for different materials. The assistance device in this work will measure the distance of the obstacle from the user and different types of materials are distinguished based on light intensity phenomenon for indoor environment. In the distant future it can be extended to a system to suit outdoor environments.

9. FUTURE SCOPE

This system can be used to navigate by everyone not only visually impaired under certain circumstances, like foggy mornings with low visibility. Some winter mornings are foggy where the visibility is very low, then this system can be used.

This system can also be used by patients suffering with various eye ailments like cataract, xerophthalmia, post eye operative situations and others. Hence this device has a good future scope.

By improvising it depending on our requirement like effective sensors and controllers example PIC, ARM, we can use it for various purposes as mentioned above.

In Future such implementation can be done by improving certain system parameters of the system which are following:

Recognition of colors

Detection of Multiple Objects

5. ACKNOWLEDGMENTS

It is indeed a matter of great pleasure and privilege to be able to present this paper on Blind navigation using ultrasonic sensors under the valuable guidance of Prof. KARISHMA RAUT, Professor of department (EXTC ENGINEERING).

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Fuzzy Diagnosis of Biomedical Images

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ABSTRACT

Brain tumor is uncontrolled growth of cells in Human Brain. These cells prove to be fatal when turned into tumor. The goal of this paper is to classify and detect the tumor from Magnetic Resonant Images (MRI) of Brain. Also, the paper aims at calculating the area as well as volume of the tumor. Here we first do the segmentation of Brain MR Images by Fuzzy C-Means (FCM) technique followed by feature extraction and then classifying the Tumor by using Adaptive Neural Fuzzy inference System (ANFIS) classifier.

Keywords

Computer Tomography (CT) scan, Magnetic Resonant Imaging (MRI), Adaptive Neural Network Fuzzy inference System (ANFIS)

1. INTRODUCTION

Brain tumors are the most complicated cancer diseases recognized globally. Brain tumors can be of two types: Primary brain tumors and Secondary brain tumors. A primary brain tumor originates from brain and remains confined to brain only whereas Secondary brain tumors are caused due to tumors from other body organs. The common type of brain tumor found in children is glioblastoma which is caused due to glial cells of brain. Astrocytoma is common type of brain tumor in adults. Astrocytoma is due to astral shaped (Star) cells in the human brain.

There are various treatments available for treating these cancerous cells which includes chemotherapy, surgery and radiotherapy. Early determination of tumor type is an important factor which can be done by advanced medical imaging techniques that include MRI and CT scan followed by Biopsy. Biopsy, however, is still not applicable for many patients with brain cancer and hence can be life threatening. Manual classification of brain tumor is challenging task. Moreover, it can lead to various errors such as inter-observer variability and human error. Automatic classification technique is therefore desirable.

The main objective of this paper is to detect the Tumor in its early stage and classify it. The volume and area of the tumor can also be calculated which will prove to be beneficial in the field of medical science.

The segmentation technique used here is Fuzzy C-Means. The feature extraction of Image is done followed by classification of Image by ANFIS classifier. The output of ANFIS classifier is then used for calculating area and volume of tumor. [1]

2. LITERATURE SURVEY

Image Segmentation plays a crucial role in detecting and classifying tumor. There are various methods through which we can detect tumor. Till date, many researches have been proposed by researchers for MR Brain Images Segmentation techniques. Few researches are described below:

2.1 Clustering and Spatial Segmentation:

It is combined form of spatial clustering, which combines histogram techniques. Clustering is a classification of objects into different groups, partitioning of data sets into clusters. Density function is set and then next cluster center is selected as greatest potential value. this process is repeated to generate clusters until maximum potential value in the current iteration. Drawbacks- This is slow process. Time required to move from one cluster to another cluster is more. [2]

2.2 Split and Merge method:

Basically it splits segments into quarters and the merge method joints the segments of quarters. The image is first distributed into parts by quarters and then each part is segmented and deflection of waves are identified on basis of segmented parts. Then the quarters are joined again by merge method to find the actual tumor in image by negatives. Initially take the image as a whole to be the area of interest. Look at the area of interest and decide if all pixels contained in the region satisfy some similarity constraint.

If true, then the area of interest corresponds to a region in the image. If false, split the area of interest (usually into four equal sub-areas) and consider each of the sub-areas as the area of interest in turn.

Drawbacks- This is not accurate procedure and gives errors at times. [3]

2.3 Region Growing:

The main goal of segmentation is to partition an image into regions. Region growing is a technique in which a particular region of image is extracted on predefined criteria. Region-based segmentation is a technique for determining the region directly. The basic formulation is:

$$(a) \bigcup_{i=1}^n R_i = R.$$

The first step in region growing is to select a set of seed points. The initial region begins as the exact location of these seeds.

The regions are then grown from these seed points to adjacent points depending on a region membership criterion. The criterion could be, for example, pixel intensity, gray scale texture, or color.

Drawbacks- Computationally expensive. It is a local method with no global view of the problem. It is Sensitive to noise. Unless the image has had a threshold function applied to it, a continuous path of points related to color may exist which connects any two points in the image.[4]

2.4 Thresholding:

Thresholding procedure attempts to determine an intensity value which separates the desired classes. It is used as initial step in sequence of image processing. From a grayscale image, thresholding can be used to create binary images. Thresholding converts multilevel image into binary image. Integrated thresholding based tumor detection are uses watershed and histogram analysis,.

Drawbacks- No guarantees of object coherency: may have holes, extraneous pixels, etc. High time consuming output [6]

2.5 Neural based Networks:

Neural network based segmentation methods use artificial neural network computational models consisting of processing elements (called neurons) and weighed connections between them. MLP, HNM, SOM etc methods are used in these segmentation process.

The image processing chain contains different tasks: preprocessing, data reduction, segmentation, object recognition and image understanding. The neural-network applications we reviewed had various designs ranging from relatively straightforward to highly complex, modular approaches.

2.6 Hybrid methods:

It is mixture of all methods of machine algorithms.

The researches till date by various other researchers have been listed in the table.

Table 1: Literature Survey in Tabular form

Title and Author	Work Done
SURVEY: Image Segmentation Techniques by Haralick, R.M, & Shapiro, LG. [2]	Clustering and spatial segmentation can be combined to form spatial clustering, which combine histogram techniques with spatial linkage techniques for better results.
Machine Vision by Jain R. et al [3]	The split method splits each segment into quarters. The merge method joins adjacent segments of the same object.
Image Processing Analysis, and machine vision by Sonka m. Hlavac V., & Boyle,R.[4]	Region growing connects the neighbouring points to make a large region.

A short overview of MRI artifacts by L.J. Erasmus, D. Hurter, M.Naude, H.G.Kritzinger and S.Acho [5]	Techniques of Image segmentation
Adaptive Image Segmentation based on fast thresholding & Image merging by Y. Zhang, H. Qu.Y.Wang [6]	A thresholding procedure attempts to determine an intensity value which separates the desired classes.
Skull Striping based on Region growing for Magnetic Resonance Brain Images by Park, Jong Geun and Chulhee Lee [7]	Region growing is a technique in which a particular region of image is extracted on predefined criteria.
Image processing with neural Networks-a review by M.Egmant-Peterson, D. de Ridder & H. Handels [8]	Neural network based segmentation methods use artificial neural network computational models consisting of processing elements (called neurons) and weighed connections between them.
An Overview of Image and Video Segmentation by Zhang. Y.J [9]	Fuzzy logic is a set of mathematical principles for knowledge representation.
Foundations of Neural networks, Fuzzy Systems and knowledge Engineering by Nikola K. Kasalov [10]	Hybrid system is a mixture of different methods of machine learning algorithms.

After comparing all these methods, it was concluded that RGB Thresholding is the best method of all which not only detects the tumor but also finds its area and thickness with ease and simplicity.

3. METHODOLOGY

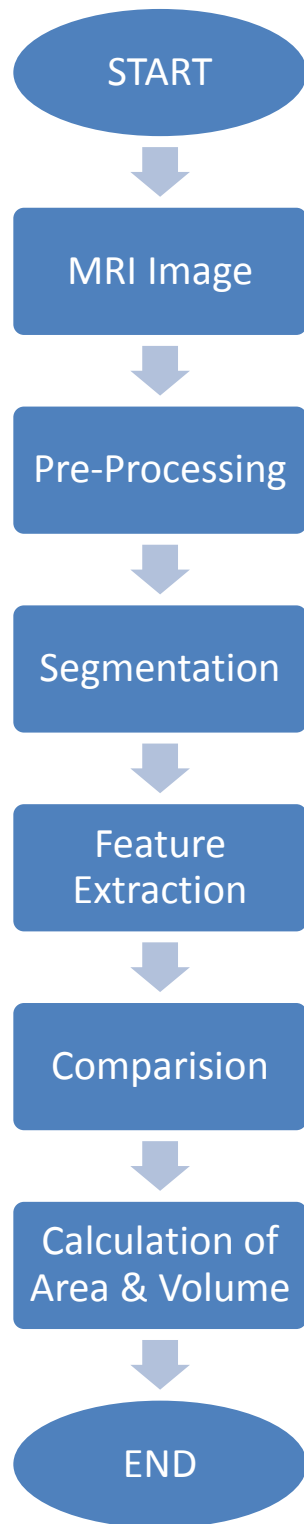


Fig 1: Flowchart of the Project

4.1: MRI Image:

Magnetic Resonant Images are taken as input and processing is done. MRI of brain is generally preferred over Computer

Tomography (CT) Scan as it does not involve any ionization radiation making MRI comparatively safer for children and other patients. Moreover, MRI has greater availability of soft tissue contrast and it depicts anatomy in greater details. MRI Images are more sensitive and specific for abnormalities brain. Due to all the advantages of MRI over CT Scan, these images are preferred mostly.

4.2: Pre-Processing:

This is the stage in which the input image of brain is enhanced to make every possible small detail noticeable. It also helps to reduce irrelevant information present in image such as noise. The contrast level of the image can also be improved in order to increase the quality of image.

The Pre-Processing of image involves three steps:

4.2.1: Image Thresholding:

Image thresholding is a segmentation process of combining or grouping pixels having same properties. A particular value is assigned to an entire image known as threshold value. According to this value, the image is divided into parts. Thresholding is the simple but powerful method in segmentation process. [13]

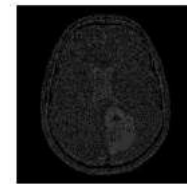


Fig: 4.2.1: Original Image



Fig 4.2.2: Image after Thresholding

4.2.2: Histogram Equalization:

Histogram Equalization is a graph representing grey level frequencies of image. The Histogram Equalization technique spreads out intensity values over the entire range of image thus, enhancing the contrast of image. [14]

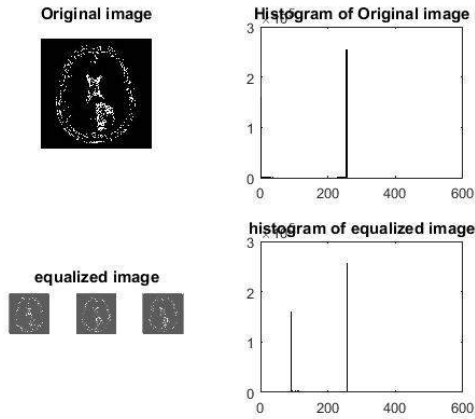


Fig 4.2.3: Histogram of Image

4.2.3: Morphological Operations:

These operations are used as preprocessing tools to sharpen the regions and fill the gaps of the image obtained. There are in all four basic morphological operations namely Erosio, Dilation, Opening and Closing. In this proposed paper, only Dilation and Erosion are used. In Erosion, every pixel touching the background is converted into background making image smaller. Erosion can be mathematically expressed as:

$$(A \ominus B)(x) = \{x \in X, x = a + b : a \in A, b \in B\} \quad [14]$$

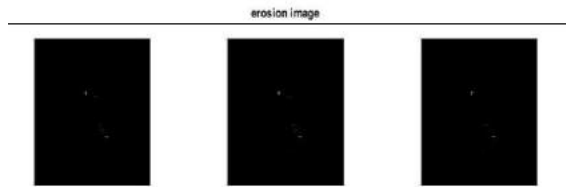


Fig 4.2.4: Image of Erosion

In Dilation, the pixel of background touching the object is converted into object thus making the object bigger. Mathematically, Dilation can be described as:

$$(A \oplus B)(x) = \{x \in X, x = a + b : a \in A, b \in B\} \quad [14]$$

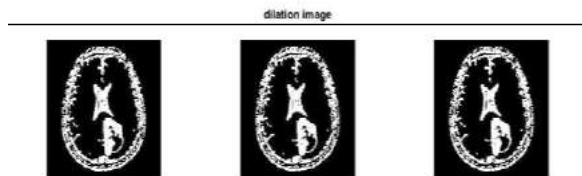


Fig 4.2.5: Image of Dilation

4.3: Segmentation:

Various segmentation techniques are available. Some of them are region growing, region splitting, region merging, split & merge, K-Means clustering, Ant Colony Optimization, Fuzzy C-Means, etc. Out of all these methods, RGB threshold is used for segmentation in this paper. In this technique the image is split into three planes that is red, green and blue; one

of the colour is taken as reference and a threshold is set. In this paper we have consider the blueness of the image. The entire image which is divided into three planes is subtracted from the blueness of the one plane. Thus, we obtain a segmented image.

4.3.1: ANFIS Classifier:

ANFIS Classifier is a kind of artificial network which integrates two techniques- Neural Network and Fuzzy Logic. The ANFIS learns features in the data set and adjusts the system parameters according to a given error criterion. Neural networks have the ability to learn from the input data and feedback network whereas Fuzzy based rules are easy to understand and implement. Both these qualities together combine to form Adaptive Neural and Fuzzy Inference System (ANFIS). [12]

The Fuzzy if/then rules framed for MR brain tumour classification are as follows:

- If A=contrast=1, B=Correlation=1, C=Energy=1, D=Entropy=1, E=IDM=1, F=variance=1 then output=1.
- If A=contrast=2, B=Correlation=2, C=Energy=2, D=Entropy=2, E=IDM=2, F=variance=2 then output=2.
- If A=contrast=3, B=Correlation=3, C=Energy=3, D=Entropy=3, E=IDM=3, F=variance=3 then output=3.
- If A=contrast=4, B=Correlation=4, C=Energy=4, D=Entropy=4, E=IDM=4, F=variance=4 then output=4.
- If A=contrast=5, B=Correlation=5, C=Energy=5, D=Entropy=5, E=IDM=5, F=variance=5 then output=5.
- If A=contrast=6, B=Correlation=6, C=Energy=6, D=Entropy=6, E=IDM=6, F=variance=6 then output=6.
- If A=contrast=7, B=Correlation=7, C=Energy=7, D=Entropy=7, E=IDM=7, F=variance=7 then output=7.

4.4: Feature Extraction:

In feature extraction, the segmented center vectors are grouped together to form a cluster. The image is then segmented to make the bright pixels brighter and dark pixels darker. The purpose of feature extraction is to reduce the original data set by measuring certain properties that distinguishes one input pattern from another input pattern. The features that can be calculated are given below with their mathematical formulae. [15]

- Contrast = $\sum_{i,j} |i - j|^2 p(i, j)$
- ASM = $\sum_{i,j} p^2(i, j)$
- HOM = $\sum_{i,j} \frac{p(i, j)}{1 + |i - j|}$
- IDM = $\sum_i \sum_j \frac{1}{1 + (i - j)^2} p(i, j)$
- E = $\sum_{i,j} p(i, j)^2$

- $EN = \sum_{b=0}^{L-1} p(i, j) \log_2 \{p(i, j)\}$
- $VAR = \sum_i \sum_j p(i, j) p(i, j) - \mu^2$

After this step, the output image is further given for area and volume calculation.

4.5: Comparison:

The input image is then compared with the image from the data base to detect and classify the type of tumor.

4.6: Area and Volume Calculation:

This is the last part of the paper in which area calculation is done. The following steps must be followed for area calculation:

- Step 1] Consider a segmented Image. Convert the rgb image into grayscale image.
- Step 2] Calculate the number of rows and columns. Let Rows=R and Columns =C.
- Step 3] Initialize a variable a
- Step 4] for i=1:1:R
for j=1:C
if a(i,j)==255
do
a=a+0
else
a=a+1
end
Display the Output [15]

4. CONCLUSION

This paper includes classification of Brain MR Image using ANFIS classifier along with area and volume calculation which helps to reduce observational errors caused by Humans thus increasing level of accuracy.

5. FUTURE SCOPE

The ANFIS architecture can be enhanced to achieve high classification accuracy and measure thickness of the tumor. More advanced hybrid ANFIS Classifiers can be developed to provide 100% accuracy in detection and classification.

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WIRELESS PICK AND PLACE LIBRARY MANAGEMENT ROBOT

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system.

ABSTRACT

A Library Management robot is a tool to help any libraries which are still using the old way to manage their library. The old way like searching for a book using manual work is hassle, fast report generation is not possible, information about issue/return of the books are not properly maintained, no central database can be created as information is not available in database. But by using this, user can overcome all the problems mentioned above. This system can manage all the happenings of the library..

Keywords

Line Follower, Book, Robotic Arm, Microcontroller, Robot

1. INTRODUCTION

A library is a collection of information resources; it provide invaluable service to its members, to a wider local community. Typically we need a librarian to pick the book and handover it to the person to whom the books are being issued. This might be an easy task in case the library floor area is small. Also, to search for the books by humans take a lot of time as many a times the books gets overlooked the human eye. To overcome this problem we introduce automation in library to fast diction of books and for picking we suggest a robot with an arm with some degrees of freedom which will be able to find out the book with the required tag and then pick it and place it on the table.

2. FEATURES

- **Line follower robot:** The Line follower robot is a mobile machine that can detect and follow the line drawn on the floor. Sensing a line and maneuvering the robot to stay on course, while constantly correcting wrong moves using feedback mechanism forms a simple yet effective closed loop

- **PC control:** Here we are using PC to select required book using database and give command to robot to pick that

particular book. The command to the robot is wireless. We have to give command only once from pc then further procedure will be automated.

- **Wireless - CC2500:** This wireless module is used to make communication between the robot and PC wirelessly. It is half duplex module hence only pc or robot can send and receive data at the time.

- **Pick books from different pre-defined location and place it on common (pre-defined) location:** The above work is done by the automated and preprogrammed robotic arm for picking and placing and to bring that book at predefined position is done by the line follower mechanism.

- **Single (active) RFID Tx - for book identity:** Here we are using RFID(Active) transmitter and receiver for book identification. This circuit utilizes the RF module (Tx/Rx) for making a wireless remote, which could be used to drive an output from a distant place. RF module, as the name suggests, uses radio frequency to send signals. These signals are transmitted(book side) at a particular frequency and a baud rate. A receiver(robot side) can receive these signals only if it is configured for that frequency. This radio frequency (RF) transmission system employs Amplitude Shift Keying (ASK) with transmitter/receiver (Tx/Rx) pair operating at 434 MHz.

- **Database on PC side – VB:** For the selection of book from the pc side is possible only if there is some data is stored related to the books. For that we are using Virtual base database.

- **8051 Controller and DC motor:** The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. And this

is the brain of the robot. It process the data transmitting from the pc side and send commands to the robot.

3. METHEDOLOGY

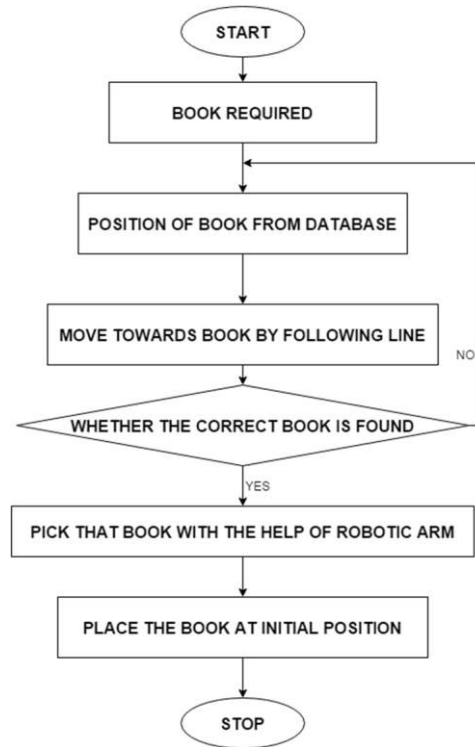


Fig. 1: General Flow of Working

The base houses the entire arm with development board and RFID decoder. A motor will be fitted under the base which can be made to move forward/reverse to take this mechanism to all the books in the rack.

Here we will be placing the books in a rack and all the books will be tagged by RFID encoder. The robot will perform a brute force method search and incase the book is found, the robotic arm will lower until the IR obstacle sensor placed over the arm detects the book and then the gripper will close the jaws to get an hold of the book.

Gripper mechanism is used to hold the components to be picked. The gripper will be designed in such a manner that the books which it picks should not fall down. And then the robotic arm is lifted after which the robot moves in the reverse direction to the place it started from and places the book.

Suppose someone wants to select particular book then we have to give specific number which we have tagged on the book .Then it will be transmit from user to robot via transmitter and receiver module of serial communication. Once the microcontroller got that number then robot start following the line. At that same time controller start the RFID

module and start the obstacle (book) detection. Image identification and verification is done using active RFID encoder decoder. The position of the book is stored on the server. If the book is detected then it will proceed for the verification. If detected book is not required one then robot starts line following. And if the detected book is right one then controller starts the arm part. Arm will pick that book. After picking the book from the rack robot will come back to the initial position which we have given and place the book.

4. BLOCK DIAGRAM

4.1 ROBOT SIDE

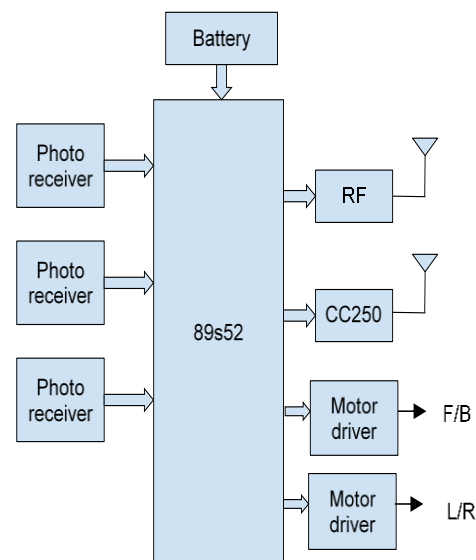


Fig. 2: Block Diagram of Robot Side

4.1.1 Microcontroller (AT89S52):

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the

AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

4.1.2 Day Light Sensor:

L14G2 is an NPN phototransistor. It acts as a photo detector in the sense that it can convert the incident light into electric response. They are commonly used as sensors usually paired with a light source like LED.

These are the bipolar transistors having a transparent case. This transparent case exposes the base collector region of transistor to external light. When light incidents on this junction, electrons are generated by the photons. These electrons are injected in the base of phototransistor. The current gain of the transistor amplifies the resulting photocurrent at the base collector junction. Thus a phototransistor conducts in the presence of light and remains in off mode in absence of light. The maximum dark current is 100nA; while in light its current is 500µA.

A phototransistor is different from a simple transistor in the way that in the latter, voltage applied to the base is replaced by light striking it. Simply put, a phototransistor amplifies variations in the light striking it.

Phototransistors may or may not have a base terminal. If a base terminal is available, it is used to bias its light response.

Photodiodes can also be used for similar function as phototransistors, but they have much lower gain and thus lower photocurrent. Phototransistors cannot detect low intensities of light but are more responsive to the exposed light. Also, the transistor response lasts for a longer period as compared to a photodiode.

The required light source is a gallium arsenide LED with peak wavelength is 940 nm. The emitter lead is indicated by a protruding edge in the transistor case. The base is nearest to the emitter. The collector is at the other extreme side of the casing.

4.1.3 Motor Driver:

Since motors require more current than the microcontroller pin can typically generate, you need some type of a switch (Transistors, MOSFET, Relay etc.) which can accept a small current, amplify it and generate a larger current, which further drives a motor. This entire process is done by what is known as a motor driver.

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-

pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC, Dual H-bridge Motor Driver integrated circuit (IC). The L293D can drive small and quiet big motors as well.

4.1.4 DC motor:

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

4.1.5 Robotic Arm:

Today, mobile robots are often deployed in critical situations that are simply too dangerous for humans to handle as part of industrial operations, law enforcement or anti-terror measures, e.g. to identify a suspicious object or disarm a bomb. Owing to the extreme circumstances, these manipulator vehicles have to meet particular requirements. Exact maneuvering and precision handling of tools are two essential prerequisites. Of course, the device also has to be kept as small as possible in order to allow access through narrow passageways. Naturally, the drives used for such robots have to be equally impressive. Special high-performance micro motors have become an essential component.

We were able to perform a detailed study of the robotic arm and the micro-controller. We tested the built robotic arm, and the servo motors & dc motors when the robot is loaded. We also learnt and familiarized with the microcontroller using assembly language, and converting the assembly language codes to hexadecimal codes using a development board.

4.2 BOOK SIDE

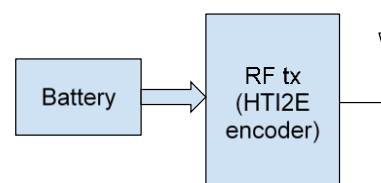


Fig. 3: Block Diagram of Book Side

4.2.1 RF Transmitter Receiver:

This small sized RF module set can be used in robots and home automation applications. The RF Rx-Tx pair allows wireless control of robots at a range of more than 200 meters.

The external antenna for Receiver and Transmitter are not included. There are holes on both the modules, where an external antenna can be connected. It is possible to send and receive some data without antennae, but this limits the range. Putting an antenna on either the RX or/and TX will further extend the range. The tiny copper wire (spiral) on the unit is an inductor, not an antenna.

4.3 PC SIDE

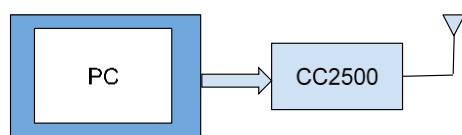


Fig. 4: Block Diagram of PC Side

4.3.1 CC2500:

CC2500 is a FSK /MSK Transceiver module. It provide extensive hardware support for packet handling, data buffering, burst transmissions, clear channel assessment, link quality indication and wake on radio . It's data stream can be Manchester coded by the modulator and decoded by the demodulator. It has a high performance and easily to design your product. It can be used in 2400-2483.5MHz ISM/SRD band systems, Consumer Electronics, Wireless game controllers, Wireless audio wireless vKB/Mouse and others wireless systems.

The Module's frequency, Output power , Sensitivity could be programming and have a Digital RSSI function could be used.

4.3.2 USB to TTL:

The cable is easiest way ever to connect to your microcontroller/Raspberry Pi/WiFi router serial console port. Inside the big USB plug is a USB<->Serial conversion chip and at the end of the 36" cable are four wire - red power, black ground, white RX into USB port, and green TX out of the USB port. The power pin provides the 5V @ 500mA direct from the USB port and the RX/TX pins are 3.3V level for interfacing with the most common 3.3V logic level chipsets.

5. ADVANTAGES

1. The system excludes the use of paper work by managing all the book information electronically.

2. Admin can keep updating the system by providing the new books arrival in system and their availability thus students need not to go to library for issuing purpose.
3. The system has books well organized and systematically arranged in different categories in the system so that user can easily search and find the book.
4. Thus, it saves human efforts and resources.

6. CONCLUSION

Misplacing of the books can be identified easily. It reduces the manual work. With the proposed architecture, if constructed with at most accuracy, the robot will pick the book. If such a system is developed, it will act as a basic platform for the generation of more such devices for the book picking.

7. FUTURE SCOPE

Line following robot based materials supply system can play a vital role in the field of hospitality. Line following robot's application over electronics engineering can't be underestimated.

This can be used in driver less car system with some added features like obstacle detection.

This can also be used in industrial automated equipment carriers, Entertainment and small household applications, automated cars, Tour guides in museums and other similar applications, Second wave robotic reconnaissance operations.

8. RESULTS

The robot works according to the input command given from the pc side through cc2500 in which we have to select the book no from the database. When port no 3.0, which is Rx port of uc recieves the command it get set to logic 1 which in result starts the bot to follow the line. Sensors are connected to uc adc pins in which with the help of motor driver it follow the line. After reaching to particular book position ,with the help of rfid from robot and the book side, matching is done. After matching the frequency robotic arm is activated as a result it pick up the book and bring it to the final destination.

9. ACKNOWLEDGMENTS

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AUTOMATIVE FLOOR CLEANING ROBOT USING MICROCONTROLLER 8051

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ABSTRACT

In Manual work is taken over the robot technology and many of the related robot appliances are being used extensively also. Here represents the technology that proposed the working of robot for Floor cleaning. This floor cleaner robot can work in any of two modes i.e. "Automatic and Manual". All hardware and software operations are controlled by AT89S52 microcontroller. This robot can perform sweeping and mopping task. RF modules have been used for wireless communication between remote (manual mode) and robot and having range 50m. This robot is incorporated with IR sensor for obstacle detection and automatic water sprayer pump. Four motors are used, two for cleaning, one for water pump and one for wheels. Dual relay circuit used to drive the motors one for water pump and another for cleaner. In previous work, there was no automatic water sprayer used and works only in automatic mode. In the automatic mode robot control all the operations itself and change the lane in case of hurdle detection and moves back. In the manual mode, the keypad is used to perform the expected task and to operate robot. In manual mode, RF module has been used to transmit and receive the information between remote and robot. The whole circuitry is connected with 12V battery.

Keywords

Microcontroller, KEYPAD, RF MODULE, IR SENSOR

1. INTRODUCTION

Robots are rapidly moving from the pages of science fiction novels to everyday life. These robots are convenient, user-friendly and much importantly application based robots. Project is on a domestic robot named as the 'AUTOMATIVE FLOOR CLEANING ROBOT USING MICROCONTROLLER 8051'. The idea of designing such a robot struck our mind when thought about building a robot to ease the domestic day-to-day chores. This cleaner robot is an electric home appliance, which works in two modes as per the user convenience "Automatic and manual". The robot uses a four stage cleaning system to prep, scrub, wash and dry the floors all by itself.

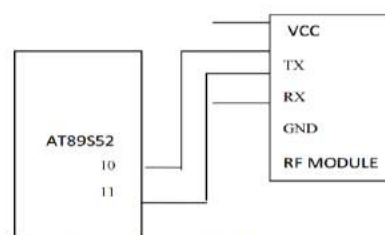


Fig 1: Shows RF and AT89S52 interfacing

2. BLOCK DIAGRAM

2.1 Transmitter section

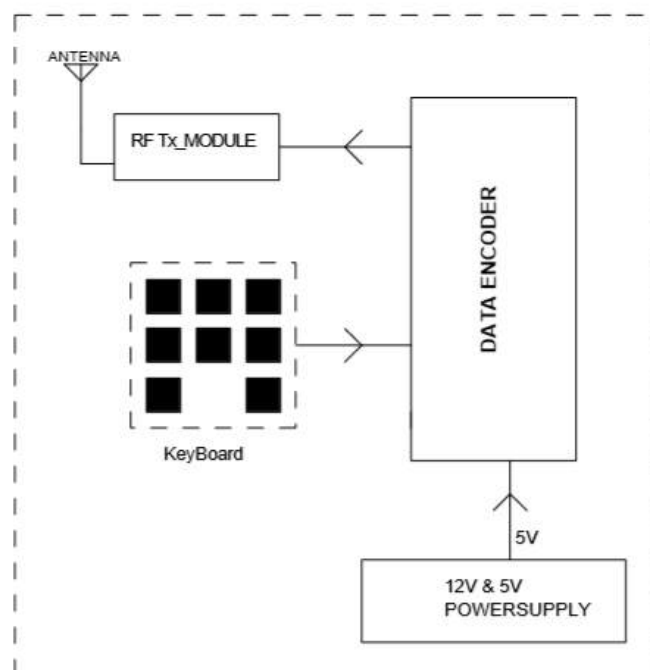


Fig 2: Control unit

2.2 Receiver Section

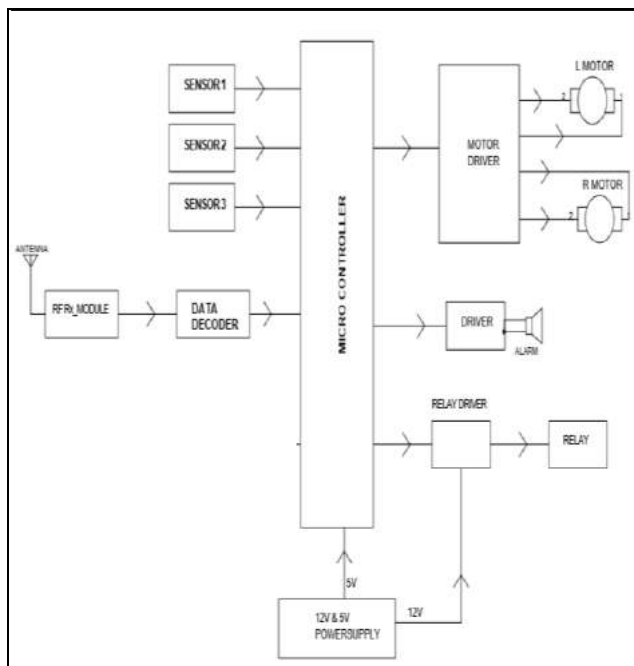


Fig 3: Receiver hardware unit

3. Working of block diagram

The diagram 'Fig 2: Control unit' and 'Fig 3: Receiver hardware unit' consists of a transmitter and receiver block. In transmitter section, the input is given through the 8-button keyboard. The output of this keyboard is further given to data encoder. The data encoder serially sends the data through transmitter antenna and then data is been received by receiver antenna. The received data is passed through data decoder and that can further pass to the Microcontroller IC 89S52. Various types of sensors can be connected to the microcontroller. Motor driver and relay driver connected to the microcontroller. To microcontroller give 5V power supply and to relay give 12V.

For automative mode robot can be work itself. For obstacle detection and to avoid hurdle IR sensors have been used. If any hurdle detected then robot change the lane automatically and give the alarm. Two supply voltages are required for circuit. A DC or AC 12 V mains adaptor is connected to bridge rectifier (D1 - 4) via CN5 connector. U1, U2 and U3 are supplied with a regulated 5 V from a 7805 (U4) fixed voltage Regulator. The unregulated voltage of approximately 12 V is required for Motor driving circuit (U3) and Two DC Motor

4. Flow chart for automatic mode :

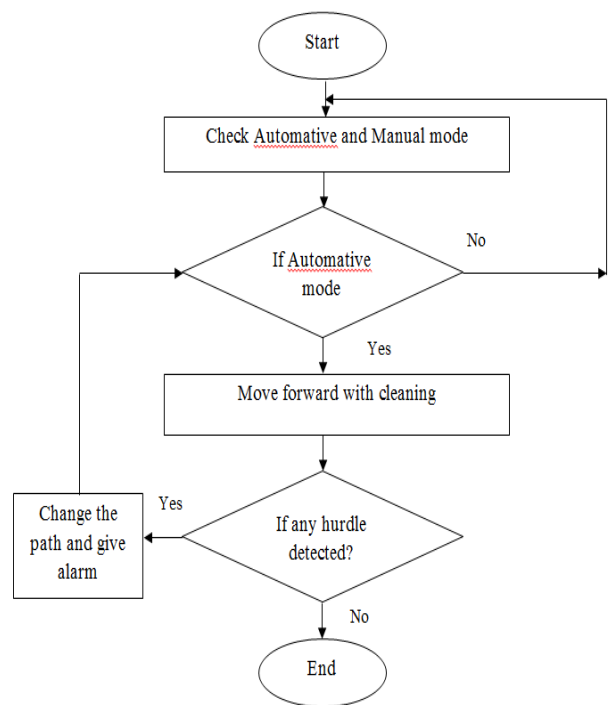


Fig 4: Flow chart

4.1 Description

Initially it will check whether it is automative mode or manual mode.

If it is in manual mode, the robot is been operated by the user. If it is in automative mode, the robot start cleaning in forward direction. Along with, it will also check if it has any hurdle it will its path and gives alarm.

5. FEATURES:

- 600mA output current capability per channel
- 1.2a peak output current (non repetitive) per channel
- Enable facility
- Over temperature protection
- Logical '0' input voltage up to 1.5v
- High noise immunity
- Internal clamp diodes

6. RESULT

Firstly, when switch on the robot, it asks for which mode, user want to select i.e. automatic or manual by the switch. When auto mode has been selected robot will start doing, cleaning operation automatically. In this, Robot will move in forward direction with water pump and cleaner on. Obstacles detection is on in auto mode. For the 10*10 Feet area it need approximately 15 minutes to clean.

When in manual mode, the robot is been operated by the user. In this mode time required will depend on user. During this mode the sensor remains in OFF state.

7. CONCLUSION

This is a robot which works on automatic and manual modes. Here it detects the obstacle and move away for it, the detection range is 1ft. RF modules have been used for wireless communication between remote (manual mode) and robot and having range 300m. If there is hurdle in its way it is indicated by buzzer. The operations such as sweeping, mopping and changing the path in case of hurdle are performed automatically. In automotive mode, the cleaning n mopping is done automatically. The main advantage of this project that there is no pushing and pulling of vacuum cleaner. It is a wireless device.

8. ACKNOWLEDGMENTS

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Multilevel Security System for Banks Using Digital Code Lock & Video Processing

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ABSTRACT

In today's modern world, security plays an important role. Every person has precious accessories like gold jewellery or cash. It is not enough to have these accessories, but security of these is very important, for this purpose we keep them in bank lockers. But it is very important task to overcome fraud authentication of the user. In this project; we are designing advance security systems for banking which will ensure the genuine access of the locker, overcoming all the misuses. For this purpose project proposes password verification and face recognition technique. The face recognition technique is effective and fast that's why this kind of techniques applied in the bank security system. For entering into the locker section, the person has to enter his password and after verification of the password person has to clear the second security level that is face recognition. Person can Access locker only and only if he clears this two security level. If the unauthorized person breaks digital code lock and try to enter in the room, that time the another authentication level that is facial recognition plays an important role to avoid the robbery. If the unauthorized person enters in the room by another way without passing from this two authentication level (like breaking wall or floor etc) and try to access the lockers, alarm starts ringing and we can prevent the frauds.

KEYWORDS:

Security systems, biometrics, digital (electronic) code locks, authentication, face recognition

1. INTRODUCTION

Ensuring high levels of security at public access facilities like airports and seaports is an extremely complex challenge. A number of technologies can be applied to various aspects of the security challenge, including screening systems for people and objects (bags, vehicles, etc.), database systems for tracking "trusted people," biometric systems to verify identity, and video surveillance systems to monitor activity. Today's video surveillance systems act as large-scale video recorders, either analog or digital. Their primary focus is the application of video compression technology to efficiently multiplex and store images from a large number of cameras onto mass storage devices (either video tapes or disks). These systems serve two key purposes: providing a human operator with images to detect and react to potential threats and recording evidence for investigative purposes. This project describes innovative way to implement Security system for banks. The idea behind developing this system is to identify the Authorized person and provides strong protection of safe operation for banks To overcome the all the difficulties and to facilitate automation in banking locker systems and to reduce problem associated with burglary in banks and also deployment of man power for taking logs and opening lockers we would like to share automated locker systems. The advancement in the technology has increase the scope of such surveillance system. So far the system needs human surveillance and power. But we present a new framework that is robust and efficient would help people by providing A Multilevel Security System.

2. METHODOLOGY:

FLOWCHART:-

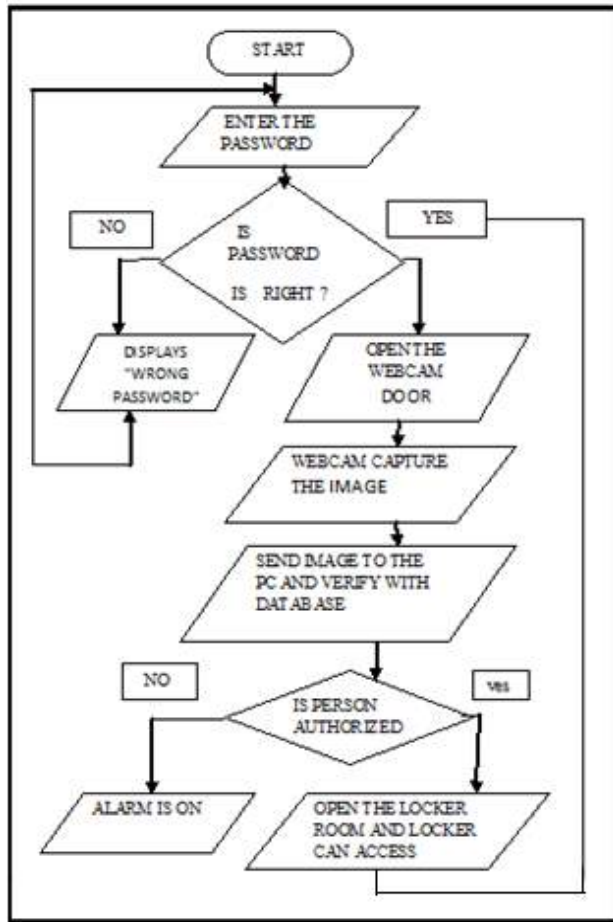


Fig.:2.1 Flow Chart

FLOWCHART EXPLANATION:-

If the person wants to enter into the locker room of the bank then, the person has to clear the Authentication levels. There are two authentication levels at the entrance of the locker room:

1. First there is keypad on the screen, so first person will enters the password.(i.e. first authentication level).
2. System check whether the enter password is right or not, if the password is right then system will on the webcam for face recognition (i.e. second authentication level). If password is wrong then it displays "wrong password".

3. Then face image of the person is capture by webcam and it's send to the system.
4. System check the image of face is matching with database images or not.
5. If the image will match then system will open the locker door and person can access the lockers.

If the image will not match then system will on the alarm and restrict the entry of person into the locker room.

3. IMPORTANCE & MOTIVATION:

3.1. Importance:

Even though there are various security systems consuming large power are available in market nowadays, robbery rate is very high. We are proposing a novel system to prevent robbery in highly secure areas with lesser power consumption, To provide the customers a efficient locker system and also To improve the present locker scenario and the security with an automated system having multiple security.

3.2. Motivation:

There is a saying that "NECESSITIES IS THE MOTHER OF ALL INVENTIONS". Which in a more advanced version would read "APPLICATION DRIVES THE TECHNOLOGY"? Going by those lines, we would like to highlight some areas of work where our project has some potential use. Our project is basically concerned with banking locker systems. It is about taking all the security These applications are possible due to some of the advantages of our work. They are as follows:

1. User friendly
2. Applications at major banks
3. Software in embedded C
4. Fully automated operation
5. Compact size, portable
6. Easy interfacing with PC
7. Cost of systems is less as compared to manual systems.

4. DESIGN OF THE SYSTEM:

BLOCK DIAGRAM:

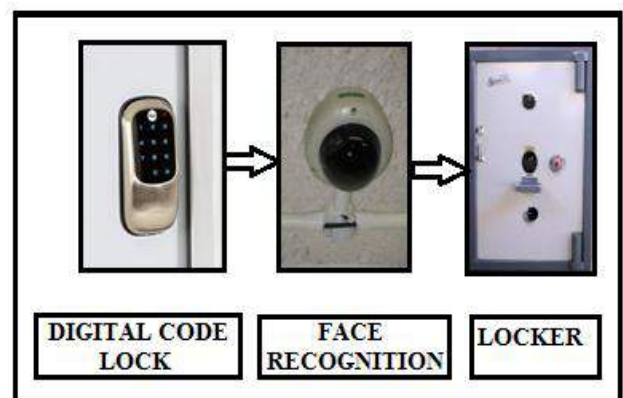


Fig.:4.1 Block Diagram

THE MAIN MODULES OF THE PROJECT ARE:-

[1] Password Verification:

A password is a secret word or string of characters that is used for authentication, to prove identity or gain access to a resource (example: an access code is a type of password). The password should be kept secret from those not allowed access. Password verification will complete only when the password entered by person matches with the password stored in the system.

[2] Face Recognition Technology:

“Facial recognition is a form of computer vision that uses faces to identify a person or verify a person’s claimed identity”. A facial recognition device is one that views an image or video of a person and compares it to one that is in the database. It does this by comparing structure, shape and proportions of the face; distance between the eyes, nose, mouth and jaw; upper outlines of the eye sockets; the sides of the mouth; location of the nose and eyes; and the area surrounding the cheek bones.

HARDWARE REQUIREMENT:

[1] Webcam:

A web cam is a device that usually connects to the computer via a USB port. A web cam takes what it sees in its lens and transmits it to the computer as an image. In this level webcam is continuously monitoring the locker area. Here we use video processing. There is one default image save in the system and camera is continuously capturing the images and compare those images with the default image if any intrusion is occur then Matlab sends high signal to the arduino input port.

[2] Keypad:

Keypad is use for entering the password.

[3] Alarm:

This level will secure the locker from unauthorized person. It takes input from digital code lock and **Matlab** (webcam) respectively. And take appropriate action according to users program.

SOFTWARE REQUIREMENT:-

Matlab: MATLAB (matrix laboratory) is a numerical computing environment and fourth generation programming language. Developed by Math Works, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, and FORTRAN. Due to complexity in other two & ease of use of Matlab, Matlab is used.

5. FEATURES:

- It is fully automatic security system.
- Frauds in banking can be reduced to great extend.
- Need of the human power in the field is reduces.
- Ensures total genuine access of the locker.
- Highly advanced microprocessor controlled locking system.
- Prevents tampering and use of incorrect codes.
- System just switched off for 10 minutes in case of 3 times consequently
Wrong code is fed in.
- Back up memory for years of secret codes in case of power failure
- Accepts numerical password in combination of cores.

6. CONCLUSION:-

After installing such type of security systems we can avoid many frauds in banking or any other authorized area. If someone (means unauthorized person) will get success in cracking the digital code lock then here one more system (face recognition) is available to protect the locker. So this is looking like completely protected security system for banks. And it will also provide the 24 hours protection to the bank locker.

7. FUTURE SCOPE:-

Additional features can be added to the proposed system such as face detection etc. which will make the system totally foolproof. This system then would not be only for Bank lockers but can used at airports, railways and private lockers. This technology will reduce the chances of burglary in the bank and also customer will save his time. There are other additions that can be added in terms of technologies:

1. Face recognition technique can be used in mobile authentication.
2. Data encryption will also prove very useful as database can be very secure with its help.
3. It can also be done by using IR-Based technology, to achieved excellent Accuracy.
4. Multi-Biometrics can be used for ultimate authentication.
5. Since the system developed is a low cost system therefore it has wide future scope.
6. For home automation also have better scope.
7. It will be very useful in military use also.
8. We can install it in our private vehicle also to prevent vehicle from theft.

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2014 Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT’14) Organized by Department Of CSE, JayaShriram Group Of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014 Copyright @ IJIRCCCE www.ijirccce.com 3563 Moving Object Detection By Background Subtraction V.AISWARYA LAKSHMI, E.ANITHA, S.SELVAKUMARI. Final year M.E, Department of Computer Science and Engineering

[8] International Journal of Innovative Research in Computer and Communication Engineering (An ISO 3297: 2007 Certified Organization) Vol. 3, Issue 3, March 2015 Copyright to IJIRCCCE 10.15680/ijirccce.2015.0303174 2291 Intelligent Surveillance and Security System Monali Chaudhari¹, Gauresh Vanjare², Dhairya Thakkar³, Malay Shah⁴, Amit Kadam⁵ Assistant Professor, Dept of EXTC, Vivekanand Education Society Institute of Technology, Chembur, Mumbai, India.1 B.E Student, Dept of EXTC, Vivekanand Education Society Institute of Technology, Chembur, Mumbai, India.2,3,4,5

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[12] Volume 2, Issue 10, October 2012 ISSN: 2277 128X International Journal of Advanced Research in Computer Science and Software Engineering Research Paper Available online at: www.ijarcsse.com “*Monitoring and Controlling of Bank Security System*” (Based on MICROCONTROLLER) S.Ramesh¹, Soundarya Hariharan² and Shruti Arora³ 1Asst Prof- Dept of EEE , 2,3Dept of ECE SRM University, NCR Campus Ghaziabad, India

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PAPER BASED MOUSE AND KEYBOARD CONTROL USING MALAB

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ABSTRACT

The sixth sense technology uses different hand gestures and colors to give various commands for the Human-Machine (Computer) Interfacing. Gestures recognition deals with the goal of interpreting human gestures via mathematical algorithm. Gestures made by users with the help of a color band or body pose, in two or three dimensions, get translated by software/image processing into predefined commands. The computer then acts according to the command. There has been a lot of work already developed in this field either by extracting hand gesture only or extracting hand with the help of color segmentation. In this Project, color detection is used for better, faster, robust, accurate and real-time applications. Red, Green, Blue colors are most efficiently detected if RGB color space is used. Using HSV color space, it can be extended to any number of colors. For hand gesture detection using color markers, the default background is captured and stored for further processing. Comparing the new captured image with background image and doing necessary extraction and filtering, hand portion can be extracted with the help of color markers. Then applying different mathematical algorithms different hand gestures can be detected. All this work is done using MATLAB software. By computing the values and different properties of color markers, the computer can be controlled with the help of virtual mouse and keyboard implemented on a paper. And then many virtual (Augmented reality) or PC based application can be used (e.g. Calculator, Paint). It does not matter whether the system is within your reach or not; but a camera that is linked with the system must have to be near-by.

1. INTRODUCTION

Computer is used by many people either at their work or home or in their spare-time. Special input and output devices have been designed over the years with the purpose of easing the communication gap between computers and humans. Keyboard and mouse are frequently used for this purpose. Each new device is seen as an attempt to increase the intelligence-level of computer and making humans able to perform more complicated communication with the computer. This has been possible due to the result oriented

efforts made by computer professionals for creating successful human computer interfaces. As the complexities of human needs have turned into many folds and continues to grow so, the need for Complex programming ability and intuitiveness are critical attributes of computer programmers to survive in a competitive environment. The computer programmers have been immensely successful in easing the communication between computers and human. With the emergence of every new product in the market; it attempts to ease the complexity of jobs performed. For instance, it has helped in facilitating tele operating, robotic use, better human control over complex work systems like cars, planes and monitoring systems. Earlier, Computer programmers were avoiding such kind of complex programs as the focus was more on speed than other modifiable features. However, a shift towards a user friendly environment has driven them to revisit the focus area. The idea is to make computers understand human interactions and develop a user friendly human computer interfaces (HCI). Making a computer understand speech, facial expressions and human gestures are some steps towards it. Gestures are a type of nonverbally exchanged information. A person can perform innumerable gestures at a time. Since human gestures are perceived through vision, it is a subject of great interest for computer vision researchers. The project aims to understand and utilize human hand gestures by creating an HCI. Coding of these hand gestures into machine language requires a complicated programming algorithm to be done using image processing in MATLAB.

Here in this project we are going to make a region of interest i.e. the desired area of operation on a paper which is a rectangular box and the corners of the rectangular box coincide with the centre of four color squares which are used to get the pixel values of the corners using the centroid algorithm. Then the webcam captures consecutive frames of the color markers on the fingers to perform particular operations related to mouse like mouse pointer movement, left click, right click, drag, drop etc.

In the same manner the virtual keyboard algorithm uses the colour marker to detect the position of the finger on a particular key, so that it can be pressed. The virtual keyboard is divided into number of blocks with different letters, the algorithm uses positioning of the color marker to select a particular alphabetic key or numeric key, and the area of the color marker to perform keystrokes.

2. LITERATURE SURVEY

In the past few years Gesture recognition technology using colour markers or any different techniques has become very popular and has found a large number of applications. Then came the technology which used a camera to capture the real world 3D images and then store it in 2D form i.e. an image, this captured images were then sent to a computer for further processing. This technique of capturing the image and then further processing it to extract image features like texture, shape, colour, size etc, was then collectively named as IMAGE PROCESSING. a color pointer has been used for the object recognition and tracking. Left and the right click events of the mouse have been achieved by detecting the number of pointers on the image. Virtual keyboard enables the user to type on any surface, including a plain paper on your desk. Some virtual keyboards give vibration as the in feedback; some are projected on the typing surface, while others give different kind of visual feedback such as showing it on a smart phone's screen.

3. DESIGN METHODOLOGY

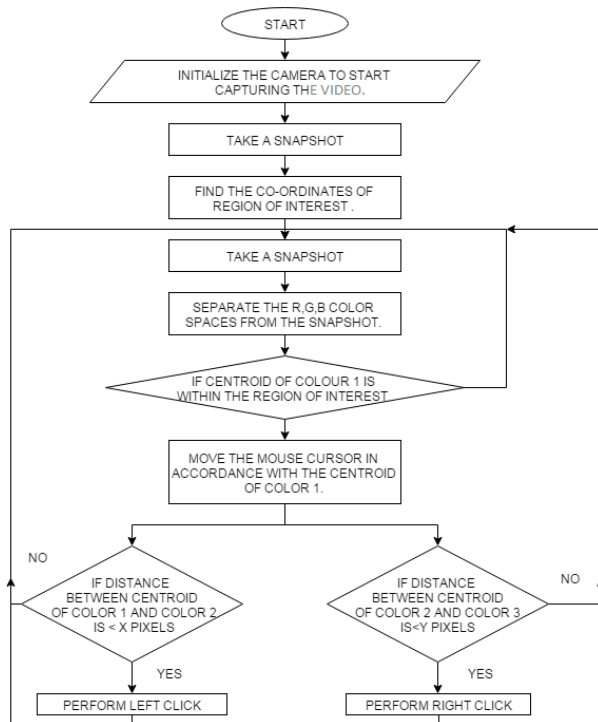


Fig 3.1 Block diagram for virtual mouse using colour markers.

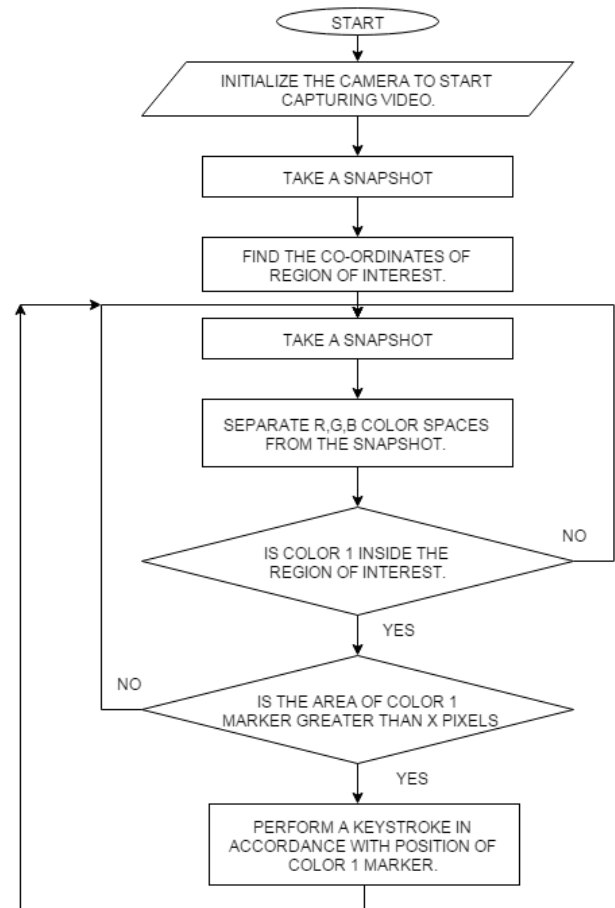


Figure 3.2 Block diagram for virtual keyboard using color markers.

3.1 Region of interest: First a snapshot is taken from the acquired video then the pixels values of the corners of the rectangular box are taken and stored with the help of centroid algorithm which defines our region of interest.

3.2 Separate RGB frames: Frames are captured continuously for processing. But we have to separate the Red, Green and Blue colour frames because we are using different colour markers.

3.3 Storing values: The number of coloured markers and their relative position in terms of pixel value is stored in variables.

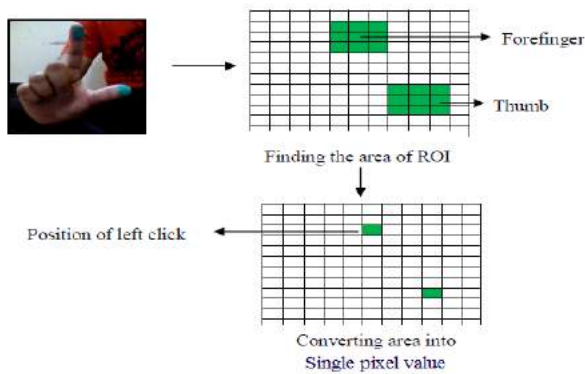


Fig 3.3: storing centroid values of desired color markers.

Then the single pixel value i.e. the mid pixel value of the colored markers are found out. This single pixel value facilitates the smooth movement of mouse pointer and performs operations equally well.

3.4 Scale conversion: The webcam used in the experiment has the resolution of 640 x 480 but the screen resolution is 1024 x 768. Therefore, there is a need of scale conversion.

3.5 Mirror value: Once Xs Ys are obtained, we flip and invert the resultant image because the webcam is placed above and in opposite direction. Basically, we first flip the acquired image upside down and then flip it left to right.

3.6 Mouse Event: The mouse event such as cursor movement, left click, right click, drag etc are performed according to the number of region of interests and their relative position in each captured frame.

3.7 Mouse Interfacing: MATLAB directly does not support mouse pointer control. Using Matlab only cursor can be moved. Set (0,"PointerLocation",[X,Y]) But using only Matlab right click and left click can not be done. For this Java is used. Java Robot class can be easily interfaced with Matlab which is used for Left Click and Right Click operation. java.awt.Robot, This class is used to generate native system input events for the purpose of test automation, self-running demos and other applications where the control of mouse and keyboard is needed. robot.mouseMove(X,Y) For mouse pointer movement where, robot is the class name and mouseMove is the function of class robot.

3.7.1 For Left Click:

```
robot.mousePress(java.awt.event.InputEvent.BUTTON1_MASK)
robot.mouseRelease(java.awt.event.InputEvent.BUTTON1_MASK)
```

3.8 Keyboard Interfacing:

Similarly java.awt.Robot class can also be used for keyboard interfacing. For pressing 'R', following commands need to be given.

```
robot.keyPress(KeyEvent.VK_R);
robot.keyRelease(KeyEvent.VK_R);
```

4. TOOLS USED

4.1 HARDWARE:

4.1.1 Webcam: We can use any camera capable of capturing images, but we use a webcam because it is compact. Its cost is also moderate. A webcam is basically a device which sees and captures the 3D background in front of it and converts it into a 2D signal which is an image. It then sends the image to the computer through wireless or wired medium.

4.1.2 Computer: A computer device that will receive the data i.e an image from the webcam and process using MATLAB software and generate control signals to carry out necessary tasks as programmed.

4.2 SOFTWARE:

4.2.1 MATLAB: MATLAB is the abbreviation for matrix laboratory. As the name suggests it computes all the data in the form of matrix. It is a very advanced level software used for computation in a number of fields. It was in the developing stages back in the 70's but was distributed in the early 80's by Mathworks. MATLAB allows matrix manipulations, plotting of functions, and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, Fortran and python.

MATLAB contains a number of toolboxes which is basically a GUI with the help of which we compute certain data to obtain the output. The toolboxes are intended to help and simply the user's work by providing him with GUI. There are a number of tool boxes in MATLAB like speech processing toolbox. Aerospace tool box, data acquisition tool box, image processing tool box and many more.

5. CONCLUSION

In this project we have developed an object tracking based virtual mouse application and implemented using a webcam. The system has been implemented in MATLAB environment using MATLAB Image Processing Toolbox. As an object a color sticker is used to make the detection easy and fast. Using the color sticker cursor movement and clicking events are performed. However, system has some disadvantages such as; being invariant to illumination up to some scale, and movement of the cursor is very sensitive to motion. Because of this reason, to control the cursor, pointer cannot be used on the air efficiently

6. FUTURE SCOPE

For the future works, instead of a color pointer directly finger tips can be detected. To detect the object salient feature different algorithm can be used. However, this type of complex algorithm might slow down the speed and the system may not be used in real time.

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Memory Efficient CCTV recording using Motion Detection in MATLAB

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ABSTRACT

A camera is used to monitor low movement areas such as home, ATM. The camera used can be of any quality. As the project aims on detecting the motion, it will start recording only after the motion is detected. This will show us the recording only when the movement has occurred; this in turn will save the time of the user and will also save the storage space. A series of algorithm is used to track the motion in the video. A pixel variant plays a very important role in detection of the motion in a video clip. The captured frames are compared with the previous frame for detection of the motion. The frames are compared on the basis of the pixels in the frame.

KEYWORDS

Motion detection, Sum of Absolute Difference, real time video, Surveillance camera, comparing frames

1. INTRODUCTION

The security industry is a multibillion dollar industry and everyone is in need of protecting their own property or assets by some means. Recently security concerns have grown tremendously, it is important for all to be able to safeguard their property from worldly harms such as thefts, destruction of property, etc. As the technology is widely growing in modern world, the methodology used by thieves and robbers have also equally improved in stealing. Therefore it is necessary for the surveillance techniques also to be improved with the changing world. The most commonly used technology nowadays is the use of surveillance cameras for monitoring the property. The cameras used for monitoring are kept ON 24*7. The recording obtained from this kind of camera is very much lengthy and big in size too. These cameras capture the recording of unwanted things also which is unwanted for the user. If there is any intruder activity then the user has to view the whole recording from first till where the intruder activity has taken place. In order to avoid this nuisance, this project is used.

2. FEATURES

- Video recording starts only after motion detected.

3. METHODOLOGY

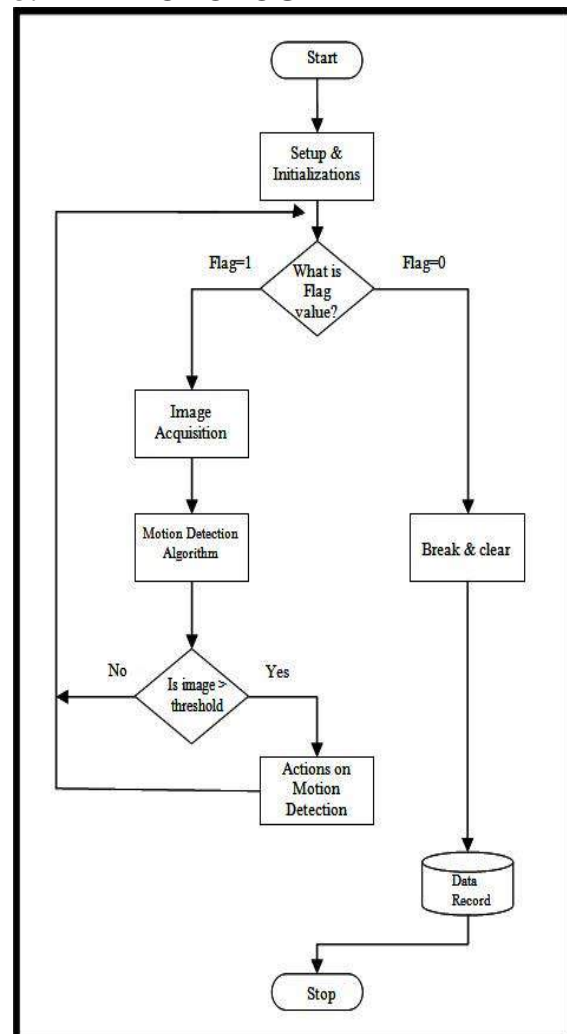


Fig 1: flowchart

It starts with the general software installation and object setup. The MATLAB software is used to capture still images from camera and process these images to detect the motion. As soon as the motion is detected by processing on this images and frames will save in storage. When program starts, it will start reading images and process it depends on one of two algorithms. Once the program is started it checks the flag button is press or not. If start button is not pressed it starts reading the images and process them. When motion is detected software will perform series of operation till flag value is 1. As soon as the flag value is zero, program will stop and necessary results are recorded.

4. BLOCK DIAGRAM

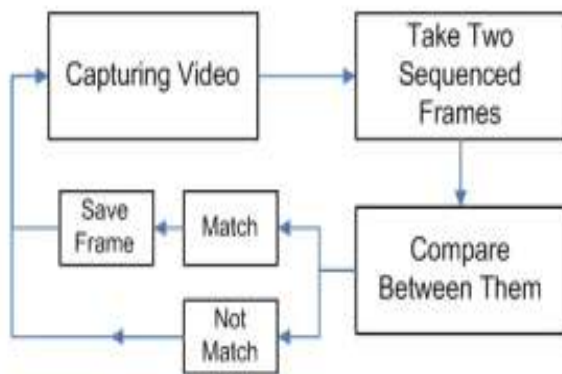


Fig 2: block Diagram

These images are saved in a place previously selected. The motion detection is done by comparing the two frames of images. If the images match, then the recent image is saved at the selected place and is further used for comparison with the other frames. If the images do not match, that means there is some movement and hence the camera starts. The system will start after pressing the start button and the connected camera will start capturing the images to record.

5. HARDWARE

5.1 Camera

A webcam is a device used to capture images. In this project, we can use any type of camera. The camera used can be a low resolution camera also. The video recorded by a low resolution camera will be of low size and low quality whereas; the video recorded by a high resolution camera will be of high size and high quality. In this project camera is used to monitor the area under observation.

6. SOFTWARE

6.1 MATLAB

For the project we chose to use MATLAB as the programming language. It is high level language that specializes in data analysis and computing mathematical problems. MATLAB's official website can be found at www.mathworks.com. The program environment has an interactive command window that allows user to test and experiment with the code line by line. User can also save their codes into an .m file and run the program. The MATLAB help navigator is also very useful. It properly categorize and provides detailed explanation and sample usages of all

function. Just like C++ and JAVA, the language syntax provides loop and condition statement for programming purposes. The language was chosen over C++ and JAVA because there are a lot of built in functions that are specific for image processing. As well, the compiler can compute large mathematical equations faster than other languages. These advantages suit the project perfectly due to the large matrix computation required during the extraction process. MATLAB can calculate matrices quicker, but the large video files take a long time for a scripting language to compile.

7. ADVANTAGES

1. Reduces the length of video recorded.
2. Shrink data storage requirements.
3. Save the time of user.
4. Any camera can be used.
5. Cost efficient.

8. CONCLUSION

This project will clearly demonstrate feasibility of a low cost motion tracking surveillance system. Using only a low end computer platform along with readily available hardware component, we will be able to implement a surveillance system with software for image processing, camera panning, and AVI recording. The system will maintain a log of all recording activity, and it will also allow security personal to access recorded videos. Furthermore, because the software is implemented on MATLAB, it remains highly flexible across a variety of platform configurations. All of these features are available at cost that can compete with other basic surveillance packages.

Though the current system accomplishes or most significant project goals, we are trying to improve and extend it in several ways. First far most, manual recording, and access to the live video stream should be implemented. This would make the system better for practical usage.

The project in its current form is in initial stage of surveillance system, but the improvements mentioned above would make the system far more marketable. These improvements are software changes and can be incorporated into the current design without problems.

9. FUTURE SCOPE

1. Since the system used is a low cost system, it has a wide future scope.
2. In future, it can be used at homes also.

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REMOTE FILE SEARCHING AND RETRIEVING USING SMS

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ABSTRACT

In the last few years, Short Message Service (SMS) has made a big impact on the way we communicate. Instead of communicating over the phone using voice, people rather prefer SMS not only for messaging but also for information exchange. This project proposes a method of building an extendable generic application which can be used to search a file on remote desktop and mail it to user. Mobile users send required information through a SMS to a mobile gateway that forwards it to the generic application. Given the user-provided information, the generic application automatically searches the file on remote machine and mails it to the user. Our project is based on the concept of searching a file on remote machine by just sending a simple SMS.

KEYWORDS

SMS, FTP, Email, File

1. INTRODUCTION

The purpose of the project is to search a file on remote machine by just sending a simple SMS and get that file mail it to user if found. The application will be kind of desktop application where it will check for new incoming SMS. The application will first check whether the mobile number through which SMS has been sent is authorized to search the file or not. If not application will send back an acknowledgement saying that user is not authorized to search the file. If the user is authorized, than application will start the file search and if the file is found it will mail it user on the emailed that is received in SMS. While sending SMS user has to send the option, file name, file path (optional) and email id. Apart from file search and emailing the file, application also support uploading, downloading the file from any FTP server provided the details of FTP server is known.

The exceptional growth of the mobile phone market has motivated the design of new forms of mobile information services. With the growth of Twitter, SMS Gup-Shup and other social messaging networks, the past few years have witnessed a growing prevalence of Short-Messaging Service(SMS) based applications and services. SMS-based services are also increasingly common in developing regions.

Despite the increasing power of mobile devices with the advent of “smart phones”, a significant fraction of mobile

devices in developing regions are still simple low-cost devices with limited processing and communication capabilities. Due to a combination of social and economic factors, voice and SMS will likely continue to remain the primary communication channels available for a non-trivial fraction of the population in developing regions.

For any SMS-based web service, efficient SMS-based search is an essential building block. SMS-based search is a rapidly growing global existing SMS-based search engines take on the order of tens of seconds to several minutes per response. Even without the 140-byte SMS size constraint, tailoring traditional web search to mobile devices is a challenging problem due to the small form factor and low bandwidth. Unlike desktop search, users on mobile devices rarely have the luxury of iteratively refining search queries or sifting through pages of results for the information they want. In this project, we address the problem of SMS-based search: how does a mobile user efficiently search the file on the remote machine.

2. SCOPE AND FEASIBILITY STUDY

2.1 Scope of the system

• Contact No Registration

It comprises registering the user contact number so that application can authenticate user when a SMS is received by the application. Contact No registration is for security purpose to avoid and prevent unauthorized user to do a file search. The module will also comprise of editing and deleting of existing Contact No.

• FTP Details

It comprises of adding details related to FTP server. This will be required when user has to upload or download a file from FTP server and get that file on his email. The module will also comprise of editing and deleting of existing FTP Details.

• File Search

This module will actually search the file in the user remote machine and emails the file to the mail id mentioned in the SMS.

• FTP File Upload

This module will actually search the exact file in the users remote

machine and then uploads the file to the FTP server mentioned in the SMS.

- FTP File Download

This module will actually search the file on the FTP server and downloads the file to the user machine and mail the file

- File Info

This module will give the file related information like size, creation date, modified date and last accessed date remote machine and get that file on his email.

2.2 Feasibility Study of the system

Mobile Search Characteristics:

Mobile search is a fundamentally different search paradigm than conventional desktop search. Till now, we continue to view mobile web search as either an extension of the desktop search model for high-end phones (such as PDA/iPhone) or a slightly restricted version via XHTML/WAP on low-end devices. Mobile search in both of these settings differs from traditional desktop search in several ways. We found that searching a file on remote desktop using any android app requires a good, active and fast internet connection. With these requirements, many users are not able to make use of these apps due to fast and active internet connection. Again the apps require smart phone. There is no provision for user if he has a normal simple mobile phone.

SMS-based Search Services:

SMS-based search is very different from conventional mobile search via XHTML/WAP or android apps. An attractive aspect of SMS-based search is the lower barrier to entry of SMS (in comparison to other data services) due to the use of low-end phones and widespread availability of SMS. In developing countries, SMS is the most ubiquitous protocol for information exchange next to voice. In addition, there is speculation that “the economic downturn will most likely dampen growth for the more luxury-based mobile services, but SMS is expected to continue its growth as it is popular, cheap, reliable and private.”

Many of the top most companies like Google, Yahoo!, and Microsoft have entered the SMS search market and developed their own versions of SMS-based search services. All these services have been tailored for very specific topics and specialized in nature. These automated services are not the only ones available. Cha-Cha and Just Dial (in India) are SMS- or voice-based question/answering systems using a human to respond to queries. The queries to Cha-Cha and Just Dial are in natural language question form, interpreted by a human who looks for the solution online, and responds with an answer via an SMS. A recent private study by one Search Groove comparing the accuracy of responses of these services has shown that the automated systems suffered from low accuracy when satisfying an arbitrary set of queries: Google SMS 22.2%, Yahoo! One Search 27.8%, as compared to 88.9% for Cha-Cha..

The problem we seek to answer is how do we build a system that achieves the best of both worlds: an SMS search system that is both a fast (automatic) and provides accurate query responses? One reason this problem is hard is that search queries are inherently ambiguous, yet returning a disambiguated result is especially vital to SMS search queries for various reasons.

3. DESIGNN METHODOLOGY

UML (Unified Modeling Language) is a general-purpose modelling language that includes a standardized graphical notation used to create an abstract model of a system, referred to as a UML model.

The UML is a language that can be use for the artefacts of a software intensive system as follows:

- Visualizing
- Specifying
- Constructing
- Documenting

3.1 UML diagrams as a part of our project:

1. Use Case Diagram
2. Sequence Diagram
3. Data Flow Diagram
4. Activity Diagram

3.1.1 Use Case Diagram:

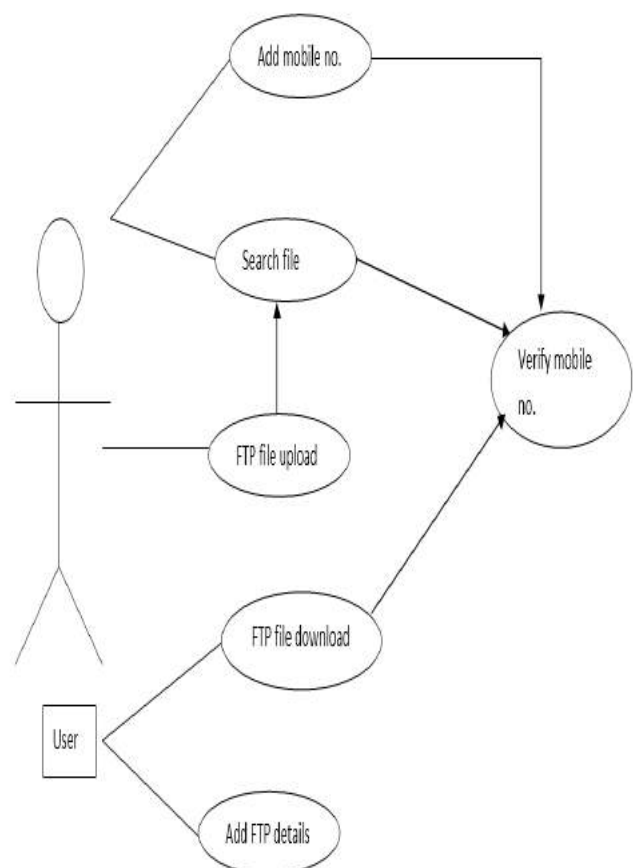


Fig.(3.1.1)

3.1.2 Sequence Diagram:

Add Mobile Number:

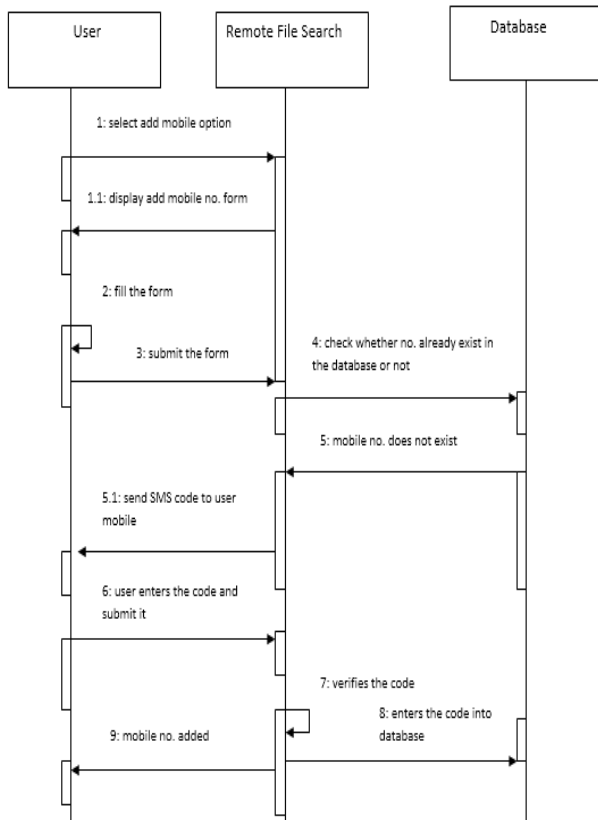


Fig.(3.1.2)

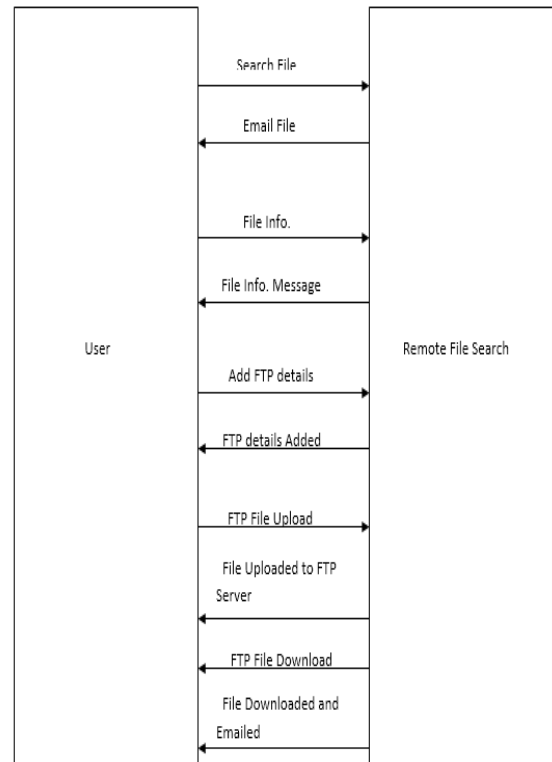


Fig.(3.1.3)

File Search & Emailing:

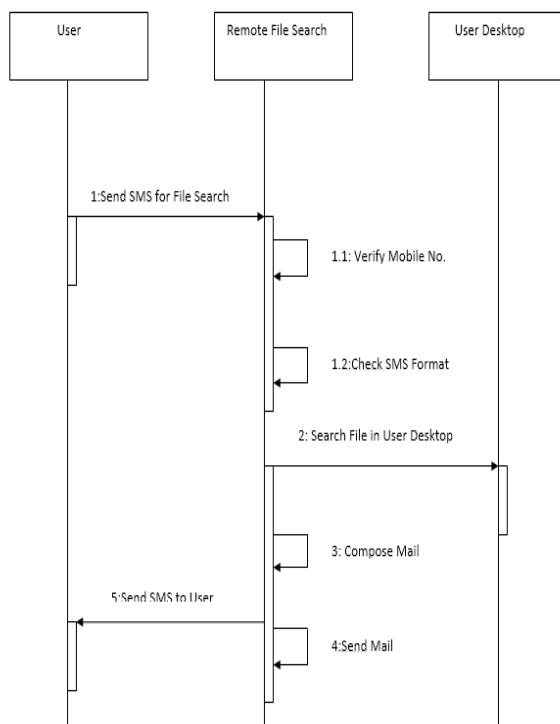


Fig.(3.1.2)

3.1.4 Collaboration Diagram:

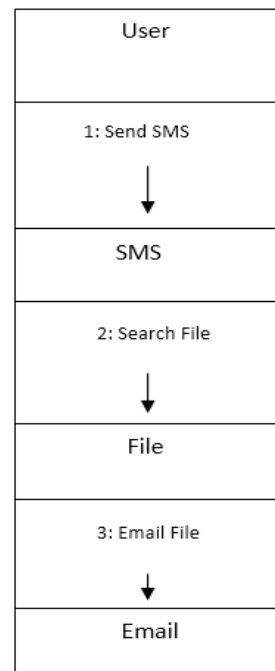


Fig.(3.1.4)

3.1.3 Data Flow Diagram:

Mail Server:

One of the important part is mail server. Mail transfer agent (MTA) or mail relay is software that transfer electronics message from one computer. This is the one of the important part needs in the project as our project base on retrieving electronic mail.

Authentication is require for this application. As credentials provided are compared to those on file in a database of authorized user's information on a local operating system or within a authentication server.

GSM Modem:

This belongs to hardware part connect client pc which act as a mobile gateway. This modem is responsible to receive the SMS send by the user. The process is like message is first sent to a short message service centre (SMSC) which provides "store and forward" mechanism. It attempts to send message to the SMSC's recipients. The SMSC queues the message for later reply if the recipient is not reachable. One more important part of the hardware is User Machine where the actual application is installed.

FTP Server:

FTP Server includes file uploading and file downloading. Sometimes the user not only need to retrieve the stored file but also to download the files from the internet that time this file uploading module will actually search the file in user remote machine and upload the file to FTP Server mentioned in the SMS. The file downloading module will search the file on the FTP server and downloads the file to the remote machine and mail the file.

4. ADVANTAGES

- It is not necessary to use smart phone for using RFS application.
- The application has to be installed only on remote machine.
- Just normal SMS charges will be applied while sending sms to running application.

5. CONCLUSION

In this project, a concept of searching a file on a remote machine through SMS is implemented. User can search any type of file and get it mail on his or her mailed. The requirement of this project is that the application must be installed on remote machine where the file needs to be searched and internet connection must be available for getting file mailed or uploading and downloading to FTP server. It also overcomes the problem that user get his file any time anywhere.

6. FUTURE SCOPE

The current implementation allows only single files to be searched but the Future implementation will allow folder search by input single SMS. Also future implementation will

have the user based profile so that he can track the SMS history.

7. ACKNOWLEDGMENTS

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HIGH SPEED VISION BASED NAVIGATION OF A STABILIZE QUADCOPTER

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ABSTRACT

The main problem about war field is human victims in terrorist attack. So this problem can be overcome by designing the quadcopter which involves wireless camera and a laser gun. Since human life is always precious, this quadcopter is the replacement of fighters against terrorists in war areas. This quadcopter is radio frequency operated and does the specific task i.e. FORWARD, BACKWARD, LEFT RIGHT, UP and DOWN.

A wireless camera has been installed on it, so that we can watch live video and stored on a laptop or pc that is located up to 100 meters away to monitor enemy remotely when required. A laser gun has been installed on it so that it can fire on enemy remotely when required. The movement of this robot is wirelessly controlled by a hand held RF transmitter to send commands to the RF receiver mounted on the moving quadcopter. RF 2.4GHz transmitter and receiver are used for the remote control. The Kk2.1.5 board is used for flying and landing quadcopter in stable manner.

This quadcopter can be used in star hotels, shopping malls, jewellery show rooms etc where there can be threat from intruders or terrorists.

Keywords

Kk2.1.5 Board, Laser Gun, Wireless Camera, GUI, Wireless Remote Control, Quadcopter

1. INTRODUCTION

A high speed vision based navigation of a stabilize quadcopter, which will save our soldier's life in border area, when war is going on and to minimize human casualties in terrorist attack. Many times our army soldiers need to venture into the enemy area just to track their activities which is often a very risky job, it may cost precious life. Such dangerous job could be done using small quadcopter. This quadcopter must be capable of flying and landing in stable manner. The quadcopter must be capable of storing and logging data.

This project created a platform to learn about unmanned aerial vehicles such as a quadcopter. This expands the scope of the electronic and telecommunication engineering education to

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include the control and the understanding of the electronic components. The quadcopter has many applications that we are interested to develop like mapping and reconnaissance especially in a disaster and dangerous area. It also opens up the possibilities to broaden the understanding and applications of control systems, stabilization, artificial intelligence and computer image processing as it applies to the quadcopter.

A laser gun has been installed on quadcopter so that it can fire on enemy remotely when required. A wireless camera has been installed on it, so that we can watch live video and stored on a laptop or pc that is located up to 100 meters away to monitor enemy remotely when required.



Fig 1: Vision Based Quadcopter

2. SYSTEM OVERVIEW

2.1 Quadcopter

The main aim of this project is to control the quadcopter with wireless technology. For this purpose we have designed two separate boards. One is transmitter and another is receiver which is placed on the quadcopter. Here we are using RF technology (wireless communication). In the transmitter, if we press the buttons according to that some predefined data will be transferred through RF communication and the receiver will receive the data. According to the command, the robot will do the specific task i.e. FORWARD, BACKWARD, LEFT and RIGHT. And through the wireless camera, the receiver receives that information and stores it on the hard disk of pc.

KK2.1.5 acts as a Multi-Rotor controller is a flight control board for multi-rotor aircraft. Its purpose is to stabilize the aircraft during flight. KK2.1.5 is the ATMEL Mega 644PA 8-bit AVR RISC-based microcontroller with 64k of memory. The KK2.1.5 Multi-Rotor controller manages the flight of (mostly) multi-rotor Aircraft (Tricopters, Quadcopters, Hexcopters etc). Its purpose is to stabilize the aircraft during flight and to do this, it takes signals from the 6050MPU gyro/acc(roll, pitch and yaw) and passes these signals to the Atmega644PA IC, which in-turn processes signals according to the users selected firmware (e.g. Quadcopter) and passes the control signals to the installed Electronic Speed Controllers (ESCs) and the combination of these signals instructs the ESCs to make fine adjustments to the motors rotational speeds which in-turn stabilizes the craft. The KK2.1.5 Multi-Rotor control board also uses signals from your radio system via a receiver (Rx) and passes these signals together with stabilisation signals to the Atmega644PA IC via the aileron, elevator, throttle and rudder user demand inputs. Once processed, this information is sent to the ESCs which in turn adjust the rotational speed of each motor to control flight orientation (up, down, backwards, forwards, left, right, yaw).

A 2.4Ghz wireless remote control will be used to control the physical movements of the copter. Configuration software is provided to calibrate the boundary conditions. A Six pin ISP connector is provided to load the user configuration to the KK2.1.5 board. A wireless camera interfaced will add a vigilance feature which is the main application of the proposed system.

3. SYSTEM CONTROL

3.1 Movement mechanism

Quadcopter can be described as a small vehicle with four propellers attached to rotor located at the cross frame. This aim for fixed pitch rotors are used to control the vehicle motion. The speeds of these four rotors are independent. By independent, pitch, roll and yaw attitude of the vehicle can be controlled easily.

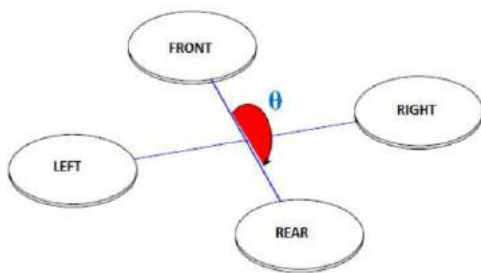


Fig 2: Pitch direction of Quadcopter

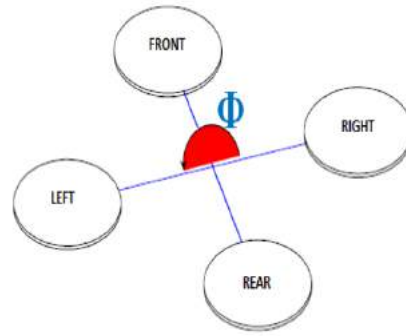


Fig 3: Roll direction of Quadcopter

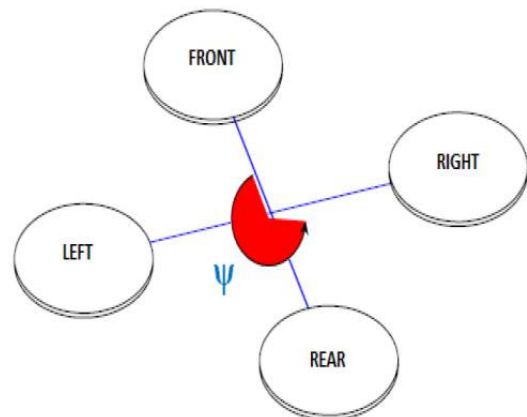


Fig 4: Yaw direction of Quadcopter

Quadcopter has four input forces and basically the thrust that is produced by the propeller that connects to the rotor. The motion of the Quadcopter can be controlled by fixing the thrust that is produced. These thrusts can be controlled by the speed of each rotor.

3.1.1 Take-off and landing motion

Take-off is the movement of the Quadcopter that lifts up from the ground to a hover position, and the landing position is the reverse of the take-off position. Take-off (landing) motion is controlled by increasing (decreasing) the speed of the four rotors simultaneously, which means changing the vertical motion.

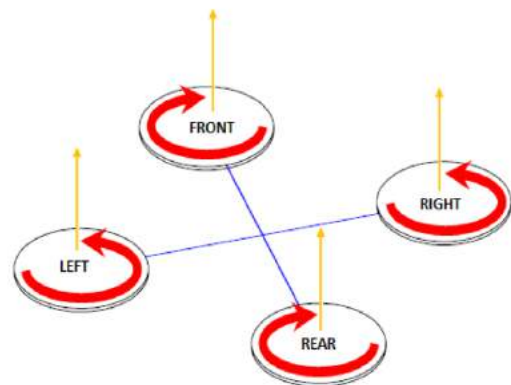


Fig 5: Take-off motion

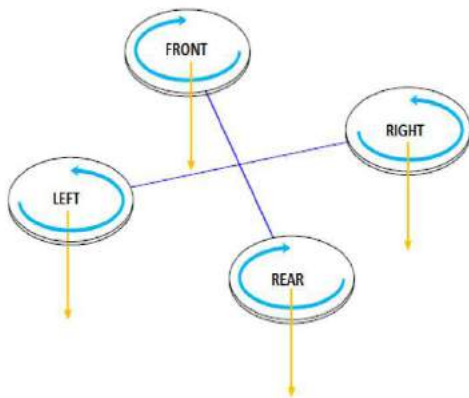


Fig 6: Landing motion

3.1.2 Forward and backward motion

Forward (backward) motion is control by increasing (decreasing) speed of rear (front) rotor. Decreasing (increasing) rear (front) rotor speed simultaneously will affect the pitch angle of the Quadcopter.

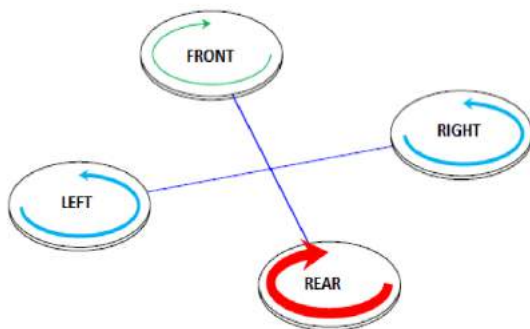


Fig 7: Forward motion

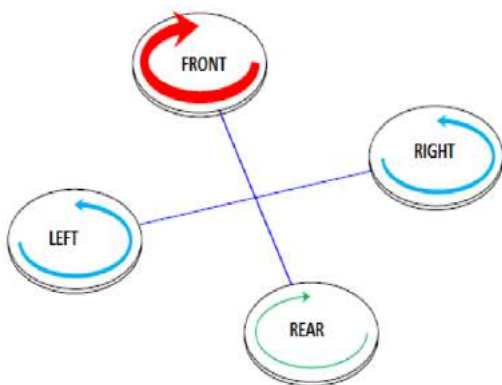


Fig 8: Backward motion

3.1.3 Left and right motion

For left and right motion, it can control by changing the yaw angle of Quadcopter. Yaw angle can control by increasing (decreasing) counter-clockwise rotors speed while decreasing (increasing) clockwise rotor speed.

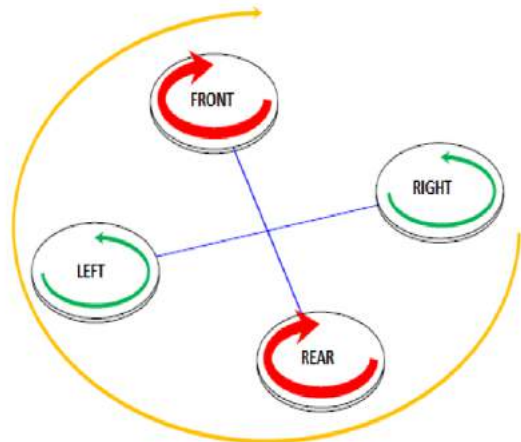


Fig 9: Right motion

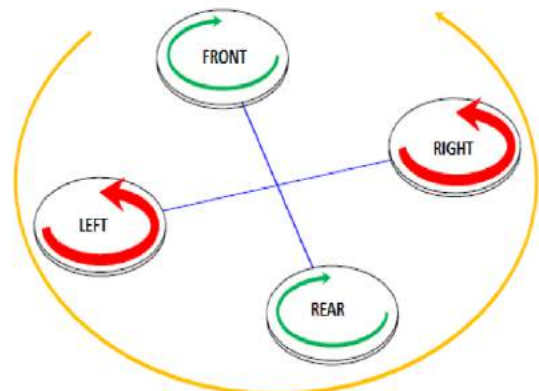


Fig 10: Left motion

4. SYSTEM DESIGN

4.1 kk2.1.5 multi-rotor controller

The original KK gyro system has been updated to the incredibly sensitive 6050 MPU system making this the most stable KK board ever and adds the addition of an auto-level function. At the heart of the KK2.1.5 is the ATMEL Mega 644PA 8-bit AVR RISC-based microcontroller with 64k of memory. The total of 8 motors to be controlled. A handy Piezo buzzer is also included with the board for audio warning when activating and deactivating the board.

The KK2.1.5 added polarity protection to the voltage sense header and a fuse protected buzzer outputs, in case something is accidentally plugged in incorrectly. The voltage sense line has been updated for better accuracy. The board is clearly labeled and the voltage sense line color has been changed to red for easy identification, making installation and connections a snap.

4.2 2.4Ghz transceiver remote

An RF Module (Radio Frequency Module) is a usually small electronic circuit used to transmit and/or receive radio signals on one of a number of carrier frequencies. RF Modules are widely used in electronic design owing to the difficulty of designing radio circuitry. Good electronic radio design is notoriously complex because of the sensitivity of radio circuits and the accuracy of components and layouts required to achieve operation on a specific frequency.

4.3 Wireless camera with receiver

We are using a wireless CCD camera, this type of cameras are commonly available in the market. This camera works on 12 volts DC supply. The camera has a receiver, which is placed in the remote station. Its output signals are in the form of video. This CCD camera is connected to the quadcopter. This camera captures the video signal and sends those signals to the remote station and with the help of the camera receiver which is connected to a computer.

4.4 High speed BLDC

Brushless DC electric motor (BLDC motors, BL motors) also known as electronically commutated motors (ECMs, EC motors) are synchronous motors which are powered by a DC electric source via an integrated inverter/switching power supply, which produces an AC electric signal to drive the motor.

4.5 Laser high directive 5V dc

A laser is a device that emits light through a process of optical amplification based on the stimulated emission of electromagnetic radiation. Lasers allows to emit light with a very narrow spectrum, i.e. they can emit a single color of light.

4.6 NiCd battery

The nickel-cadmium battery (NiCd battery or NiCad battery) is a type of rechargeable battery using nickel oxide hydroxide and metallic cadmium as electrodes. Ni-Cd batteries are made in a wide range of sizes and capacities. The maximum discharge rate for a Ni-Cd battery varies by size. Ni-Cd batteries not easily damage. This is reusable battery and it has a significantly longer total lifetime.

4.7 Electronic speed controller

An electronic speed controller is an electrical circuit that controls the speed of an electric motor and the direction a motor rotates. A motor turns because of the magnetic forces created by the windings and the magnets within the motor. ESCs are often used on electrically powered radio controlled model, with the variety most often used for brushless motor essentially providing an electronically-generated three phase electric power low voltage source of energy for the motor.

4.8 Configuration software

A tree view of Configurations for fast access. Make changes without the transmitter connected and post the changes to the transmitter later. Helicopter and Airplane configuration capable. Template Creation and Use for faster setup of aircraft. Import and Export of Configuration and Template files to Share your Setups. Import files from the T6Config application.

4.9 Embedded c

Embedded C is a set of language extensions for the C Programming language. Embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations. Embedded C uses most of the syntax and semantics of standard C. It is small and simpler to learn, understand, program and debug.

4.10 Transmitter section

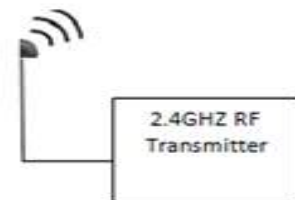


Fig 11: Control unit

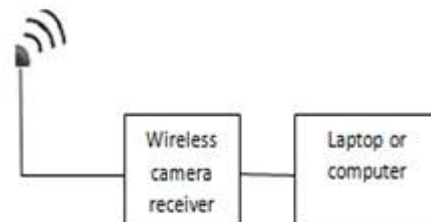


Fig 12: Monitoring unit

Controller Unit consists of the radio controller through which the operator can control the movement of the quad copter from the distant place which is convenient to the operator. This radio controller that we are using can cover distance up to 100m. To control the quad copter, we have used 6 channel radio controller system. This controller works on the frequency range of 2.4GHz & the FM modulation technique is used. The programming prototype used is GFSK.

Monitoring system is mounted at the convenient place from where the operator can easily monitor and analyze the data that has been received. The camera receiver module is connected at the monitoring system to receive the information. This is directly connected to the hyper terminal of the computer i.e. PC or the Laptop is interfaced for the display purpose.

4.11 Receiver section

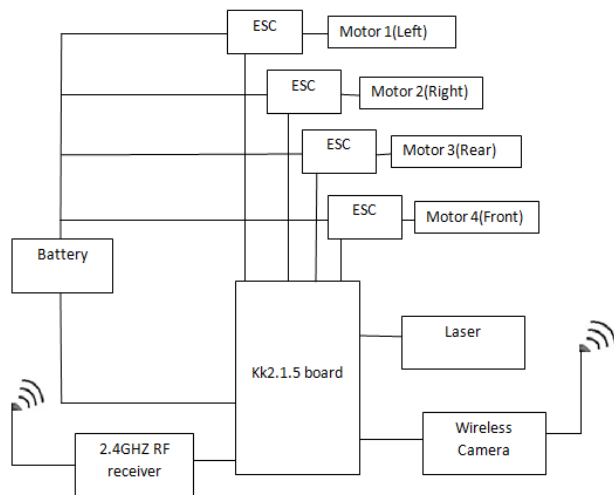


Fig 13: Quadcopter unit

The quad copter built up of 4 BLDC motors, 4 propellers, 4 ESCs and the KK2.1.5 board used to control the overall operation of the quad copter. There is laser gun which is used for fire on enemy when required. This quad copter is controlled by the radio controller and can be sent to the remote locations from which we want to collect the information.

5.FLOW CHART

Whenever we start power supply of quadcopter camera will be ON. RF receiver will check that any instruction came or not. If yes, then it will do task as per instruction from transmitter. Otherwise, the quadcopter will move in the same direction in which previously the quadcopter is moving. If command received for activation of laser, then quadcopter activates the laser and fires on enemy. Then all the data captured by the wireless camera will be sent to PC wirelessly.

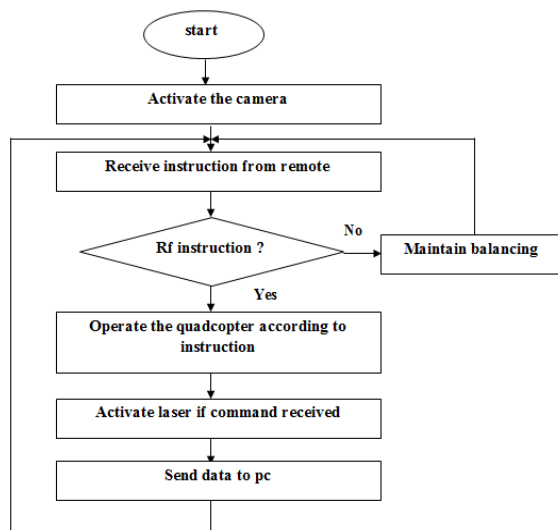


Fig 14:Flow chart

6. CONCLUSION

The primary need for our project would be accuracy. We have been able to view the things accurately that are currently happening in the surrounding area. Our design has not caused any sort of disturbances. In this control unit, RF signal is used. Using these signals, encoding is done and signal is sent through the transmitter. In the receiver end, these received signals are decoded and given as input to drive the motor. This will help us to manipulate the quadcopter in the manner we want. A video transmitter mounted on top of the quadcopter helps us to see the path of motion. KK2.1.5 board makes the quadcopter stable, robust, and reliable.

7.FUTURE SCOPE

- We can use zig bee+ Wi-Fi, so we can connect the system directly to the internet. Through the internet, we can control the system via remote location.
- By using voice recognition system, we also control the project on commanding in our voice.
- Easily operated by Cellphones by implementing DTMF system.
- By implementing GPS system, the detection of robot can be easily determined.

8.ACKNOWLEDGMENTS

Foremost, we would like to express our sincere gratitude to our project guide Prof. Archana Ingle, Head of Department of Electronic and Telecommunication Engineering. We could not complete this project without her constant encouragements, valuable insight, motivations, and guideline. We would like to thank with gratitude to Dr. Arunkumar for providing us the opportunity & infrastructure to complete the project as a partial fulfillment of B.E degree.

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HEALTHCARE RESOURCES FOR PATIENTS BY SECURE SHARING OF DIAGNOSIS RECORDS USING CLOUD COMPUTING.

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ABSTRACT

Cloud computing is set of resources and services offered through the Internet. Cloud services are delivered from data centers located throughout the world. It facilitates its consumers by providing virtual resources via Internet.

The paper states the idea of using the cloud for storage of patient's medical information. Further the link set up between the (Government) Gram-Panchayat and hospitals which makes it comfortable and provides ease to patients from rural areas to get the medical facilities from the Hospitals appropriately will be done using IIS (Internet information system) feature of windows OS which will host the website on Local Area Network. The patients from particular village approaches the Gram-Panchayat. The Gram-Panchayat uploads the patients information on the cloud. Then further the cloud segregates data to respective hospitals based on the disease or data provided by the patient. The hospital checks the cases and replies back with the facilities that will be provided by them. Using Microsoft SQL server database with necessary information of the patient will be available to the hospital profile so that accurate measures will be taken. This becomes easy for hospitals to maintain information according to various Gram-Panchayat's. So it benefits in saving time of patients from rural areas in transportation, thus saving on expenditure and the patient gets timely treatment or diagnosis.

Keywords

Cloud Computing, Internet Information System (IIS), Virtual Machine (VMware), Relation Database Management System (RDBMS), Microsoft Structured Query Language (SQL), Integrated Development Environment (IDE).

1. INTRODUCTION

Cloud computing allows for organizations to have the opportunity to use internet-based services so that they can reduce start-up costs, reduce the cost of construction and maintenance in healthcare, reduce loss risk, use services on a pay-as-you-use basis, access applications only as needed, and quickly reduce or increase capacities.

Cloud computing means storing and accessing data and programs over the internet instead of computer's hard drive. The present availability of high-capacity networks, low-cost computers and storage devices as well as the wide spread adoption of hardware virtualization, service-oriented architecture, and autonomic and utility computing have led to a growth in cloud computing.

Cloud-Computing architecture refers to the various components and sub-components of cloud that builds the structure of the system. Broadly, this architecture can be classified into two sections: Front-end and Back-end. They are connected to each other via virtual network or internet. Besides, there are other components like Middleware, Cloud Resources etc; that is included in the Cloud Computing architecture.

Front-end is the side that is visible for the client, customer or the user. It includes the client's computer system or network that is used for accessing the cloud system. Different Cloud Computing system has different user interfaces. For email programs, the support is driven from web browsers like Firefox, Chrome, and Internet Explorer etc. On the other hand, for other systems there are unique applications shared between the client and the service provider.

Back-end is the side used by the service provider. It includes various servers, computers, data storage systems, virtual machines that builds together the cloud of computing services. This system can include different types of computer programs. Each application in this system is managed by its own dedicated server. The back-end side has some responsibilities to fulfill towards the client: To provide security mechanisms, traffic control and protocols and To employ protocols that connects networked computers for communication

2. METHODOLOGY

The patient approaches the Gram-Panchayat for his/her treatment, has medical reports for the same, these reports are updated on the cloud server on timely basis. This keeps the medical information stored on the cloud which will be

accessed by the hospitals in the nearby locality for any specific or emergency aid for the patient.

The Gram-Panchayat is to update the patients personal medical information or his/her medical history by logging into our cloud and reports the information on the cloud server. so it could be accessed by the registered hospitals.

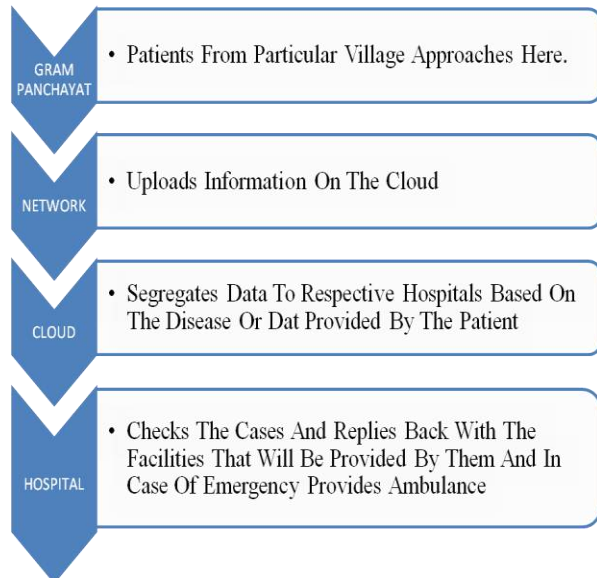


Fig-1 Flow chart of the project.

The cloud server serves 2 main aspects, healthcare and security. Server provided with functions of reading, scanning and altering data with acknowledgement from user.

The cloud server helps the hospital by searching through the keywords in the details mentioned in the filled form submitted by the Gram-Panchayat and segregates the hospitals available as per the data provided by the Gram-Panchayat to the aid of the patient in its area. It also sends information of the patient to particular hospitals. The cloud server provides patient the options of the hospital which are willing to take up the case.

The Hospital after receiving the data send by the cloud server checks the cases and replies back to the cases which they wish to take with the facilities and details regarding the doctor availability, doctor name, treatment timing, appointment, diagnosis cost etc. This data is then uploaded back to the cloud which is then send immediately to the patient. The patient have to go through the list of hospitals available to them and according to their preference have to reply back to the hospital with an acknowledgment and confirmation of the appointment through cloud as a medium thus serving the first purpose of cloud servers of establishing a secure connection.

Cloud carrier is intermediary which provides connectivity and transport of cloud services between the cloud provider and cloud user (Gram-Panchayat and Hospital). The study of cloud carrier is important as cloud users have no control over the network through which the data transports. This leads to an efficient data exchange between user and server with a tool to search and segregate available data/options according to user requirement.

3. IMPORTANCE AND MOTIVATION

Maintenance of cloud computing applications is easier, because they do not need to be installed on each user's computer and can be accessed from different places.

To reduce the paperwork of the hospital and patients, time spent over transportation and interdependency of hospitals over patients and vice versa.

Performance is monitored, and consistent and loosely coupled architectures are constructed using web services as the system interface.

Productivity may be increased when multiple users can work on the same data simultaneously, rather than waiting for it to saved and emailed .

Reliability improves with the use of multiple redundant sites, which makes well-designed cloud computing suitable for business continuity and disaster recovery.

Security can improve due to centralization of data, increased security-focused resources, but concerns can persist about loss of control over certain sensitive data and the lack of security for stored data.

4. DESIGN OF THE SYSTEM

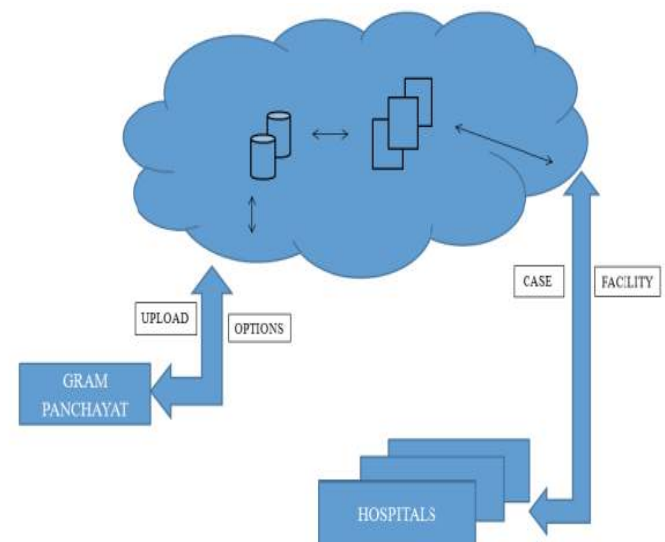


Fig-2 Structure of the project

The design structure refers with the above diagram where the Gram-Panchayat. Works for the villagers as a healthcare solution. The Gram-Panchayat does the job of uploading the patients health related information on Cloud. Here we assume that Gram-Panchayat works 24X7 for people and has a system which can access the cloud. By uploading we mean that the operator has to fill in the patients information requested by the cloud in the form of text details and image or digital format of the reports related with the details filled by the operator.

This information on the cloud is further passed to the Hospitals which they can access through their log in.

Prior to providing information to the Hospital the cloud segregates the data according to the treatment facilities

provided by the hospitals and makes a list of those hospitals. This segregation is done on the basis of:

1. The information provided by the patient about the medical illness, the cloud scans the information on basis of keywords and the data mapped with the keyword in cloud database, cloud decides patients illness and proper treatment required.
2. The information provided by hospitals regarding their facilities and treatments provided.

The hospital in the list are only sent the patient's information.

Once the hospital gets the information of the cases related to the patients it replies with the facilities provided by them on the particular disease. For Eg: cost of the treatment, plan and schedule of the treatment, medication and cost of the treatment etc. This information is provided to Gram-Panchayat via cloud which formats it for the operator.

Further the Gram-Panchayat (operator along with decision of patient) decides on from the particular hospital which will avail aid to the patient. The confirmation is sent to the hospital and an appointment is granted to the patient.

By using this we can even provide facilities to the village at its particular Gram-Panchayat centre on weekly basis depending on the need of the villagers

5. HARDWARE & SOFTWARE REQUIREMENTS

5.1 Laptop/Desktop

It will act like server and data storage for the cloud. It is required for installation of various software required to generate cloud and different assisting applications. It is required by the host user (Gram-Panchayat & hospital) to communicate for data transmission to and from with server.

5.2 MySQL

My SQL is the world's most popular open source database. With its proven performance, reliability and ease-of-use, My SQL has become the leading database choice for web-based applications, used by high profile web properties including facebook ,twitter, you-tube, yahoo! And many more. The developers of My SQL are Oracle Corporation. The operating system used by My SQL are Windows ,Linux, Solaris, OS X, FreeBSD. It can be written by using C, C++ language.

5.3 Microsoft SQL Server

As a database server, it is a software product with the primary function of storing and retrieving data as requested by other software applications which may run either on the same computer or on another computer across a network (including the internet). Microsoft SQL Server is a relational database management system developed by Microsoft. It is the most widely used open-source client-server mode RDBMS .Microsoft markets at least a dozen different editions of Microsoft SQL Server

5.4 Visual Studio

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop

computer programs for Microsoft Windows, as well as web sites, web applications and web services. Visual Studio uses Microsoft software development platforms such as Windows API, Windows Forms, Windows Presentation Foundation, Windows Store and Microsoft Silverlight. It can produce both native code and managed code. Visual Studio includes a code editor supporting IntelliSense (the code completion component) as well as code refactoring. The integrated debugger works both as a source-level debugger and a machine-level debugger. Other built-in tools include a forms designer for building GUI applications, web designer, class designer, and database schema designer.

6. CONCLUSION:

Laptops, smart phones, tablets or any other device are capable of accessing data. i.e. no one needs to be tied to a computer or phone. All that needed is a way of accessing the data and that can be done from any machine.

If anything severe then emergency ambulance can be given for the patient. This saves the time of the patient in travelling to the hospitals in the cities. This project can be implemented for betterment of people mostly in Rural areas.

It helps to introduce fast and efficient information sharing and response remedy and helps to increase dependency on technology.

The information accessed through the cloud server in the hospitals will state the health of any patients and treatment facilities can be availed for the same.

6. FUTURE SCOPE

Although there is still a way to go before digital health technologies using cloud computing are fully integrated into our daily lives, like the internet and smart phones, there are countless examples where cutting edge technology is already starting to revolutionize the ways clinicians diagnose and treat their patients.

Much of this technology is in pilot stage right now, but will very soon we will see them applied in all areas of clinical practice. One day soon this technology will be available to patients, as well as to manage their own conditions on a day to day basis. Given the impact of this cloud computing technology on the customer world, it does not take much to imagine the potential it could have on healthcare.

Here's an example: Algorithms are being designed that can compare the ultrasound scans of expectant mothers to those of the wider population, to help improve the diagnosis of genetic defects in unborn babies. Hosted on the cloud, this data would be accessible to any clinician with a secure connection, enabling more accurate diagnoses as clinicians will have more information on which to base their decisions. Such evaluations will also widen access of the cloud computing technology and will provide accurate and timely for the patients.

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SILICON EYES

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ABSTRACT

For many visually impaired people, a cane or a stick is a close friend helping them to detect and avoid obstacles in the walking paths. During walking with the cane going from place to place, they sense and guess directions and locations by hearing sounds surrounding, sniffing smells in the air, feeling touches on skin, counting footsteps they walk, and memorizing events in time and spaces. However, it is difficult for them to guess where they are when surrounding environment are new or changed, or when they get lost memory of locations. One important writing method of blind people is to emboss Braille dots on paper with slate and stylus, and the result can be read by finger feeling on the other side of paper, where dots are embossed. However, there are several problems. It takes longer time and larger space to write. Hands get tired quickly because of using force pressing stylus. The dots are not easy to read as emboss dots. It's difficult for blind persons to learn holding stylus perpendicular. The writing is not convenient for transferring, copying, or editing. Therefore, this writing method limits communication ability of blind people. There are some electronic type-writer products are being used but they are bulky and expensive. With the advancement in modern day electronic sensors, touch sensing and microcontroller technology, we planned to integrate them into a traditional walking cane. This project aims to provide the blind navigation information via audible messages and haptic feedback, helping them localize where are they, where they are going to, and to improve their mobility.

In addition, the device provides user information needed, in audio format, including time, calendar, object color, alarm, obstacle distance, navigation direction, ambient light and temperature condition. The device has a finger messaging module that moves an actuator up/down for obstacle recognition and rotates another actuator for direction recognition. The purpose of this project is to help blind people improve their communication ability and depend on none during walking in even unknown areas.

Keywords

Microcontroller, Global Positioning system (GPS), GSM module, Ultra Sonic Sensor

1. INTRODUCTION

Worldwide, there are over 314 million of visually impaired and 45 million of them are blind. About 87% of the visually impaired live in the developing countries. According to EU reports for every 1000 Europeans 4 are blind or visually impaired [2]. These statistics indicate the global scale of this sensory impairment that poses severe limitations to the individuals and creates a serious burden to societies and economies. In the USA the cost related to blindness and visual impairment amounts to \$68 billion annually. The indicated numbers will increase due to aging demographics (about 82% out of all visually impaired are aged Over 50). Vision loss is the most serious sensory disability that causes approx. 90% deprivation of entire multisense perception for a human. According to American Medical Association's (AMA) guides to evaluation of permanent impairments, blindness accounts for approx. 80% of Whole Person Impairment (WPI) rating. For many visually impaired people, a cane or a stick is a close friend helping them to detect and avoid obstacles in their pathway. During walking with the cane going from place to place, they sense and guess directions, locate places by hearing sounds surrounding, sniffing smells in the air, feeling touches on skin, counting footsteps they walk, and memorizing events in time and spaces. However, it is difficult for them to guess where they are when surrounding environment is new or when they forget the locations.

2. FEATURES

- Microcontroller: This system is supported by a 32-bit ARM cortex –M3 microcontroller which controls the overall system operations of the device

- Global Positioning System(GPS): The Global Positioning System (GPS), triangulates the position of the person carrying the device, and sends the exact location to the responder through SMS. The smart antenna can track upto 66 satellites at a time. It has a superior sensitivity and has an accuracy of less than 10m. It has a built-in micro battery to preserve system data for rapid satellite

acquisition.

-GSM Module :The on-board GSM module is responsible for sending the SMS containing the information about the location of the visually disabled person who is carrying the

device. The SMS is sent to the person, whose number is already preloaded, depending upon the request of the user.

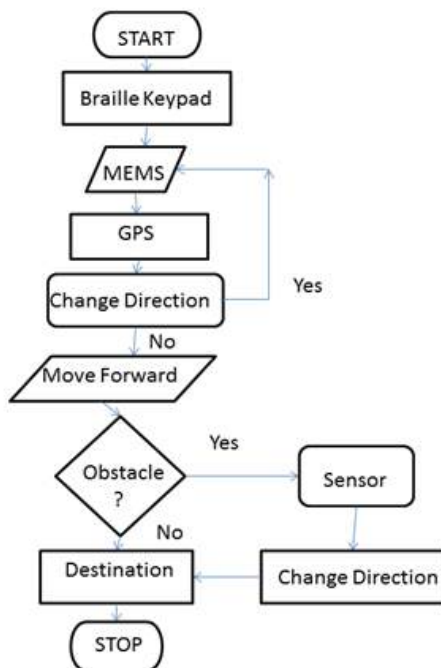
- S O N A R : Sound Navigation and Ranging (SONAR),

helps the user by identifying the obstacles and notifies him about it. This has a range of about 3m. The vibrator provides a haptic feedback for the obstacle detected.

M i c r o - S D C a r d : A 2GB Micro-SD card is utilized, that allows FAT-32 formatting for easy file management with a maximum data rate of 25Mbps. This is responsible for storing all the system configurations, audio library, GPS location libraries and maps.

3. DESIGN METHEDODOLOGY

This paper proposes a method that allows blind people to enter notes and control device operation via Braille capacitive touch keypad instead of sending SMS by entering the number and text. location An emergency button triggers an SMS from the GSM module that will send the present (GPS coordinates) of the user to a remote phone number asking for help. In addition, the device provides the information needed to the user, in audio format using audio codec, obstacle distance using SONAR, navigation direction, ambient light and temperature conditions



Working

When the blind starts its journey from the source to destination, first it decides where his/her destination is and accordingly, starts to type a letter. In the Braille keypad, all the letters from alphabet system are allocated some specific locations while programming i.e. GPS location coordinates are feeded in the letters in keypad.

The person just have to type the letter and its destination is found out. The person starts walking along the direction of the destination.

.By typing the letter in the braille keypad, the MEMS sends the location coordinates to the GPS module and GPS module then starts to locate the direction to its destination

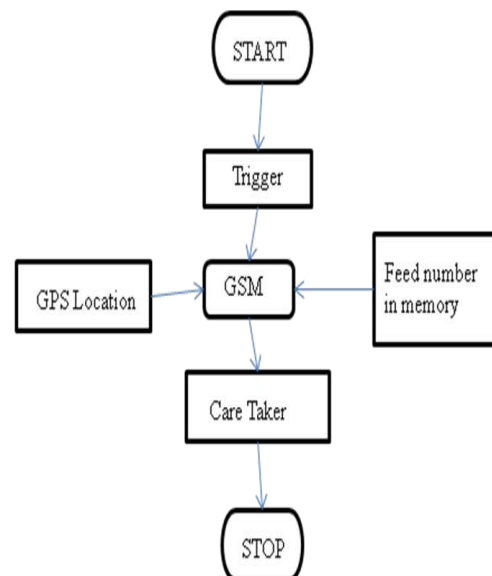
The person starts walking along the direction as per given direction of the GPS.

As the direction changes, the location coordinates are sent to the GPS via MEMS magnetometer and person can move forward along the changed direction.

If any obstacle comes in between the path, then sensor senses the object, gives an alertness by vibrating the buzzer to the person and makes person safe before colliding to the obstacle.

The sensor then searches a direction where no obstacle is detected and gives a signal to move forward by giving the appropriate direction via GPS.

Thus the person reaches its destination safely and carefully



When the person clicks the trigger button, its location coordinates are send to the GPS. Along with the GPS coordinates, a message like "Help! I am in danger." will be sent to the number feeded in the memory. The number feeded will be of the care taker. The care taker will get its location coordinates & by tracing it will get the location of the person in trouble. Then it help to save a person from getting any trouble.

4. SCOPE OF PROJECT

Throughout the human life span, blindness, and particularly the inability to freely navigate, disrupts independence. This leads to decreased competence, economic dependence, depression, even failure of cognitive abilities to develop. Early and on-going training in orientation and mobility can have the opposite results; independence replaces dependence, jobs replace dependency, confidence and feelings of self worth replace depression and incompetence. Cognitive skills flourish rather than diminish. There is absolutely no doubt that navigational training is necessary and benevolent. Early tools and strategies open the doors for these benefits. New navigational technologies promise further development in the cognitive, self-sufficiency, and culturally productive domains.

This trend will develop faster and reach more people if there exists a champion for these technologies.

5. CONCLUSIONS

The proposed solution describes a talking navigation assistant that helps the visually disabled in their movement.

Low power 32-bit ARM Cortex-M3 microcontroller enables highly deterministic operation using battery power only. 66-channel GPS module gives highly accurate position information and universal time Automatic Emergency SMS service helps in providing immediate aid when required where SMS can be sent to many numbers. The Capacitive Touch keypad eliminates finger pain while using older Braille keys and allows blind people to enter notes and control device operation easily. Notes written are digitally stored in a compact 2GB micro-SD card for future computer access. SONAR is capable of measuring object distance upto 3m. 24-bit Color Sensor capable of recognizing multitude of colored objects The device has a finger messaging module based on DC Servo Motor that rotates an actuator for direction recognition. Navigation information is provided through Natural MP3 quality voice interface via head phone. In addition, the device provides the information needed to user, in audio format, including time, calendar, object color, alarm, obstacle distance, navigation direction, ambient light and temperature condition

6. ACKNOWLEDGMENTS

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THE RESCUE ROBOT

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ABSTRACT

In today's world, robots are used for almost all purposes. They find their application in defense, surveillance, transport and in many other places. The project is based on building a robot having a capability to climb staircase. Fire extinguisher cylinders are loaded on the robot so that it can be used to douse fire. The hardware and software requirements, project information, and applications of a rescue robot are mentioned. Hardware components consist of Johnson motors for wheels, mild steel for chassis of robot, conveyor belts are used along with wheel to provide better friction. Software can be used are Proteus for Simulation of circuit, eagle for printed circuit board, flash magic to Burn program into Micro-controller, Keil μ vision for programming. Working consist of autonomous mode and manual mode. IR sensors will be used only in the autonomous mode to rotate arm of the robot. In the manual mode, robot will be completely controlled by the remote control. This robot will be able to go to places where human life can be at risk. It can help in surveillance, as a camera will be placed at the front side of the robot which will send live video to the device linked with it.

KEYWORDS

Defense, Surveillance, climbing robot, Transport, Fire extinguisher, Camera, Video, IR Sensor.

1. INTRODUCTION

The robot is built to discover areas where people cannot reach. Robots for disaster mitigation and rescue application have replaced humans [1]. The robot has been designed for the purpose of aiding rescue workers. And in the Common situations that employ the robot are urban disasters, hostage situations, and explosions. The design of the robot depends on the application it is being used for. The robot built by us can be used for surveillance, transport and as fire fighter. The mechanical design and electrical components enable this robot to climb stairs and travel through fairly large amounts of rubbles. On the robot there will be a camera which is used to take video. The robot is built to discover areas where people cannot reach.

To make this robot work efficiently, at the initial stage we have created a prototype using wood to test our design and troubleshoot the design. Once the prototype is completed we will build the robot using mild steel as wood cannot be used for fire-fighting application as it can catch fire and would be rendered useless for the purpose its being designed.

2. WORKING PROCESS

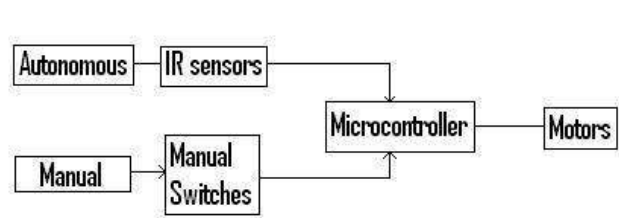


Fig.1 Block diagram showing the process used by the BOT to reach its destination

This robot has two modes of operation: autonomous and manual. In the autonomous mode, the robot will measure the stair size using five IR sensors placed vertically one above the other as shown in [2] and will move the arm with a specified angle and will climb the stair (arm is not shown in the [2] as we want to show the placement of the IR sensors).

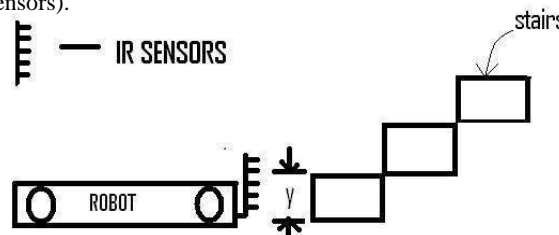


Fig.2 IR sensor measuring the size of the stair

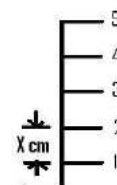


Fig. 3 IR sensor placed one above the other

fig.3 shows a step of IR sensor connected one above the other.

This arrangement is done in order to reduce the complexity of the design. As the IR sensor goes to logic high from logic low stair, microcontroller will be informed about this condition and then signals from the microcontroller will be given to the motor. As soon as a stair is encountered, IR sensors measure the step size.

In the actual structure shown in [4], after measuring the step size, arm of the robot is moved by a certain angle, this angle measured is the angle by which the arm will rotate. This depends on the number of IR sensor getting activated. Once this is achieved the robot will start climbing the stair as programmed and will reach to its destination to douse fire.

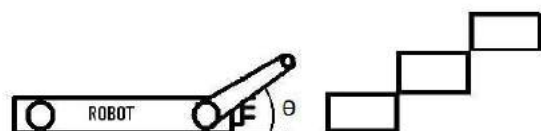


Fig.4 Arm at an angle θ

This is the only region where the robot will be autonomous because being completely dependent on robot is not possible. In the manual mode, the robot will be controlled using a computer wirelessly as the camera is placed on the robot which will send live video to the computer which will help the instructor to move the robot in a particular direction.

3. EQUIPMENTS

To create our prototype we have made use of wood because it is easily available and at low cost. Four Johnson motors each of 10Kg/cm torque are used in the prototype so that, while climbing the stair the robot will not fall back.



Fig.5 Johnson motor

Johnson motor of 10kg/cm are used in the project is illustrated in [5].



Fig.6 IR sensor

IR sensors will be used to measure the step size of the robot. These IR sensors will be used only in the autonomous mode to rotate arm of the robot. In the manual mode, robot will be completely controlled by the remote control. IR Sensor is a trans-receiver device. It works by using a specific light sensor

to detect a selected light wavelength in the Infra-Red (IR) spectrum.

By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold. [7] illustrates the principle on which an obstacle is detected using infrared rays.

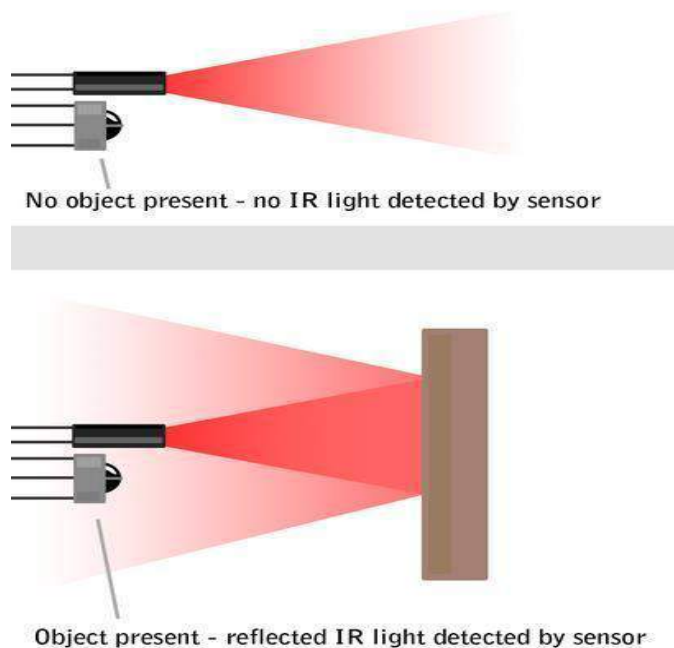


Fig.7 Transmission and reception of Infra-Red

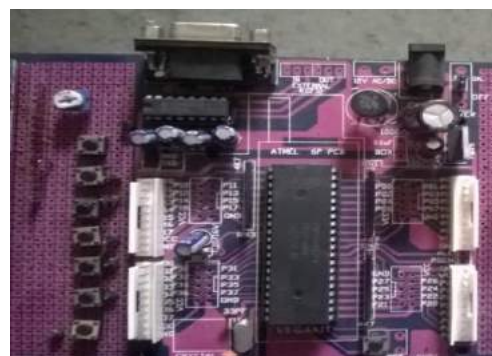


Fig.8 8051 programming board

Microcontroller 8051(P89V51RD2) is used. It has 64 KB flash and 1024 bytes of data RAM. A key feature of the P89V51RD2 is the X2 mode option. The design engineer can choose to run the application with conventional 80C51 clock rate (12 clocks per machine cycle) or select the X2 mode (6

clock per machine cycle) to achieve twice the throughput at the same clock frequency.

The Flash program supports both parallel and in serial In-System Programming (ISP). The P89V51RD2 is also In-Programmable (IAP), allowing flash program memory to be reconfigured even while the application is running.



Fig.9 CCTV camera

CCTV camera will be placed on the robot that which will transmit the live video it captures. It will make the controller's job easier to control the robot.



Fig.10 Aluminum

Aluminum is used to construct the zig-zag structure inside the robot on which fire extinguisher is to be placed.



Fig.11 Mild steel

Mild steel is used to construct the chassis of the robot.



Fig.12 Fire extinguisher

4. DIMENSIONS

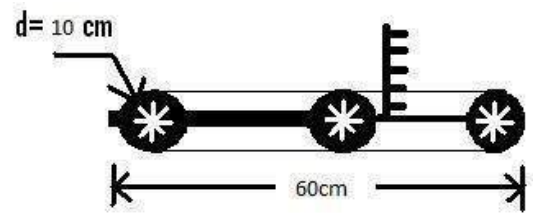


Fig.13 Side view of the robot with dimensions

5. CHALLENGES FACED

The challenges faced during implementation are mentioned below:

Initially the height of the chassis was 14 cm, and the wheel was of diameter 14 cm. Due to this, there was no proper ground clearance while climbing stairs. To avoid this, we reduced the height of the robot from 14 cm to 12 cm. By doing this a gap of 2 cm was created between the chassis and the ground surface. In the prototype, we have used four Johnson

motor as it provides torque of 9Kg/cm^2 working at 9V dc. We tested the individual motors to check their working condition and to ensure it meets our requirements. As we had four motors and only two power supplies, we shorted the negative and positive terminal of the front and the rear wheel. After switching ON the power supply there was no movement of the motor, that is, motor was stationary. The reason being, the current supplied by the power supply was not sufficient to drive all the motor together.

6. IMPLEMENTATION OF THE PROTOTYPE

We started the journey of our project by building a Mild steel prototype.



Fig.15 Chassis of the Robot

6.1 SOFTWARES USED

- [1] Keil μ vision - This software is used to program the microcontroller. It is a windows-based front end for all Keil compilers and assemblers. Mvision includes everything needed to create, edit, compile, assemble, link, load and debug 8051 project.
- [2] Proteus - Using Proteus we can design as well as simulate our project. We have tested the rotation of stepper motor in proteus.
- [3] Flash magic- We are using flash magic to Burn program into Micro -controller
- [4] Eagle- Printed Circuit Board.

7. CONCLUSION AND FUTURE WORK

The robot is called Rescue robot from the fact that it's designed to cope with stairs, can be used as a firefighter, or for surveillance. Our project is based on building a robot having a capability to climb stairs carrying 10Kg of weight excluding its own weight. We will be loading fire extinguisher cylinders on the robot so that it can be used to douse fire. This robot will be able to go in the places where human life can be at a risk and can help in surveillance, as a camera will be placed at the front side of the robot which will send live video into the device linked with it.

In this paper, we have presented the structure, construction, implementation of the prototype and the application of the Rescue robot. Our future work comprises of construction, simulation and testing of the final robot structure in real life scenario.

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DIAGNOSIS OF DIABETIC RETINOPATHY USING CBIR METHOD

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ABSTRACT

We apply the process and knowledge of image processing to diagnose Diabetic retinopathy from images of retina. Here we will use the Content Based Image Retrieval (CBIR) method. Content-based image retrieval method said physicians in the early Detection of diabetic retinopathy for preventing blindness. A content based image retrieval System allows the user to presents query image in order to retrieve images stored in the Database according to their similarity to the query image. a CBIR frame work will be Developed based on feature extraction method for diagnosis of diabetic retinopathy. Wavelet transform and dual tree complex wavelet transform is used for feature extraction of fundus image, for matching Euclidean distance will be calculated between the query image and the database and which will be having minimum Euclidean Distance will be the best match for query image and the retrieved images will be ranked.

Keywords

DWT, diabetic retinopathy, image database, image processing, Messidor.

1. INTRODUCTION

Diabetic retinopathy is a critical eye disease which can be regarded as manifestation of diabetes on the retina. The arteries in the retina become weakened and leak, forming small, dot like hemorrhages. These leaking vessels often lead to swelling or edema in the retina and decreased vision. New fragile, vessels develop as the circulatory system attempts to maintain adequate oxygen levels within the retina. This phenomenon is called neovascularization. Blood may leak into the retina and vitreous, causing spots or floaters, along with decreased vision. The screening of diabetic patients for the development of diabetic retinopathy can potentially reduce the risk of blindness in these patients. This work is one of the method of applying digital image processing to the field of medical diagnosis in order to lessen the time and stress undergone by the ophthalmologist and other members of the team in the screening, diagnosis and treatment of diabetic retinopathy. Content Based image retrieval (CBIR) is an automated system for a large database using query by image content. CBIR is found to be an efficient retrieval system for medial image database in diagnosis of disease. CBIR is an automatic retrieval of images generally based on some particular properties such as color composition, shape and

texture. The main objective of this research work is to retrieve the similar images matching the query image from medical databases by using feature extraction and similarity measurement techniques. Feature extraction is initial and important step in the design of content based image retrieval system. Feature extraction means extracting unique and valuable information from the image, these features are termed as signature of image. Wavelet transform is used to generate the feature vectors. The input image is compared with the images in database by extracting features from images and computing distance between them. Distance metric is the main tool for retrieving similar images from large medical databases. Euclidean distance is used for the purpose of similarity comparison. The images with minimum distance are displayed.

2. DESIGN METHODOLOGY

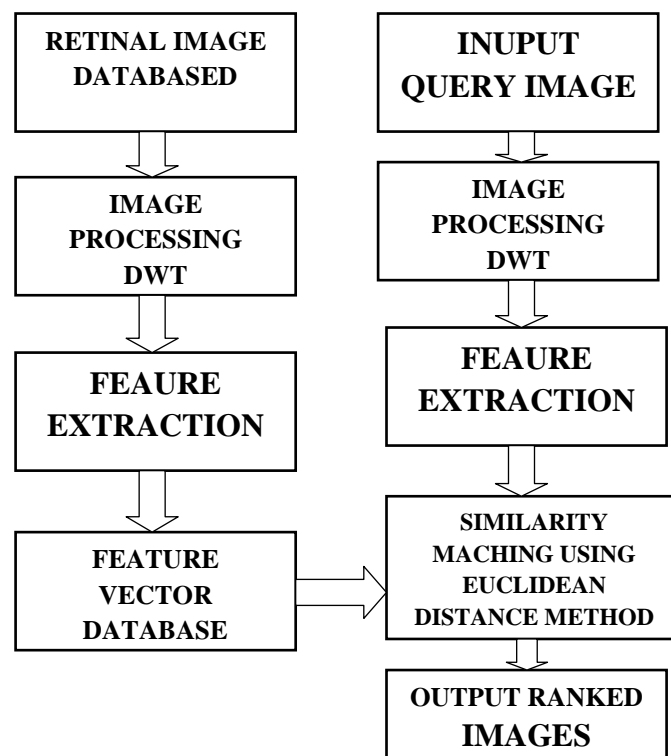


Fig 1: Flow chart of the design methodology

2: Database

2.1 MESSIDOR:

The Messidor database, which contains hundreds of eye fundus images, has been publicly distributed since 2008. It was created by the Messidor project in order to evaluate automatic lesion segmentation and diabetic retinopathy grading methods. The MESSIDOR database has been established to facilitate studies on computer assisted diagnoses of diabetic retinopathy. The research community is invited to test its algorithms on this database.

2.2: Data description

The 1200 eye fundus color numerical images of the posterior pole for the MESSIDOR database were acquired by 3 ophthalmologic departments using a color video 3CCD camera on a Topcon TRC NW6 non-mydratricretinograph with a 45 degree field of view. The images were captured using 8 bits per color plane at 1440*960, 2240*1488 or 2304*1536 pixels. 800 images were acquired with pupil dilation (one drop of Tropicamide at 0.5%) and 400 without dilation. The 1200 images are packaged in 3 sets, one per ophthalmologic department. Each set is divided into 4 zipped sub sets containing each 100 images in TIFF format and an Excel file with medical diagnoses for each image.

2.3: Medical diagnoses

Two diagnoses have been provided by the medical experts for each image:

- Retinopathy grade
- Risk of macular edema

Retinopathy grade

- Grade 0 (Normal): ($\mu A = 0$) AND ($H = 0$)

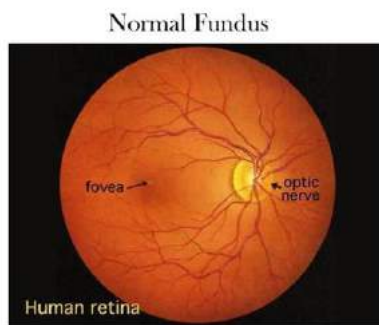


Figure no. 4.1 Grade 0

- Grade 1 : ($0 < \mu A \leq 5$) AND ($H = 0$)

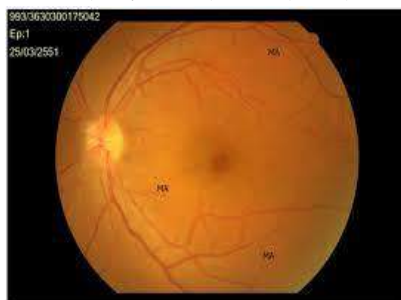


Figure no. 4.2 Grade 1

- Grade 2 : ($(5 < \mu A < 15)$ OR ($0 < H < 5$)) AND ($NV = 0$)

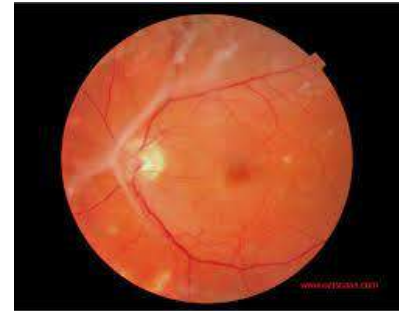


Figure no. 4.4 Grade 2

- Grade 3 : ($\mu A \geq 15$) OR ($H \geq 5$) OR ($NV = 1$)



Figure no. 4.4 Grade 3

3. Image Pre-processing.

This is the process of preparing the acquire images for image enhancement. Image resizing is the major process to carry out. This will reduces the size of the image to enable digital image processing to carry out. It enables the MATLAB application to display the full image instead of a reduce size of the image i.e. before resizing the image was shown at 67% instead of the normal 100%.

3.1 2D-DWT

The concepts of one-dimensional DWT and its implementation through subband coding can be easily extended to two-dimensional signals for digital images. In case of subband analysis of images, we require extraction of its approximate forms in both horizontal and vertical directions, details in horizontal direction alone (detection of horizontal edges), details in vertical direction alone (detection of vertical edges) and details in both horizontal and vertical directions (detection of diagonal edges).

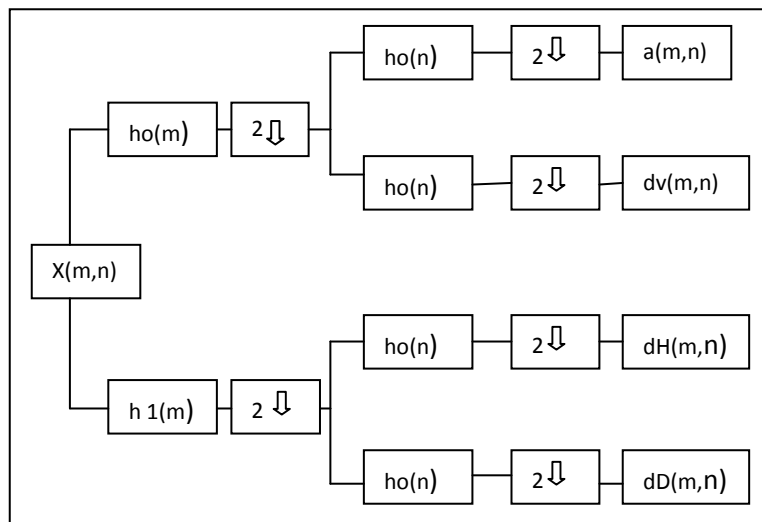


Fig 2 : 2D DWT

The filtering in each direction follows sub sampling by a factor of two, so that each of the subbands corresponding to the filter outputs contain one-fourth of the number of samples, as compared to the original 2-D signal.

3.2: Feature Extraction

As we know that raw image data that can not used straightly in most computer vision tasks. Mainly two reason behind this first of all, the high dimensionality of the image makes it hard to use the whole image. Further reason is a lot of the information embedded in the image is redundant. Therefore instead of using the whole image, only an expressive representation of the most significant information should extract. The process of finding the expressive representation is known as feature extraction Feature extraction can be defined as the act of mapping the image from image space to the feature space.

The main point for choosing the features to be extracted should be guided by the following concerns: The features should carry sufficient information about the image and should not require any domain specific knowledge and it should be easy to compute in order for the approach to be feasible for a large image collection and rapid retrieval. Another thing is that it should relate well with the human perceptual characteristics since users will finally determine the suitability of the retrieved images

3.2.1 Color

Colour is the one mostly used visual feature in Image retrieval. It is relatively robust to background complication and independent of image size and orientations. Color Histogram is commonly based on the intensity of three channels. It represent represents the number of pixels that have colors in each of a fixed list of color ranges. Color Moment is based used to overcome quantization effect in color histogram. It represents to calculate the color similarity by weighted Euclidean distance. Color set is used for fast

search over large collection of image. It is based on the selection of color from quantized color space. A histogram is the distribution of the number of pixels for an image. The color histogram represents the color content of an image. It is robust to translation and rotation. Color histogram is a global property of an image. The number of elements in a histogram depends on the number of bits in each pixel in an image.

3.2.2 Shape

In image retrieval, depending on the applications, some require the shape representation to be invariant to translation, rotation, and scaling, while others do not. shape descriptor is some set of numbers that are produced to describe a given shape feature. A descriptor attempts to quantify shape in ways that agree with human intuition (or task-specific requirements). Good retrieval accuracy requires a shape descriptor to be able to effectively find perceptually similar shapes from a database.

3.2.3 Texture

Texture refers to visual patterns with properties of homogeneity that do not result from the presence of only a single color such as clouds and water. Texture features typically consist of contrast, uniformity, coarseness, and density. There are two basic classes of texture descriptors, namely, statistical model-based and transform-based. The former one explores the grey-level spatial dependence of textures and then extracts some statistical features as texture representation.

3.3 CBIR

The role of CBIR starts when a query image and a large data base of images are available, then CBIR extracts visual contents (features) of the query image and compares these with the visual contents of each image in the data bank. Those images in the data bank, whose visual contents closely match those of the query image, are then retrieved. These retrieved images are supposed to be looking “similar” to the query image. However, in practice, only a few retrieved images will look similar, because the extracted visual features from any image will not fully characterize represent that image. Images that are close in feature space are, in general, not close semantically.

Two main functionalities are supported:

- Data insertion

- Query processing.

The data insertion subsystem is responsible for extracting appropriate features from images and storing them into the image database.

The query processing, in turn, is organized as follows:

the interface allows a user to specify a query by means of a query pattern and to visualize the retrieved similar images. The query-processing module extracts a feature vector from a query pattern and applies a metric (such as the Euclidean distance) to evaluate the similarity between the query image and the database images. Next, it ranks the database images in a decreasing order of similarity to the query image and forwards the most similar images to the interface module. Note that database images are often indexed according to their feature vectors by using structures.

4: Similarity Matching Techniques

After feature extraction we calculate the mean and standard deviation of these vectors.

Mean:

To find mean of N numbers add N numbers and divide it by N

If the numbers are ,X1,X2,X3,...,Xn the total is:

$$X1+ X2+ X3+...+Xn$$

The total is divided by N to make the average

$$X1+ X2+ X3+...+Xn/N$$

For multidimensional array we calculate mean along rows and columns

Standard Deviation:

The standard deviation (represented by the Greek letter sigma, σ) is a measure that is used to quantify the amount of variation or dispersion of a set of data values. A standard deviation close to 0 indicates that the data points tend to be very close to the mean of the set, while a high standard deviation indicates that the data points are spread out over a wider range of values. There are two common definitions for the standard deviation s of a data vector X.

$$(1) s = \left(\frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2 \right)^{\frac{1}{2}}$$

$$(2) s = \left(\frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2 \right)^{\frac{1}{2}},$$

where

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$$

and n is the number of elements in the sample. The two forms of the equation differ only in n – 1 versus n in the divisor. We save these values as feature vector for all the images in the database and at run time we calculate the feature vector of the query image, then these feature vectors are compared using different matching technique.

4.1: Euclidean Distance Algorithm

This distance metric is most commonly used for similarity measurement in image retrieval because of its efficiency and effectiveness. It measures the distance between two vectors of images by calculating the square root of the sum of the squared absolute differences. The Euclidean distance between point p and q is the length of the line segment connecting them (). In Cartesian co-ordinates, if p = (p1, p2,..., pn) and q = (q1, q2,..., qn) are two points in Euclidean n-space , then the distance (d) from p to q, or from q to p is given by formula

$$d(p,q)=d(q,p)=\sqrt{(q_1-p_1)^2+(q_2-p_2)^2+...+(q_n-p_n)^2}$$

5: CONCLUSION

Techniques that effectively use most of the information from image are backbone of an efficient content based image retrieval system for medical diagnosis. In this project we will develop an image retrieval system based on various techniques for feature extraction and similarity measurement. An algorithm for Content Based Image Retrieval (CBIR) using Discrete Wavelet Transform (DWT) and Dual Tree Complex Wavelet Transform (DT-CWT) will be implemented in this project images containing any evidence of retinopathy. Here texture features will be extracted which will be later on compared with entire database to perform classification of retinopathy grades. We will assess the algorithm performance using Messidor database containing 1200 retinal images with grades of each image marked in an excel sheet.

6: ACKNOWLEDGMENTS

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RETINA RECOGNITION SYSTEM

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ABSTRACT

Biometric is well known for abilities of using some humans body characteristics such as face, gait or voice i.e. physical or behavioral characteristics to recognize each other. Retina authentication is the most reliable and accurate biometric identification system available. Retina is very difficult to spoof because even the patterns are different for right and left eye and are unique even for identical twins. Moreover, retinal patterns do not change with age. In contrast to most algorithms known from the literature Morphological operations to be applied on segmented image of retinal blood vessels for smoothening the image. For feature detection FAST Feature Detection and Extraction algorithm is used to detect the corners of retina due to lesser computational time. Matching of retina feature points is done by Euclidean distance. Retinal recognition has been used in ATM identity verification and the prevention of welfare fraud, it is also used for security propose, Retinal scanning also has medical application [1].

Keywords

Retina Recognition, FAST Feature Detection and Extraction, Morphological operations, Euclidean distance.

1. INTRODUCTION

The security and the authentication of users is a prime concern in the network environments. Traditional security systems like Passwords or Personal Identification Numbers (PIN) and key devices like Smart cards cannot provide security and reliability in all the scenarios. The main problem with these traditional techniques is that there is possibility to forget the password. Moreover, if the password is known to others, the unauthorized user can have access to the accounts of the valid user. Biometric based user authentication techniques provide a best solution for the above mentioned problem. This technique is extremely reliable and secure. The authentication server is completely secure where biometric verification data are stored in a central database. Areas that may use biometric recognition schemes include secure access to private areas of a building, computer systems to prevent unauthorized log-ins, government and military facilities and ATMs. Such facilities are vulnerable to security breaches and would require high level security to curb such incidents. Biometric Recognition refers to the automated recognition identification of individuals based on their physiological characteristics and to some extent also behavioral characteristics. By use of biometrics it is possible to achieve this high level of security requirements in the facilities mentioned above.

An automated process of identifying an individual based on the individual's biometric features is the biometric approach [2].

2. DESIGN METHODOLOGY

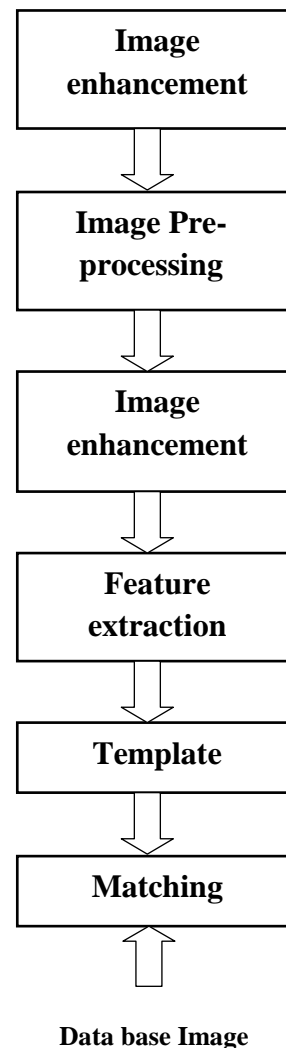


Figure 1: Flow chart of the design methodology

2.1 Image Acquisition

Image Acquisition is the process of obtaining an image from a hardware source like camera or scanner. MATLAB provides image acquisition toolbox which helps reading the image and preparing it for image pre-processing. Since retina scanner is expensive DRIVE data base is used. The DRIVE database has been established to enable comparative studies on segmentation of blood vessels in retinal images [3].

2.2 Image Pre-processing

This is the process of preparing the acquire images for image enhancement. Binarization, thresholding, resizing, normalization etc. are image preprocessing techniques. Image resizing will enlarge smaller image to fit in big screen so that further process is carried out on it [4].

2.3 Image Enhancement.

This is a process that improves the subjective quality of image more suitable to use. It is the process of making the image characteristics more visible and highlighting the edges of blood vessels of the retina in preparation of the feature extraction process. It involves four processes:

- RGB to grayscale conversion and Green Channel Image selection.
- Histogram Equalization.
- Noise removal and Filtering.
- Image sharpening and smoothening.

2.3.1 RGB to grayscale conversion and Green Channel Image selection.

This is the process of converting RGB image to the grayscale image. Green channel is selected because it has the highest intensity as compared to Red and Blue. First the RGB image conversion is done in green channel then this green channel image conversion is done in grayscale. All image enhancement process is further proceeding on grayscale image [5].

2.3.2 Histogram Equalization.

This is one of the processes of enhancing an image using the image histogram. It is used to spread the dynamic range of the image and also to have equal pixels in all the grey levels [6].

2.3.3 Noise removal and Filtering.

This is the process of removing noise. Noise in images could arise from the process of image acquisition. Median filters will be used to remove noise from the image [4].

2.3.4 Image sharpening and smoothening.

This is a process of enhancing that deals with de-blurring, highlighting edges, improving image contrast and brightening the image. Low pass filtering help for smoothening the image and high pass filter for sharpening the edges of the image.

2.4 Feature Extraction.

This is the process of extracting the feature like corner or edges or line from the image. Here unique corner or edges of blood vessels from the retinal image is extracted using image

processing techniques. This process is done after the image is enhancement. It involves the following processes:

- Morphological structuring.
- Feature Detection.

2.4.1 Morphological structuring

Morphology relates to the study of object forms, regions and shapes. It is used for extracting feature from an image as per our application. Erosion with opening operation is used to make the thick edges thinner after the image has been filtered. Disk shape structuring element (SE) is used on retina has a parameter such as radius. Skeletonization is a process of reducing or thinning the edges of blood vessels of an image without changing the essential structure of the blood vessels [7].

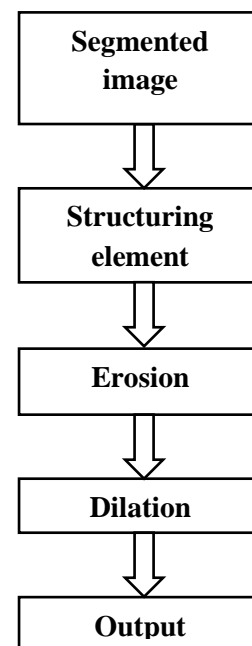


Figure 2: Morphological Process

2.4.2 Feature Detection

For the detection of these blood vessels, the corners of the lines that form the blood vessel were used to identify the blood vessels. Since the blood vessels lines are inconsistent and have numerous sharp bend, the FAST Algorithm we propose to use to detect them and return corner points.

2.4.2.1 FAST Feature Detection and Extraction

This is a feature detection method that detects corners as the basis of feature extraction. They emphasized on efficiency and high speed of operation while still maintaining a high level of accuracy. This is the fastest detection method as compared to others above such as the SIFT (scale-invariant feature transform) and MSER (maximum stable external Regions). It takes less time and also little memory during computational process [8].

3. ALGORITHM OF FAST FEATURE DETECTION

1. Select a pixel **P** in the image which is to be identified as an interest point or feature point. Let its intensity be I_P .
2. Set an appropriate threshold value **t**.
3. Consider a circle of 16 pixels around the pixel of interest point **P** under test. (See the image below)

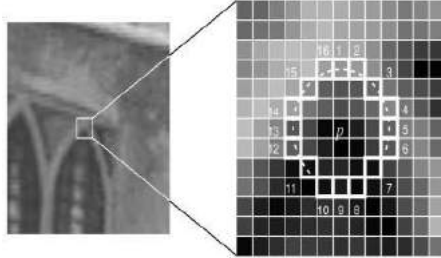


Fig 3: Fast Detection Image

Now the pixel **P** is a corner if there exists a set of **N** contiguous pixels in the circle (of 16 pixels) which are all brighter than $I_P + t$ or all darker than $I_P - t$. (Shown as white dash lines in the above image). **N** Was chosen to be 12.

4. A high-speed test was proposed to exclude a large number of non-corners. This test examines only the four pixels at 1, 9, 5 and 13 (First 1 and 9 are tested if they are too brighter or darker. If so, then checks 5 and 13). If **P** is a corner, then at least three of these must all be brighter than $I_P + t$ or darker than $I_P - t$. If neither of these is the case, then **P** cannot be a corner. The full segment test criterion can then be applied to the passed candidates by examining all pixels in the circle. This detector in itself exhibits high performance, but there are several weaknesses:
 - It does not reject as many candidates for $N < 12$.
 - The choice of pixels is not optimal because its efficiency depends on ordering of the questions and distribution of corner appearances.
 - Results of high-speed tests are thrown away.
 - Multiple features are detected adjacent to one another.

First 3 points are addressed with a machine learning approach. Last one is addressed using non-maximal suppression [9].

3.1 Machine Learning Corner Detection

1. Select a set of images for training (preferably from the target application domain).
2. Run FAST algorithm in every images to find feature points.
3. For every feature point, store the 16 pixels around it as a vector. Do it for all the images to get feature vector **P**.
4. Each pixel (say **X**) in these 16 pixels can have one of the following three states:

$$S_{p-x} = \begin{cases} d, & I_p - x < I_p - t \quad (\text{darker}) \\ s, & I_p - t < I_p - x < I_p + t \quad (\text{similar}) \\ b, & I_p + t < I_p - x \quad (\text{brighter}) \end{cases}$$

Depending on these states, the feature vector **P** is subdivided into 3 subsets P_d, P_s, P_b .

5. Define a new Boolean variable, K_P which is true if **P** is a corner and false otherwise.
6. Use the ID3 algorithm (decision tree classifier) to query each subset using the variable K_P for the knowledge about the true class. It selects the **x** which yields the most information about whether the candidate pixel is a corner, measured by the entropy of K_P .
7. This is recursively applied to all the subsets until its entropy is zero.
8. The decision tree so created is used for fast detection in other images [10].

3.2 Non-maximal Suppression

Detecting multiple interest points in adjacent locations is another problem. It is solved by using Non-maximum Suppression.

1. Compute a score function, **V** for all the detected feature points. **V** is the sum of absolute difference between **P** and 16 surrounding pixels values.
2. Consider two adjacent key points and compute their **V** values.
3. Discard the one with lower **V** value.

4. EUCLIDEAN DISTANCE ALGORITHM

1. There are key point descriptors for both the image. Take one of the key point descriptor from one image [11].
2. Now, find the Euclidean distance between the key point which descriptor is taken and the key point descriptors of other image.
3. Take the Euclidean distances of one key point in image1 to all the key points of image2.
4. Arrange them in ascending order
5. Set some threshold T (mostly in the range of 0.3 to 0.7).
6. Take the ratio of First nearest distance to second nearest distance and would be less than this threshold, then only it is a match and save that index, otherwise there is no match.
7. Repeat this for all key points' descriptors in image1 [12].

5. CONCLUSION

From the literature survey that has been done so far, Morphology operation like dilation, erosion, structuring element and Skeletonization are best suited for feature extraction as these operations helps to find the prominent blood vessels and provide a proper retinal tree for detecting feature key. For feature detection, FAST feature detection algorithm seems more efficient and take less time compare to SIFT (scale-invariant feature transform) and MSER (maximum stable external Regions) feature detection. As the device required for capturing retinal image is very expensive, retinal images will be taken from DRIVE database.

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Besides, we would like to thank our other faculties' teachers of our branch electronic and telecommunication.

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SELF BALANCING ROBOT

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ABSTRACT

The use of robots nowadays has become an integral part of our lives. We use them for a variety of purposes ranging from life saving to entertaining. Due to their growing popularity, a vast number of research programs have been set up all around the world. One such case of robotics research that sparked a high level of interest worldwide is the research on unstable systems such as the inverted pendulum. Since the birth of this ground-breaking research, many studies have followed thereafter, seeking to integrate or incorporate the idea with other systems. Some of the fields that are endorsed by the inverted pendulum research include aero dynamics (landing systems), freight systems and self-balancing robots. This particular research focuses on the topic of self-balancing robots.

1. INTRODUCTION

Self balancing robots are increasingly becoming popular because of their unique ability to move around in two wheels. They are characterized by their high maneuverability and excellent agility. The goal of the project is to adjust the wheels' position so that the inclination angle remains stable within a pre-determined value. When the robot starts to fall in one direction, the wheels should move in the inclined direction with a speed proportional to angle and acceleration of falling to correct the inclination angle. So I get an idea that when the deviation is small, we should move "gently" and when the deviation is large we should. For performing this operation a balancing unit will be equipped with a gyro and accelerometer sensor whose output will be processed by PID controller and necessary angel of tilt and angular velocity will be found to run the motors. Accelerometer sensor whose output will be processed by PID controller and necessary angel of tilt and angular velocity will be found to run the motors.

2. METHEDOLOGY

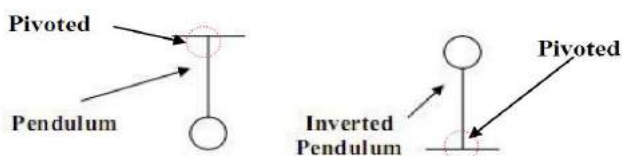


Figure 1.

For two-wheeled self-balancing robots, stability is vital as they cannot remain upright (balanced) without effort. As previously mentioned, their design concepts are mostly derived from classical robotics research called the inverted pendulum. An inverted pendulum, like its name suggests, is a pendulum that has its mass above its pivot point and not below like traditional pendulums(fig) .A self-balancing robot, such as a Segway, is an extended version of an inverted pendulum. The two systems could be related on two accounts; the cart of the inverted pendulum could be related to the wheels and the pole to the robots chassis



Figure 2.

For two systems to be able to balance and thus staying upright at all times, there must be a thrust applied at their pivot points every time their mass is leaning or falling. This thrust or torque must always be in the same direction that the mass is falling so that it can induce the pivot to stay under the body or mass of the system, to maintain balance. For the inverted pendulum or the robot to move to a pre-defined location or target position from the upright position (stable position), a specific lean to the direction of the target position has to be invoked by the wheels or cart. To do so, the wheels have to cautiously roll in the opposite direction of the target position so as to provide a required lean for the distance.

One analogy that may bring this mechanism to a clear understanding might be of a hand balancing a stick on it's a palm as in the illustration above in figure. One clear issue that this analogy might help bring to the surface is that as the stick gets reasonably shorter, more effort will be required to balance it and the opposite is true.

3. FLOW CHART

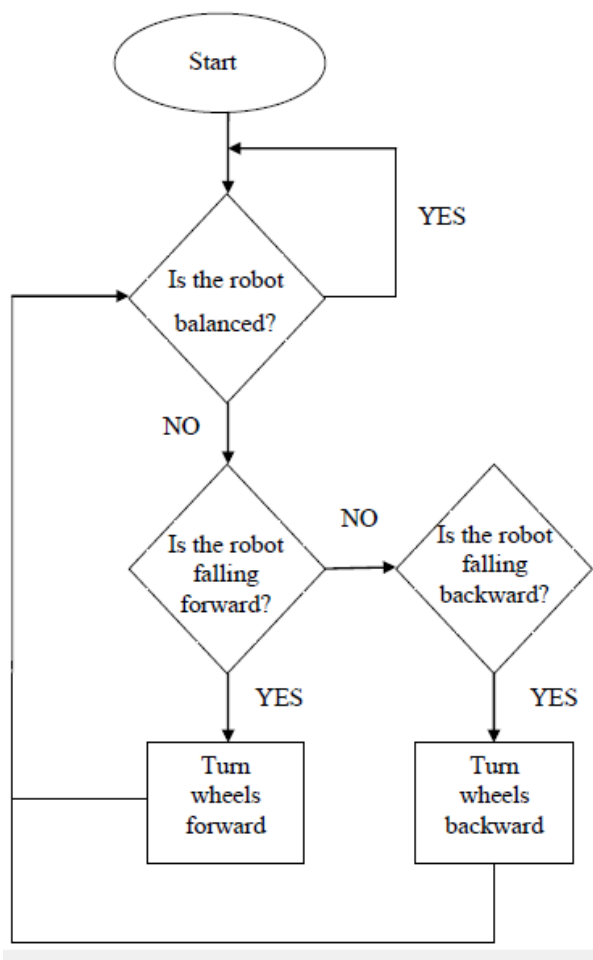


Figure 3: Flow chart of Self balancing robot

As explained earlier in chapter 4.1 thrust or torque must always be in the same direction that the mass is falling so that it can induce the pivot to stay under the body or mass of the system, to maintain balance. That is the wheels should be always below the center of gravity of body.

So when we initially start the system the sensors will start calibrate angle of tilt and angular velocity and it will take some secs for sensors to get stable and accurate reading .now the sensors will generate the reading proportional to its position.

Now this readings are send to microcontroller i.e arduino , where this generated readings are compared to the stored readings if this readings match the stored readings it is considered as the robot is balancing. Continuous monitoring of this readings and controlling is done. Now if the readings does not match the stored readings it is considered as robot is not balancing and falling in either direction.

Now depending on the readings the side in which robot is falling is found necessary action of moving the wheels is initiated by the controller . it is simple move the wheels in direction of fall. If robot is falling in forward direction move wheels forward and vice versa.

Once the robot again starts balancing continuous monitoring. The same is explained in flow chart below

4. BLOCK DIAGRAM

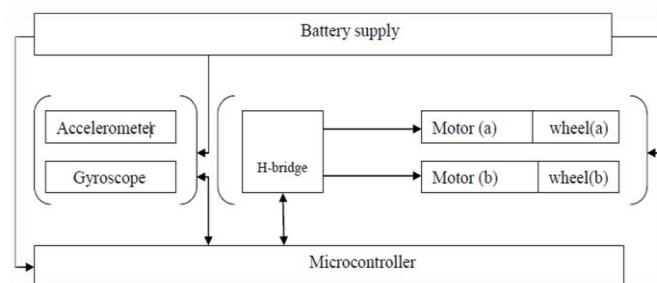


Figure 4: Block diagram of Self balancing robot

- **Microcontroller** :- Arduino mega ATmega2560 microcontroller
- **Sensors**:- MPU-6050, Accelerometer & Gyroscope
- **Motor controller**:- l298 h bridge motor driver
- **Motors**:- Dc geared motors
- **Software**:- arduino ide

5. FUTURE SCOPE

1. The robot can be manually controlled by either using Bluetooth ,rf or any other wireless means .
2. A prototype can be made of human size that can be used by human's in daily use.
3. Proximity sensor can be added to avoid collision.

6. CONCLUSION

Thus with an self balancing robot we can attain an robotic ability to stand still by balancing itself as per movement of friction. By monitoring the sensors value, processing it accordingly helping it balance, thus making it a better machine then ordinary robot.

The accelerometer sensor senses the direction of fall of the robot, whereas the gyro will sense speed off falling ie angular velocity, now this all terms will be processed in the arduino using PID control algorithm.

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PATIENT MONITORING USING GSM AND ZIGBEE AND DATA LOGGING SYSTEM

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ABSTRACT

In hospitals, considering the huge campus, it is very difficult for the doctors to reach every patient for their daily updates and its very time consuming to monitor all the patients on daily basis. Home care services are growing up in the past years. Contemplating the patient-family pair, it represents a solution to the medical problems of the modern life. Also in critical situations, it is very important to report the live health status of the patient to the doctor and provide immediate medical help to the patient during the critical hour. Statistics reveal that everyday many lives are affected because the patients did not get timely and proper help. In this paper we have designed and developed a reliable, energy efficient patient monitoring system. It is able to send parameters of patient in real time. It enables the doctors to monitor patient's health parameters (temperature, heartbeat etc.) in real time. We present the design and implementation of a Remote Patient Monitoring (RPM) system based on wireless technology using a cellular phone, to send an SMS (Short Message Service) to the medical staff. The proposed system combines two commonly used technologies namely, Global System for Mobile (GSM) and ZigBee Technology

General Terms

Remotely accessing patient's health using ZigBee and GSM and saving patient's health statics in the form of data logs.

Keywords

Patient Monitoring, ZigBee, GSM, Data Logging Syatem, Remotely access patient's health.

1.INTRODUCTION

So for such scenarios we are proposing a system which is wireless and it will give all the information about the patient's vitals to the doctor at one central station of hospital where they can monitor the patient. This will contain a .Net based software interface, which will also log the data of the patient's vitals so that it can be analyzed to determine the patients' health situation. And this interface will also contain the Medicines that have been recommended by the doctors, so that the staff other than the doctor can take care of the patient in absence of the doctor. Ambulatory patients are well suited to be monitored using wearable sensors. The goal of such systems is to provide early warning of physiological deterioration such that preventative clinical action may be taken to improve patient health.

Despite wearable patient monitors now being manufactured commercially, allowing the collection of continuous physiological data from ambulatory patients, the resulting quantity of data acquired each day is large, and a "data deluge" effect occurs. The workload of clinicians and

healthcare workers prevents them from inspecting long time-series of multivariate patient physiological data to a high degree of accuracy, and the predictive aspect to patient monitoring is lost. Therefore online processing of these large datasets is, therefore, required for predictive monitoring. However, existing clinically validated devices often simply compare physiological data to data determined by trial-and-error, variable thresholds and generate an alert if those thresholds are exceeded.



Figure 1. Basic Working Of Patient Monitoring.

2. LITERATURE SURVEY

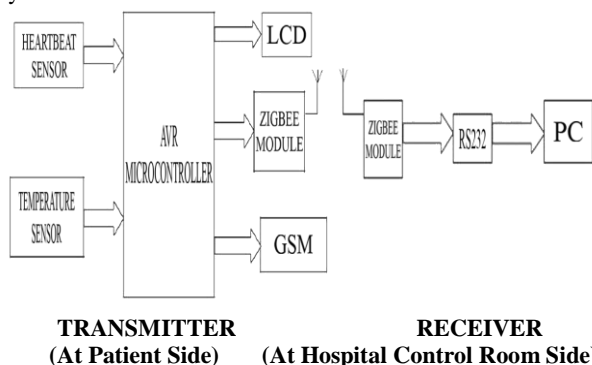
Few years ago a person's heartbeat was generally measured personally by connecting patch cord on their chest. This created a problem to keep a tab on patient's health and provide treatment in case of emergency. Lately, measurement of Heartbeat and Temperature is done with the help of stethoscope and thermometer which require personal visit. To overcome these limitations we are proposing a system to enable remote access of statistical representation of any patient's biological parameters. Here we are using ZigBee for the hospital communication for monitoring the patient.

3.DESIGN METHODOLOGY

In our project we are going to measure patient vitals using Heartbeat sensor and Temperature sensor which indicates one of the critical vital states of patient. The data received by the sensors will be processed by the predefined software and will be transmitted to the transmitter side of the ZigBee module which will be near to the patient's room. This data will be

received at the receiver side of the ZigBee module which will be at the doctor's desk. At the same time, in case of any critical condition, we also have a GSM module which will send an alert message to all the numbers that are predefined in the program. The critical condition will be decided based on the readings received from the Temperature sensor and the Heartbeat sensor. The alerts generated from the sensors transmitted with the help of GSM will help providing proper treatments to patients within the "Golden Hour".

Following is a block representation of the working of the system.



TRANSMITTER **RECEIVER**
(At Patient Side) (At Hospital Control Room Side)

Figure 2. Block Representation of the System

This vitals we are going to measure using dedicated sensor such as heart beat sensor and temperature sensor (MLX 90614), this sensors are interfaced with AVR μ C which will take this parameters and it will forward this values to central PC using ZigBee and check this values for any critical situation if it falls under any life threatening situation then it will send message to the doctors by using GSM module.

So we are going to use following components in our project

1. AVR μ C 128
2. Heart Beat sensor
3. Temperature sensor
4. GSM SIM 300 module
5. ZigBee
6. PC side we will have .NET interface

1) **AVR Microcontroller 128:** It collects output of the sensors and analyses it. Then sends it to the doctor's pc through ZigBee transmitter and to the doctor's mobile through GSM module. The high-performance, low-power Atmel 8-bit AVR RISC-based microcontroller combines 128KB of programmable flash memory, 4KB SRAM, a 4KB EEPROM, an 8-channel 10-bit A/D converter, and a JTAG interface for on-chip debugging. The device supports throughput of 16 MIPS at 16 MHz and operates between 4.5-5.5 volts. By executing instructions in a single clock cycle, the device achieves throughputs approaching 1 MIPS per MHz, balancing power consumption and processing speed.

2) **ZigBee Module:** Sensors value should be sent to the central machine of the hospital which can be achieved by using ZigBee. It consists of a transmitter and a receiver for communicating data from microcontroller to the doctor's pc.

3) **Heart Beat Sensor:** Heart Beat sensor is designed to give digital output of Heart beat when a finger is placed inside it. This digital output can be connected to microcontroller directly to measure the Beats per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger each pulse. Its dual low power operational amplifier consists of a super bright red LED and light detector. One will act as amplifiers and another will be used as comparator. LED needs to be super bright as the light must pass through finger and detected at other end. When heart pumps a pulse of blood

through blood vessels, finger becomes slightly more opaque so less light reach at the detector. With each heart pulse, the detector signal varies which is converted to electrical pulse.

4) **Temperature Sensor:** Temperature sensor will be interfaced with AVR using ADC (Analog to Digital convertor), the value which is sensed by the temperature sensor is in Analog form which is not understandable by the μ C which has to be digitize by the ADC which then in digital format to do further calculation and for our algorithm. So now these values will be transmitted using GSM and ZigBee

5) **GSM:** - In our μ C, the people to whom we desired to share our critical situation will be predefined. So our algorithm will first check for any critical situation from the values, and if found, than our Embedded system will generate the message for the desired persons and this alert message will be sent.

6) **Software side for Database:-**The wirelessly data sent by the Embedded system will be received by the PC which will be presented in Graphical interface which will be developed by .NET. It will receive the data and it will display the data LIVE. It will also store the data in Historical format for further analysis.

An illustration of the above hardware is as shown in the flowchart below.

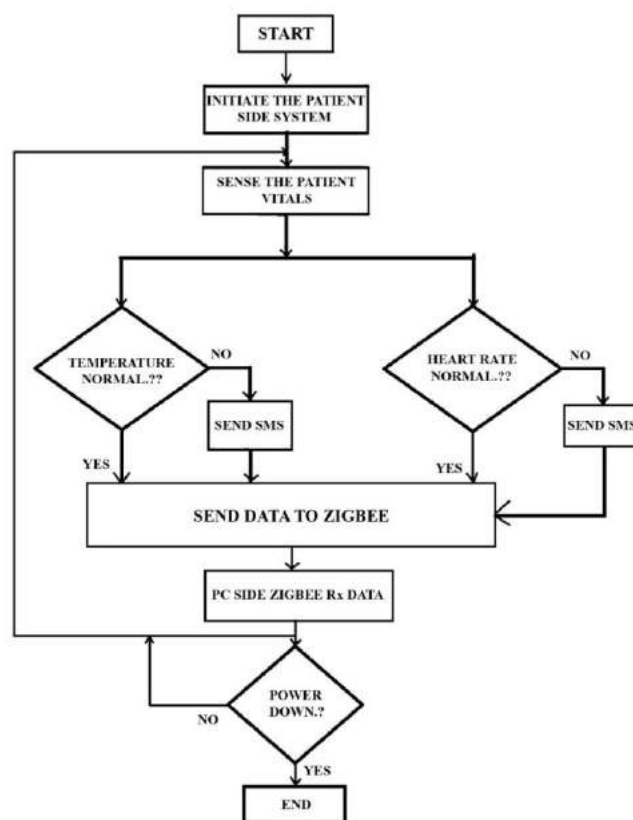


Figure 3. Flowchart representing the entire operation

Alert System:- Our system will have predefined levels for the sensor, which will define the critical level for the patient, if this vitals drop below the abnormal then the SMS will generate by the system at will be sent to the Doctor and the patient family.

Data Logging Process: - The Temperature sensor and Heart beat sensor will monitor the patient as per there vital and give the information to the μ C. μ C will take this value and it will

transmit this value on it ZigBee network where the central system will receive this data.

Now at the PC side we will have the ZigBee which will receive the data which is sent by the Patient side system. This software will receive the data and it will generate the Daily Log of the data as per the time it has been received. We can also access the old data as per the Date, so that doctor can analyze the patient health status.

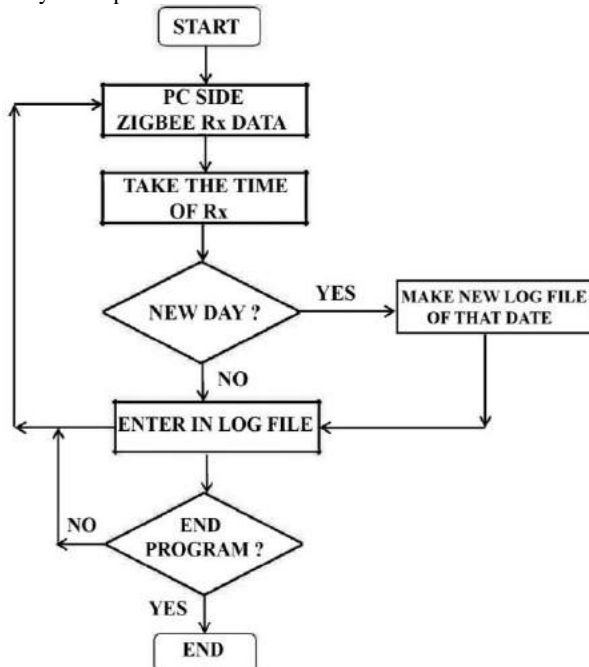


Figure 4. Flowchart for the database updating

4.TOOLS TO BE USED

1) AVR MICROCONTROLLER 128

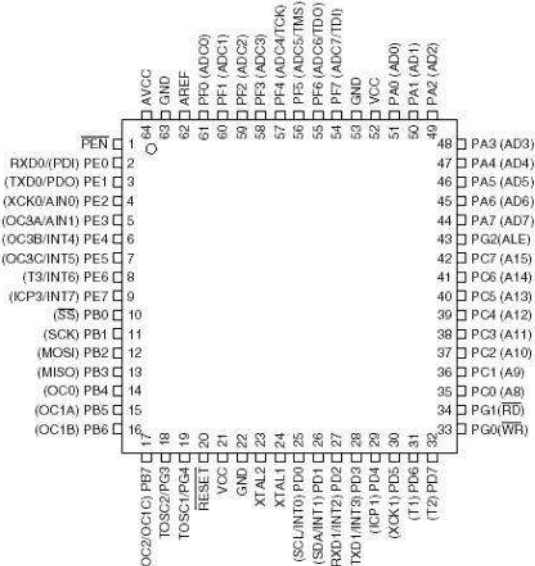


Figure 5. Pin Diagram of AVR 128

VCC Digital supply voltage.

GND Ground.

Port A to F Ports are an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). As inputs, Port pins that are externally pulled low will source current if the pull-up resistors are activated. The Port pins are tri-stated

when a reset condition becomes active, even if the clock is not running.

Port G (PG4--PG0) Port G is a 5-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port G output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port G pins that are externally pulled low will source current if the pull-up resistors are activated. The Port G pins are tri-stated when a reset condition becomes active, even if the clock is not running. The port G pins are tri-stated when a reset condition becomes active, even if the clock is not running.

RESET Reset input. A low level on this pin for longer than the minimum pulse length will generate a reset, even if the clock is not running. Shorter pulses are not guaranteed to generate a reset.

XTAL1 Input to the inverting Oscillator amplifier and input to the internal clock operating circuit.

XTAL2 Output from the inverting Oscillator amplifier.

AVCC AVCC is the supply voltage pin for Port F and the A/D Converter. It should be externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter.

AREF AREF is the analog reference pin for the A/D Converter.

PEN PEN is a programming enable pin for the SPI Serial Programming mode, and is internally pulled high. By holding this pin low during a Power-on Reset, the device will enter the SPI Serial Programming mode. PEN has no function during normal operation.

2) Power supply

The 12V AC supply to the step down transformer, in power supply unit, converts AC to DC using bridge rectifier.

3) ZigBee Transmitter and Receiver

ZigBee wireless network technology is launched and made by ZigBee Alliance, founded in August 2001, is a fast-growing organization. It mainly focuses on reliability, simplicity, low power and low cost. The ZigBee module is used to transfer information from the patient section to the server section. With ZigBee, communication upto about 50-100m away becomes easy.

There will be a ZigBee at the transmitting end for transfer of information and a receiving ZigBee at the receiving end for receiving the transmitted information and finally the received data is sent to the PC. In the PC a coding is written using Visual basic for transmitting the information of any abnormal health conditions to the specified mobile number in the program through a GSM modem.



Figure 6. ZigBee Transceiver

Features/Benefits

- 2.4 GHz for worldwide deployment
- Fully inter-operable with other Digi Drop-in Networking products, including gateways, device adapters and extenders
- Multiple antenna options
- Industrial temperature rating (-40° C to 85° C)

4) Mobile and GSM SIM 300 module

GSM (Global System for Mobile Communications) is a global digital mobile communication system, whose coverage is the most widely and reliability is very high. A GSM modem is a wireless modem that works with a GSM wireless network. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.



Figure 7. GSM Modem

5) Heart Beat Sensor

This sensor monitors the flow of blood through a clip that can be used on a fingertip or on the skin between the thumb and index finger. At rest, an adult man has an average pulse of 72 per minute. Often it is more convenient to use a program that simply displays the pulse rate in beats per minute. The amount of the blood in the finger changes with respect to time.

The sensor shines a light lobe (a small very bright LED) through the ear and measures the light that gets transmitted to the Light Dependent Resistor. The amplified signal gets inverted and filtered, in the Circuit.

Features of Heartbeat Sensor

- Provides a direct output digital signal for connecting to a microcontroller
- Works with a working Voltage of +5V DC

- Works as a Digital Heart Rate monitor
- Used as a Bio-Feedback control of robotic applications

Working of a Heartbeat Sensor

The heart beat sensor circuit diagram comprises a light detector and a bright red LED. The LED needs to be of super bright intensity.

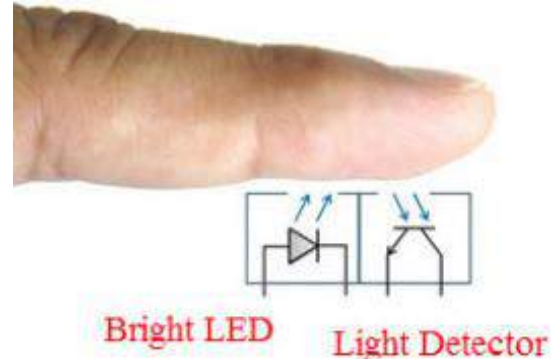


Figure 8.Heartbeat Sensor Principle

Now, when the heart pumps blood through the blood vessels, the finger becomes slightly more opaque; due to this, less amount of light reaches from the LED to the detector. With every heart pulse generated, the detector signal gets varied. The varied detector signal is converted into an electrical pulse. This electrical signal gets amplified and triggered through an amplifier which gives an output of +5V logic level signal.

6) Temperature sensor (MLX 90614):- The temperature sensors can measure temperature signals which are sent to the microcontroller. The data are then transmitted by ZigBee to the PC. The sensors are connected to the I/O port of the microcontroller. It is electronic device which provides a voltage analogue of the temperature of the surface on which it is mounted.



Figure 9. Temperature sensor (MLX 90614)

PIN DESCRIPTION

Table 1. Pin Description

NAME	FUNCTION
SCL	Serial CLock
SDA	Serial DATA

Features:

- Small size, low cost

- Factory calibrated in wide temperature range: -40 to 125 °C for sensor temperature and -70 to 380 °C for object temperature.
- Measurement resolution of 0.02°C
- SMBus compatible digital interface
- Movement detection;

Applications include thermostatic controls, industrial systems, consumer products, thermometers, or any thermally sensitive system, HVAC environmental controls, temperature monitoring systems inside buildings, equipment, or machinery, and process monitoring and control systems.

7) PC: -To monitor Patients health via ZigBee Receiver. The data transmitted by the ZigBee transmitter is received by the ZigBee receiver situated at the doctor's place. The data received is displayed on the PC to make it easier for the doctor to read.

8) Visual Basic .NET

Microsoft launched VB.NET in 2002. Microsoft's integrated development environment (IDE) for developing in Visual Basic .NET language is Visual Studio. VB.NET uses statements to specify actions.

5.RESULT

The paper shows monitoring of patients taking into consideration their physical parameters like the body Temperature and Heartbeat. The embedded system will consider the inputs it has received from these two sensing devices and generate an outcome with respect to the predefined software calculations. The final result of the outcome will be compared to the defined thresholds and a data log of the result will be generated. The patient's condition can be monitored remotely and continuously with the help of ZigBee transmitter and ZigBee receiver. If the values generated in the data log do not appear in between the defined thresholds an alert message will be generated. The alert message will be sent to all the predefined mobile numbers that are attached to the person under consideration with the help of GSM module. The alert messages will symbolize that the patient under the system's observation has developed some critical condition and needs to be attended immediately. In general cases, the data log will contain the time-to-time health parameters as generated by the embedded system and the list of medicines prescribed by the doctor. The data log will be in the form of a GUI interface and will help the doctor to study about the patient's history. This data log will also help the doctor to decide the medical course for the patient. The data log will also help caretakers to provide primary treatment to the patient in case of doctor's absence.

6.CONCLUSION

The Patient Monitoring system has great potential in improving problems in today's emergency response system. Any abnormalities in health conditions are informed via SMS to the indicated mobile number through GSM. We studied the feature of information gathering, processing data, and storing data from ZigBee and GSM help in monitoring of patients. This technology can also be setup at the patient's own house with the assistance of the family. Home care represents a growing field in the health Assistance. It reduces costs and increases the quality of Life saving of patients. As the modern life becomes more stressful and acute diseases appear,

prolonged treatments become more necessary. The same occurs for the elderly or handicapped patients. It reduces the need of transporting patients between house and hospital. Recent studies conclude that early and specialized pre-hospital management contributes to emergency case survival. The only limitation that poses a problem with the functioning of this setup is that the network may pose a problem during the sending of message with the GSM module.

7.FUTURE SCOPE

-The following measurements can be done in future: Blood pressure, Pulse oximetry and, Galvanic-Skin Resistance.Amenia. Similarly, we can also use SY-HS-220 which is the humidity sensor module used to measure humidity for the patients suffering from asthma.

-In future we can use various sensors like ECG sensor, SPO2 sensor, Saline level sensor, MEMS Sensor etc.

-Using GPS, the location of remote patient can be detected so that help can be provided in case of emergency from nearest hospital.

-In this project Doctor and other hospital staff can manage only one patient at a time. But in future Doctor can remotely monitor multiple patients at a time while walking in Hospital campus. For that we can develop an android application. By using this application Doctor can monitor multiple patients at a time and for that this android application will connect wirelessly with ZigBee module. And doctor using his Hand device like mobile, Tablet and other gadgets he can manage patients very easily.

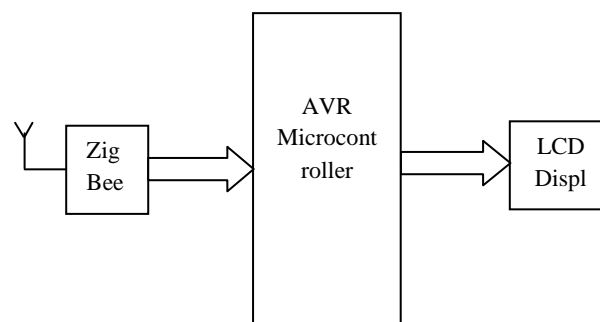


Figure 10. Block Diagram for Doctor's Hand Device

-Other future applications of our project are shown in the below diagram



Figure 11. Other Future Applications of Patient Monitoring

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RF/Microwave filter design using Matlab

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ABSTRACT

The project describes the Designing of microstrip filters which are suitable at high frequency(RF). Low pass and band stop filter are designed with the help of Richard transformation and kuroda's identity to get the value of length and width of the strip line. Microstrip filter calculation is done using MATLAB software to get values of all components and for simulation SONNET and ADS software is used. micro-strip band pass filter is designed with the help coupled lines, odd and even impedances of each coupler is calculated from which wshl is evaluated. ADS is used for finding wshl. The filter which are designed has cutoff frequency as 2.8GHz Substrate used is FR4($\epsilon_r=4.14$)

KEYWORDS

Highpass, Bandpass, lowpass

1. INTRODUCTION

In this paper we going to design micro-strip low-pass filter, band-stop and band-pass filter. The design process for low pass and band stop Microwave frequency ranges from 300Mhz to 30Ghz. Design of low pass filter is simple where as design of bandpass, bandstop, highpass involves other method. Radio frequency (RF) and microwave filters represent a class of electronic filter, designed to operate on signals in the megahertz to gigahertz frequency ranges (medium frequency to extremely high frequency). This frequency range is the range used by most broadcast radio, television, wireless communication (cellphones, Wi-Fi, etc.), and thus most RF and microwave devices will include some kind of filtering on the signals transmitted or received. Such filters are commonly used as building blocks for duplexers and diplexers to combine or separate multiple frequency bands RF measurement methodology can generally be divided into three major categories: spectral analysis, vector analysis, and network analysis. Spectrum analyzers, which provide basic measurement capabilities, are the most popular type of RF instrument in many general-purpose applications. Specifically, using a spectrum analyzer you can view power-vs-frequency information, and can sometimes demodulate analog formats, such as amplitude modulation (AM), frequency modulation (FM), and phase modulation (PM) micro-strip filter are not as difficult as that of band pass filter as the process for design the band pass filter requires completely new concept after we get component values (ie from the table of Chebyshev or butterworth) for designing in terms of micro-strip lines that will be

discussed further in this paper. Richard transformation and kurodas

identity will be used for band stop filter and for band pass filter coupled line designing method is used. and to calculate the value of impedances we have have some standard methods. With the help of DGS output characteristics is improved.

2. DESIGN METHODOLOGY

From the given data determine the order of the filter, cutoff frequency of the filter then design the low pass prototype the component values would be known from the butterworth or chebyshev

Table 2.1 elements values for maximally flat filter prototypes ($g_0 = 1, w_c = 1$ to 10)

N	g_1	g_2	g_3	g_4	g_5	g_6	g_7	g_8	g_9	g_{10}	g_{11}
1	2.0000	1.0000									
2	1.4142	1.4142	1.0000								
3	1.0000	2.0000	1.0000	1.0000							
4	0.7654	1.8478	1.8478	0.7654	1.0000						
5	0.6180	1.6180	2.0000	1.6180	0.6180	1.0000					
6	0.5176	1.4142	1.9318	1.9318	1.4142	0.5176	1.0000				
7	0.4450	1.2470	1.8019	2.0000	1.8019	1.2470	0.4450	1.0000			
8	0.3902	1.1111	1.6629	1.9615	1.9615	1.6629	1.1111	0.3902	1.0000		
9	0.3473	1.0000	1.5321	1.8794	2.0000	1.8794	1.5321	1.0000	0.3473	1.0000	
10	0.3129	0.9080	1.4142	1.7820	1.9754	1.9754	1.7820	1.4142	0.9080	0.3129	1.0000

Table 2.2 elements values for equal ripple low pass filter prototypes ($g_0 = 1, w_c = 1$ to 10, 0.5dB Ripple)

N	g_1	g_2	g_3	g_4	g_5	g_6	g_7	g_8	g_9	g_{10}	g_{11}
1	0.6986	1.0000									
2	1.4029	0.7071	1.9841								
3	1.5963	1.0967	1.5963	1.0000							
4	1.6703	1.1926	2.3661	0.8419	1.9841						
5	1.7058	1.2296	2.5408	1.2296	1.7058	1.0000					
6	1.7254	1.2479	2.6064	1.3137	2.4758	0.8696	1.9841				
7	1.7372	1.2583	2.6381	1.3444	2.6381	1.2583	1.7372	1.0000			
8	1.7451	1.2647	2.6564	1.3590	2.6964	1.3389	2.5093	0.8796	1.9841		
9	1.7504	1.2690	2.6678	1.3673	2.7239	1.3673	2.6678	1.2690	1.7504	1.0000	
10	1.7543	1.2721	2.6754	1.3725	2.7392	1.3806	2.7231	1.3485	2.5239	0.8842	1.9841

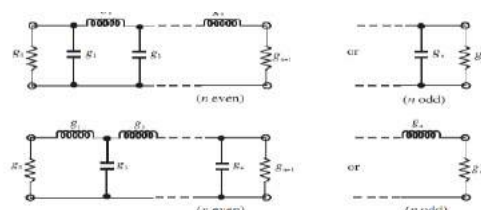


Figure 2.1 lowpass prototype filter

Table 2.3 elements values for equal ripple low pass filter prototypes ($g_0 = 1, w_c = 1$ to 10, 3dB Ripple)

N	g_1	g_2	g_3	g_4	g_5	g_6	g_7	g_8	g_9	g_{10}	g_{11}
1	1.9953	1.0000									
2	3.1013	0.5339	5.8095								
3	3.3487	0.7117	3.3487	1.0000							
4	3.4389	0.7483	4.3471	0.5920	5.8095						
5	3.4817	0.7618	4.5381	0.7618	3.4817	1.0000					
6	3.5045	0.7685	4.6061	0.7929	4.4641	0.6033	5.8095				
7	3.5182	0.7723	4.6386	0.8039	4.6386	0.7723	3.5182	1.0000			
8	3.5277	0.7745	4.6575	0.8089	4.6990	0.8018	4.4990	0.6073	5.8095		
9	3.5340	0.7760	4.6692	0.8118	4.7272	0.8118	4.6692	0.7760	3.5340	1.0000	
10	3.5384	0.7771	4.6768	0.8136	4.7425	0.8164	4.7260	0.8051	4.5142	0.6091	5.8095

Prototype filter is designed for $\Omega=1$ Converting values of this filter for the desired cutoff frequency is called frequency transformation.

$$L1 = L / \omega_c \dots (3.1)$$

$$C1 = C / \omega_c \dots (3.2)$$

$L1$ and $C1$ are the values of component suitable for desired cutoff frequency.

As the component values are found out use Richard transformation and kurodas identity to convert lumped component to transmission line.

Richard transformation

Recall the input impedances of short-circuited and open-circuited transmission line stubs.

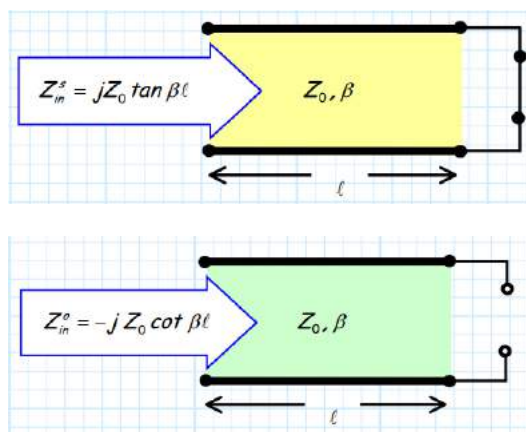


Figure 2.2 Richard transformation

Basically inductor is replace by short circuit and its impedance value will be same($L1$) and capacitor will be replace by open circuit and its impedance value is inversed ie($1/C1$).

$$L2 = L1 \dots (3.3)$$

$$C2 = (1/C1) \dots (3.4)$$

Where $L2$ and $C2$ are the impedances of the transmission line not the lumped elements

Kurodas identity

It is used to replace short circuited stub into open circuited stub.

Table 2.4 kurodas identity table

Initial Circuit	Kurodas's Identity

Denormalize the value of transmission line impedance and calculate the values of width and length for designing in micro-strip line simulate it using sonnet or ads software.

3.2 Designing of band pass filter.

Since filter has to implement on microstrip thus using coupled line. Determine the order of the filter and cutoff frequency as well as FWB(Fractional bandwidth). After finding filter coefficient calculating admittance interval from the formula listed below

$$\frac{I_{01}}{Y_0} = \sqrt{\frac{\pi FWB}{2g_0g_1}} \quad (3.5)$$

$$\frac{I_{j,j+1}}{Y_0} = \frac{\pi FWB}{2} \sqrt{\frac{1}{g_jg_{j+1}}} \quad \text{For } j=1 \text{ to } n-1 \quad (3.6)$$

$$\frac{I_{n,n+1}}{Y_0} = \sqrt{\frac{\pi FWB}{2g_ng_{n+1}}} \quad (3.7)$$

$$Y0 = 1/Z0$$

Then calculating the values of odd and even mode impedance.

coefficient calculating admittance interval from the formula listed below

$$(Z_{0e})_{j,j+1} = \frac{1}{Y_0} \left[1 + \frac{I_{j,j+1}}{Y_0} + \left(\frac{I_{j,j+1}}{Y_0} \right)^2 \right]$$

$$(Z_{0e})_{j,j+1} = \frac{1}{Y_0} \left[1 - \frac{I_{j,j+1}}{Y_0} + \left(\frac{I_{j,j+1}}{Y_0} \right)^2 \right]$$

3. RESULT

Table 3.1 Impedance and dimension values for coupled line filter(combined line filter).

Z(oe)	Z(oo)	W(mm)	S(mm)	L(mm)
80.0964	37.7964	2.1576	0.245289	14.24
63.1185	41.5385	2.855880	0.807593	13.9666
63.1185	41.5385	2.855880	0.807593	13.9666
80.0964	37.7964	2.1576	0.245289	14.24

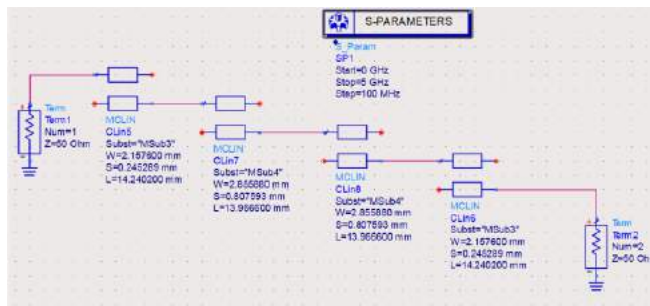


Figure 3.1 Design of band pass filter

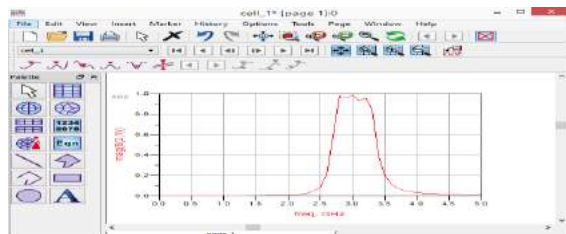


Figure 3.2 Frequency response of band pass filter

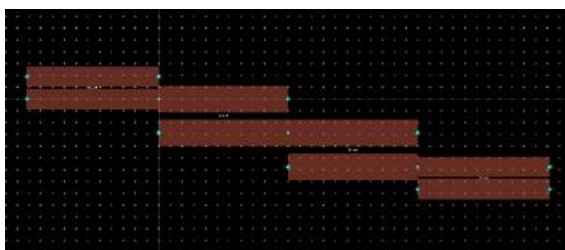


Figure 3.3 Final layout of bandpass filter

MATLAB OUTPUT

press 1 for butterworth or 2 for chebyshev 3dB filter or 3 for chebyshev0.5dB ripple 4 for bandstop filter 5 for band pass filter 4

order of the filter5

enter the lower cutoff freq 1*10^9

enter the higher cutoff freq 2*10^9

0.3568 0.9342 1.1547 0.9342 0.3568

0 1 0

0.3568 0.9342 1.1547 0.9342 0.3568 2.8025

0.9342 0.8660 0.9342 0.3568

c1=2.401259e+02 unitelement1=6.314918e+01

c2=6.592431e+01 unitelement2=8.355943e+01

c3=4.330127e+01

4. CONCLUSION

Designing of bandpass filter with Chebyshev(3rd order) approach in combination with concentrated components, i.e. inductors and capacitors and its computational verification in form of parallel coupled microstrip lines with the ADS give good filter characteristics at the center frequency 2.8GHz.for designing of microstrip low pass filter we used microstrip line calculator band pass filter implemented using coupler and its magnitude response is as satisfactory.

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Li-Fi (Light Fidelity): The Future Evolution

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ABSTRACT:

Li-Fi is nothing but Light Fidelity which makes the use of VLC i.e. Visible Light Communication which is brought up by Dr. Harald Haas who name's it as the data illumination technology which makes use of the LED bulbs to transfer the data with a speed of 10 megabits and works on the principle of the optical current. It surpasses the present day RF Communication in terms of speed, capacity, security, accuracy, cost, electromagnetic interference and efficiency. This technology is still under research and future advancements could lead to varied applications.

1. INTRODUCTION:



Fig. 1: Light Fidelity

Li-Fi can be considered as a light technology which has its roots with Wi-Fi i.e. it uses light instead of radio waves to transmit the information. Instead of Wi-Fi modems Li-Fi uses the Trans receiver fitted LED lamps that can light a room as well as transmit and receive information. Li-Fi is transmission of data through the illumination i.e. sending the data through LED light bulbs that varies in intensity faster than the human eye can follow.

Li-Fi = Light Fidelity. It is a bidirectional high speed and fully networked wireless communication and it is a subset of the optical wireless communication that could be a compliment of Radio frequency. It could also be a replacement in contexts of the data broadcasting with speeds of 224 Giga bits per second

It is wireless and it uses the visible light communication or infrared and near field communications technology, which carries much more information and has been proposed as a solution to the RF bandwidth limitations.

2. CONSTRUCTION:

The Li-Fi product consists of 4 primary sub-assemblies,

- Led Bulb
- RF power amplifier
- PCB
- Enclosure

The PCB controls the electrical input and the outputs of homes. The microcontroller is used to manage the different lamp functions. A RF is generated by the power amplifier and it is guided into the electric field by the electric bulb. The high concentration of the energy in the electric field vaporizes the content of the bulb to the plasma state at the bulb's center. This generates an intense source of the light. All of these sub-assemblies are contained in an aluminum enclosure.

In bulb assembly, a sealed bulb is embedded in a dielectric material. It is used as an electric field construction that forms focuses energy in the bulb. The energy from electric field rapidly heats the bulb to a plasma state that emits light of high intensity and full spectrum.

3. WORKING:

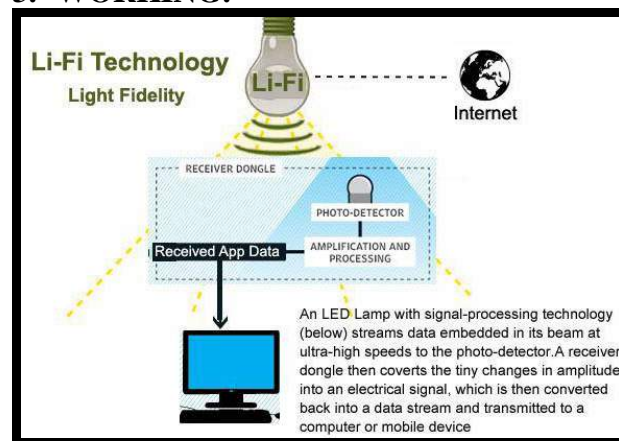


Fig 2: Working of Li-Fi

Li-Fi is typically implemented using the white LED light bulbs at the transmitter. These devices are normally used for illumination only by applying a constant current. By fast and subtle variations of the current, the optical output can be made to vary at extremely high speeds. This property of the optical current is used in the Li-Fi technology.

The procedure of operation is very simple. A digital 1 is transmitted if the LED is turned 'ON' and a zero is

transmitted if the LED is turned 'OFF'. The LED's can be turned ON and OFF very quickly which gives the opportunities for transmitting the data.

The LED and a controller that will code the data into it uses an array of the LED's for the parallel data transmission. This promises the speed of 10 Gbps i.e. one can download a full high definition movie in just 30 seconds. Even IR remote can send a single data stream of bits at the rate of 10,000-20,000 bps.

4. IMPORTANCE:

4.1 Why only VLC?

- VLC is the 'Visible Light Communication'.
- VLC is a combination of Illumination and Communication.
- Gamma rays are harmful for the human body.
- X rays have their related issues regarding human health.
- Infrared, due to eye safety regulation can only be used with low power.
- Ultraviolet light is good for place without people, but otherwise it is very dangerous for the human body.
- Li-Fi is the one which can replace the radio waves for the wireless communication systems.

4.2 Advantages over Wi-Fi:

Table 1: Comparison with Wi-Fi

PROPERTIES	LIFI	WIFI
SPEED	1-3.5GBPS	54-250MBPS
IEEE STANDARD	802.15.7	802.11b
RANGE	10 Meters	20-100 Meters
FREQUENCY BAND	100 times of THz	2.4 GHz
SPECTRUM RANGE	10,000 times than Wi-Fi	Radio spectrum
TRANSMISSION MEDIUM	Light as carrier	Use of radio waves
NETWORK TOPOLOGY	Point to point topology	Point to multi point topology

- Li-Fi transmits data with the help of LED and not radio waves.
- Interference is absent in Li-Fi.
- Pass through salty water also works in dense region.
- In Li-Fi light is blocked by walls and hence more privacy.
- Data transfer speed is more.

- Li-Fi covers a good distance of about 10 meters.
- Data density is good.

5. ADVANTAGES:

1. Traffic lights – to avoid accidents.
2. Intrinsically safe environment – Uses VLC which is safe.
3. Airlines – Overcomes the drawback of Radio waves.
4. Hospitals – In few of the medical instruments.
5. On ocean beds – For the military and the navigation purposes.
6. Street lamps – As free access points.
7. Reduces the electricity and maintenance bill.

6. LIMITATIONS:

1. Light cannot pass through objects.
2. Interferences from external light sources like sunlight and opaque materials in the path of transmission line will cause interruption in communication.
3. High installation cost of the VLC systems.
4. A major challenge faced by Li-Fi is how the receiving device will transmit back to the transmitter.
5. Connectivity.
6. Low reliability.
7. Short range.

7. FUTURE SCOPE:

Li-Fi provides a great platform to explore the grounds of transmission of wireless data at high rates. If this technology is put into practical use, each light bulb installed is potential and can be used as Li-Fi hotspot to transmit data in a cleaner, greener and safer manner.

8. ACKNOWLEDGMENTS:

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The Haptic Technology: Feel Virtual Objects

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ABSTRACT

Touch is very important sense among the 5 senses in advance computing. Haptic technology deals with applying touch sensation, vibrations and control to interact with computer application, so that when we touched virtual objects, they seems real. Haptic technology has power to change the whole experience of interaction with computing devices. Haptic Technology been described as “for the sense of touch what computer graphics does for vision”. Haptic screens are able to measure reactive forces generated by users. This emerging technology currently used for solving challenging problems in mechanical design, actuators, real time system. This paper describes what is Haptic Technology, how it works, types of Haptic interfaces, application, advantages and disadvantages, future scope.

1. INTRODUCTION

1.1 What is Haptic Technology?

Term haptic is from the Greek word *ἅπτικός* (haptikos), meaning pertaining to the sense of touch and comes from the Greek verb *ἅπτεσθαι* (haptesthai) which mean to “contact” or “touch”.

Haptic technology is science that interfaces or recreates the user with a virtual environment via the sense of touch by applying different layer forces, vibrations, and even motions to the user. This mechanical stimulation could be used to creation of virtual, for control of such virtual objects. Even it is used to enhance the remote control of machines and devices.

A haptic system includes:

- Sensors
- Actuator control circuitry and actuators that either vibrates or exert force.
- Real-time algorithms 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 user interacts with your product's buttons, touch screen, lever, joystick, etc. this control area or environment information is sent to the OS, now OS then sends play command through the control circuitry to the actuator.

1.2 What is Haptic Interface?

A user interface that allows a computer to interpret the sensation of touch. Haptic interfaces are used in surgical rehearsal systems to imitate the body's reaction to touch, and

incorporated into minimally invasive instruments to give surgeons a better 'feel' for the tissue without invasive access.

A haptic interface is mainly implemented and applied in virtual reality environments, where an individual can interact with virtual objects and elements. A haptic interface relies on sensors which send an electrical signal to the computer based on different sensory movements or interactions. Each electrical signal is interpreted by the computer to execute a process or action. In turn, the haptic interface also sends a signal to the human organ or body. For example, while playing a racing game using a haptic interface powered data glove, a user can use his or her hand to steer the car. However, when the car hits a wall or another car, the haptic interface will send a signal that will imitate the same feeling on user's hands in the form of a vibration or rapid movement.

1.2.1 Types of Haptic interfaces

Haptic interfaces are divided into 2 categories:

1. **Force feedback**- Force feedback interfaces are used to explore and modify virtual objects in three physical dimensions in applications and has basic function as to display contact forces and positions to the user.
2. **Tactile feedback** - Tactile feedback deals with properties such as roughness, smoothness and temperature etc.

1.3 Working of Haptic:

Follow below diagram to understand the basic working of haptic:

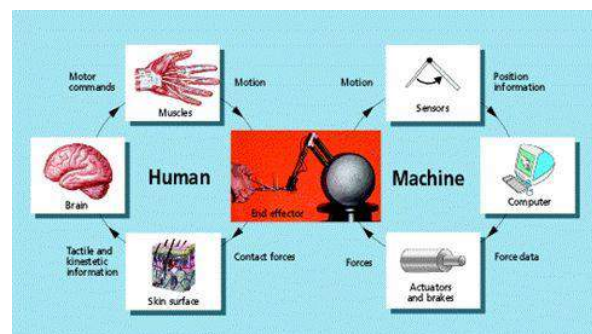


Fig 1 Working of Haptic

From figure 1, human part (left side) controls the situation and area of the hand, while the machine part (right side) exerts forces from the hand to replicate contact with a virtual object. Also all required sensors, processors and actuators will be provided by both the system. In the case of the human system, nerve receptors perform 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. HAPTIC TECHNOLOGIS

2.1 Cutaneous:

Relating to or involving/affecting the skin. It comes with sensitivity of pressure, temperature, and pain.

2.2 Tactile:

Tactile means “of or connected with the sense of touch”. Pertaining to the cutaneous sense, but more specifically the sensation of pressure rather than temperature or pain.

2.3 Kinesthetic:

Relating to the feeling of motion. Exerts controlled forces on the human body using a passive connection that constantly remains in contact with the limbs of the operator. It is related to sensations originating in muscles, tendons, and joints.

2.4 Force Feedback:

Relating to the production of information mostly mechanical production that can be sensed by the kinesthetic system.

2.5 Haptic communication:

Haptic communication means by which users and machines or system communicate via touch. It mostly concerns networking issues.

2.6 HAPTIC Devices:

Haptic devices (or haptic interfaces) are mechanical devices that mediate communication between the user and the computer. Force feedback is field of haptic that deals with devices that interact with the muscles and tissues that provides human a sensation of a force being applied. Hardware and software that stimulates humans' sense of touch and feel through tactile vibrations or force feedback. These devices mainly consist of robotic manipulators that push back against a user with the forces that correspond to the environment that the virtual effector's is in. Tactile feedback uses devices that interact with skin to indicate heat, pressure, and texture. These devices have been used to indicate whether user is in contact with a virtual object or not. Other tactile feedback devices have been used to stimulate the texture of a virtual object. PHANTOM and CyberGrasp are some of the examples of Haptic Devices.

A haptic device must be able to resist the force applied by a user. Just as a lever allows you to apply a large force with little effort, longer links in a robotic arm allow you to exert larger forces on the motors that control the bending of the robotic arm. Larger linkage-based systems therefore require larger motors that can exert more force. This can become very expensive and in most cases impractical, which puts a limit on the size of a linkage-based system. Because a tension-based device applies force directly to the point of contact through the tension in the cables, there is no need to compensate for the “lever effect”. This removes the limitation on workspace size and the amount of force that could be applied. As a result,

a tension-based device could be the size of a mouse pad or the size of a room.

2.7 HAPTIC RENDERING:

Haptic rendering is the process of computing and generating forces in response to user interactions with virtual objects. The goal of haptic rendering is to enable a user to touch, feel, and manipulate virtual objects through a haptic interface. As in the days when people were astonished to feel their first capacitive touch screen device, people are astonished today to feel their first virtual object. Yet the rendering techniques we use today will someday seem like yesterday's touch screen displays - the first steps into a vast field. To understand the issues, we present here a brief overview of haptic systems, and the techniques needed for rendering the way objects feel. This includes a description of the mechanics of haptic interfaces and a simplified view of the system architecture including haptic display, computational, and software elements. Haptic rendering algorithms are responsible for computing the correct interaction forces between the haptic interface representation inside the virtual environment and the virtual objects populating such environment. Moreover, haptic rendering algorithms make sure that such forces are correctly rendered on the human operator by the haptic device.

2.8 Virtual Reality (VR)

What do we think of when we hear the words Virtual Reality (VR)? This can be described as the technology that makes feel users that they are in Virtual Reality (VR). VR provides complete different way to feel and experience information. It is term used to describe a three-dimensional, computer generated environment which can explored and interacted with by a person.

VR further divided into:

- Development of a real environment for training and education purpose.
- The development of an imagined environment for a game, can be used for interactive story.

3. APPLICATIONS

Haptic Technology is very advanced technology having lots of applications like Medical training, surgical training, Physical rehabilitation, Training and education, Museum display, sculpting and CAD, Scientific Visualization, Military application and Entertainment.

FUTURE APPLICATIONS

1. Holographic Interaction:

Research is carried on by adding haptic feedback to holographic projection .Using this feedback, the user receives tactile response from holograph as if it were a real object .It is based on using ultrasound waves thereby creating acoustic radiation pressure .It is through tactile response that user perceives the object.

2. Biometric Haptic:

Haptic can also be used for biometric. Conventional biometrics require a unique ID and password. These can be tedious to remember and hence are inconvenient. Further, these passwords are less secure. These can be hacked without being known and hence are not very safe and reliable. The haptic-based biometric measure the position, velocity, and force. After these measurements using algorithms, unique physical patterns can be developed which can be used for identification.

3 E-Commerce:

Using haptic feedback in electronic commerce enables consumers to physically interact with the commodity. The product can be felt by touching and properties such as texture, roughness can be determined. Consumers usually like to feel and touch the object before buying.

4. ROADMAP TO MULTIMEDIA HAPTICS:

In a virtual environment, a real scenario is simulated by a computer-generated application where some of the user's senses are innovatively represented in order for them to interact and feel stimuli that are very similar to the real environment.

Different Parts of Multimedia Haptic-

- **Part 1 : Human Haptic:**

It includes following –

1. The human sensory system
2. Touch & Cognition
3. Human Motor System
4. Haptic Anatomy

- **Part 2: Machine & Computer Haptic:**

Involves designing, constructing, and developing mechanical devices as well as Design and development of algorithms and software

Traditionally, human-computer interfaces have delivered types of stimuli that are based on two of our senses, namely vision and sound. However, with the addition of the sense of touch through tactile and force feedback, the computer-based applications become richer in media content through better mimicry of real-life situations and tasks or remote real environments. The sensing of forces is coupled with both the

visual system and one's spatial sense; the eyes and hands work collectively to explore and manipulate objects. Moreover, researchers have demonstrated that haptic modality reduces the perceived musculoskeletal loading that is measured through pain and discomfort in completing a task. Therefore, there is a trend in the design of interfaces toward multimodal human-computer interaction that incorporates the sense of touch.

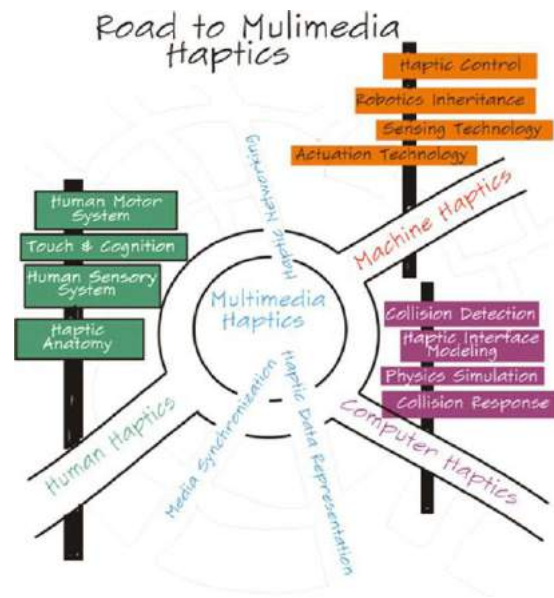


Fig2: Roadmap to multimedia haptics

However, the keyword here is perception, so if the cross-modal information is not well synchronized and consistent, the added sensory information might corrupt the intended stimulus.

5. LIMITATIONS

Haptic technology is expensive. Implementation of Haptic Technology is very limited. Haptic applications can be extremely complex, requiring highly specialized hardware and considerable processing power. The haptic devices are usually bulky. These devices are large in size and greater in weight which become a big problem in case of wearable haptic devices.

6. CONCLUSION

We finally conclude that Haptic is still in its nascent stage but it is the solution for interacting with the virtual environment and used widely in many applications. The touch access technology is essential and important till now. But, haptic technology has totally changed the way to feel touch. This technology makes the future world more sensible one. 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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An emerging network paradigm- Opportunistic network

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ABSTRACT

Opportunistic networks provide communication facilities by the intermittent connectivity among mobile nodes. Opportunistic network is an extension of MANET where complete path between two nodes wishing to communicate is unavailable. Opportunistic networks (OPPNET) consider mobility, partitions, disconnections, etc. as norms instead of the exceptions. The paper reviews Opportunistic networks as evolutions of MANETS and related issues in Opportunistic networks.

General Terms

Opportunistic network, Mobile node, Information sprinkler.

1. INTRODUCTION

Opportunistic network (Oppnet) has been emerged as interesting evolutions of the Mobile Ad-hoc Networks paradigm. Thus they have challenges and issues faced by MANET along with some other challenges of their own. As in MANETs, the nodes which want to communicate remain connected with each other through common inter-network which is rarely possible in pervasive scenarios. During such type of environment devices carried out by users are partially connected to the network as users may turn them off their energy or due to high mobility nodes may move out of the radio range of the other nodes [1].

So, traditional MANET routing protocols will fail to work in Oppnets. Opportunistic networks [2] consider mobility, disconnections, partitions, etc. as norms instead of the exceptions. In opportunistic network mobility is used as a technique to provide communication between disconnected groups of nodes, rather than a drawback to be solved.

In opportunistic networking a complete path between two nodes wishing to communicate is unavailable [3]. These networks try to allow such nodes to exchange messages by removing the assumption of end-to-end connectivity. In this case nodes are built dynamically which act like store-carry-forward paradigm [4], and intermediate nodes communicate like routers that store messages when no forward opportunity addressed to other nodes and exploit any future contact opportunity with other mobile devices to bring the messages closer and closer to the destination. In Opportunistic network any node can opportunistically be used as next hop to bring the message closer to the destination. These requirements make network a challenging research field.

2. Opportunistic Network

An opportunistic network is a network of wireless connected nodes. Nodes may be either mobile or fixed. Communication range between two connected nodes is within walking distance, that is, nearly between 100–300 meters. The network topology may change due to node mobility or node activation and node deactivation. The nodes provide the following functionality:

- Node discovery: A network node is able to discover other network nodes in direct communication range.
- One-hop message exchange: A node is able to send and receive arbitrary data in form of a message to or from any other node in direct communication range. This definition indicates that in an opportunistic network there is an opportunity for nodes (devices) to recognize other nodes in physical proximity and to talk to them. Our view on opportunistic networks supports only one-hop message exchange due to a missing relation and a missing common goal among nodes[5].

2.1 Opportunistic Network Node Definition

An opportunistic network node consists of a device with short-range wireless communication capabilities. The device operates an opportunistic network application that uses a data sharing protocol for data dissemination. The data sharing protocol uses node discovery and one-hop message exchange mechanisms. An opportunistic network node can be a mobile device carried by a human or a fixed device. This is reflected in the next two definitions.

2.1.1 Mobile Node Definition

A mobile node (or node for short) consists of a user arraying a mobile device that acts as an opportunistic network node.

2.1.2 Information Sprinkler Definition

An information sprinkler (abbreviated IS) is a fixed opportunistic network node within the network. It is a device placed at a dedicated location, thus it is not mobile and not under direct user control. The information sprinkler uses the same data sharing protocol as other opportunistic network nodes. An IS can operate in a sprinkler mode, meaning information is only dispersed, or in a sink mode, meaning information is only collected, or in both modes together. An Information Sprinkler may also be connected to a backbone network. The backbone network may be a wired network that connects a set of Information Sprinklers and synchronizes their operation. For example, data that is collected at one Information Sprinkler is available at all other sprinklers shortly after [6].

3. Opportunistic networks vs. MANETS

Since opportunistic network nodes are either mobile or fixed (cf. Information Sprinkler) and communicate over a wireless link, there is a relation to mobile ad hoc networks (MANETs). The MANET Definition says: E. Mobile Ad Hoc Network Definition A mobile ad hoc network (MANET) is a self-configuring Network of mobile routers or hosts connected by wireless links—the union of which form an arbitrary topology. The routers are free to move randomly and organize themselves arbitrarily; thus, the network's wireless topology may change rapidly and unpredictably. Such a network may operate in a stand-alone fashion, or may be connected to the larger Internet. MANETs are similar to opportunistic networks: both network types do not rely on a central component, for example, a central server. Their architecture is decentralized by definition and takes node mobility into account, that is, nodes connect and disconnect since they move in and out of communication range. Connection and disconnection may also happen because devices are turned on or off unpredictably. This is similar to opportunistic network. MANETs reside on the network layer and take special care about routing—an aspect that is deliberately left aside in opportunistic networks. Routing allows end-to-end communication of network nodes via intermediates. Since MANETs have been investigated in the context of military networks, emergency response, and mobile sensor networks, all applications considered have several assumptions in common that are a prerequisite for routing: All nodes expose a close node relationship. Nodes trust each other and share a common goal they want to accomplish. In contrast, opportunistic networks are formed between unrelated nodes, and users might even be anonymous and therefore unknown to each other. This has an important impact on routing. Opportunistic networks solely expose a wireless one-hop communication scheme, where only directly connected nodes exchange messages if they benefit from the communication, for example, by learning about information they were looking for. This implies that opportunistic networks reside on the application layer.

3.1 Issues In Mobile Opportunistic Networks

Opportunistic Networks can have both fixed nodes as well as mobile nodes but generally they are mobile in nature. Opportunistic Networks (OPPNETs), such as delay tolerant networks, vehicular communication networks, and ubiquitous mobile social networks, have received considerable research attention in recent years. As an interesting evolution of MANETs, OPPNETs are more pervasive and distinguishably characterized by non-exist end-to-end connection, but intermittent connectivity among mobile nodes during their opportunistic contacts. However, due to the extremely dynamic and unstable network topology, the packet propagation in OPPNETs usually follows a —store-carry-and-forward manner and the packets can only be opportunistically relayed to their destinations with high transmission delay and low delivery ratio. In order to reduce the transmission delay and increase the delivery ratio, extensive research efforts have recently been put into OPPNET routing and dissemination, and a variety of efficient routing and dissemination protocols [7]–[8], which either rely on network and mobility characteristics or utilize pre-existing social network information, have been proposed for OPPNETs. Routing of

messages in Oppnets is based on the contact opportunity between the nodes that arises due to their mobility. Due to sparse nature of opportunistic networks, it is possible that the intermediate nodes do not encounter other nodes frequently or consistently [9]. It may also happen that there might not be intermediate nodes which can be selected as a next hop to make the message closer to the destination or to the destination itself. In such situations either message will be directly forward to the destination whenever a direct link found or message will be store by nodes for a long period of time in the buffer when there is no forward opportunity towards the destination. Due to which messages may suffer longer delays while waiting for the path to be available towards the destination [9]. Routing and forwarding is the challenging task in Opportunistic Networks due to uncertain mobility and intermittent behaviour of the nodes. Most of the research work in oppnets has been done in routing and forwarding. There are various protocols that have been designed for Oppnets that is energy efficient and consumes power of nodes in forwarding the message. The routing protocols used in Oppnets can be classified in to two categories- Infrastructure based protocols and Infrastructure-less protocols[10].

Mobile Opportunistic Networks (MobiOpps) are an extreme generalization of Mobile Ad-Hoc Networks (MANETs) that aim at enabling communication between mobile nodes in highly challenged conditions, which raise new networking and security issues due to:

A. Heterogeneity: as in MANETs, nodes cannot rely on a global infrastructure and on top of that they belong to heterogeneous networks that rely on various communication technologies. This means in particular that naming is an issue, because nodes don't have a unique address across the different networks and furthermore raises the requirement for new authentication and trust establishment mechanisms.

B. High mobility: nodes are extremely mobile and disruptions in paths are frequent. It is thus impossible to establish a stable end-to-end route: routing and security solutions should be highly dynamic and flexible, and should not depend on a pre-defined path.

C. Delay tolerance: since nodes belong to heterogeneous networks, an end-to-end path might simply never exist. Messages can still be delivered by adopting a store and forward strategy, where intermediate nodes store messages when communication is impossible and forward them when a communication opportunity arises, for example thanks to mobility. Such a strategy trades a higher delay for a higher delivery ratio, but this also means, from a security point of view, that direct interactions cannot be assumed: end-to-end key agreements are thus unpractical and all protocols relying on an on-line authority need to be revisited. Because of these characteristics, MobiOpps call for a radical revision of all the aspects of communication, and in the following we present a review of routing protocols used in Opportunistic Networks.

4. Conclusion

In opportunistic networking a complete path between two nodes wishing to communicate is unavailable. Opportunistic networking tries to solve this problem by removing the assumption of physical end-to-end connectivity and allows such nodes to exchange messages. By using the store-carry-and-forward paradigm intermediate nodes store messages when there is no forwarding opportunity towards the

destination, and exploit any future contact opportunity with other mobile devices to bring the messages closer and closer to the destination.

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MULTIFUNCTIONAL OPEN SOURCE O.S.

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ABSTRACT

Many Automotive industries , Corporations and Companies prefer to have OS (Operating System) based on their compatibilities and software usage, open source operating systems has enticed the attention of many professionals , administrations and organizations. An Operating System is just like a facilitator, it provides an environment to run application programs.

The main goal of this project is to design an Operating System, which will have user friendly features such as Voice recognition, Theming option, providing a Dual Boot alongside Linux and windows, also a new kind of A.V Scanner for Linux .It could be easily modified as per user or company's expectations. This project deals with the study of booting paradigm, Linux distribution such as Ubuntu, Fedora, Linux mint etc. The primary aim of this project is to develop a stable operating system which will be small in size, flexible and provide an optimum performance by using Linux as the kernel base. This project will provide a step by step guide for development of multifunctional open source operating system.

General Terms

Unix, Desktop Environment, Dual Boot

Keywords

Operating System, Linux, GUI, Methodology, Open Source, Kernel.

1. INTRODUCTION

Operating system

An Operating system (O.S) is system software that manages computer hardware and software resources and provides basic facilities for computer programs. An Operating System (OS) is an intermediary between the hardware and the operator.

Open source

Open source refers to a program/software in which the source code (it is a form of program when a programmer writes a script/program in a specific programming

language) is open to the general public for use and/or

alteration from its original design free of charge

Linux kernel

A kernel is the bottommost level of easily replaceable software that interfaces with the computer hardware. It is in charge for interfacing all applications that are running in "user mode" down to the physical hardware, and permitting processes, well-known as servers, to acquire information from each other by using inter-process communication (IPC).

The Linux kernel is a Unix-like computer O.S kernel. It is extensively used world-wide; the Linux Operating System or popularly known as the Linux Distributions is based on Linux Kernel. The Linux kernel was primarily conceived and created by a Finnish computer science student Linus Torvalds in the year 1991.

Linux distribution

A Linux distribution (often called as distro) is an O.S (containing various software) which is based upon a package management system and the Linux kernel

A typical Linux distro contains GNU tools and libraries, a Linux kernel, additional software, certification, a window system (X Window System is the most common), a desktop environment (D.E.) and a window manager. Examples: Ubuntu, Linux Mint, Debian, Fedora etc.

Desktop Environment

In computing, D.E. is an implementation of the desktop metaphor made of a multiple programs running on top of a computer O.S, which share a common GUI (Graphical User Interface).

The popularity of Linux on laptops and personal computers has been increasing over the years. Presently most Linux distributions consists a graphical user environment, the two most popular environments are the KDE and GNOME.

KDE, GNOME, UNITY, CINNAMON etc. are some Linux desktop environments.

Bash

Bash is a UNIX shell and command language. It is written by Brian Fox for the GNU Project as a free software replacement for the Bourne shell. It was released in 1989. It has been distributed extensively as the shell for the GNU operating system and as a default shell on Linux.

Programming on Linux

Various programming languages are supported by Linux distributions for example C, C++, FORTRAN.

Most of the distributions also include the support for PHP, Perl, Ruby, Python and other dynamic languages.

M.O.S.O.S

M.O.S.O.S is a Multifunctional Open Source Operating System. Primary goal of this project is to implement multifunctional operating system which will have features like theming options for different users (such as windows, Mac), this project also aims to make offline virus total software to make system more secure.

Rest of the paper is structured in the following fashion: In section 2 we have described the Related work. In Section 3 a detailed explanation of the Methodology is given. In Section 4 we present the Design of the system procedure for the Operating system. The Features are given in Section 5. We Conclude the paper in section 6 and have discussed the Future scope in section 7

2. RELATED WORK

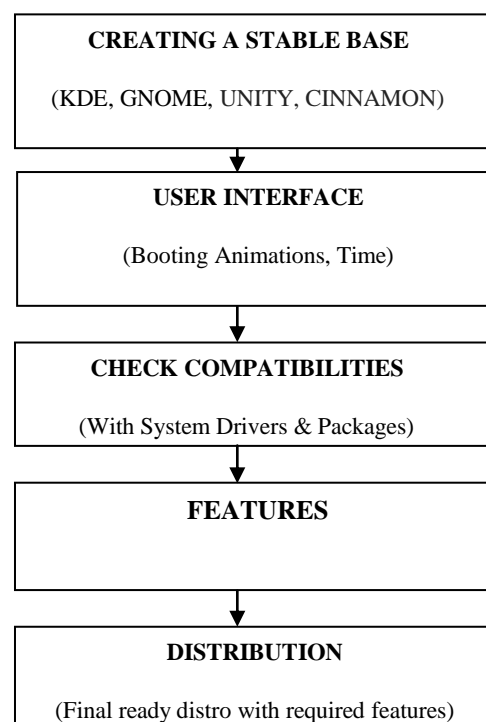
Many industries, Corporations and Companies prefer to have OS (Operating System) based on their compatibilities and software usage, open source operating systems has enticed the attention of many professionals, administrations and organizations. In [2,3], the authors compared Various operating system such Linux, Windows and MAC and based on those comparisons Linux was found to be a better and reliable Operating system, the comparison was based on cost, stability, flexibility and versatility.

Linux is an open source Operating System. Number of operating system use linux kernel as a base to make their own distribution. Also many application runs on Linux kernel, this was proposed by Machtelt Garrels. In [4] author proposed that Linux operating system have a set of powerful compilers and programming tools and also has the ability to coexist with other sets of OS. Linux repositions itself as the safe OS and can be used successfully. There are hundreds of linux distros available in market. Any disro can be used by a user depending upon their choice. Linux from scratch is a method where a user can design a distro of their choice. An alternative to this method is called remaster, In this non useful packages

are deleted and desired one's are added, this was examined in [14,1].

Quantitative analysis of various distribution, their complexity, growth and change in Linux Operating system was revealed by author in [15]. In [5] author presents the concept of Virtual Operating system in which multiple Operating system can be used simultaneously at a given time. Linux is mostly a more powerful system, with less requirements. It is highly configurable, flexible, and extremely low in cost or mainly free. In [10] author planned the design and implementation of Linux Security Modules and the challenges in providing a truly common solution that marginally impacts the Linux kernel.

3. METHODOLOGY



There are thousands of linux distro available today. Each distro has a unique flow of development, designing an OS can be very tedious process or it can be a very simple process if we are clear about the development flow.

The first step in developing any OS is to create a stable base. Base of an OS is very important as we are going to build everything on it, so it should be capable of handling various tasks and it should be error free. Base is the foundation of an Operating System. This project uses Linux kernel as a base since it is an open source and highly customizable.

After getting a kernel ready next part is to create a desktop environment for user to interact with OS. This projects tests various DE such as KDE GNOME XFCE etc. and after testing different DE , XFCE is being used as DE for this project.

After creating stable base and choosing perfect DE for simplicity the next step is to customize user interface which includes booting animations, icons, boot time . this project aims to lessen the time for booting and provide a simple UI.

The next step is testing phase. In this step, testing and checking the compatibility with different software's and hardware's are done. Also debugging of various errors is done in this step. After getting a stable and error free OS the next step is to add different features such as Dual boot, AV Scanner, Grade it etc. and finally we are ready to make an ISO for this system.

4. Design of the system

4.1 Creating a stable base

In this project we are using Linux kernel as a base. In order to make a distribution we need a Linux source kernel, we have used Ubuntu and customized it i.e. deleted some packages as per our requirement to make it compact and checked the stability of it. For creating a stable desktop environment we have used the packages of Lxde, Mate desktop.

4.2 User interface

In this we worked on the booting animation, which is nothing but the Ubuntu logo that appears at the start, booting (or booting up) is the initialization of a computerized system.

We compressed the script and modified it to scrap the logo during the system boot. So that it will look more beautiful.

4.3 Check Compatibilities

This step involves the software testing and also hardware testing. Sometimes the software is not compatible with hardware or there might be some problems while booting a system on hardware or there might be some issues with graphics or other drivers. Sometimes packages and script don't run properly.

So we need to find exact packages or script for OS and we need to modify some to make the OS compatible with every package installed. We also need to check for

every driver which is useful for our system to run on every hardware. So basically this step is checking compiling step.

These were the basic steps for designing an Operating System. After achieving all these goals the next step is to add features that make this Operating System different than the other Operating Systems.

5. FEATURES

Many features are added in the Operating System to make it more interactive and efficient.

5.1 Text to speech

This script converts any text into a speech. We have to type a text and Operating System will convert it into voice.

Also we can specify a path of a text file and OS will convert it into speech.

5.2 Theme IT

There are various people who use different Operating systems. This feature will provide a single platform for every user. It will provide an ease for Windows and MAC user to use this Operating System.

5.3 AV Scanner

We have designed a tool/ script/program that contain 5-6 antiviruses in the background to scan a given file. Only the path of the suspicious file is provided and the scanner will scan it. Based on scanning, the script will generate a report. Thus the scanner will add an extra protection to the Operating system.

5.4 File Manager

Managing files can be tricky. File Manager is a script that will help user to create, delete or move any files very easily as per his/her requirement. All the basic operation as mentioned above can be done using this script.

5.5 Dual boot

Viviate can be installed alongside any other Operating System such as WINDOWS, MAC OR any other LINUX based Operating System. Dual boot function allows an individual to run the Linux Distro as a live CD or it can be used as a native system amongst any other system.

5.6 Grade IT

GRADE IT is a Grading script that calculates the grade of a particular student. The marks of the student is given as input and GRADE IT will calculate the grade based on the input provided.

5.7 Additional installations

Many software installations are done to make the distribution user friendly. It can run almost all applications of Windows and contains various education related installations. Viviate contains all the basic features of Windows and other Linux Distribution

5.8 Converter

It is an Education related script. As the name suggests it's a converter i.e. it converts one format into other format.

CONVERTER is a script that converts text file to pdf and also a pdf file to text.

These were the features that we have included in the Operating System.

5. CONCLUSION

This project is an Open Source Operating System which is free to use, distribute and modify. This project will be available to everyone. It's small in size and easy to use and can be used as a replacement over windows. We learned about various desktop environments and were able to inhibit some additional features in our distribution. We were able to develop a Stable final ready Distribution.

6. FUTURE SCOPE

VIVIATE will be open to everyone. Anyone can modify it as per his/her requirement.

As the source code of Linux is available to everyone there are no restrictions unlike MAC and Windows. It provides full access to the source code and is very flexible.

Linux OS is everywhere on desktops, in phones, in cars etc. With many programmers working on the Linux kernel and distribution, the future of Linux is very bright.

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Replacement of lead Screw and shaft mechanism by three bearings and shaft mechanism in winding machine

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ABSTRACT

Three bearings and shaft mechanism converts the constant rotary motion of a plain shaft into a traversing action that moves an attached carriage used in positioning and reciprocating linear-motion applications. It is a mechanical alternative of electronically controlled linear-motion drive systems. It runs on a smooth, unthreaded shaft. The rotary input of the motor-driven shaft is converted into linear output by the action of specially machined bearings. The mechanism generating the linear output is friction between the bearings and the shaft.

This mechanism is totally backlash-free and automatically reciprocating in bi-directional linear travel. It works on the principle of friction and linear thrust which generates the imaginary screw profile. It consists of an assembly of a shaft and bearings. The bearings are mounted in such a way that it generates the imaginary screw profile on the shaft.

This research project highlights the replacement of lead screw and nut by the assembly of the shaft and bearings.

Keywords

lead screw, nut, shaft, bearing, linear drive

1. INTRODUCTION

This linear drive works on the principle of friction and linear thrust which generates the imaginary screw profile. The mechanism of frictional linear drive consists of an assembly of a shaft and three bearings. The bearings are mounted in such a way that it generates the imaginary screw profile on the shaft.

There is clearance between the shaft and bearing on either side of the ridge. This clearance permits the bearing to be pivoted, angled left or right on the shaft and still maintain point contact with the shaft.

A three bearing assembly is fixed within the housing. Each bearing is held at a specific angle relative to the shaft. When the shaft rotates, the bearings generate axial force on the central ridge. This causes the bearing assembly to roll along the length of the shaft. The rotary input provided by the motor-driven shaft is thereby converted to linear output. As the bearing assembly moves carries the tool mounting head with it.

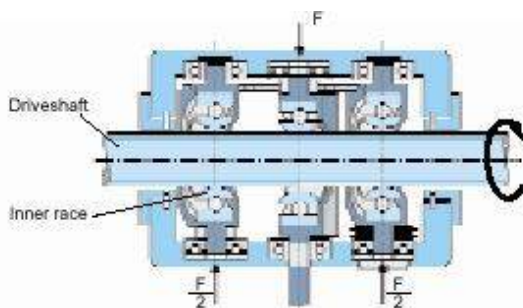
The angle at which the bearing assembly contacts the shaft is adjustable. The travel direction of the tool mounting head is determined by this angle. Changing the angle of the bearing assembly is done mechanically making the reversal process totally independent of the drive motor or other controls.

Reversal occurs when contacting a hardware fixture called an "end stop" triggers the spring-actuated reversal mechanism. When the reversal mechanism is triggered, the entire bearing assembly is flipped on the shaft to its opposite to mirror position and reversal is instantaneous. The end stops are -positioned adjustable to determine the system's stroke length.

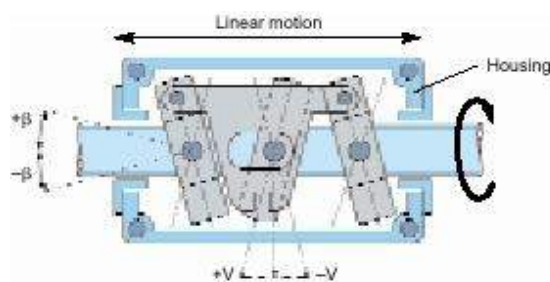
At no time does the bearing lose contact with the drive shaft. This is how three bearings and shaft mechanism prevent backlash, because there is no play between shaft and bearing. Furthermore, the shaft on which a three bearings and shaft mechanism operates is not threaded, which means dirt and debris cannot be trapped and cause clogging or jamming.

Three bearings and shaft mechanism drives move loads with a rotating, smooth, unthreaded driveshaft. Replacing the threaded nut is a housing containing three r shaft-mounted, metal bearings. The bearings mount in a pivoting ring carrier enclosed in housing. Each bearing contains a specially machined inner race that maintains contact with the shaft and is free to rotate with it. The outer race is fixed to the pivoting ring carrier. The rings themselves mount at an oblique angle to the driveshaft.

Rotating the driveshaft applies an axial thrust from friction and compression to the rings and housing. Adding one extra ring ie. changing a three-ring into a four ring design for example doubles axial thrust. Power-transmission efficiency for the devices is greater than 90%. Bearing-to-shaft angle determines pitch or linear distance travelled per shaft rotation. Pitch adjustment can be made as the shaft rotates, allowing a fixed-speed driveshaft to generate a wide range of linear travel rates.



Compressive forces F keeps the three inner rings in contact with the driveshaft. Force on the upper, central ring is balanced by compressive forces on two lower, flanking rings. Inner rings rotate with the shaft and outer rings are fixed to the translating housing. Inner rings set at an oblique angle to the driveshaft. Friction between the inner rings and rotating driveshaft produce axial thrust to drive the rings and attached housing.



Direction of travel and thrust can be reversed with a simple mechanical switch. The switch flips rings to their mirror image angle at the desired reversal points. This action is triggered automatically by the motion of the feeder itself through the application of friction and compression and requires no external devices. And direction reversal is backlash-free and far simpler mechanically than other linear drives.

2. LITERATURE REVIEW

1] **F. Thaden, P. Beutin, H. Reese, (2015).** Rolling ring drives are a common method of converting rotary motion to linear motion. Such drives are often used with regard to coiling wire and such like. The rolling ring drive proceeds in one direction whereupon its direction of travel is reversed by flipping the rings contained within the rolling ring drive. Previously such reversal mechanisms have been entirely mechanical and the reversal of rings has been achieved by a lever attached to the reversal mechanism hitting a stop and the direction of travel of the drive thereby reversing as the rolling rings inside are rotated by spring-loaded mechanical mechanism. The lever mechanism for such a mechanical reversal mechanism be replaceable to deal with the breakages that occur due to the mechanical stress. It is an aim of the present invention to provide a reversal mechanism which does not have the disadvantages of previously mentioned reversal mechanisms namely the wear on the reversal mechanism and shock to the drive upon contact with a fixed stop. This provides the advantage that the motor alters the pitch of the rolling rings in a controlled constant manner thus avoiding the mechanical shock to the drive and leading to smoother reversal of direction. This results in significantly less wear to the rolling ring drive. Preferably the motor is a stepper motor. In a preferred embodiment the position detection system comprises a magnetic incremental measuring system with a scanning head. This provides a simple positional system that can be easily fitted to indicate the position of the rolling ring drive. This provides the further advantage if the rolling ring drive is further equipped with a non- contact flange detection mechanism. This enables the valley or mountain formation on any winding material to be compensated for by the rolling ring drive. The pitch of the rolling ring

drive merely needs adjusting to greater or lesser extent with the shaft at constant speed.

[2] **G. Wardley, (1981).** A traversing unit comprises a shaft rotatably mounted in plain bearings and in housing. The housing houses three rings in contact with the shaft and respectively rotationally supported in ball races and through balls. The rings may be loaded via a mounted plate comprising bearing which receive corresponding pins and integrally formed with respective races. This plate is located axially of the shaft by dowels which are free to move at right angles to the shaft. Excess loads caused by reversal torques on the housing when the direction of traverse of the rings is reversed during operation of the unit with the shaft rotating and the rings loaded are reduced and transferred to bearings permitting higher loads to be used on the rings and maintenance problems to be reduced as compared with known traversing units.

[3] **G. L. Bauer, (1976),** An automatically reversing traverse mechanism cooperable with a rotating shaft, comprising a base, a roller mounted on the base for simultaneous turning and swiveling movement, and engageable with the shaft, and a unique yieldable biasing means which urges the roller by means of a snap movement to either of two oppositely disposed, extreme angular positions. As the shaft is rotated, the angularly disposed roller and base automatically undergo reciprocative movements in a path parallel to the axis of the shaft. The traverse mechanism includes a novel operating means which substantially instantaneously swivels the roller from its one extreme position to its other extreme position in response to movement of the base past a predetermined point. The operating means includes a fixed abutment located at a predetermined point along the shaft, and an arm rotatably carried by the base, which engages the abutment and subsequently undergoes turning movement. This turning movement is made to effect a substantially instantaneous turning movement of a second arm on which the roller is carried, thus accomplishing the swiveling of the latter from one extreme position to another. Due to the snap action which swivels the roller, the rate of traversal axially along the shaft is very constant and does not suffer from a reduction in speed immediately before the reversal in direction of the base. An additional abutment is disposed opposite

to and acts like the first, thereby to enable the mechanism to undergo reciprocating movement. Means are also provided for counting the number of traversals and for automatically shifting the two abutments after a predetermined count, thus enabling the length of the reciprocating stroke to be varied in accordance with a predetermined pattern.

[4]**J. Uhing, K. G. Gmbh, (2004).** Switching for rolling ring gear to prevent forces, upon contact of the switching lever with the Hubendanschlägen on the pin an annular housing the act, characterized in that the bearing for the switching lever without using a ring housing pin with the housing of the rolling ring and the ring gear is connected to the housing pins the gear housing no longer has to penetrate.

[5] **J. Uhing, (1986)** A rolling nut in combination with a smooth shaft includes a plurality of bearing-like roller cages surrounding the shaft and having internal surfaces in contact with portions of the outer surface of the shaft and is operative for transforming a rotary movement of the shaft into thrust movement of the rolling nut. The rolling nut is open and is provided with a base plate formed with a plurality of pocket-shaped recesses in which the roller cages are partially inserted. The base plate is formed with similar recesses at both sides thereof so that the roller cages can be repositioned on either side of the plate to selectively adjust the roller cages to the left hand thread of the shaft or the right hand thread of the shaft.

[6] **J. Uhing, (1981)** The arrangement for transforming rotary movement of a smooth shaft into a thrust movement by means of a rolling nut that comprises a housing and, within the housing, four inclined roller cages each defining a centre passage having an inside diameter larger than the diameter of the shaft and each engaging an arcuate surface section of the shaft; the end points of the section of engagement forming with the centre point of the corresponding roller cage a bevel angle within the range of 60° and the distance between the two points being sufficient for insuring a stable position of each cage on the shaft even if the cages are loaded laterally. The intermediate two roller cages are urged in contact with the shaft by a pair of springs, respectively.

[7] **J. Uhing, (1960).** A frictional drive gear embodying translatory and rotary motions, comprising a plurality of frictionally connected rotatable members, one of which is relatively long in its axial direction and another relatively short in its axial direction, said members having their contacting surfaces formed on different radii of generation, with the member of larger radius being annularly shaped in transverse cross section, means for supporting the member of shorter axial length for rotation about its axis and for pivotal movement about an axis extending normal to and intersecting such rotational axis and the rotation axis of the other member so that the external surface of the member of smaller radius frictionally engages the internal surface of the member of larger radius at a single region of contact which is intersected by said pivotal axis, rotation of said members about their respective axes being operative to effect translatory movement there between at a rate corresponding to the angular relation of the rotational axes of said members relative to said pivotal axis, and means for effecting adjustment of the axis of said member of shorter axial length about said pivotal axis for the control of said translatory movement.

3. PROBLEM DEFINATION

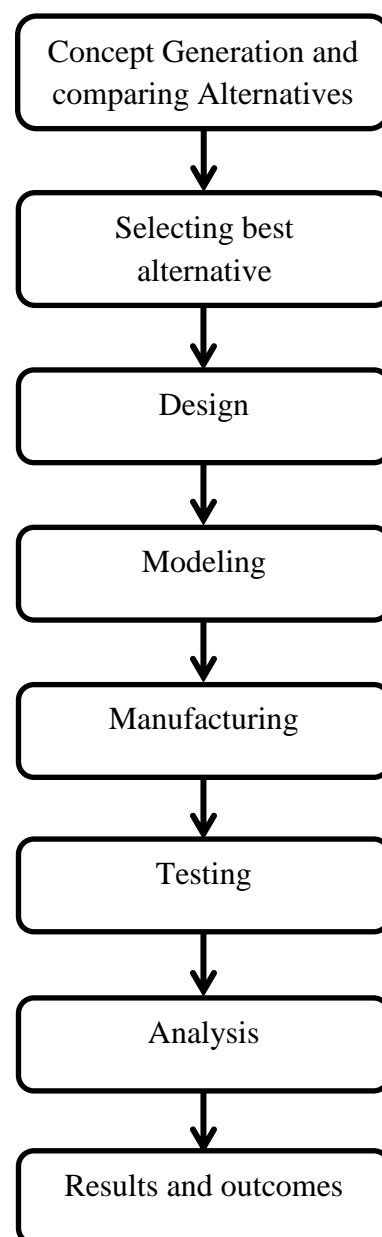
The lead screw and nut mechanism used in the winding machine is the one of the method opted for the linear travel of the carriage. When the reel rotates and the wire is fed then the wire gets wound on the barrel. To maximize the utilization of the surface area of the reel on which the wire is being wound, there should be a particular way of winding. The progression of winding along the length of the reel gives the optimum result, which is achieved by lead screw and nut mechanism but this lead screw and nut mechanism has certain limitations and disadvantages

To ensure the travel of the feeder in both the direction the system, the motor must rotates in both the direction hence for the continuous operations the lead screw and nut mechanism requires semi-automaton. The variable linear velocity of the feeder is obtained by arrangement of the gear trains which drives the lead screw and nut. Hence the lead screw and nut mechanism involved high cost of manufacturing as the manufacturing of lead screw and nut is complex. Another problem with this lead screw and nut

mechanism is backlash. Preloading is one of the method which can be applied to overcome the backlash but this preloading may result to the high wear and tear.

Hence to overcome these problems, in this research the best alternative mechanism which cost effective and easier to manufacture and to operate is find out.

4. PROPOSED METHODOLOGY



4.1 Concept generation

To overcome the various difficulties which are mentioned in the problem definition various concepts based on the linear travel are being studied and various alternatives which can be opted are been checked.

4.2 Alternative solutions

There are following alternative solutions which can be applied on the system.

- Rack and pin mechanism
- Pneumatic actuators
- Three bearings and shaft mechanism

4.3 Comparison of alternative solutions

Basis	Rack and pin mechanism	Pneumatic actuators	Three bearings & shaft mechanism
Motor/ Driver	Bi direction	Bi direction	Unidirection
Change in Linear travel velocity	By Gear Train	By flow control	By changing bearing angle
Backlash	Backlash exist	No backlash	No backlash
Automation	Automation needed	Automation needed	No automation needed
Maintenance	Moderate	High	Low
Manufacturing cost	Moderate	High	Low

5. CONCLUSION

Three bearings and shaft mechanism is the best alternative to the lead screw and shaft mechanism in the winding operation as this mechanism is having following advantages.

- Uni-directional motor is required as the reversing of the direction is take place by reversing the bearing angles.
- The linear travel velocity can be adjusted by adjusting the bearing angles
- No backlash
- Comparatively less maintenance
- Pure mechanical system hence no automation is required
- Cost effective

6. ACKNOWLEDGMENTS

Our thanks to the experts who have contributed towards development of the research and our special thanks to “SaiTech engineering” for allowing us to carry out the research in their premises

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OPTIMIZATION OF PROCESS PARAMETERS IN CNC WIRE ELECTRICAL DISCHARGE MACHINE USING TAGUCHI GREY RELATIONAL ANALYSIS.

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ABSTRACT:

In this report the effect of Process parameters on material removal rate (MRR) and surface roughness of OHNS (oil hardened non-shrinkage steel) die steel are investigated as MRR and Surface roughness in CNC W-EDM (wire electrical discharge machining) are of crucial importance and Taguchi L9 orthogonal array and Grey relational analysis techniques are used for optimization of parameters. For experimentation Pulse on time (Ton), Pulse off time (Toff), Peak current (Ip), and wire feed rate (Wf) are taken as input parameters while MRR and Surface roughness are taken as output parameters. For each experiment Surface roughness is calculated by using Surface finish tester and MRR is calculated by measuring the difference in weight of workpiece before and after machining with time required for machining.

1. INTRODUCTION

CNC Wire Electrical Discharge Machining (CNC WEDM) 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 CNC 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.

The spark discharge across the work piece and wire electrode causes the ionization of water which is used as a dielectric medium as well as cooling agent. The process uses a thin wire (Zinc coated Brass) of diameter 0.25 mm as a electrode and work piece is mounted on CNC (computer numerical control) table. The gap between the work piece and electrode ranges from at 0.025-0.05mm and is maintained constant by computer control positioning system. The wire electrode is continuously fed through the work piece by microprocessor which enables machining of complex shape parts.

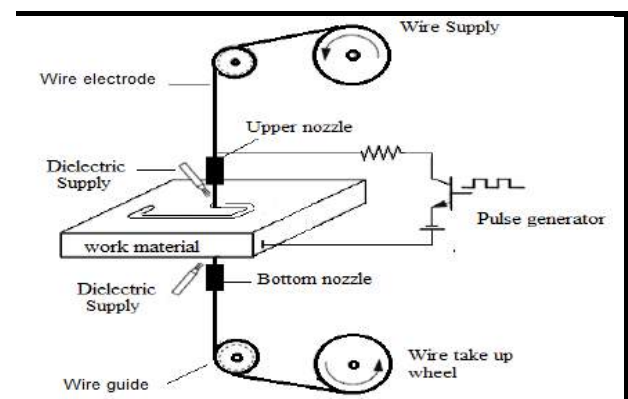


Fig 1.1 Schematic Representation of WEDM process

2. LITERATURE REVIEW

Various researcher presented research paper on CNC wire electrical discharge machining optimization such as,

(Scott *et al.*1991) used a factorial design method to determine the optimal combination of control parameters in WEDM, the measures of machining performance being the metal removal rate and the surface finish. Based on the analysis of variance, it was found that discharge current, pulse duration and pulse frequency are significant control factors for both the metal removal rate and surface roughness [1]. (Rajurkar and Wang, 1993) analyzed the wire rupture phenomena with a thermal model. An extensive experimental investigation has been carried out to determine the variation of machining

performance outputs viz., MRR and SF with machining parameters in the study [2].(Lok and Lee, 1997) compared the machining performance in terms of MRR and surface finish through observations obtained by processing of two advanced ceramics under different cutting conditions using WEDM [3]. (Huang et al.1999) investigated experimentally the effect of machining parameters on the gap width, the surface roughness, and the depth of white layer on the machined work piece surface [4]. (Rozenek et al. 2001) used a metal matrix composite as work piece material and investigated the variation of machining feed rate and surface roughness with machining parameters[5].(Nihat Tosun et.al. 2004) investigated on the effect and optimization of machining parameters on the kerf (cutting width)and material removal rate (MRR) in wire electrical discharge machining (WEDM) operations. The experimental studies were conducted under varying pulse duration, open circuit voltage, wire speed and dielectric flushing pressure. The settings of machining parameters were determined by using Taguchi experimental design method [6]. (Manna et al. 2006) Investigated the effect of various process parameters for each machining performance criteria such as, the metal removal rate, surface roughness, gap current and spark gap during WEDM of Aluminum reinforced silicon carbide metal matrix composite and established a optimal set of parameters for achieving better result [7].(Yao Zou, 2006) In this thesis, both theoretical and application aspects of GA are studied. On the theoretical side, an improved GA—Evolution Direction Guided-GA (EDG-GA) is developed to enhance the computation efficiency. [8]. (Mahapatra and Patnaik, 2007) applied Taguchi method and Genetic Algorithm to obtain an optimal parametric combination optimal result predicted by GA cannot be achieved in reality; due to nonexistence of the optimal parameter combination in the machine.(B. C. Routara and B.K. Nanda,2009) The use of the orthogonal array with grey relational analysis to optimize the WEDM process with the multiple performance characteristics has been reported here. A grey relational analysis of the experimental results of material removal rate and surface roughness can convert optimization of a single performance characteristic called the grey relational grade. As a result, optimization of the complicated multiple performance characteristics can be greatly simplified through this approach. It is shown that the performance characteristics of

the WEDM process such as material removal rate, surface roughness are improved together by using this study [10].

3. 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.

4. CASE STUDY

4.1 Optimization of parameters by 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.

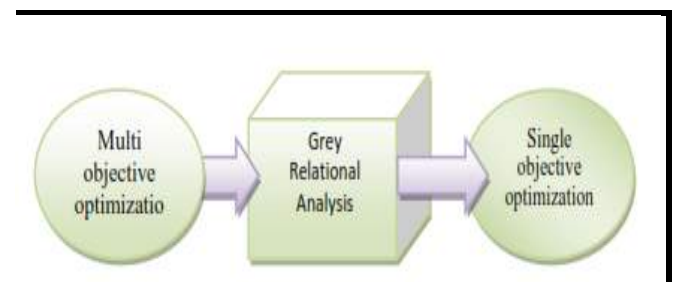


Fig. 4.1: Purpose of grey relational analysis

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 Steps in GRA:

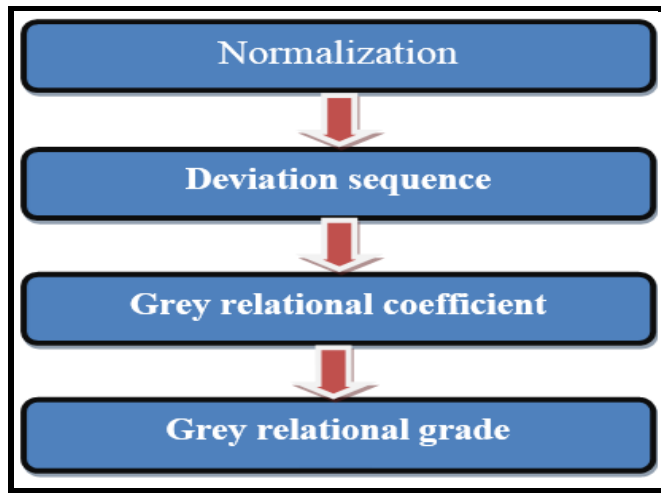


Fig. 5.2: Steps in GRA

(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)

$$x_i(k) = \frac{y_i - \min y_i(k)}{\max y_i(k) - \min y_i(k)} \dots \dots \dots (5.1)$$

(b) LB (lower-the-better)

$$x_i(k) = \frac{\max y_i(k) - y_i(k)}{\max y_i(k) - \min y_i(k)} \dots \dots \dots (5.2)$$

(c) NB (nominal-the-best)

$$X_i^*(k) = \frac{y_i(k) - y_i}{\max y_i(k) - y_i(k)} \dots \dots \dots (5.3)$$

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, Δ_{0i}

The deviation sequence Δ_{0i} is the absolute the reference sequence $x_0(k)$ and the comparability sequence $x_i(k)$ after normalization. It is determined using

$$\Delta_{0i} = |x_0(k) - x_i(k)| \dots \dots \dots (5.4)$$

(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.

$$\xi_i(k) = \frac{\Delta_{min} + \theta \Delta_{max}}{\Delta_{0i}(k) + \theta \Delta_{max}} \quad (5.5)$$

Where, $\Delta_{0i} = \|x_0(k) - x_i(k)\|$ = difference of the absolute value $x_0(k)$ and $x_i(k)$; θ 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 Δ_{0i} ; and $\Delta_{max} = \forall j^{max} \in i \forall k^{max} \|x_0(k) - x_j(k)\|$ = largest value of Δ_{0i} . Comparability sequence and ζ is the distinguishing coefficient. The value of θ 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.

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 γ_i can be computed as:

$$\gamma_i = \frac{1}{n} \sum_{k=1}^n \xi_i(k) \quad (5.6)$$

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 characteristic that higher value represents better machining performance, such as MRR, "higher-the-better", HB and inversely the

characteristic that lower value represents better machining performance, such as surface roughness is called 'lower-the-better', LB. Therefore, HB for the MRR, LB for the SR selected for obtaining optimum machining performance characteristics. The loss function (L) for objective of HB and LB is defined as follows:

Table.4.1: Experimental Design Matrix of Actual Values

Expt. No	Ton	Toff	Ip	Wf
1	127	45	210	3
2	127	46	220	4
3	127	47	230	5
4	128	45	220	5
5	128	46	230	3
6	128	47	210	4
7	129	45	230	4
8	129	46	210	5
9	129	47	220	3

Table 4.2: Designed matrix of input and output parameters

EX.N O	To n	Tof f	Ip	Wf	MRR (gm/min)	Ra(μm) Longitudinal
1	127	45	210	3	0.33	1.8
2	127	46	220	4	0.46	2.2
3	127	47	230	5	0.50	2.8
4	128	45	220	5	0.33	1.9
5	128	46	230	3	0.53	1.8
6	128	47	210	4	0.41	1.2
7	129	45	230	4	0.56	1.2
8	129	46	210	5	0.41	1.8
9	129	47	220	3	0.56	1.4

Table 4.3: Signal-to-Noise Ratio

Response Values		S/N Ratio	
MRR(gm/min)	Ra(μ m)	MRR(dB)	Ra(dB)
0.33	1.8	-9.6297	-5.1055
0.46	2.2	-6.7448	-6.8485
0.5	2.8	-6.0206	-8.9432
0.33	1.9	-9.6297	-5.5751
0.53	1.8	-5.5145	-5.1055
0.41	1.2	-7.7443	-1.5836
0.56	1.2	-5.0362	-1.5836
0.41	1.8	-7.7443	-5.1055
0.56	1.4	-5.0362	-2.9226

Table 4.4: Normalization

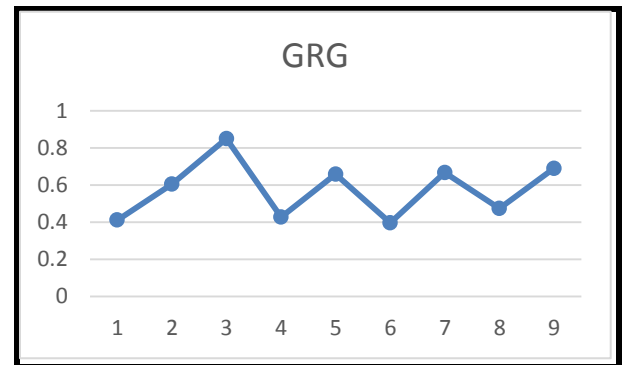
Expt. No	S/N Ratio		Normalized S/N Ratio	
	MRR(dB)	Ra(dB)	MRR	Ra
1	-9.6297	-5.1055	0	0.478539
2	-6.7448	-6.8485	0.628037	0.715375
3	-6.0206	-8.9432	0.785705	1
4	-9.6297	-5.5751	0	0.54235
5	-5.5145	-5.1055	0.895887	0.478539
6	-7.7443	-1.5836	0.410451	0
7	-5.0362	-1.5836	1	0
8	-7.7443	-5.1055	0.410451	0.478539
9	-5.0362	-2.9226	1	0.181932

Table 4.5: Deviation sequence and grey relational analysis

Expt. No	Deviation Sequence		Grey Relational Coefficient	
	MRR	Ra	MRR	Ra
1	1	0.521461	0.333333	0.48949497
2	0.371963	0.284625	0.573419	0.637247185
3	0.214295	0	0.699991	1
4	1	0.45765	0.333333	0.522111634
5	0.104113	0.521461	0.827659	0.48949497
6	0.589549	1	0.458905	0.333333333
7	0	1	1	0.333333333
8	0.589549	0.521461	0.458905	0.48949497
9	0	0.818068	1	0.379343128

Table 4.6 Grey Relational Grade

Expt.No	Process Parameters				Grey relational grade
1	127	45	210	3	0.411414
2	127	46	220	4	0.605333
3	127	47	230	5	0.849995
4	128	45	220	5	0.427722
5	128	46	230	3	0.658577
6	128	47	210	4	0.396119
7	129	45	230	4	0.666667
8	129	46	210	5	0.4742
9	129	47	220	3	0.689672


Fig. 4.4: Scatter plot of GRG vs order of experiment

The mean of the grey relational grade for each level of the machining parameters is summarized and shown in Table 5.7

Table 4.7: The Main Effects of the Factors on the Grey Relational Grade

Symbols	parameters	Grey Relational Grade			Main effect	Rank
		Level-1	Level-2	Level-3		
A	Ton	0.6222	0.4941	0.6102	0.1281	3
B	Toff	0.5019	0.5794	0.6453	0.1433	2
C	Ip	0.5734	0.5742	0.7251	0.1516	1
D	Wf	0.5866	0.5560	0.5840	0.0305	4

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 5.8, the optimal parameter combination was determined as A1(pulse on time)-B3(pulse off time)-C3(Input current)-D1(wire feed rate).

4.3. 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.

Table 5.9: Confirmation results

	Predicted	Experimental	Error
MRR(gm/min)	0.5558	0.56	0.001
Ra(μm)	2.1925	2.01	0.182

5. CONCLUSION

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).

(b) From the optimization results, Current is highest influence on MRR & Surface Roughness, as current increases both MRR & Surface Roughness increases.

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IMPROVEMENT IN PLANT LAYOUT FOR INCREASED PRODUCTIVITY

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ABSTRACT

Plant layout is systematic and functional arrangement of men, materials, machines, departments in a manufacturing industry .It is essential to have a well-developed plant layout for all available resources in an optimum manner and get maximum out of capacities of facilities .The efficiency of production plant is dependent on how well all services are located in an industry so that there will almost no bottlenecks and manufacturing time and cost will be minimized. Also the unnecessary flow of material is considered as a waste because it adds to overall manufacturing cost. So this research paper aims to study and improve the current plant layout of Fasteners manufacturing firm..

Keywords

Plant layout, bottlenecks, capacities, Fasteners

1. INTRODUCTION

Increasing global competition has evolved a manufacturing environment which gleans vast product configuration, reduced lead times, and increased standards of quality and competitive costs. In parallel with a rising trend toward

globalization, these manufacturing facilities must be designed to cater for new challenges to survive and grow in the marketplace. Plant layout is the arrangement of desired machinery and equipment of a plant in a way which will permit the easiest flow of materials, at the lesser cost with minimum handling, in processing the product from the raw materials to the dispatched of the finished product. The research paper presents solving an industrial problem using the principle of string diagram and simulation software.

1. The string diagram is a simple tool for analyzing and designing work spaces in such a way that the movement of material, men, equipment etc... are minimized.
2. The string diagram is a form of flow diagram, in which a thread is used to measure the distance of material, men movement. It is important that the string diagram drawn to an exact scale.
3. The string diagram is carried out in exactly the same way as all other method studies, by recording all the relevant information and facts from direct observation..

2. PROBLEM STATEMENT

- Facility Layout Problem: design problem
- locations of activities
- dimensions
- configurations
- No overall algorithm exists

The plant layout redesign for increase in efficiency was considered necessary because of the following

reasons:

1. Improper material flow through the shop floor i.e., the current plant layout was not designed according to the process flow given by DGCA.
2. Extended transportation time for material transfer. The sheet metal section had issues to be handled. Based on the discussion with the manager and supervisors and direct observation by the team, the following problem surface was about non value added operations in the process.

1.1 Types of layout

1.1.1 Fixed product layout

- Processes → product (e.g. shipbuilding)

1.1.2 Product layout

- Production line according to the processing sequence of the product
- High volume production
- Short distances

1.1.4 Process layout

- All machines performing a particular process are grouped together in a processing department
- Low production volumes
- Rapid changes in the product mix
- High interdepartmental flow

1.1.5 Group layout

- Compromise between product layout and process layout
- Product layouts for product families → cells (cellular layout)
- Group technology

3. PROPOSED SOLUTION

String diagram: The string diagram is one of the simplest techniques of method study for recording and examining movement of workers and materials. It is a tool for analyzing and designing work spaces in such a way that the movement of material, men, equipment etc... During a specified sequence of events. The string diagram is thus a form of flow diagram. In this a thread is used to measure distance. Hence, it is necessary that the string diagram be drawn correctly to scale. It is most often used to supplement the flow process chart. A string diagram can be used to plot the movement of material and this is done especially when a work study person wants to find out easily just how far the materials travel. The complete plan containing all the equipment's and doorways, pillars and partitions, which affect path of movement, are drawn to scale. A measured length of thread is then taken and tied round the pins at the string points of movement. Thus the string diagram is a useful aid in explaining proposed changes to company management, production supervisors and employees.

4. RESULTS

- The proposed plant layout efficiency is 126.05% which is greater than the efficiency of the current plant layout i.e.,
- 68.02%. The efficiency improvement of the plant was increased up to 85.31%. And the reduction in transportation length of 46% was achieved.

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THE WORKHORSE OF INDIAN RAILWAYS -WDM2

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ABSTRACT

It is quite obvious that in every Mechanism, machines and Automotive Engineering is the heart of the system. Any Machine or Device is always based on Logical approach and Technology. A most appropriate example of highly integrated Engineering Materials is a Diesel-Electric Locomotive. In described locomotive, the various mechanisms and processes carried out; especially the Regulation of Locomotive done by virtue of IC Engine of C.I (Compression-Ignition) type. This paper explicitly and uniquely deal with Indian Broad Gauge Diesel-Electric locomotive of class WDM2, which enjoys the status of being very fundamental and popular locomotive in Indian Railways, aptly called **THE WORKHORSE OF INDIAN RAILWAY**

Keywords

Mechanisms, Automotives, WDM2, CI Engines.

1. INTRODUCTION

WDM2 stands for-

W- Broad Gauge (1676 mm)

D- Diesel Locomotive

M- Mixed service (Goods and Passenger)

2- Version Number

In the early 1960s Indian Railways began conversion of its mainline from steam to diesel locomotives. For this conversion General Motors Electro-Motive Division (EMD) and the American Locomotive Company (ALCO) were asked to submit designs for new diesel locomotives. Each company submitted prototypes. Indian Railways designated prototypes of the WDM-2 class. Technologically the General Motors WDM-4 was superior to ALCO's WDM-2, but Indian Railways required a transfer of technology agreement that would allow these locomotives to be manufactured in India. General Motors did not agree to the transfer of technology agreement so the ALCO prototype was selected for production. The first few prototype WDM-2s were imported. After Diesel Locomotive Works (DLW) completed construction of its factory in Varanasi, production of the locomotives began in India. The first 12 locos were built using kits imported from ALCO in the United States. After that DLW started manufacturing the WDM-2 locomotives from their own components. Since then over 2,800 locomotives have been manufactured and the WDM-2 has become the most popular locomotive in India.

These specific locos have various no. of series viz 16XXX, 17XXX, 18XXX... For example 17793, 18561 etc. The sheds holding these locos are Tughlakabad (TKD), Bhagat Ki Kothi (BGKT), Patratu (PTRU), Howrah (HWH), Katni (KTE), Ludhian

a(LDH), Kharagpur (KGP), Maula Ali (MLY), Abu Road (ABR), Bokaro Steel City (BKSC), Lucknow (LKO), Malda Town (MLDT), Bondamunda (BNDM), Gonda (GD), Shakurbasti (SSB), Mughal sarai (MGS), Bardhaman/Burdwan (BWN), Raipur (R), Vishakhapatnam (VSKP), Andal (UDL), Jamalpur (JMP), Guntakal (GTL), Gooty (GY), Itarsi (ET), Golden Rock (GOC), Kalyan (KYN), Samastipur (SPJ), Pune (PUNE), Kazipet (KZJ), Krishnarajapuram (KJM), Izzatnagar (IZN), Erode (ED), Jhansi (JHS), Ratlam (RTM), New Guwahati (NGC), Ernakulam (ERS), Motibagh, Nagpur (MIB), Vatva (VTA), Vijaywada (BZA), Kurla (CLA), Agra (AGA), Tondiarpet (TNP) etc.

1.1 Technical Specifications

Loco type: Diesel-Electric

Builder: Alco, DLW

Bogie: Co-Co Asymmetrical Trimount, Axle hung,

Nose Suspended, Force Ventilated

Wheel Diameter: 1092 mm

Gauge: 1676 mm

Loco Length: 17120 mm

Loco Height: 4185 mm

Axle load: 18800 kg

Locomotive weight: 112800 kg

Fuel capacity: 5000 lts

Lube oil capacity: 990 lts

Cooling water capacity: 1210 lts

Engine RPM (Idle): 400 rpm

Engine RPM (8th Notch): 1050 rpm

Aspiration: Turbo-supercharged

Power output: 2400 HP

Top speed: 120 km/hr

No. of Traction Motors: 6

No. of Cylinders: 16

Compression Ratio: 12.5:1

Piston Stroke: 12.5 inches

Gear Ratio: 18:65

Adhesion: 27%

Tractive Effort: 299.205 kN (30.5 t)

2. Components of Workhorse.

2.1 Diesel Engine

This is the main power source for the locomotive. It comprises a large cylinder block, with the cylinders arranged in a straight line or in a V shape. The engine rotates the drive shaft at up to 1,000 rpm and this drives the various items needed to power the locomotive. As the transmission is

electric, the engine is used as the power source for the electricity generator or alternator, as it is called nowadays.



Fig 1: Diesel Engine.

2.2 Alternator.

The diesel engine drives the main alternator which provides the power to move the train. The alternator generates AC electricity which is used to provide power for the traction motors mounted on the trucks (bogies). In older locomotives, the alternator was a DC machine, called a generator. It produced direct current which was used to provide power for DC traction motors. Many of these machines are still in regular use. The next development was the replacement of the generator by the alternator but still using DC traction motors. The AC output is rectified to give the DC required for the motors.



Fig 2: Main Alternator.

2.2.1 Auxiliary Alternator

Locomotives used to operate passenger trains are equipped with an auxiliary alternator. This provides AC power for lighting, heating, air conditioning, dining facilities etc. on the train. The output is transmitted along the train through an auxiliary power line. In the US, it is known as "head end power" or "hotel power". In the UK, air conditioned passenger coaches get what is called electric train supply (ETS) from the auxiliary alternator.



Fig 3: Auxiliary Alternator

2.2.2 Motor Blower.

The diesel engine also drives a motor blower. As its name suggests, the motor blower provides air which is blown over the traction motors to keep them cool during periods of heavy work. The blower is mounted inside the locomotive body but the motors are on the trucks, so the blower output is connected to each of the motors through flexible ducting. The blower output also cools the alternators. Some designs have separate blowers for the group of motors on each truck and others for the alternators. Whatever the arrangement, a modern locomotive has a complex air management system which monitors the temperature of the various rotating machines in the locomotive and adjusts the flow of air accordingly.

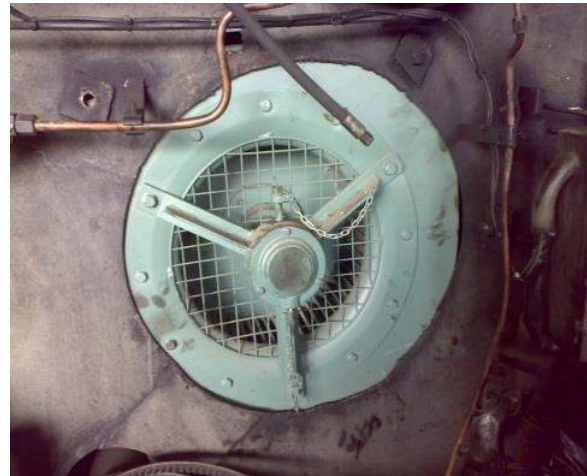


Fig 4: Motor Blower.

2.3. Air Intakes

The air for cooling the locomotive's motors is drawn in from outside the locomotive. It has to be filtered to remove dust and other impurities and its flow regulated by temperature, both inside and outside the locomotive. The air management system has to take account of the wide range of temperatures from the possible +40°C of summer to the possible -40°C of winter.

2.4. Control Stand

This is the principal man-machine interface, known as a control desk in the UK or control stand in the US. The common US type of stand is positioned at an angle on the left side of the driving position and, it is said, is much preferred by drivers to the modern desk type of control layout usual in Europe and now being offered on some locomotives in the US.



Fig 5: Control Stand.

2.5. Radiator and Radiator Fan

The radiator works the same way as in an automobile. Water is distributed around the engine block to keep the temperature within the most efficient range for the engine. The water is cooled by passing it through a radiator blown by a fan driven by the diesel engine.



Fig 6: Radiator and Radiator Fan

2.6 Turbo Super Charger

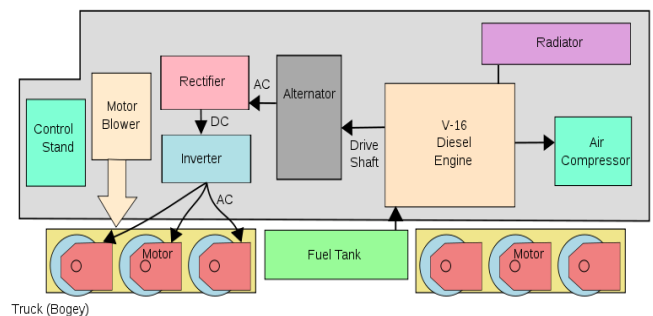
The amount of power obtained from a cylinder in a diesel engine depends on how much fuel can be burnt in it. The amount of fuel which can be burnt depends on the amount of air available in the cylinder. So, if you can get more air into

the cylinder, more fuel will be burnt and you will get More power out of your ignition. Turbo charging is used to increase the amount of air pushed into each cylinder. The turbocharger is driven by exhaust gas from the engine. This gas drives a fan which, in turn, drives a small compressor which pushes the additional air into the cylinder. Turbo charging gives a 50% increase in engine power. The main advantage of the turbocharger is that it gives more power with no increase in fuel costs because it uses exhaust gas as drive power. It does need additional maintenance, however, so there are some types of lower power locomotives which are built without it.



Fig 7: Turbocharger.

3. Working of WDM2



SCHEMATIC DIAGRAM OF MODERN U.S. DIESEL ELECTRIC LOCOMOTIVE

- Engines may be V-12, V-16 or V-20
- Engine drives either an alternator (AC) or generator (DC)
- Traction motors are either DC or AC
- Motor blower blows air over traction motors to cool them

Fig 8: Working of WDM2.

After inspecting loco and realizing that the loco is fit for duty necessary switches plugged on and pre-lubrication cranking of loco is started. During this time main generator is driven by locomotive batteries of 72V DC. 3. Particular time comes when magnetic field of generator will be able to drive crank shaft. This process is called Cranking of locomotive. Crank Shaft has 8 Crank pins such that on each crank pin 2 connecting rods of respective pistons are attached in V shape as shown in image. At the power take off end, 2 cam shaft gears of 104 teeth engaged with split gear coming from crank

shaft. This drives respective Cam shafts for opening inlet, fuel injection and exhaust valves with the help of cam lobes shown below-6. Now crank shaft start moving, since this is four stroke engine, each piston possesses 4 strokes. At 1st stroke piston moves from TDC to BDC sucking air from Air gallery. In 2nd stroke piston compresses air up to ratio 12.5:1 and moves BDC to TDC. When piston come nearer to TDC, fuel is injected in cylinder by pressure of around 279-298 Kg/cm². Due to very high temperature fuel catches fire and a big blast is responsible to move piston to BDC from TDC. This is 3rd stroke i.e. Power Stroke. Power is given to crank shaft and at 4th stroke exhaust gases released from Exhaust manifold through TSC. 7. The crank shaft is driver for many systems like Lube oil system, air intake system, water system Expressor, Auxiliary generator, Exciter Generator, FTTM, RTTM, RAGB etc. Fuel oil system is backbone of system. HSD fuel is used. Lube oil system is also very essential which provides lubrication to each moving element of locomotive. After obtaining power stroke, electric current is generated by main generator, the current is given to traction motors. The pinion of TM is engaged with bull of axle, when pinion rotates, axle start rotating and loco moves.



Fig 9: Crank.



Fig 10: Cam Lobes



Fig 11: Piston Alignment.

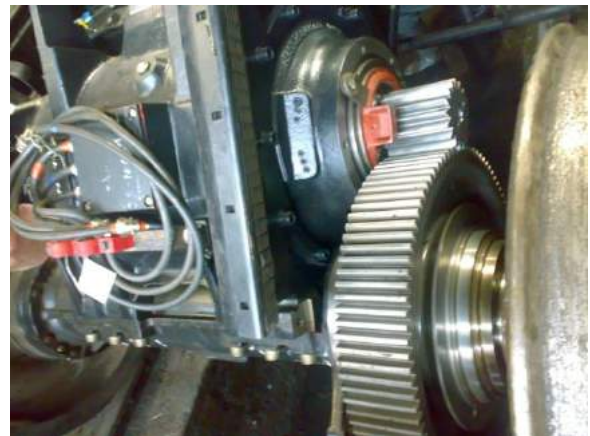


Fig 12: Traction motor pinion engages with axle bull gear

4. DRAWBACKS OF WDM2

Due to Low Horse power and less Axle load (2400HP and 18.8 t) this loco is actually unfit for Goods service .Less fuel efficient due to less compression ratio(12.5:1). Low ratio of total wt of power axles to starting TE the adhesion factor is less (0.27); due to low adhesion factor the wheel sleeping and wheel creeping occurs and which is beyond control by applying sand. DC traction motors are used in WDM2 ; which are less efficient than AC or Three phase traction motors .The loco cannot be MU'd beyond the limit of 2. The bogie used is less adhesive than HTSC bogie (used in WDG4 loco)

5. ADAPTATIONS IN WDM2:

By considering all the drawbacks in WDM2, the new locos were invented and some of WDM2's were rebuilt. The new locos are as follows-

5.1 WDM3A:

The very next version of WDM2, made by DLW, Varanasi. Mixed version and uprated to 3100HP. AC

traction motors are used. LH driving cab provided. Electronic SH and LH horns provided



Fig 13: WDM3A.

5.2 WDM3D:

ALCO 251C power pack induced. Microprocessor controlled. 6000lts fuel capacity. Starting TE is increased to 353 KN. Maximum upgraded speed up to 160 km/h



Fig 14: WDM3D.

5.3 WDG3A:

ALCO 251C power pack included Goods locomotive. TE more than 370 KN. Co-Co High adhesion bogie (30% adhesion). High axle load for heavier freight operations. 6000 lts fuel capacity and 1210 lts Lube oil capacity



Fig 15: WDG3A.

6. CONCLUSION:

After discovering many variants and subtypes of WDM2 many drawbacks were wiped out but still there are some adaptations to be done in it. Since WDM2 is very fundamental Diesel-Electric locomotive the all desired changes cannot be done in it but in small extend we can modify this loco. To make the loco fit for goods service, the axle load is to be increased .As axle load and little amount of HP increased the loco can provide more tractive effort. We can provide ACD (Anti Collision Device) for safer journey. Experimentally it has been found that the WDM2 can be run on BIO-DIESEL. Bio-diesel can reduce the conventional energy consumption. Microprocessor control is very advanced system for WDM2 and its variants

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Value Engineering / Analysis in Furniture Industry

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ABSTRACT

Value Engineering/ Analysis is a management technique that can make valuable contributions to value improvement and cost minimization in furniture industry. In this paper a wooden furniture Product is selected and value engineering technique is applied and its effects on different parameters have been observed. M/s Trendy Furniture Works, Mumbai (Maharashtra) has been manufacturing different types of wooden furniture products and supplying to individual customers as per their requirements.

This paper introduces how to apply methods and Principles of Value Engineering in the industry. Value engineering with its different phases can be implemented in any product to reduce the cost. The material, design, methods are chosen such that the cost is reduced without affecting the value of the product. To find the best choice we have used the tools such as Function analysis, Functional Evaluation and Decision Matrix, which gives best result.

Keywords: Value Engineering, Value Analysis, Function Evaluation, Decision Matrix, Wooden Furniture Industry.

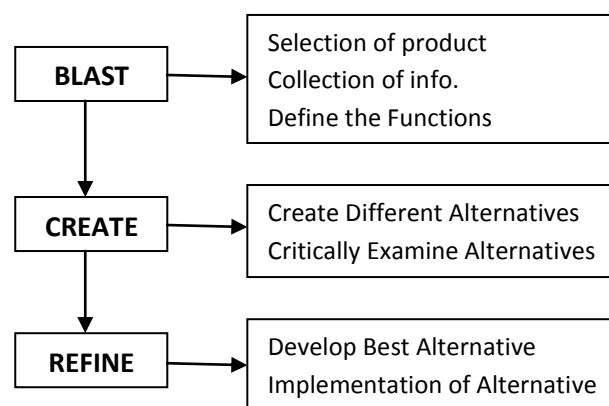
1. INTRODUCTION

Value Engineering is Systematic application of techniques which identify the value of product and try to improve it at minimum cost. Value analysis is applied to the existing product to improve its value whereas value engineering is applied to the product at the design stage and thus ensures prevention rather than elimination. In this report value engineering / analysis technique is applied to wooden furniture product to improve its value by reducing cost without

compromising quality.

The experimental work carried out at M/s Trendy Furniture Works, Mumbai. It is found that application of value engineering techniques reduced cost of the product considerably.

2. STEPS IN VALUE ANALYSIS



3. CASE STUDY-WOODEN TABLE

3.1 Selection of Product

Selection of product is important in value analysis. It should justify selection of V.E. are

- There should not be major changes in product or item under study.
- The functions of components are definable and understandable.
- The proposed changes are likely to be implemented after recommendation.
- A large saving potential.

Considering all above things I chosen a wooden table to go for value analysis as it was sold costly as compared to other manufacturers. It is form of furniture with flat horizontal upper surface used to support objects, for storage and show. Different types of tables are there based on functions performed by it.

3.2 Gather Information

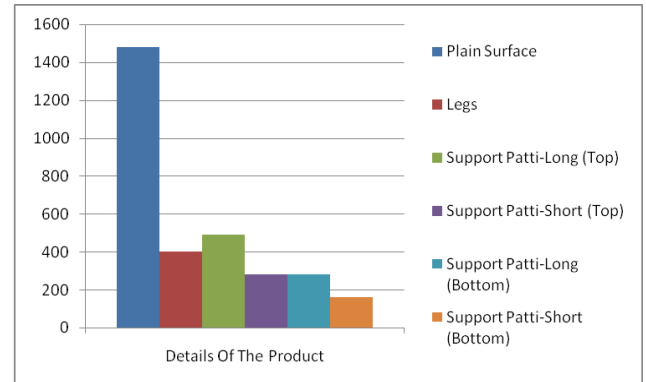
Drawing:-



Specifications:-

Sr. No.	Parts Name	Size	Quantity	Cost
A	Plain Surface	54"x 36"x1.5"	1	1480
B	Legs	2"x 2"x 30"	4	400
C	Support Patti-Long (Top)	4"x1"x42"	2	490
D	Support Patti-Short (Top)	4"x1"x24"	2	280
E	Support Patti-Long (Bottom)	2"x2"x42"	2	280
F	Support Patti-Short (Bottom)	2"x2"x24"	2	160
Total Cost				3090

3.3 Define Function & Functional Analysis



Cost of parts of Table.

Sr. No.	Parts Name	Weight %	Cost %
A	Plain Surface	35%	48%
B	Legs	20%	13%
C	Support Patti-Long(Top)	15%	16%
D	Support Patti-Short(Top)	10%	9%
E	Support Patti-Long (Bottom)	12%	9%
F	Support Patti-Short (Bottom)	8%	5%

3.4 Speculation of Alternatives

The central theme of the creative phase is “what else could be done to satisfy the same needed function?” the ranking of the function based on the value gap in descending order, is the indicator to which one must pinpoint in order to get the maximum advantages. In order to more ideas, the group restored to the brainstorming technique. The following ideas were generated during this phase,

1. Make changes in the design.
2. Change the material.
3. Change the dimensions of the parts.
4. Use waste pieces of required size in some places
5. Change the process.

First phase of brainstorming usually result in quantity generation and the second phase generates a qualitative evaluation.

3.5 Evaluation of Alternatives

The ideas are evaluated against four parameters as shown of feasibility ranking matrix.

- A. Durability
- B. Rigidity
- C. Compactness
- D. Appearance

Following criteria is used for evaluating the ideas

Major Performance-3

Medium Performance-2

Minor Performance-1

	B	C	D	E	F	
A	A3	A3	A3	A3	A3	35%
	B	B2	B2	B2	B2	20%
		C	C2	C2	C2	15%
			D	D1	D1	10%
				E	E1	12%
					F	8%

Function-Cost-Worth-Analysis (FCWA) is prepared by using function of product, existing and estimated cost of product, tentative alternatives and value gap.

Part Name	Material Used	Existing Cost	
Part Name	Tentative Alternative	Cost	Gap
Plain Surface	Board can be used or Ply thickness can be reduced	1160	320
Legs	Material with Same strength but less costly	280	120
Support Patti-Long (Top)	Width of the patti can be reduced without affecting strength required	360	130
Support Patti-Short (Top)		210	70
Support Patti-Long (Bottom)	Material with Same strength but less costly can be chosen	215	65
Support Patti-Short (Bottom)		140	20
FCWA		2365	725

Plain Surface	Plywood	1480
Legs	Teak Wood	400
Support Patti-Long(Top)	Teak Wood	490
Support Patti-Short(Top)	Teak Wood	280
Support Patti-Long (Bottom)	Teak Wood	280
Support Patti-Short (Bottom)	Teak Wood	160
Total Cost		3090

It is observed that cost of the product can be reduced without compromising 'value' of it. In this case cost can be reduced from 3090 to 2365. i.e. 23% reduction in cost.

Evaluation Of Parameters

	B	C	D	
A	A3	A3	A3	8
	B	B2	B2	5
		C	C2	2
			D	1

Decision Matrix

Parameter Weightage Alternative	Durability	Rigidity	Compactness	Appearance	Total
Existing	8	5	2	1	56
	4	3	3	3	
Alternative	32	15	6	3	63
	4	4	4	3	
	32	20	8	3	

4. CONCLUSION

From this Case Study it is observed that how the value engineering is used for the cost reduction without the change in the product design & its value. A proper decision matrix is prepared for choosing the appropriate alternative from the feasible choices available.

The Value Engineering process and procedures are generally well defined and well-understood at all levels in the industry. VE is recognized as an effective way to improve the performance of a product with reduction in cost. The quality of the team leader and specialists is a key ingredient to the success of the VE program. It is more effective and influential on the performance, quality, and cost of a product when done relatively early in the production schedule.

5. FUTURE SCOPE

In future, furniture product design can be modified so that the value of the product can be enhanced. Also other Industrial Engineering techniques can be used for further improvement in the product.

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Recent breakthroughs in Automobile technology- Air Powered Vehicles

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ABSTRACT

Air? At first glance, the idea of running a car on air seems almost too good to be true. If we can use air as fuel, why think about using anything else? Air is all around us. Air never runs out. Air is nonpolluting. Best of all, air is free. The **Air car** is a car currently being developed and, eventually, manufactured by Moteur Developpement International (MDI), founded by the French inventor Guy Nègre. It will be sold by this company too, as well as by ZevCat, a US company, based in California. The air car is powered by an air engine, specifically tailored for the car. The used air engine is being manufactured by CQFD Air solution, a company closely linked to MDI. The engine is powered by compressed air, stored in a glass or carbon-fiber tank at 4500 psi. The engine has injection similar to normal engines, but uses special crankshafts and pistons, which remain at top dead center for about 70% of the engine's cycle; this allows more power to be developed in the engine. Though some consider the car to be pollution-free, it must be taken into account that the tanks are recharged using electric (or gasoline) compressors, resulting in some pollution, if the electricity used to operate the compressors comes from polluting power plants (such as gas-, or coal-power plants). Solar power could possibly be used to power the compressors at fuel station.

Keywords

Mechanisms, Automotives, , Air Engines.

1. INTRODUCTION

We know that our world is facing fuel crisis now. All kinds of conventional source of fuels are on the verge of exhaustion. Gasoline which has been the main source of fuel for the history of cars, is becoming more and more expensive and impractical (especially from an environmental standpoint). These factors are leading car manufacturers to develop cars fueled by alternative energies. Two hybrid cars took to the road in 2000, and in three or four years fuel-cell-powered cars will roll onto the world's highways.

While gasoline prices in the United States have not yet reached their highest point (\$2.66/gallon in 1980), they have climbed steeply in the past two years. In 1999, prices rose by 30 percent, and from December 1999 to October 2000, prices rose an additional 20 percent, according to the U.S. Bureau of Labor Statistics. In Europe, prices are even higher, costing more than \$4 in countries like England and the Netherlands. But cost is not the only problem with using gasoline as our primary fuel. It is also damaging to the environment, and since it is not a renewable resource, it will eventually run out. One possible alternative is the air-powered car.

Air powered cars run on compressed air instead of gasoline. This car is powered by a two cylinder compressed engine. This engine can run either on compressed air alone or act as an IC engine. Compressed air is stored in glass or fiber tanks at a pressure of 4351 psi.

Within the next two years, you could see the first air-powered vehicle motoring through your town. Most likely, it will be the e.Volution car that is being built by Zero Pollution Motors. The cars have generated a lot of interest in recent years, and the Mexican government has already signed a deal to buy 40,000 e.Volutions to replace gasoline- and diesel-powered taxis in the heavily polluted Mexico City.

2. Components .

2.1 Compressed air tanks

Compressed air tanks are one of the major part of this cars. These tanks hold 90 cubic meters of air compressed to 300 bars. It is similar to the tanks used to carry the liquid gas used by buses for public transport. The tanks enjoy the same technology developed to contain natural gas. They are designed and officially approved to carry an explosive product: methane gas. In the case of a major accident, where the tanks are ruptured, they would not explode since they are not metal. Instead they would crack, as they are made of carbon fiber. An elongated crack would appear in the tank, without exploding, and the air would simply escape, producing a loud but harmless noise. Of course, since this technology is licensed to transport an inflammable and explosive gas (Natural gas), it is perfectly capable inoffensive and non-flammable air. It is fitting, therefore, that MDI has reached an agreement with the European leader in aerospace technology air bus industries for the manufacture of the compressed air storage tanks. With a remote supervision arrangement, Airbus Industries oversees the making of the storage tanks at each MDI factory. The coiled carbon fibre technology used in the construction of the tanks is complex and requires a substantial quality control process which the multinational company, home of the Airbus aircraft, will provide for our vehicles.

2.2 Brake power recovery

The MDI vehicles will be equipped with a range of modern systems. For example, one mechanism stops the engine when

the car is stationary (at traffic lights, junctions etc). Another interesting feature is the pneumatic system which recovers about 13% of the power used.

2.3 The Body.

The MDI car body is built with fibre and injected foam, as are most of the cars on the market today. This technology has two main advantages: cost and weight. Nowadays the use of sheet steel for car bodies is only because of cost - it is cheaper to serially produce sheet steel bodies than fibre ones. However, fibre is safer (it doesn't cut like steel), is easier to repair (it is glued), doesn't rust etc. MDI is currently looking into using [hemp fibre](#) to replace fibre-glass, and natural varnishes, to produce 100% non-contaminating bodywork

2.4 The Air Filter

The MDI engine works with both air taken from the atmosphere and air pre-compressed in tanks. Air is compressed by the on-board compressor or at service stations equipped with a high-pressure compressor. Before compression, the air must be filtered to get rid of any impurities that could damage the engine. Carbon filters are used to eliminate dirt, dust, humidity and other particles, which unfortunately, are found in the air in our cities. This represents a true revolution in automobiles - it is the first time that a car has produced minus pollution, i.e. it eliminates and reduces existing pollution rather than emitting dirt and harmful gases. The exhaust pipe on the MDI cars produces clean air, which is cold on exit (between -15° and 0°) and is harmless to human life. With this system the air that comes out of the car is cleaner than the air that went in.

2.5. The chassis

Based on its experience in aeronautics, MDI has put together highly resistant, yet light, chassis, aluminum rods glued together. Using rods enables us to build a more shock-resistant chassis than regular chasses. Additionally, the rods are glued in the same way as aircraft, allowing quick assembly and a more secure join than with welding. This system helps to reduce manufacture time.

2.6 Electrical system

Guy Nègre, inventor of the MDI Air Car, acquired the patent for an interesting invention for installing electrics in a vehicle. Using a radio transmission system, each electrical component receives signals with a microcontroller. Thus only one cable is needed for the whole car. So, instead of wiring each component (headlights, dashboard lights, lights inside the car, etc), one cable connects all electrical parts in the car. The most obvious advantages are the ease of installation and repair and the removal of the approximately 22 kg of wires no longer necessary. Whats more, the entire system becomes an anti-theft alarm as soon as the key is removed from the car.

3. Technology Description.

The following is the technology description of the actual functionality of the motor.

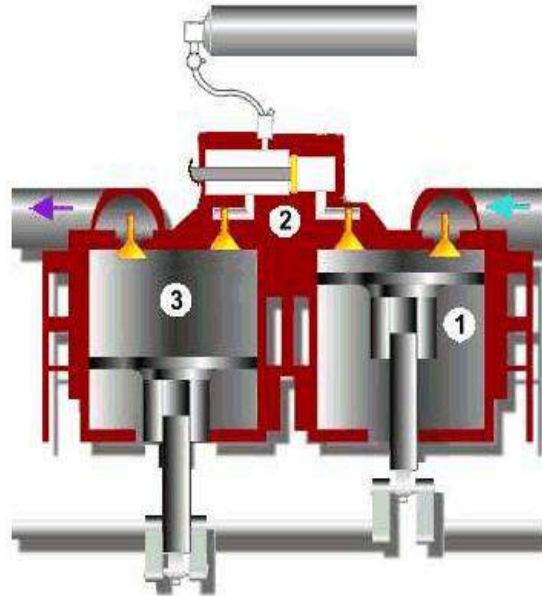


Fig 1: lay out

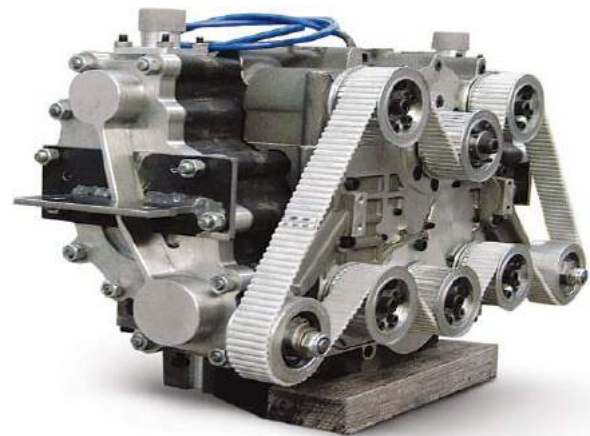


Fig 2: Engine

3.1 PROCESS DESCRIPTION

The first piston takes in ambient air and compresses it to approximately 300 psi and 200°F in the compression chamber during the first cycle of the engine. When the piston pauses, a small amount of compressed air from the tanks is released into the expansion chamber to create a low pressured, low temperature volume of about 140psi. Shortly before the valve to the exhaust cylinder is opened, a high-speed shutter

connects the compression and expansion chambers. The sudden pressure and temperature difference between the low chambers creates pressure waves in the expansion chamber, thereby producing work in the exhaust chamber that drives the piston to power the engine. The air tanks for storing the compressed air are localized underneath the vehicle. They are constructed of reinforced carbon fiber with a thermoplastic liner. Each tank can hold 3,180 ft³ of air at a pressure of up to 4,300 psi. When connected to a special compressor station, the tanks can be recharged within 3-4 minutes. They can also be recharged using the on-board compressor 3-4 hours after connecting to a standard power outlet.

3.2 TECHNOLOGY OVERVIEW

These new vehicles incorporate various innovative and novel systems such as storing energy in the form of compressed air, using new materials such as fiberglass to build the car and vegetable oil for the motor lubrication.

Numerous innovations have been integrated in the engine design. As an example, there is a patented system of articulated conrods that allow the piston to pause at top dead center. The following graph indicates this movement of the piston in relation to the driving shaft rotation.

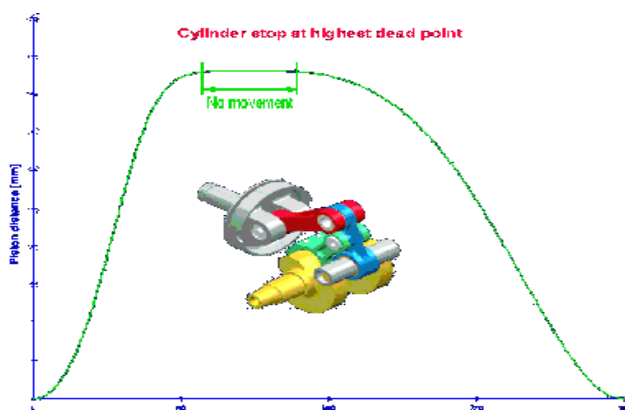


Fig 3 :the graph showing the working

The car engine runs on compressed air and incorporates the three laws of thermodynamics.

1. The first law states that energy can neither be destroyed nor be wasted.
2. The second law describes the disorder within substances.
3. The third law defines that only in crystals at 0° k, there is absolute disorder.

The car incorporates these laws of thermodynamics in the following way. First, the pressure that is created within on-board tanks during compression is in direct proportion to the energy that has been stored in it. This process is equivalent to the energy stored in a wire spring when it is compressed. Furthermore, thermal energy is dissipating from the system, thereby lowering the temperature of a compressed gas volume that expands. This process is equivalent to harnessing energy that has been stored

4. WORKING

Air powered cars run on compressed air instead of gasoline. Since the car is working on air there is no pollution. A two cylinder, compressed air engine, powers the car. The engine can run either on compressed air alone or act as an internal combustion engine. Compressed air is stored in fiber or glass fiber tanks at a pressure of 4351 pounds per square inch. The air is fed through an air injector to the engine and flows into a small chamber, which expands the air. The air pushing down on the piston moves the crankshaft, which gives the vehicle power. This car is also working on a hybrid version of their engine that can run on traditional fuel in combination with air. The change of energy source is controlled electronically. When the car is moving at speeds below 60kph, it runs on air. At higher speeds, it runs on a fuel such as gasoline diesel or natural gas. Air tanks fixed to the underside of the vehicle can hold about 79 gallons (300 litres) of air. This compressed air can fuel the car upto 200km at a top speed of 96.5kph. When the tank nears empty it can be refilled at the nearest air pump. The car motors require a small amount of oil about 0.8 litres worth that have to change just every 50,000km.

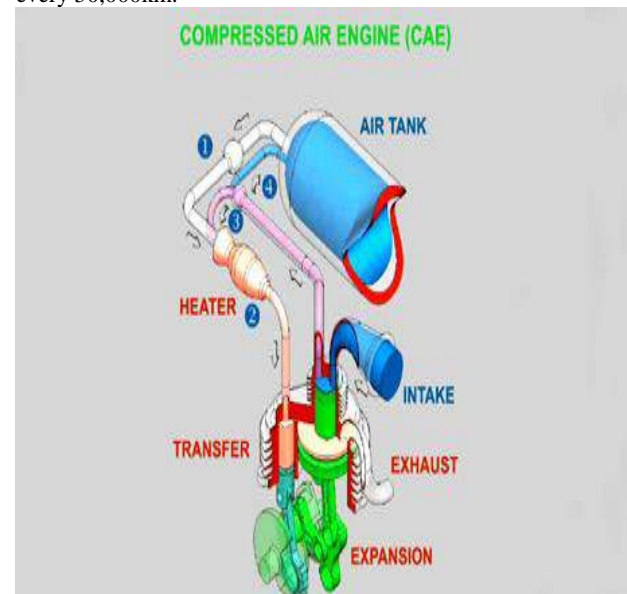


Fig 4 : Working Cycle.

Gear changes are automatic, powered by an electronic system device. A computer which controls the speed of the car is effectively continuously changing gears. The latest of many previous versions, this gearbox achieves the objective of seamless changes and minimal energy consumption.

4.1 DISTRIBUTION AND VALVES

To ensure smooth running and to optimize energy efficiency, engines use a simple electromagnetic distribution system which controls the flow of air into the engine. This system runs on very little energy and alters neither the valve phase nor its rise.

4.3 MOTO-ALTERNATOR

The moto-alternator connects the engine to the gearbox. It has many functions: It supports the vehicle's motor to allow the tanks to be refilled. As an alternator it produces brake power. It starts the vehicle and provides extra power when necessary.

5. BASIC PRINCIPLES OF COMPRESSED AIR TECHNOLOGY ENGINE

It uses an innovative system to control the movement of the second-generation pistons and one single crankshaft. The pistons work in two stages and one intermediate stage of compression and expansion.

The engine has four stage pistons that are 8 compression and or expansion chambers. They have two functions:

1. To compress ambient air
2. To make successive expansions thereby approaching isothermic expansion.

5.1 THE DUAL ENERGY SYSTEM

The engine can be equipped with and run on dual engines. Fossil fuels and compressed air and incorporate a reheating mechanism between the storage tank and the engine. This mechanism allows the engine to run exclusively on fossil fuel, which permits compatible autonomy on the road. While the car is running on the fossil fuel, the compressor air tanks. The control system maintains a zero pollution emission in the city at speeds up to 60 km per hour.

5.2 THE AIR FILTER

The air compressed engine works on with both air taken from the atmosphere and air pre compressed in tanks. Air is compressed by the on board compressor or at service stations equipped with a high-pressure compressor. Before compression the air must be filtered to get rid of any impurities that could damage the engine. Carbon filters are used to eliminate dirt, dust, humidity and abundant abrasive particles that unfortunately exist in the air from our cities.

This system eliminates and reduces existing pollution rather than emitting dirt and harmful gases. The exhaust pipe on the air-powered cars produces clean air which is cold on exit (between 15° and 0°) and is harmless to human life. With this system the air that comes out of the car is cleaner than the air that went in.

6. CRYOGENIC HEAT ENGINE

Another version of an air-powered car is being developed by researchers at the [University of Washington](#) using the concept of a [steam engine](#), except there is no combustion. The Washington researchers use liquid nitrogen as the propellant for their LN2000 prototype air car. The

researchers decided to use nitrogen because of its abundance in the atmosphere -- nitrogen makes up about 78 percent of the Earth's atmosphere -- and the availability of liquid nitrogen. There are five components to the LN2000 engine: A 24-gallon stainless steel tank. A pump that moves the liquid nitrogen to the economizer. An economizer that heats the liquid nitrogen with leftover exhaust heat. A heat exchanger that boils the liquid nitrogen, creating a high pressure gas. An expander, which converts nitrogen's energy into usable power.

The liquid nitrogen, stored at -320 degrees Fahrenheit (-196 degrees Celsius), is vaporized by the heat exchanger. The heat exchanger is the heart of the LN2000's **cryogenic engine**, which gets its name from the extremely cold temperature at which the liquid nitrogen is stored. Air moving around the vehicle is used to heat the liquid nitrogen to a boil. Once the liquid nitrogen boils, it turns to gas in the same way that heated water forms steam in a steam engine.

Nitrogen gas formed in the heat exchanger expands to about 700 times the volume of its liquid form. This highly pressurized gas is then fed to the expander, where the force of the nitrogen gas is converted into mechanical power by pushing on the engine's pistons. The only exhaust is nitrogen, and since nitrogen is a major part of the atmosphere, the car gives off little pollution. However, the cars may not reduce pollution

as much as you think. While no pollution exits the car, the pollution may be shifted to another location. As with the e.Volution car, the LN2000 requires electricity to compress the air. That use of electricity means there is some amount of pollution produced somewhere else. Some of the leftover heat in the engine's exhaust is cycled back through the engine to the economizer, which preheats the nitrogen before it enters the heat exchanger, increasing efficiency. Two fans at the rear of the vehicle draw in air through the heat exchanger to enhance the transfer of heat to the liquid nitrogen.

The Washington researchers have developed a crude prototype of their car, using a converted 1984 Grumman-Olson Kubvan mail truck. The truck has a radial five-cylinder that produces 15 horsepower with the liquid nitrogen fuel. It also features a five-speed manual transmission. Currently, the vehicle is able to go only about two miles (3.2 km) on a full tank of liquid nitrogen, and its top speed is only 22 mph (35.4 kph). However, because a liquid nitrogen-propelled car will be lighter, the researchers think that a 60-gallon (227 liters) tank will give the LN2000 a potential range of about 200 miles (321.8 km). With gas prices soaring, as they have over the past two years, it might not be long before many motorists turn to vehicles powered by alternative fuels. Although air-powered vehicles are still behind their gasoline counterparts when it comes to power and performance, they cost less to operate and are arguably more environmentally friendly, which makes them attractive as the future of highway transportation.

7. NEW MODELS, NEW APPLICATIONS

The MiniCAT's prototype is featured in the latest edition of the 'Salon Mondial de l'Automobile Paris 2002'. This model is as ecologically sound as its predecessors and has equally low fuel consumption; one tank of air is enough for 200 km, at a cost of only 2 Euro. Like its "sister" vehicles, the MiniCAT's emits only clean air at a temperature of -20°C. A main

innovation is that with 2.65 meters in length, and with a three seat configuration (the driver is in the center) the boot is as capacious as a conventional family saloon.

Guy Nègre has also designed a dual-energy vehicle for longer distances, which works on compressed air in the city, and air/petrol on motorways. This vehicle (the RoadCAT's) can travel more than 2000 km on 100 m³ of air and 50 litres of petrol, so can be used for long journeys and is not an exclusively urban vehicle. Other applications of the technology include power generation, compressing air as a means of storing energy, and powering boats.

MDI also presented the MultiCAT's concept of a zero pollution urban transportation system which incorporates several important economic advantages. Consisting of a Driver module and up to 4 transport modules, (as in a train with tyres) it has been developed with a view to transporting up to 135 people at a cost of only 2.5 Euros for each 100 km per module, which could allow local and/or national governments to offer practically free urban transport to its citizens. At the moment the sale of the first license to manufacture the MultiCAT's for the Spanish and Portuguese market is in an advanced stage of negotiation with a group of investors consisting of the MDI license holders for Spain and other companies involved in the transport and energy sectors of those countries.

[6] Hugh Currin "Air Engine Design for Machining Class"
April 11, 2007

8. ADVANTAGES AND DISADVANTAGES

8.1 ADVANTAGES

- Economical.
- Pollution free.
- Better fuel efficiency.
- Better comfort.
- Less maintenance
- Low cost.

8.2 Disadvantages.

- Less power is produced.
- Air pumping stations are less in number.

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Zero liquid discharge as a sustainable water treatment solution towards green initiative – A review

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ABSTRACT

Waste water from industries contribute major amount of toxic wastes to environment. This results in serious pollution problem in water environment and cause negative impact to eco-system. Fresh water scarcity and concern for environmental impact resulting from industrial waste water discharge justifies the need of recycling and reuse of water. Zero Liquid Discharge (ZLD) is a method that not only helps reduce fresh water usage but also concentrates on eliminating waste water discharge from facility. ZLD process purifies and recycles plant waste water, changing liquid into disposable dry solid and delivering recycled water back into the plant process stream to be reused.

This paper aims in highlighting the sustainability outlook of ZLD system that justifies its environmental factors.

General Terms

Sustainable development, Environment, Eco-system, Waste water treatment, Effluent treatment, thermal, physical, chemical, biological

Keywords

Zero liquid discharge, waste water treatment, waste water management, sustainable development, Effluent treatment, Ultra filtration, Reverse osmosis, Evaporator

1. INTRODUCTION

There are three basic needs that a man possesses food, clothing, and shelter. The global textile and clothing industry is bound to be huge, as it fulfills the second basic requirement of man. But the sad fact is that the textile industry uses high volumes of water throughout its operations. There are two major concerns that relate the textile industries.

One is the enormous amount of water required by textile production competes with the growing daily water requirements of the half billion people that live in drought-prone regions of the world. By 2025, the number of inhabitants of drought-prone areas is projected to increase to almost one-third of the world's population. If global consumption of fresh water continues to double every 20 years, the polluted waters resulting from textile production will pose a greater threat to human lives.

The second fact is the pollutants released by the textile industry are continuously doing unimaginable harm to the environment. In general the effluent of textile industries mainly contains toxic organic compounds, COD (chemical oxygen demand), BOD (Biological oxygen demand),

suspended solids, total dissolved solids, biocides, and toxic anions. Untreated effluent cause chemical and biological changes in our aquatic system, which threatens species of fish and aquatic plants. The presence of these harmful components makes practical water use unhealthy or dangerous.

Along with textile industry, which is the major contributor of industrial water waste, other industries identified as water polluting industries are: - Sugar, Distilleries, Pulp and Paper, Tanneries, Chemicals, Dyeing and Textiles, Refineries, Food, Dairy and Beverages, and Electroplating.

Zero Liquid Discharge (ZLD) is being talked about more frequently in the manufacturing industry where waste water is produced. Businesses across the world are becoming increasingly concerned about water use and pollution reduction. This is mostly inspired by a larger "Green" or sustainable initiative, which companies are incorporating into their mission statements and corporate objectives.

2. ZERO LIQUID DISCHARGE – AN APPROACH TOWARDS GREEN INITIATIVE

A potential solution for above mentioned problems is not just to improve water use efficiency and reduce liquid effluents, but to discharge no water at all, that is Zero Liquid Discharge (ZLD).

A ZLD system involves a range of advanced wastewater treatment technologies to recycle recovery and re-use of the 'treated' waste water and thereby ensure there is no discharge of wastewater to the environment. At the same time there is reduction in water demand from the industry as majority of the waste water can be reused after treated by ZLD process. This result in a more sustainable growth of the industry and at the same time meets most stringent regulatory norms.

ZLD process views the effluent not as a waste stream, but as a resource stream. It is equally important to view the ZLD process as a part of the manufacturing activity rather than an 'end-of-the-pipe' process. [8]

The goal of these Green initiatives is to adopt a more environmental friendly and socially responsible approach to the firm's business and manufacturing processes.

3. TECHNICAL NEEDS FOR ZLD

Adoption of Zero Liquid Discharge system will be applicable to zero-down organic load, recover metals and other constituents. Direct installation of ZLD facilities may have technical constraints to operate specialized system.

In the process of achieving ZLD, solids are recovered and

these are to be utilized. However, in case of not used, they will have to be stored. Cost-wise, achieving ZLD will be costly proposition but, now becoming necessity because rivers need to be rejuvenated. A typical cost indicates that a CETP treating 1 MLD of waste water with conventional physico-chemical and biological treatment is around Rs. 3.0 to 4.0 Crores with operation and maintenance cost of Rs. 300-350 per cubic meter (M3), Whereas, cost of combination of conventional ETP with ZLD facilities costs around Rs. 12.0 to 15.0 Crores per MLD.[2]

4. TECHNICAL ROUTE TO ACHIEVE ZLD

The waste water coming from industry characterized by COD (chemical oxygen demand), BOD (Biological oxygen demand), (SS) suspended solids, (TDS) total dissolved solids, (TS) total solids and variable PH.[3] The task of ZLD to control or eliminate the parameters as per guideline by pollution control board (Standards for compliance have been notified under the Environment Protection Act, 1986) and for the reuse of water.

Pre-requisite for ZLD accomplishment would need physical and chemical treatment and followed by biological system to remove organic load. The treated effluents can be then subjected for concentration and evaporation. The concentration process as applicable can be adopted at appropriate stage. The concentration method quite often involves the adoption of Reverse Osmosis (RO) and Nano Filtration (NF) methods. The evaporation methods involve incineration/ drying / evaporation of effluent in multi effect evaporators (MEE).

It is possible to obtain a very high recovery (99%) of waste water if scaling parameters such as calcium, magnesium barium and silicate are removed in the pre-treatment.[4]

Table 1: Various treatments and its principle

Treatment	Process
Pre-treatment	Physical, chemical and biological Process
Reverse osmosis	Membrane Process
Evaporator & Crystallizer	Thermal Process

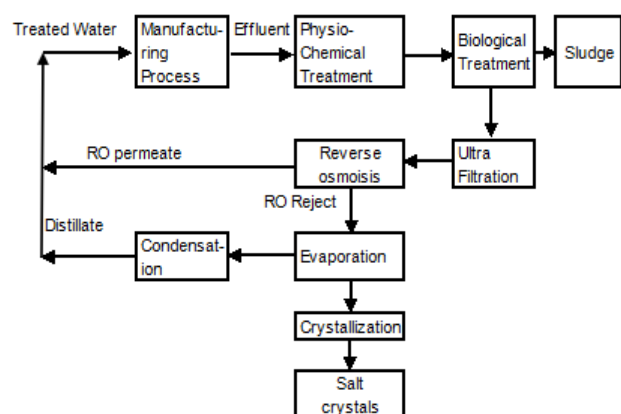


Fig 1: Zero liquid discharge process flow

4.1 Effluent Treatment Plant – Pre-treatment

The systems available of treating industrial effluent are based on Physico-chemical and biological principles. The operation of effluent treatment plants requires technical skill and regular attention so to achieve compliance to standards for 24 hrs x 365 days.

4.2 Physio-chemical treatment.

Raw waste water from plant passes through screen chamber where its physical waste removed. This water goes in Equalization tank. Where with the help of Air blower all chemical waste water mixes equally. As the flow is not continuous or fluctuating so the equalization tank is needed.

From the flow equalization tank effluent is enter into flash mixture where its pH is corrected by acidic or alkaline solution whichever needed. By adding flocculent and coagulant part of TSS, TDS are get separated the sediments remain in the suspension. Then this chemically treat effluent passes through primary settling tank /lamella clarifier where sediments are settle in settling tank and the supernatant is taken to aeration tank. The settled sediments are collected in the primary sludge tank from where it is converted to solid sludge. This solid sludge further use for land filling application.[7]

4.3 Biological treatment

The supernatant from primary tank is allowed to enter in the aeration tank where secondary treatment of water is done. Aeration tank is having biomass or activated sludge, aerobic or anaerobic bacteria. Aerobic means in the presence of air (oxygen); while anaerobic means in the absence of air. These two terms are directly related to the type of bacteria or microorganisms that are involved in the degradation of organic impurities in the given waste water. The activated sludge is a biochemical process for treating waste water that uses air and microorganisms to biologically oxidize organic pollutants thus removes COD and BOD load.

The water then passes through the tertiary treatment units PSA (Pressure sand filter) and ACF (Activated carbon filter); which act as a polishing unit removes suspended matters, odor and residual organic colour compound.[7]

4.4 Membrane filtration technology (Reverse Osmosis)

The membrane-based separation process, which began as a scientific curiosity in the 1960s, is now a commercial reality. During the last two decades significant advances have been made in the development and application of microfiltration (MF), ultrafiltration (UF), nanofiltration (NF), and reverse osmosis (RO) processes. These processes have now become major players in the field of solid-liquid separation technology.[1]

Table 2: Different filtration mechanism and its level

FILTRATION MECHANISM	LEVEL OF FILTRATION
Micro filtration	Suspended particles
Ultra-filtration	High molecular weight
Nano filtration	Low molecular weight

Reverse osmosis	Ionic species
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Microfiltration (MF) and ultrafiltration (UF) membranes have been introduced in recent years. These membranes are not as tolerant as media filters to suspended solids. They are also more expensive and require additional equipment for their operation. UF are used for the removal of suspended particle from up to the 0.01 Micron. However, MF and UF membranes provide consistent, good quality low SDI water which in many cases may be fed directly to an RO system with little or no additional pretreatment. Additionally, they are fairly rugged (compared to RO).[1]

The process of reverse osmosis is based on the ability of certain specific polymeric membranes, usually cellulose acetate or nylon to pass pure water at fairly high rates and to reject high TDS water. To achieve this, water or waste water stream is passed at high pressures through the membrane.

Water purification by the RO process involves the separation of dissolved solids from the feed water by means of a semi-permeable membrane. Semi-permeable membranes allow water to pass through (permeate) readily, but are fairly impermeable to other constituents present in the feed stream.

Feed water passing over the membrane at a trans-membrane pressure exceeding the osmotic pressure of the feed water with the result that the permeate (product stream) is selectively passed through the membrane. This product stream (on the low-pressure side of the membrane) is depleted of dissolved ions while the reject stream (reject or waste stream) is enriched in the dissolved material. To treat the feed streams, applied trans-membrane pressure must be higher than the osmotic pressure for permeation of the solvent. The osmotic pressure strongly depends on charge, number of ions, and molecular weight of feed water.

RO membranes typically remove greater than 99% of the dissolved salts, microorganisms, and colloids and in some cases more than 90% of the soluble silica and TOC (total organic carbon) from the feed stream.

The performance of RO system is largely controlled by the quality of feed water. Feed water quality will determine the amount of pre-treatment needed to make an RO economical process. This balance is the primary limiting factor of most RO systems. Pre-treatment of the water is generally achieved by physio-chemical and biological treatment.

4.5 Evaporators

Multiple effect evaporation remains one of the popular methods used for the concentration of aqueous solutions or RO reject. Water is removed from a solution by boiling the liquor in an evaporator and withdrawing the vapour. If the solution contains dissolved solids, the resulting strong liquor may become saturated so that crystals are deposited.

Evaporation process comprises three main steps:

1. Pre-heating of a solution prior to evaporation
2. Removal of water (solvent) as vapour by steam heating
3. Condensing the vapour removed.

Evaporation is carried out by supplying heat to the solution to vaporise the solvent. The heat is supplied basically to provide the latent heat of vaporization and by adopting methods for recovery of heat from the vapour, it has been possible to achieve great economy in heat utilization. The normal heating medium is generally saturated steam (1 to 10 kg/cm²g).[1]

An industrial evaporator system generally comprises:

1. A heat exchanger to supply sensible heat and latent heat of evaporation to the feed. Saturated steam is usually used as the heating medium.
2. A separator in which the vapour is separated from the concentrated liquid phase.
3. A condenser to effect condensation of the vapour and its removal from the system.

There are two main types of ways of improving steam economy in evaporators. One is to use a multiple effect evaporator; the other is to use mechanical vapour recompression.

If an evaporator, fed with steam at 399 K with a total heat of 2714 kJ/kg, is evaporating water at 373 K, then each kilogram of water vapour produced will have a total heat of 2675 kJ. If this heat is allowed to go to waste, by condensing it in a tubular condenser or by direct contact in a jet condenser for example, such a system makes very poor use of steam. The vapour produced is, however, suitable for passing to the calandria of a similar unit, provided the boiling temperature in the second unit is reduced so that an adequate temperature difference is maintained. This can be affected by applying a vacuum to the second effect in order to reduce the boiling point of the liquor. This is the principle used in the multiple effect systems. [1]

5. DRIVERS OF ZLD

The primary drivers of ZLD have been compliance regulations. Mandates are given by the court or regulations are formalized by the Pollution Control Boards (PCBs) at the Centre and State level (e.g.: ZLD being a mandatory requirement for a renewing a factory's License to Operate)

The ZLD system is also the most effective advanced treatment for the reduction or elimination of wastewater discharges to the environment. The evaporation process allows the reduction of liquid waste and the crystallization technology allows us to create value with the salts present in the effluent, ensuring the reduction of the environmental footprint of industrial site.

As there is zero liquid discharge and majority of the waste water is recycled, it results in production of process water of appropriate quality and reduced fresh water consumption by industrial sector. Reduction in water demand from the Industry frees up water for Agriculture and Domestic demands.

Therefore, it can be concluded that Water scarcity, ground & surface water pollution, water economics and regulatory pressures are the main drivers of ZLD in India, and will determine the financial viability of ZLD.

6. ADVANTAGES OF ZLD

- Installing ZLD technology is beneficial for plants water management; encouraging close monitoring

of water usage, avoiding wastage and promotes recycling by conventional and less expensive solutions.

- High operating cost can be justified by high recovery of water (>90-95%) and recovering of several by products from the salt.
- More sustainable growth of the industry while meeting most stringent regulatory norms.
- Reduction in water demand from the industry frees up water for Agriculture and domestic demands.

7. CHALLENGES IN ZLD

While the benefits of ZLD are noteworthy, adoption of the technology has two key environmental considerations:

First is the energy consumption for the evaporation process. On the challenges front, high capital and operating costs of ZLD make it unattractive to many industries where the process is intense or the volume of wastewater is large and a near ZLD process will suffice. The addition of evaporators and crystallizers may increase the cost of a traditional wastewater system by two times.[5]

Second being the disposal of the solid waste. ZLD results in generation of hazardous solid wastes creating disposal challenges need to think of Zero Waste Disposal Plants and to generate products/ by products out of the waste.

8. CONCLUSION

Under the global green initiative, ZLD solutions help industries not only to use water efficiently but to implicate that there is no discharge of wastewater into the water bodies. In long run, the high operating cost can be justified by high recovery of water (>90-95%) which reduces input water required by industrial processes by as much as 80% and recovering of several by products from the salt. Likewise, ZLD results in sustainable growth of industry while meeting most stringent regulatory norms.

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A Review on factors affecting implementation of ERP System for industries in India

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ABSTRACT

Managing the information is one of the most important concepts in any organization for the sake of its performance and growth. Tremendous competition due to increased globalization has forced firms to operate in changing business environment. Enterprise Resource Planning (ERP) systems are the well accepted solutions among Indian industries for improving their supply chains and overall business performance to face the strong global challenges. ERP provides advantages over conventional ways of information management which in turns strengthens cohesiveness among the different departments of an organization with quick response and low transaction cost. But the implementations of ERP involve added complexity and sometime it ends with total failure and loss of huge investment. This paper is aimed to review critical issues in ERP implementation in context to Indian industries mostly SMIs. WE observed that, certain factors, like improper system implementation strategies, lack of well-defined scope of implementation procedures, improper project planning and huge customization of the selected system for implementation etc. have significant influences on the successful ERP implementations.

Keywords

Enterprise Resource Planning (ERP), SMIs.

1. INTRODUCTION

An ERP implementation takes many years to complete and requires a large amount of IT investment and their effectiveness is hard to evaluate. With the globalizations and development of technologies, the Indian firms are facing a multitude of forces pertaining to the growth of fierce competition, market expansion, and rising customer expectations in the dynamic business environment. The global and domestic competitors in any business domain are continuously upgrading their internal infrastructure and capabilities to stay competitive in the current dynamic business environment. To keep up the pace with this dynamic environment, Indian enterprises have implemented or in the process of implementing Enterprise Resource Planning (ERP) in order to remain competitive in the market. All the Companies implement ERP systems to integrate obtain a competitive advantage and high productivity of the employees gives the company competitive advantage and increases the human capital. To achieve all of this, companies have realized the necessity to implement ERP software in order to integrate all the business activities.

ERP systems can also be an instrument for transforming functional organizations into process oriented ones. When properly integrated, ERP supports process-oriented businesses effectively.

ERP systems offer tremendous opportunities to more consistently provide IS to the organizations in a standardized, centralized and cost-efficient manner and highlights the wide scope of applications on different functional areas and multiple business units comprise accounting and financial, human resources, supply chain, operations and logistics, sales and marketing.

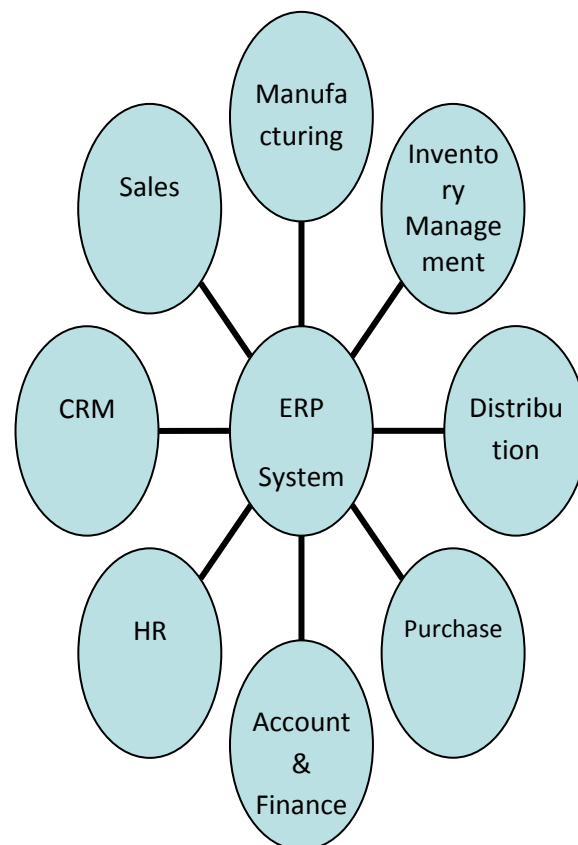


Fig 1: Fully Integrated ERP System

Fig. 1 shows the typical ERP system with fully integrated solution to handle all the different areas of an enterprise like production, procurement, manufacturing, accounting, sales, marketing, distribution, customer service, etc.

Broadly speaking, ERP is one of key IS applications that are used to capture, store, and transmit information so as to enhance efficiency and visibility in handling physical goods moving within the firm. ERP brings the two significant advantages that do not occur in non-integrated departmental systems:

- Encompasses all functions and departments within the firm
- Enhance the interdepartmental cooperation and coordination due to the firm database in which all business transactions are entered, recorded, processed, monitored, and reported.

Overall, it can facilitate the firms to accomplish their objectives of enhanced communication and responsiveness to all stakeholders.

Unfortunately, ERP systems have a reputation for costing a lot of money and providing meager results, because the people who are expected to use the application do not know what it is or how it works.

2. EVOLUTION OF ERP SYSTEM

Enterprise Resource Planning was born from its predecessor, Manufacturing Resource Planning (MRP). During its formative years in the 1960s, MRP was referred to as Manufacturing Requirements Planning. MRP and the first ERP systems were designed as an organizational and scheduling tool for manufacturing firms. The function of the next generation of ERP software systems stretched beyond the confines of what it could do for an individual manufacturing firm's internal use, and began including customers and suppliers. It wasn't long before other industries began to recognize the benefits of ERP systems; government agencies and organizations in the service sector began taking advantage of the technology.

During the 1970s, hardware and the first PCs were gaining ground. A shift towards business processes and accounting capabilities began to emerge. In this time, companies such as Oracle, JD Edwards and SAP formed, and it was Oracle that presented the original commercialized structured query language (SQL). The 1980s saw the creation of closed-loop business processes with MRP II, which was largely supplied by IBM.

The 1990s was a time of explosive growth for the technology, particularly with ERP software systems that were meant to integrate businesses processes throughout every functional area. "Purchase-to-pay" and "order-to-cash" were being incorporated more and more regularly. New developments and the number of options in both software and hardware quickly grew, but by the early 2000s, the major software vendors began to merge. This resulted in the end of many vendors, but Oracle and SAP were the big software firms that weathered the storm. To satisfy the environment of planning and initiating, accounting, HR and supply chain business process software suites grew in functionality.

3. ERP IMPLEMENTATION IN INDIA

There has been lot of work done over the world to identify the critical success factors for ERP implementations. WE have mentioned some of them in this section.

ERP systems have been widely used in developed countries all over the world. With the opening up of Indian market to the global market, there is a significant expansion in the Indian market segments both in large enterprises and small and medium enterprise (SMIs) segments. Indian enterprises have implemented ERP systems or they are in the process of implementing ERP systems. It has been found that factors like limited capital, lack of proper infrastructure, lack of skilled resources, absence of ERP awareness and poor implementation planning are seriously affecting the implementation of ERP systems in India and other developing countries as compared to the developed countries. There are similar needs that are responsible for implementing ERP systems in SMIs as compared to large enterprises. There are more or less similar factors that are affecting ERP implementations both in SMIs and large enterprises. Parijat Upadhyay et al (2008) mentioned in his research work that some critical issues, like selection of big ERP vendors and implementers, availability of proper infrastructures and availability of skilled ERP resources, affecting the implementations and impact of such enterprise systems are different depending on the volume of organization as the business strategy and policy taken by Small and Medium scale enterprises (SMIs) are not the same as large organizations.

Sometimes SMIs in India are limited by low IT budgets, insufficient infrastructure, unclear line of control and improper work culture as compared to large enterprises. M.N. Vijaya kumar and team (2010), in their research work, prioritized the critical factors affecting ERP system implementation in fertilizer industry in and the factors were identified: inadequate and in-consistent data, improper user acceptance testing and training, never run parallel system, conference room pilot, employee retention, customization, and clarity in management objective and external consultant dependency. N. Venkateswaran and Dr. V. Mahalakshmi (2010) outlined the six major challenges faced by Indian enterprises which are data maintenance and integration problems, involvement of consultants in respective projects, vendor selection, little implementation experience, weak IT infrastructure and access knowledge and human resource etc.

ERP implementations face lots of resistances in Indian organizations, mainly from SMIs, due to huge investments and more failures associated with it. The study of ERP implementation issues is necessary to encourage Indian enterprises to go for ERP implementation as ERP is vital in their future growth.

The study conducted by Parijat Upadhyay and team (2008), in their research work, on Indian SMIs, revealed that for ensuring successful ERP implementation, the six major factors like on clarity in goals and objectives behind the implementation, adequacy of user training, competency of the project implementation team, acceptance of changes brought about by the implementation and adequate vendor support and external consultant participation had a key role to play. According to Ravi Seethamraju, and Seethamraju, J.(2008) another barrier for ERP implementation is related to the IT maturity in both national and organizational levels. In developing countries like India, IT infrastructure has many weak issues related to the IT penetration such as internet and computer penetration in organizations and social levels. This is in addition to the lack of number of computer and internet

users on both national and organizational levels. Other factors which lead to lack of adoption are related to cultural factors and lack of knowledge of ERP systems.

Hany Abdelghaffar and Reem Hamdy Abdel Azim (2010), in their study conducted among Egyptian enterprises, showed that 90% of international organizations obtained their competitive edge over their competitors in their respective fields of business stems from 'National factors', namely; 1) ICT infrastructure, 2) Government regulatory, 3) Economic growth, and 4) Regional location of Egypt. Whereas the 'Manufacturing' factor is a common factor for all companies working in Egypt and has no significant role in the success of ERP implementation in this context. Additionally, we examined the 'Organizational factors', to find some of them are of significance, namely; 1) Business size, 2) IT maturity, and 3) Computer culture. Whereas the Management commitment and Business Process Reengineering are common in all organizations and do not play a differential role in the ERP success implementation in Egypt. In another study by Ali Noudoostbeni (2009), it has been found that companies spent large money in developing ERP systems that are not utilized. In a study conducted in Malaysia by studying ERP Implementations have identified 10 success factors like implementing team's teamwork and composition, effective training of users, clear and direct communication, group structure, other department's participation, reasonable expectation with definite targets, top management involvement, cooperation between enterprise & ERP implementers, project management, effective decision - making.

Yuanqiang Xia et al (2009), based on the analysis of conditions of SMEs of China, suggested the 6 critical factors for ERP implementation: top management support, great competence project team, right implementation scope, management program change, data accuracy, education and training in another study. Doom and Milis (2008) grouped the critical success factors in five categories in order to test their importance for ERP implementation and included: (1) vision, scope and goals (2) culture, communication and support (3) infrastructure (4) approach and (5) project management. These group factors and their sub-factors were considered as a core part of any successful ERP implementation in organizations (Raymond et al., 2005).

4. BENEFITS OF ERP SYSTEM

Implementation of ERP system has following benefits:

- Reduced manufacturing cycle time
- Reduced Production Cost
- Reduced inventory overheads
- Reduced requirement of manpower
- Increased transparency in procurements
- Reduced delay in supply chain
- Enables faster response to changing market situations
- Better utilization of resources
- Increased customer satisfaction
- Enables global outreach

Indian enterprises have adapted ERP systems or in the process of adapting ERP systems to avail the multi-dimensional benefits of ERP systems, though ERP systems in India are in early stages as compared to developed countries like USA, Europe. It started from the late 1990s when MRP II, ERP and SCM became more and more popular in Indian market and many industrial enterprises have commissioned new ERP systems, such as SAP/R3, Oracle, and BAAN IV/V. Government of India also continues to support the ERP system's adaptations in Government owned enterprises.

Above mentioned benefits can be availed from ERP system, once the ERP systems implemented successfully. One of the factors for successful ERP Implementation is the ERP vendor selections. There are a number of ERP vendors like SAP, Oracle, Tally, Microsoft, Ramco etc.

5. FACTORS AFFECTING IMPLEMENTATION OF ERP SYSTEM IN INDIA

Challenges in implementing ERP solutions are quite normal. Though it is not completely a technical job, a lot of planning and proper communication is very much essential to implement ERP across the organization.

5.1 Common challenges in implementation of ERP

5.1.1 Choosing an adequate ERP system

The first and foremost challenge organizations face, is determining what sort of an ERP system they should implement. Managers must decide on the size, type and scope of the ERP system they need and how to select the best solution amongst the existing multitude of systems in the market. This selection dilemma arises for all businesses (without exception) and is of critical importance as an ERP system choice defines an enterprise's strategy for at least the following 5 to 10 years (or longer) and, has a considerable impact on the future success of the entire business.

5.1.2 Organizational Changes

ERP implementation produces significant changes in an organization's conventional business model and its day-to day practices. It requires organizations to reengineer their key business processes in fundamental ways, overhauling old methods of conducting business, redefining position responsibilities, and restructuring the organization. For major multinational corporations, the ERP systems must be customized to tackle global issues where different countries have diverse ways of doing business, and to incorporate country-specific business practices relating to accounting, tax requirements, environmental regulations, human resources, manufacturing, and currency conversion into the integrated systems.

5.1.3 ERP Implementation Goals

One of the principal issues with ERP implementations derives from not having well-defined measurable goals and objectives at the outset of the project as well as a process in place for adding to or changing these goals. Many projects, not just an ERP implementation, have failed because of this. One of the most often misinterpreted issues with most ERP systems is that they normally need extensive customization. Often what an organization is buying is not a packaged solution, but a framework with which to build a solution. When decision

makers do not ask the right questions and are not able to appreciate these two factors, projects are delayed and thus experience cost overruns.

5.1.4 Flexibility of ERP Software/System

An ERP system that is not flexible may force an adopter to change their business processes to fit the ERP system model. This requires a re-engineering of steps needed to complete business tasks and a retraining of employees and business partners; and sometimes even customers or clients. As people do not inherently like change, this will create resistance and delays for any organization (at least in the short term).

5.1.5 Time consuming & costly to implement

Plenty of time and effort needs to be invested into ERP implementation before it actually starts yielding results. ERP cost structure categories include:

- Analysis
- System designing and customization
- Implementation
- Training cost
- Maintenance
- Support cost

Usually, the implementation and support costs are not planned properly and as a result, organizations are obliged to cut back on ERP maintenance services and support.

5.1.6 Resistance to Change

Another ERP implementation challenge is organizational cultural resistance. It can often be difficult to convince business units of an organization to switch from already running business processes to a new ERP system. Usually in these circumstances, the two main threats are replacing known processes with an unknown, and taking away decision-making authority for the routine business activities. If the advantages of ERP systems are not explained well, the employees can even resist and slowdown the development and adaptation process of the ERP system.

Despite these challenges, ERP is a resource that can significantly improve an organization's workflows, business, and decision making. Preparing early and being proactive and aware of the various challenges that come with the implementation of an ERP system is definitely worth the effort.

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VMC Machining Optimization Using Genetic Algorithm

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ABSTRACT

This paper proposes an expert CNC system, which optimizes the machining path process by deciding the optimum path. CAD /CAM systems has found wide application particularly in the field of metal cutting enabling control of tool path and generation of NC program. Optimizing the sequence of operations is important factor in improving the productivity of machines and also reducing the production cost. The CNC system is able to optimize paths autonomously between cutting trajectories, determined by the product's CAD model. The efficiency of CNC machining is improves greatly and also the cutting time is reduced. Genetic algorithms are used in order to optimize the path at the shortest time .It is utilized to solve the sequence of operation problem. Genetic algorithm (GA) for optimization of sequences of tool path generation by involving criteria to minimize processing time or production cost. After optimizing sequence of operation, its related CNC program will be generated.

Keywords:

Genetic Algorithms, optimization, CNC machining.

1. INTRODUCTION

Nowadays, increasing the commercial competition leads to search new methods to minimize the production cost and to increase the productivity of machines. Machines' productivity can be significantly improved by optimizing the sequence of operations problem. The whole time to produce any product in CNC machines including not only the time that the cutting tool spends in actual cutting of the work piece, but also the air time that the tools spend to travel between the operations or to make tools replacement. By the automation of manufacturing, production of goods becomes a bunch of steps and sequences, like bolt sequencing, drilling and welding process steps. Most of these sequencing type engineering problems can be modeled as traveling salesman problems (TSP). In this paper, a Genetic Algorithm (GA) is used for the (TSP) to reduce the total time and distance of tool travel for drilling sequence in CNC machine. By using Traveling salesman problem, it becomes a little bit simple and less time consuming. But

there are many possible sequences in TSP. So, there is a need to find out the best possible solution so that the process becomes more efficient and less time consumer. But in our problem will try to optimize drilling operation sequence in order to reduce machining time.

2. LITERATURE REVIEW

Many methods are used by related journal to optimize tool path in CNC machining system

Nabeel and Hasan (2014) [1] It explains minimization of non-productive time of tool during machining for drilling a group of holes significantly reduces the machining time. In the present work, GA technique is used with TSP and proved with results its performance in finding the optimum shortest path for the points to be machined, this performance is noticed clearly in problems of large number of points, where the machining time improvement in some cases reached nearly to 50%

Jaber E. Abu Qudeiri (2014) [2] Optimization procedure of the GA and the TSP, which was developed in that paper, was applied to many numerical examples to find the sequence of operation. Integration of GA and TSP proposed in that paper can be applied to many similar problems. The improvement in the solution will depend on the number of operations. The numerical experiments show that the improvement increased as the number of operations was increased. The method described in their research can be incorporated into CNC program generator to optimize the SOS during the automatic generation of CNC machine programs.

BALIC and FICKO (2011) [3] In that paper, the concept of optimization for tool path generation especially for turning process by using genetic algorithms is presented. Recently, production process is required higher quality and accurate production. To achieve this request it is necessary to optimize tool path generation for being competitive in the market. Hence,

the development of the main algorithm consisted from: linear, circular and spline algorithm for solving problems with the application of genetic algorithm has contribute directly in optimize tool path generation in automatic and intelligent NC programming systems.

Adnan Jameel1 and Mohamad Minhat (2013) [4] Optimization operation is one of the important goals of manufacturing systems, also it simple to use and are increasingly used to solve inherently intractable problems quickly. It is clear that the genetic algorithm is one of the best population searches and its variants have been extensively used. However, many studies are concentrated on optimization of surface roughness , machining / production costs and material removal rate , but only a few done in other fields like cutting temperature, torque, geometrical accuracy, heat affected zone tool geometry.

2.1 GENETIC ALGORITHM

In the field of artificial intelligence, a **genetic algorithm (GA)** is a search heuristic that mimics the process of natural selection. This heuristic (also sometimes called a metaheuristic) is routinely used to generate useful solutions to optimization and search problems. Genetic algorithms belong to the larger class of evolutionary algorithms (EA), which generate solutions to optimization problems using techniques inspired by natural evolution, such as inheritance, mutation, selection, and crossover.

In a genetic algorithm, a population of candidate solutions (called individuals, creatures, or phenotypes) to an optimization problem is evolved toward better solutions. Each candidate solution has a set of properties (its chromosomes or genotype) which can be mutated and altered; traditionally, solutions are represented in binary as strings of 0s and 1s, but other encodings are also possible. The evolution usually starts from a population of randomly generated individuals, and is an iterative process, with the population in each iteration called a *generation*. In each generation, the fitness of every individual in the population is evaluated; the fitness is usually the value of the objective function in the optimization problem being solved. The more fit individuals are stochastically selected from the current population,

and each individual's genome is modified (recombined and possibly randomly mutated) to form a new generation. The new generation of candidate solutions is then used in the next iteration of the algorithm. Commonly, the algorithm terminates when either a maximum number of generations has been produced, or a satisfactory fitness level has been reached for the population.

2.2 STEPS IN IMPLEMENTATION OF GENETIC ALGORITHM

In this project, NetBeans IDE 8.1 is used. Netbeans is used for coding java programs. The procedures of programming of modal using NetBeans software are described in the following steps:

1. Determination of the position of the drilling holes.
2. Specify GA parameters.
3. Initialize the population to run the GA by evaluating each population member.
4. Preparing java code for optimization of problems.
5. Coding for finding the best rout in the population.
6. Coding for GA operator.
7. Results of GA are inputs to decide toolpath for mastercam.

2.3 PARAMETERS SETTINGS

It is found that the following parameters as shown in table 2.1 give better results for non-productive machining time problem to run GA and TSP. As the algorithm is being tested over different sized node problems, therefore varying population sizes are considered.

Parameter	Value
Population Size	100 and 200
Tournament Size	5
boolean elitism	true
Crossover Fraction pc	0.8
Mutation Fraction pm	0.015

Table 2.1 Parameters for Genetic Algorithm

The Machining data and coordinates of points to be machined are entered to the program. The program will apply TSP using GA technique onto the entered points. After running, the program will display the sequence of points that representing the optimum shortest path.

2.4 LOCATION OF DRILLING HOLES AND BASIC OPERATION SEQUENCE.

The table below show the location of drilling hole on square aluminum plate of size 200 x 200 x 25 mm. Drilling operation is conducted as per a random sequence. Drilling operation is done till 25mm.

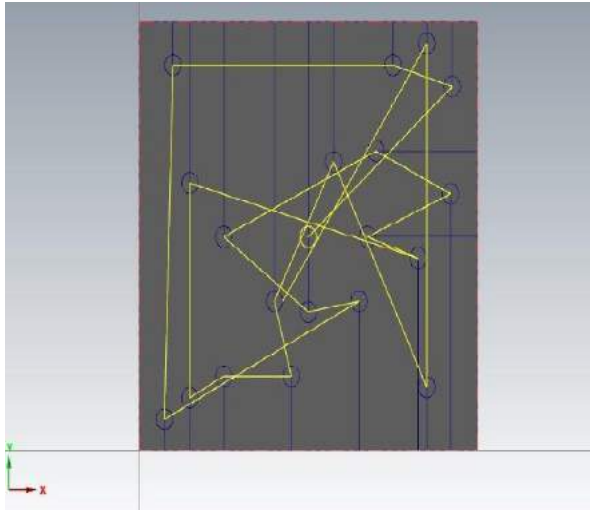


Figure 2.1 random toolpath

n	(x,y)	n	(x,y)
01	(15,15)	11	(140,140)
02	(30,25)	12	(185,170)
03	(50,35)	13	(170,190)
04	(90,35)	14	(150,180)
05	(100,100)	15	(115,135)
06	(130,70)	16	(80,70)
07	(165,90)	17	(100,65)
08	(170,30)	18	(50,100)
09	(135,100)	19	(30,125)
10	(184,120)	20	(20,180)

Table 2.2 Drill hole location

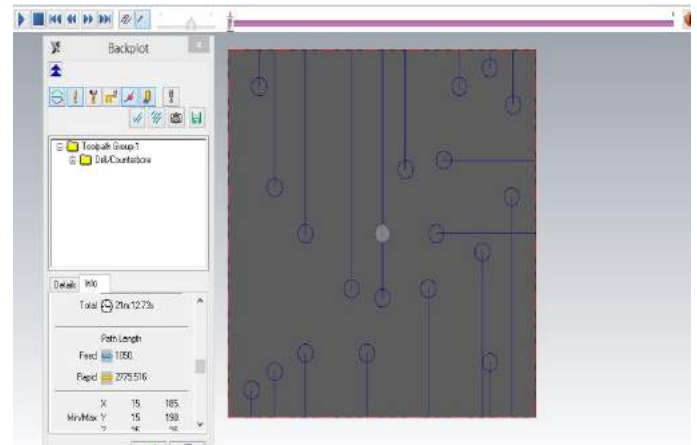


Figure no: 2.2 Machining time of randomly sequenced drill holes.

As we can see time taken to complete the drilling operation is 21mins and 12 seconds. In this the hole were selected in random pattern without following any rule. Mastercam X8 software is used to generate program for CNC operation.

2.5 Implementation of genetic algorithm.

In order to get optimum tool travel, co-ordinates of all drilling holes were entered in java program. Various iteration were carried out to reach optimal solution.

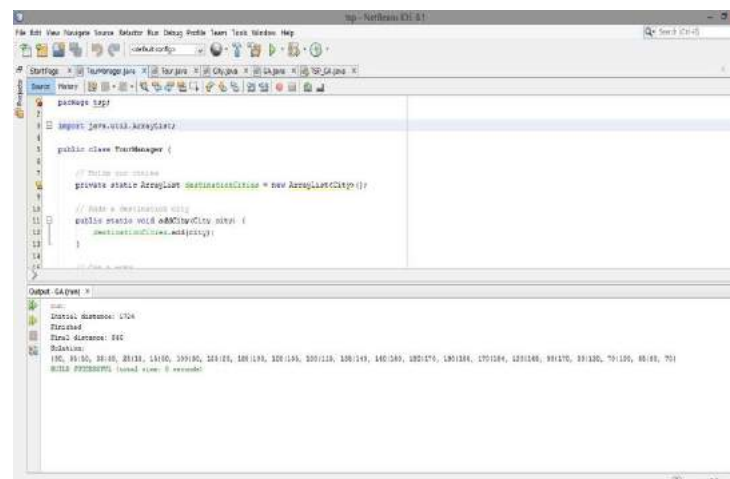


Fig 2.3: Output generated by NetBeans Software

Above figure shows the final solution given by NetBeans software. The output obtained are in the term of drill hole co-ordinates. The output obtained in this iteration were entered in mastercam software to find the final machining time for complete operation.

3.0 RESULTS:

Optimum path generated using GA will be compared with the paths obtained with the famous CAM software "Mastercam", where this software can produce many paths using various sequencing techniques.

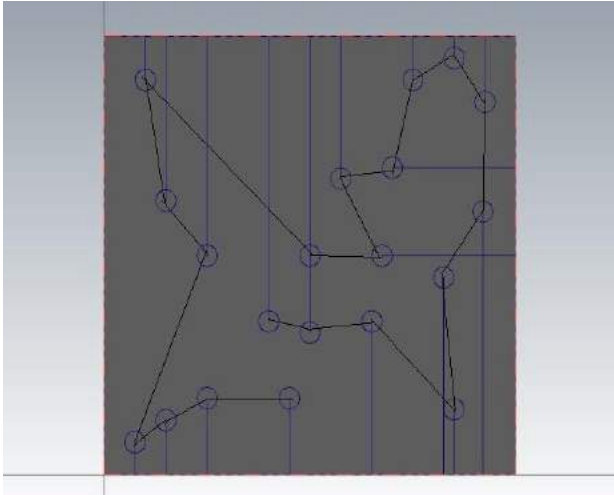


Figure no: 3.1 Path for sequenced drill

n	(x,y)	n	(x,y)
04	(90,35)	11	(140,140)
03	(50,35)	14	(150,180)
02	(30,25)	13	(170,190)
01	(15,15)	12	(185,170)
18	(50,100)	10	(184,120)
19	(30,125)	07	(165,90)
20	(20,180)	08	(170,30)
5	(100,100)	06	(130,70)
9	(135,100)	17	(100,65)
15	(115,135)	16	(80,70)

Table 3.1 Sequenced drill hole.
holes location.

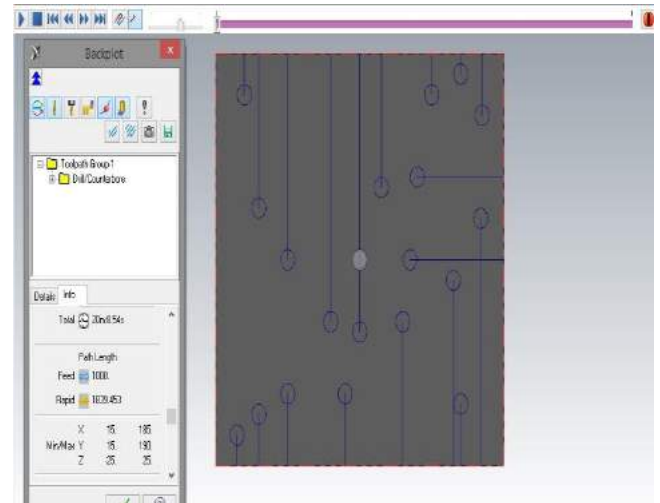


Fig. 3.2: Machining time of sequenced drill holes

After generating the CNC program by mastercam software it was observe that machining time of the toolpath obtained by genetic algorithm is 20 minutes and 84 seconds i.e.1248 seconds, which is less than 20 seconds from operation in which drilling holes were sequence randomly.

Conditions	Machining time (sec)	Reduction in time (sec)	%Reduction in time
Using random selection	1268	20	1.58%
Using genetic algorithm	1248		

Table 3.2 Reduction in machining time.

4.0 CONCLUSION:

Minimization of non-productive time of tool during machining for drilling a group of holes significantly reduces the machining time. Integration of GA and TSP proposed in this paper can be applied to many similar problems. Genetic algorithm technique is used with transport salesman problem and proved with results its performance in finding the optimum shortest path for the drilling holes to be machined, this performance is noticed clearly in problems of larger numbers of drilling holes, where the machining time can be improvement to a greater extend.

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Implementation of 5s in Small Scale Industry

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ABSTRACT

Industrial Organization play a vital role for developing an economy and global market. The aim of this paper is showing the implementation of 5s in small Scale Company. introducing the 5S rules bring the great changes in the company, The technique 5s helps in minimizing the time of manufacturing and also increases the area of work place. The 5S technique begins each programme of improvement in a company. This method can be used in all companies. Its result is the effective organization of the workplace. Many manufacturing facilities have opted to follow the path towards a “5S” workplace organizational and housekeeping methodology as part of continuous improvement or lean manufacturing processes.

Keywords : 5s technique, Total Quality management, Continuous Improvement and Productivity.

1.0 Introduction

A place for everything, and everything in its place” is the mantra of the 5S method, and storage and workspace. The result is an improved manufacturing process and the lowest overall cost for goods produced.

Many manufacturing facilities have opted to follow the path towards a “5S” workplace organizational and housekeeping methodology as part of continuous improvement or lean manufacturing processes.

5S is a system to reduce waste and optimize productivity through maintaining an orderly workplace and using visual cues to achieve more consistent operational results. The term refers to five steps – sort, set in order, shine, standardize, and sustain. 5S programs are usually implemented by small teams working together to get materials closer to operations,

right at workers’ fingertips and organized and labeled to facilitate operations with the smallest amount of wasted time and materials.

The 5S system is a good starting point for all improvement efforts aiming to drive out waste from the manufacturing process, and ultimately improve a company’s bottom line by improving products and services, and lowering costs. Many companies are seeking to making operations more efficient, and the concept is especially attractive to older manufacturing facilities looking to improve the bottom line by reducing their costs.

2.0 Objectives of the Study

Global markets are continuously changing and demanding product of high quality and low cost. In India, the survival and the growth of small scale industry largely depends on its ability to innovate, improve operational efficiency and increase productivity. Many business have been trying to adopt new business initiative in order to stay alive in the new competitive market place.

This study aims to investigate the impact of 5S practices on performance of industrial organizations. Accordingly, the main objective of the research is to measure and compare of the organization’s performance before and after implementing 5S practice.

So the objectives of this research are:

To determine factors and characteristics of industrial organizations’ performance.

To identify effectiveness of 5S implementation on the organization performance.

3.0 The 5S

Define 5S : 5S is the name of a workplace organization method that uses a list of five Japanese words: seiri, seiton, seiso, seiketsu, and shitsuke. Transliterated into English, they all start with the letter "S".

SEIRI (sorting and disposing the unnecessary items). Deals with sorting all the tools, materials and other equipment in the workplace. Important equipment is stored accordingly, which reduces the hazards at the work place.

SEITON (everything is set in order, provide a place for everything). Identifies the need of the worker. Tools, materials and other equipment should be arranged systematically for quick access and movement.

SEISO (shining, cleaning, removal of waste and dust) Point out the need and necessity of clean and neat work place. Cleaning should become a daily activity. Work place should be cleaned at regular intervals (generally at the end of the shift or once in 3 hours). Every tool and equipment should be restored at their own places after their use.

SEIKETSU (consistent and standardized work environment with unique rules of organization and storage along with cleanliness). Everyone should know his or her responsibility. Cleaning should become a part of regular work routines. This helps in having a good control over the production.

SHITSUKE (Sustain, realization of the above set of rules in order). Maintain these standards continuously for years.

Implementing 5S should begin from educating the workers about 5S and its importance. It is mandatory that every worker should understand the need of 5S and its advantages. Workers should be provided with an example for all the 5S's, which makes it easy to understand. It is very important to understand the fact that this methodology do not refer only for the production team but also refers to stores (warehouse) and other office teams. It is better to supply a 5S pocket guide to the workers such that they could clarify their doubts by reading it.

3.1 Sort :

What does it mean?

Remove all items not needed for current production operations. Leave only the bare essentials:
When in doubt, throw it out.

Why is it important?

- Space, time, money, energy, and other resources can be managed and used most effectively.
- Reduces problems and annoyances in the work flow.
- Improves communication between

workers.

- Increases product quality.
- Enhances productivity

What problems are avoided?

- The factory becomes increasingly crowded and hard to work in.
- Storage of unneeded items gets in the way of communication.
- Time wasted searching for parts/tools.
- Unneeded inventory and machinery are costly to maintain.
- Excess stock hides production problems.
- Unneeded items and equipment make it harder to improve the process flow.

3.2 Set in order

What does it mean?

- Arrange needed items so that they are easy to use.
- Label items so that anyone can find them or put them away

Why is it important?

- Eliminates many kinds of waste, including:
 - Searching waste.
 - Waste due to difficulty in using items.
 - Waste due to difficulty in returning items.

What problems are avoided?

- Motion waste.
- Searching waste.
- Waste of human energy.
- Waste of excess inventory.
- Waste of defective products.

3.3 Shine

What does it mean?

- Keep everything, every day, swept and clean.

Why is it important?

- Turn the workplace into a clean bright place where everyone will enjoy working.
Keep things in a condition so it is ready to be used when needed.

What problems are avoided?

- Lack of sunlight can lead to poor morale and inefficient work.
- Defects are less obvious.
- Puddles of oil and water cause slipping and injuries.
- Machines that do not receive sufficient maintenance tend to breakdown and cause defects.

3.4 Standardize

What does it mean?

By ensuring conditions do not deteriorate to former state, facilitates implementation of the first three pillars

What problems are avoided?

- Conditions go back to their old undesirable levels.
- Work areas are dirty and cluttered.
- Tool storage sites become disorganized and time wasted searching for tools.
- Clutter starts to accumulate over time.

What problems are avoided?

Conditions go back to their old undesirable levels.

- Work areas are dirty and cluttered.
- Tool storage sites become disorganized and time wasted searching for tools.
- Clutter starts to accumulate over time.
- Backsliding occurs.

One of the 5S above Tables is identifying and eliminating many kinds of waste, including time wasted searching for items, waste due to difficulty in using items, and waste due to difficulty in returning items. Storage solutions play an important part in implementing waste elimination through space reduction, organization improvement, and inventory management. Storage cabinets and workbench products that allow dense storage, a smaller foot-print and visual organization near where the tool is needed, become a key factor in implementing the 5S program.

Systems should be set up so everything has a place that is available when needed, including the manufacturing floor, areas where products are being packaged, through the equipment maintenance area. Everything should be labeled and identified. Local storage minimizes travel time, and adjustable storage and workbenches make it easier to adapt to the differing needs of individual employees.

Using Storage Walls organized with barcoded handles can reduce wasted time due to lost inventory and searching. Such systems also facilitate quick tool changes for different product lines. Storing tools next to machines in use rather than in multiple storage locations around the facility can save hours each day.

Modular drawer storage cabinets that allow the maximum use of cubic space for the highest density storage are ideal for high-density storage of parts, tools and items of virtually any size and type. They are scalable enough to adapt to future requirements, provide maximum weight-bearing capacity, tailored drawer organization, and ergonomic item handling and access.

3.5 Sustain

What does it mean?

Making a habit of properly main training correct procedures
Instill discipline necessary to avoid backsliding.

What problems are avoided?

Consequences of not keeping to the course of action greater than consequences of keeping to it.

What problems are avoided?

Unneeded items begin piling up
Tools and jigs do not get returned to their designated places

- No matter how dirty equipment becomes, nothing is done to clean it.
- Items are left in a hazardous orientation.

Dark, dirty, disorganized work-place results in lower morale



Before	After
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4.0 5S APPROACH IN INDUSTRY :

The 5S methodology depends upon the capacity of creating and maintaining a well organized, clean, effective and high quality work place. Our research was carried out in a manufacturing company of the metal doors. In the first phase of research we executed the

selection of things in the production process of the work place. We introduced 5S methodology to the workers on the shop floor and carried out a questionnaire for them. After that all the 5 rules of the 5S has been implemented on the shop floor in a systematic order. We appointed one of the workers as a person responsible for the implementation of 5S for that department and so with the other departments of the industry. This resulted in great changes on the shop floor.

5.0 Result : The result of this study is strongly agreed with previous studies which indicated that 5S has positive impacts on organization performance. On the other hand, this study has been performed in different companies with different kind of products and services and showed that 5S has had effect on organizational performance of all of them. It could be concluded that 5S is a useful quality management tool causes to improve performance in any organization without any limitation on different kinds of products or services.

6.0 Conclusion : implementation of 5S on small scale Company, there was improvement in space utilization, safety of the employees, less scope of error, increased productivity, and improved inventory system, also increasing of machines' efficiency, maintenance the cleanness of devices, maintenance and improvement of the machines' efficiency, maintenance the clean workplace, easy to check, quick informing about damages, improvement of the work environ elimination of the accidents' reasons in the company.

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Wind Power Optimisation

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ABSTRACT

Through the next several decades, renewable energy technologies, thanks to their continually improving performance and cost, and growing recognition of their Environmental, economic and social values, will grow increasingly competitive with Traditional energy technologies, so that by the middle of the 21st century, renewable Energy, in its various forms, should be supplying half of the world's energy needs." Hence to meet those ever increasing energy demands this paper talks about installing Venturi Wind Turbine on roof of trains.

Keywords

Venturi, Energy, Turbine.

1. INTRODUCTION

Through the next several decades, renewable energy technologies, thanks to their continually improving performance and cost, and growing recognition of their Environmental, economic and social values, will grow increasingly competitive with Traditional energy technologies, so that by the middle of the 21st century, renewable Energy, in its various forms, should be supplying half of the world's energy needs. "The cost of wind-generated electric power has dropped substantially. Since 2004, according to some sources, the price in the United States is now lower than the cost of fuel-generated electric power, even without taking externalities into account. In 2005, wind energy cost one-fifth as much as it did in the late 1990s, and that downward trend is expected to continue as larger multi-megawatt turbines are mass-produced. Wind power is growing quickly, at about 38%, up from 25% growth in 2002. Wind power is the fastest growing form of electricity generation on a percentage basis.

Wind energy conversion systems convert the power in the wind to rotational shaft power and to electricity by coupling a generator to the unit. Wind "turbines" is wind electric power units, and are used throughout the world. Commercial wind turbines range from a few hundred watts to about 20 kilowatts for rural applications. Units designed for grid connection are available in the range of 20 kilowatts to over one megawatt.

For continuous flow of air and thus continuous working of turbine idea was developed to install turbine on trains for optimization of wind energy.

For the past five decades, Indian Railways has faced increasing deficit in power supply, both for meeting its normal energy requirements as well as its peak load demand. According to a report released by Ministry of Statistics and Programme Implementation, energy consumption in Indian Railways has increased at a faster rate than energy production over the last four decades. The electricity consumption for operational purpose (Traction) and Railways sector has increased by tenfold in last four decades. Indian Railways, largest in Asia and the fourth largest in the world after United States, Russia and China, has 20059 route kms of its tracks under the electric traction system as on October 30th, 2010. It carries over 30 million passengers and 2.8 million tons of freight daily. The power consumption of the Indian Railways is around 2.5 percent of the country's total electricity consumption. Electrified Route constitutes 31.33 percent of the total Railway Network and 37.98 percent of the BG System respectively. Over all about 60 percent of the freight and about 47 percent of passenger traffic is hauled by electric traction on Indian. According to an estimate, the railway sector's demand for electricity will grow by seven percent annually and by 2020 it will have a projected energy demand of 37,500 kWh (million kilowatt hour). Power supply Indian Railways purchase power from various Electricity boards and other Electric Supply Authorities. Annually, approximately 30 billion units of electricity is consumed by Indian Railways, out of which 10.4 billion units are used for electric traction purpose. Indian Railways pays over Rs 5,000 crores every year on account of traction energy charges which constitutes about 20 percent of total revenue budget of Railways.

History of electrification Indian Railways has the second biggest electrified system in the world after Russia. The first electric train ran between Bombay Victoria Terminus and Kurla along the Harbour Line of Central Railway on February 3, 1925, a distance of 9.5 miles. In 1926, Thana and Mahim were connected. In 1927, electrification was complete up to Kalyan. In 1930, the Kalyan - Poona tracks were opened to electric. On November 15, 1931, electrification of the meter

gauge track between Madras Beach and Tambaram was inaugurated. By 1953, electrification of Howrah-Burdwan via Bandel, Sheoraphulli-Tarakeshwar started. The electrification work between Burdwan-Mughalsarai was completed in 1957. Howrah-Gaya was electrified by about 1960. Electrification till Kanpur was done by 1972. The entire Howrah-Delhi route was electrified on August 5, 1976. The Bombay-Delhi route was electrified by February 1, 1988. The Central Railway route was fully electrified by June 1990.

2. LITERATURE SURVEY

While it is not exactly known when wind first began to be used as a source of power, it is likely that some form of windmill was used in Japan and China 3000 years ago (Wizelius, 2007, p.7). The first wind mill to be well documented had a vertical axis, and was located in Persia, dating to 947 AD (Wizelius, 2007, p.7). Horizontal axis wind mills were built in Europe by the later part of the 12th century (Wizelius, 2007, p.7). Windmills were one of the dominant forms of power in Europe until the finish of the 19th century, with the number of windmills peaking in the mid-19th century with wind mills numbering 9000 in the Netherlands, 18,000 in Germany, 8000 in England, 3000 in Denmark and 20,000 in France (Wizelius, 2007, p.9). Early mills provided significant mechanical energy which was used in a variety of industries from flourmills and water pumps to lumber mills and the processing of various foodstuffs, spices and grains.

Wind power has since developed in its efficiency and its ability to produce electricity, the form of energy we most commonly associate with wind turbines today. Windmills of all sorts use the energy of wind and the principles of aerodynamics to produce energy in many forms. Modern turbines add the use of a generator to produce electricity. In 1892 the first wind turbine used to produce electric power was built in Denmark by Paul la Cour (Wizelius, 2007, p.15). Modern wind turbines can be designed and installed in multiple ways. Horizontal or vertical axis, facing into or away from the wind, the number and type of blades, and the construction materials, all aspects are variable (France Énergie Éolienne). In Ontario for the sake of efficiency, and life cycle, as well as human and environmental impacts, most wind turbines are three bladed horizontal turbines placed atop a tower of 80-120m, facing into the wind.

The familiar windmill has evolved, and in our age of growing energy consumption, is becoming an increasingly common feature, appearing on hilltops, across plains, and on the coasts, shores and banks of oceans, lakes and rivers. New technologies are allowing the installation of wind turbines at increasingly greater distances off shore.

Until the early 1970s, wind energy filled a small niche market providing mechanical power for grinding grain and pumping water. With the exception of a small number of battery chargers and the rare experiments with larger electricity-producing machines, the windmill of 1850, or even 1950, differed little from the primitive devices from which they

were derived. But the latter half of the 20th century saw spectacular changes in the technology. Wind energy is developing towards a mainstream, competitive and reliable power technology. Globally, progress continues to be strong, with more active countries and players, and increasing annual installed capacity and investments. Technology improvements have continuously reduced energy costs, especially on land. The industry has overcome supply bottlenecks and expanded supply chains. Blades that had once been made of sail or sheet metal progressed through wood to advanced fiberglass composites. The DC alternator gave way to the induction generator that was grid synchronized. From mechanical cams and linkages that feathered or furlled a machine, designs moved to high-speed digital controls. Airfoils are now tested in wind tunnels and are designed for insensitivity to surface roughness and dirt. Current knowledge of aeroelastic loads and the ability to incorporate this knowledge into detailed numerical models and structural dynamics codes make the machine of today more robust, but much less expensive than those of a decade ago.

3. PROBLEM DEFINITION

India is a country which is not suitable for wind power generation except some coastal and hilly location. Average wind velocity available in India is in the range of 0.5 to 7 m/s. this air velocity is not sufficient for power generation. In horizontal axis wind turbine it required 10 to 12 m/s air velocity for rated power generation below this air velocity the system is inefficient of power generation. So next option is vertical axis wind turbine which will run on low air velocity. The advantage of vertical wind turbine is that it works on air flow from any direction. But some efficiency was drop because of drag generated by opposite blade.

To solve this problem we will install wind turbine on train and to optimize its energy generation we set up a venturi in front of a turbine.

4. OBJECTIVE

Our aim was to build small scale wind turbine which run on variable air velocity and can be installed on roof top of trains and charges a 12 volt battery and runs various 12 volt appliances inside the train without any external power source.

By building this project we want drive the attention of people towards power generation through renewable sources so as to tackle problem of power in our country suffering from power crisis. With help of such projects we can think of driving all the appliances in the train on wind power so as to reduce power consumption from the main supply.

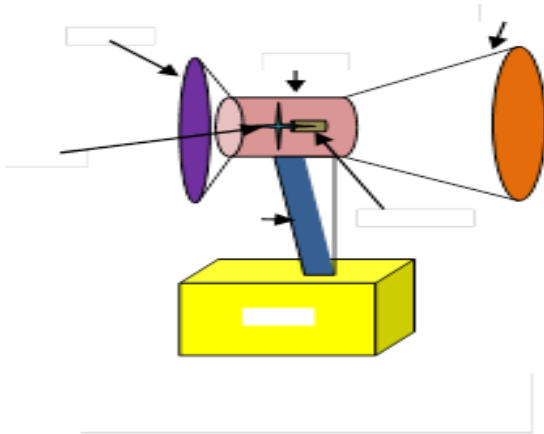


Figure 4.1 Venturi Wind Turbine

5. PROPOSED METHODOLOGY

Urban landscape changes due to new architectures. Buildings are built much higher, therefore roofs are reaching in high wind speed layers, planned urban structure is applied, which can be used to direct mainstreams, and consciousness about environmental friendly systems is more and more present, which increases the tolerance and even stimulates desire of private renewable energy. Few ideas of urban turbines, encased with vertical axis and moreover unconventional concepts, are realized. Some designs are of the category 'house hold turbines' and are meant to supply the house, with no respect to the integration of the wind turbine into the flow situation around the building itself. Some others are already considering the upwind on a house façade and are placed on logical places aligned to the main wind direction. All of them were so far fixed on an already existing building. The potential of considering a turbine already in the conceptual house design pays off in saving the structure for a turbine tower, in increased wind velocity and directing by smart blockage of the building and with this a higher power harvesting. Especially, the so long controversial encased turbine contra arguments can be cancelled out no additional heavy structure is necessary, because it can be integrated in the architecture. It is definitely a process of compromises, on the side of the architectural freedom and the side of the technical efficiency.

The new way of turbines integration in build- Figure 1: 'Castle House', conceptual designing structure by encasing them offers some interesting new parameters in terms of noise reduction, concentrating and directing the wind tip loss reduction and more, which need to be well investigated. The conceptual design shows straight ducts for the turbine encasings and smooth transitions from the facade to the inlet were not taken into consideration. The idea is to prevent or at least diminish separation at the inlet and accelerate the air by application of a Venturi shaped tube. With the mass conservation law, two cross sections in a tube are related in



the following way, while the inlet cross section over throat section ratio states the contraction,

$$C_o = A_{inlet} / A_{throat}$$

Thus, the higher the contraction, the higher is the

Velocity amplification and therefore the power amplification.

Figure 5.1.a Actual Venturi

5.1 TURBINE SIZE

Over the past 20 years, average wind turbine ratings have grown almost linearly with current commercial machines rated at 1.5 MW. Each group of wind turbine designers has predicted that their machines are as large as they will ever be. However, with each new generation of wind turbines, the size has increased along the linear curve and has achieved reductions in life-cycle cost of energy.

The long-term drive to develop larger turbines stems from a desire to take advantage of wind shear by placing rotors in the higher, more energetic winds at a greater elevation above ground (wind speed increases with height above the ground). This is a major reason that the capacity factor of wind turbines has increased over time, as documented by Wiser and Bolinger³. However, there are constraints to this continued growth to larger sizes as in general it costs more to build a larger turbine.

The primary argument for a size limit for wind turbines is based on the "square-cube law". Roughly stated, it says that "as a wind turbine rotor increases in size, its energy output increases as the rotor-swept area (the diameter squared), while the volume of material, and therefore its mass and cost, increases as the cube of the diameter." In other words, at some size the cost for a larger turbine will grow faster than the resulting energy output revenue, making scaling a losing economic game. Engineers have successfully skirted this law by changing the design rules with increasing size and removing material or by using material more efficiently to trim weight and cost.

Studies have shown that in recent years, blade mass has been scaling at roughly an exponent of 2.3 instead of the expected 3, as shown by the Wind PACT blade scaling study. The Wind PACT study shows how successive generations of blade design have moved off the cubic weight growth curve to keep weight down as illustrated in fig. If advanced research and development were to provide even better design methods, as well as new materials and manufacturing methods that allowed the entire turbine to scale as the diameter squared, then it would be possible to continue to innovate around this limit to size.

5.2 ROTOR

As wind turbines grow in size, so do their blades— from about 8m in 1980 to more than 40m for many land-based

commercial systems. Improved blade designs have enabled the weight growth to be kept to a much lower rate than simple geometric scaling, as already described. Today's blade designs are subjected to rigorous evaluation using the latest computer analysis tools so that excess weight can be removed. Designers are also starting to work with lighter and stronger carbon fiber in highly stressed locations to stiffen the blade and improve fatigue resistance while reducing blade weight. However, carbon fiber must be used judiciously because the cost is about 10 times that of fiberglass.

Fig shows the power curve for a typical modern turbine and illustrates the different control regions for the turbine. Typically, a turbine will cut-in and begin to produce power at a wind speed of about 5.4 m/s (12 mph). It will reach its rated power at about 12.5 m/s to 13.4 m/s (28 to 30 mph), where the pitch control system begins to limit power output and prevent overloading the generator and drive train. At around 26.8 m/s (60 mph), the control system pitches the blades to stop rotation (which is referred to as feathering the blades) to prevent overloads and damage to the turbine's components.

All of the energy present in a stream of moving air cannot be extracted; some air must remain in motion after extraction or no new, more energetic air can enter the device. Building a brick wall would stop the air at the wall, but the free stream of energetic air would just flow around the wall. On the other end of the spectrum, a device that does not slow the air is not extracting any energy either. The solution for the optimal blockage is generally attributed to the German Physicist Albert Betz and is called the Betz limit. At best, a device can extract a theoretically maximum 59% of the energy in a stream with the same area as the working area of the device.

The aerodynamic performance of a modern wind turbine has improved dramatically over the past 20 years. The rotor system can be expected to capture about 80% of the theoretically possible energy in the flow stream. This has been made possible through the design of custom airfoils for wind turbines. In fact, it is now commonplace for turbine manufacturers to have special airfoil designs for each blade.

Rotor RPM

Individual turbine design. These special airfoils attempt to optimize low-speed wind aerodynamic efficiency and limit aerodynamic loads in high winds. These new airfoil designs also attempt to minimize sensitivity to blade fouling, due to dirt and bugs that accumulate on the leading edge and can greatly reduce efficiency. Although rotor design methods have improved significantly, there is still room for improvement.

Controls

Today's controllers integrate the signals from dozens of sensors to control rotor speed, blade pitch angle, generator torque, and power conversion voltage and phase. The controller is also responsible for critical safety decisions, such as shutting down the turbine when extreme conditions are

realized. Today, most turbines operate at variable-speed, and the control system regulates the rotor speed to obtain peak efficiency in fluctuating winds by continuously updating the rotor speed and generator loading to maximize power and reduce drive train transient torque loads. Operating variable speed requires the use of power converters to make the generated power match the grid frequency. The power converter also enables turbines to deliver fault ride through protection, voltage control, and dynamic reactive power support

The Drive Train (Gearbox, Generator, and Power Converter)

Wind generation of electricity places an unusual set of requirements on electrical systems. Most applications for electrical drives are aimed at using electricity to produce torque, rather than using torque to produce electricity. The applications that generate electricity from torque usually operate at a constant rated power. Wind turbines, on the other hand, must generate at all power levels and spend a substantial amount of time at low power levels. Unlike most electrical machines, wind generators must operate at the highest possible aerodynamic and electrical efficiencies in the low-power/low-wind region to squeeze every kilowatt-hour out of the available energy. Traditional electrical machines and power electronics disappoint because in most motor applications, there is power to spare and efficiency is less important in this low-power region. For wind systems, it is not critical for the generation system to be efficient in above-rated winds where the rotor lets energy flow through to keep the power down to the rated level. Therefore, wind systems can afford inefficiencies at high power while they require maximum efficiency at low power—just the opposite of almost all other electrical applications in existence.

Converting torque to electrical power has historically been achieved using a speed-increasing gearbox and an induction generator. Many current megawatt-scale turbines use a three-stage gearbox consisting of varying arrangements of planetary gears and parallel shafts. Generators are either squirrel cage induction or wound-rotor induction, with some newer machines using the doubly fed induction design for variable speed, in which the rotor's variable frequency electrical output is fed into the collection system through a solid state power converter. Full power conversion and synchronous machines are drawing interest due to their fault-ride-through and other grid-support capacities.

Due to fleet-wide gearbox maintenance issues and related failures with some past designs, it has become standard practice to perform extensive dynamometer testing of new gearbox configurations to prove durability and reliability prior to introducing them into serial production. The long-term reliability of the current generation of megawatt-scale drive trains has not yet been fully verified with long-term real world operating experience. There is a broad consensus that wind turbine drive train technology will evolve significantly in the

next several years. The tower configuration used almost exclusively is a steel monopole tower on a concrete foundation that is custom designed depending on the local site conditions. The major tower variable is the height. Depending on the site's wind characteristics, the tower height is selected to optimize energy capture with respect to the tower's cost. Generally, a turbine will be placed on a tower of 60 to 80 m, but 100-m towers are being used more frequently. There are ongoing efforts to develop advanced tower configurations that are less costly and more easily transported and installed.

6. DESIGN AND CALCULATION

6.1 Designing of Wind Mill

Before going to actual designing we must consider following points

- i. Suitable site
- ii. Aerodynamics design
- iii. Overall design of wind mill

6.2 Definitions of Parameters:

Several performance parameters govern the performance of a Savonius rotor.

Overlap Ratio (β):

It is the ratio of the overlap distance (a) to the diameter of the rotor blades. It gives an indication of the extent of blade overlap for a particular configuration of the blades. It is given by

Aspect Ratio (α):

It is the ratio of the height of the rotor to its diameter. It is a measure of the extent to which the maximum dimension of the rotor differs from the minimum dimension.

Tip Speed Ratio (λ):

Tip speed ratio or TSR, is the ratio of the rotational speed of the blade to the actual velocity of the air stream. A higher tip speed ratio is indicative of higher efficiency but is also related to higher noise levels and the need for stronger blades. TSR is quite important in the design of any wind turbine. If the rotor of the wind turbine turns too slowly, most of the wind will pass undisturbed through the gap between the rotor blades. Alternatively if the rotor turns too quickly, the blades appear stationary to the wind. Therefore, wind turbines are designed with optimal tip speed ratios to extract as much power out of the wind as possible.

Reynolds Number (Re):

Reynolds number is the non-quantity that gives a measure of the inertial forces to the viscous forces in a given flow. They are used to perform a dimensional analysis of a given problem. The length scale that is used to obtain the Reynolds number is different in different situations. In each of the cases discussed in the report, the length scale is given by the diameter of the rotor, and the Reynolds number is hence, given by:

Torque Coefficient (C_t):

Torque Coefficient is the dimensionless torque of the rotor. The formalizing term is the product of the dynamic pressure due to the wind, an area term and a length equivalent of the rotor. The starting torque coefficient (C_{ts}) is another non dimensional quantity associated with the performance of a rotor. It is obtained by replacing the torque in the torque coefficient equation by the starting torque. It is given by:

$C_t = 3.2.6$. Coefficient of Power (C_p):

Coefficient of power is the non-dimensional power that is generated in the rotor. It is the ratio of the power produced in the rotor to the total kinetic energy of the air interfaced by the rotor. It is given by; [2]

7. DESIGN AND IMPLEMENTATION

7.1 Designing of venturi wind turbine

Design of Venturi

Purpose of Venturi : The Venturi effect is a jet effect; as with a funnel the velocity of the fluid increases as the cross sectional area decreases, with the static pressure correspondingly decreasing. According to the laws governing fluid dynamics, a fluid's velocity must increase as it passes through a constriction to satisfy the principle of continuity, while its pressure must decrease to satisfy the principle of conservation of mechanical energy. Thus any gain in kinetic energy a fluid may accrue due to its increased velocity through a constriction is negated by a drop in pressure.

When a fluid or air a tube that narrows to a smaller diameter, the partial restriction causes a higher pressure at the inlet than that at the narrow end. This pressure difference causes the fluid to accelerate toward the low pressure narrow section, in which it thus maintains a higher speed. The Venturi meter uses the direct relationship between pressure difference and fluid speeds to determine the volumetric flow rate

We know

$$V_1 \times A_1 = V_2 \times A_2$$

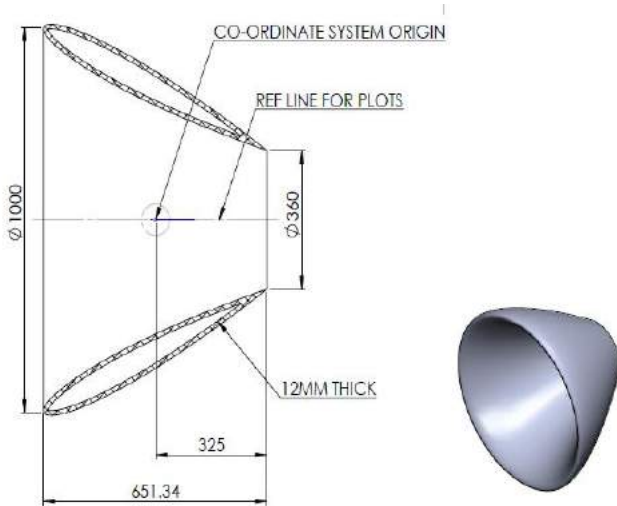
$$D_1 = 1 \text{ m}$$

$$A_1 = 3.14 \text{ m}^2$$

$D2 = 0.36 \text{ m}$

Hence by above calculation and standard size of mold available for manufacturing

We have cum up with the dimensions of venture



Design of turbine Blade

The aerodynamics of a horizontal-axis wind turbine are not straightforward. The air flow at the blades is not the same as the airflow far away from the turbine. The very nature of the way in which energy is extracted from the air also causes air to be deflected by the turbine. In addition the aerodynamics of a wind turbine at the rotor surface exhibit phenomena that are rarely seen in other aerodynamic fields.

- Blade Length
- Blade Number
- Blade Pitch
- Blade Shape
- Blade Materials

8. RESULT & DISCUSSION

Initial Conditions

Thermodynamic parameters Static Pressure: 101325.00 P

Temperature: 303.00 K

Velocity parameters Velocity vector

Velocity in X direction: 2.000 m/s

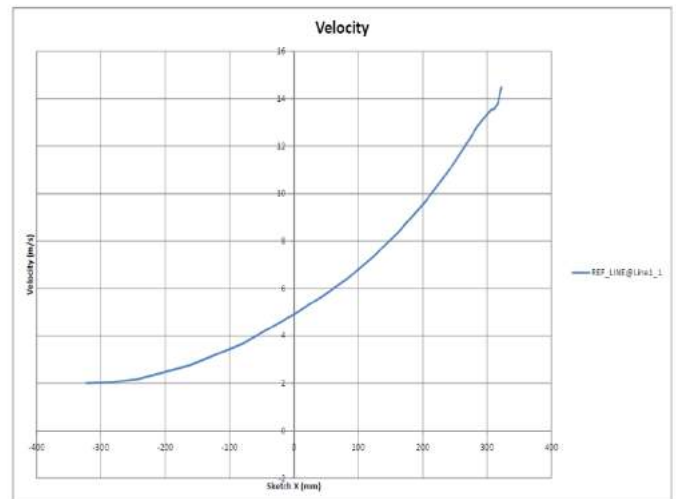
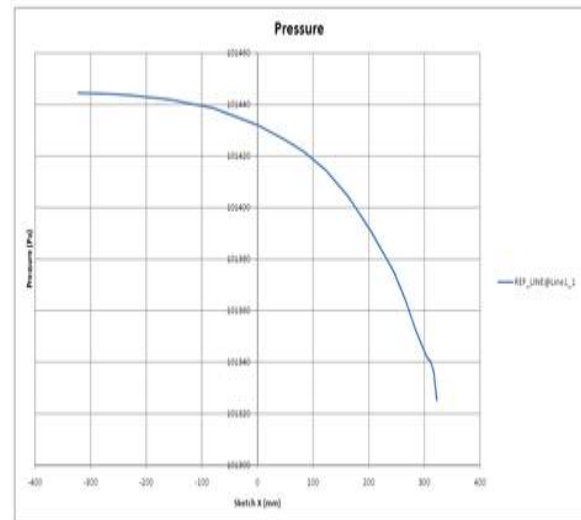
Velocity in Y direction: 0 m/s

Velocity in Z direction: 0 m/s

Turbulence parameters Turbulence intensity and length

Intensity: 0.10 %

Length: 0.007 m



9. FUTURE SCOPE

It was a challenge to restrict the parameter study and find constant parameter, respectively. Therefore a wide field for further investigations already exists only for the parameter study itself. So it would be interesting to know more about the flow behavior with different wind velocities, influence of

skewed inflow, regards to the tip loss situation structure to prevent human hazard in case of blade loss, considering of turbine fixing and nacelle structure and many more. The next step could be to go from the decoupled coin model back to the Venturi integrated in a building and take the whole structure geometry exposed to a wind velocity profile in urban areas into account. Probably a vertical skewed device build in angle could catch the upwind better to prevent separation in the inlet.

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Application of Single Minute Exchange Of Dies(SMED) to reduce the production time

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ABSTRACT

In this paper a case study regarding SMED from VIBRANT INDUSTRIES has been summarized .VIBRANT INDUSTRIES is one of the leading manufacturers of automobile horn, based on SMED tools have been summarized.. In recent trend customer's demand are changing very frequently. So compete into the market, industry must adopt management tools to enhance the productivity as well as simultaneously supply of quality product to the customers. So, in VIBRANT INDUSTRIES implementation of management tools, such as Single Minute Exchange of Dies (SMED)has been proposed , which is briefed in this paper. Related methodologies of SMED tools are also detailed. This tool helps to reduce defects in final product, overall production time savings, reduction in accidental cases, better workplace environment etc.

Keywords:-Productivity, Single Minute Exchange Of Dies(SMED),Lean

INTRODUCTION

Single Minute Exchange of Die (SMED)Single Minute Exchange of Die (SMED) mainly gives attention on setup time reduction to single minute. The necessity of SMED is mandatory due to increased demand for various products and reduced product life cycles. It helps the company to keep reduced inventory and effective utilization of the equipment. SMED analysis as to be started up with detailed process map and time study. It needs analyzing everything that happens during the changeover to understand the possibilities of activities that can be moved outside the changeover window. Non value added activities has to be eliminated or to be converted to external. If an internal activity is inevitable, it has to be simplified with the help of jigs, fixtures etc. Implementation of SMED starts from identifying the changeover process and sorting it into internal and external activity. Single Minute Exchange of Die (SMED) helps the company to keep reduced inventory and effective utilization

of the equipment. SMED analysis as to be started up with detailed process map and time study. It needs analyzing everything that happens during the changeover to understand the possibilities of activities that can be moved outside the changeover window. Non value added activities has to be eliminated or to be converted to external.

If an internal activity is inevitable, it has to be simplified with the help of jigs, fixtures etc. Implementation of SMED starts from identifying the changeover process and sorting it into internal and external activity.

SMED Terms:

Changeover time is referred to as the total time required for change from one product to the second product., total change over time is considered as lost production which includes ramp downtime, setup time and ramp-up time.

Ramp down time: Run down period is the time between the end of a batch production till the lot quantity is completed.

Setup Time: Setup time is the non-production time in which change over takes from one part to another.

Ramp up time: The time between setup is completed and the full production is achieved. Internal activity: Activities that are done after stopping the machine.

External activity: Operations that can be done without stopping the machine.

Adjustment Waste: Any activities that would cause the machine to cycle in a sample or trial mode which could create a part that must be inspected and then possible scrapped or reworded

Batch: A quantity of items that are processed together
Changeover: The process of jumping from the production of one product or part number to another in a machine or a series of linked machines by changing parts, dies, molds or fixtures, also called a set-up. Changeover time is measured as the time

elapsed between the last pieces in the run just completed until the first good piece from the process after the changeover.

Die Set: is the tooling that is removed and replaced in a punch press during changeover. A die set consists of a set of male punches and female dies which, when pressed together either creates a hole in the work piece or forms the work piece creating features desired by the customer.

Downtime: Process time lost due to planned and unplanned stoppages. Planned downtime includes scheduled stoppages for such activities as shift start up, production meetings, changeovers to produce other products and scheduled maintenance. Unplanned downtime includes stoppages for breakdowns, machine adjustments, material shortages and absenteeism.

External Setup: this is the part of the setup which can be done while the machine is still running, for example, preparing a die to be used for the next run.

Internal Setup: That part of the setup which must be done while the machine is shut down, for example, removing or attaching dies.

Lean Production: A system of production that makes and delivers just what is needed, just when it is needed and just in the amount needed. Lean manufacturing aims for the total elimination of all waste to achieve the best possible quality, lowest possible cost and use of resources, and the lowest possible production and delivery lead times.

Lot: A quantity of items that are processed together.

Non-Value Added Activities: The time spent on activities which add costs but no value to an item from the customer's perspective. These are activities that the customer is generally not willing to pay for.

Punch Press: A machine tool used to work materials (typically steel) by changing the shape of the raw material. Material shape is changed through application of direct pressure which forces the material to change shape. The function of the punch press is to hold the die set and apply the motion and pressure required to perform value added operations to raw materials.

Setup: The process of switching from the production of one product or part number to another in a machine or a series of linked machines by changing parts, dies, molds or fixtures, also called a set-up. Changeover time is measured as the time elapsed between the last pieces in the run just completed until the first good piece from the process after the changeover.

Setup Reduction: The process of reducing the amount of time needed to changeover a process from the last part for the previous product to the first good part for the next product.

Setup Waste, External: Activities such as searching, locating or moving jigs, tools, bolts, clamps, fasteners, gauges or instructions in the setup area

Setup waste(Internal): Alignment activities required to remove and install tools, for example, the time associated with

using a fork truck to manoeuvres the old tool out and the new tool in while setting up a press.

Shingo, Shigeo (1909-1990): A consultant to Toyota who made key contributions to the development of the Toyota Production System, especially quick changeovers, SMED and standardized work the target of reducing changeover times to a single digit, or less than 10 minutes.

Value Added Activities: The time spent on activities that add value to an item from the customer's perspective. These are activities that effectively change the form and function of a raw material into a good or service that the customer is willing to pay for.

Value Stream Map: A diagram that defines each step of the material an information flow needed from initial order of a good or service through delivery

Waste: Any activity that consumes resources but creates no value for the customer,

LITERATURE REVIEW

Yash Dave[2012], done the literature review of SMED tool and purpose of this literature review is to develop an overview of the conceptual framework of SMED tool. The various industrial applications and the existing articles indicate the relevance of the topic and methodology.[

B. Suresh KUMAR[2012], had found that a rapid and efficient way of converting a manufacturing process from running the current product to running the next product. He describes that the productivity Enhancement by set up time reduction in a fagot press involved in the machining of evaporator plates. The well-known Single Minute Exchange of Die technique (SMED) was applied. [17]

S. Palanisamy[2013], addresses that a setup time reduction through SMED with an integration of MES (planning system interface). Reduction of changeover time has always been critical in most of the manufacturing industries.[6]

Patel Chintan Kumar[2013], had focuses that, setup procedures should be analyzed to see if we can be done in parallel, off line, to allow production to continue. Alternatively, process checks might be accomplished with product parts instead of monitors, eliminating what is effectively downtime (waste) for a tool or sector. In this paper data was also calculated and collected after implementing of Set up Reduction Single Minute Exchange of Dies (SMED) technique.[8]



Fig. Old Existed Setup Of Assembling Of Horn Diaphragm

- Standardized the stamping tool shut height with respect to the machines we are loaded.
- Implemented proposed solutions and validated new change over system.

As above existed and proposed setup for assembling diaphragm shown in fig. in the diaphragm /plunger assembling. In existed older setup need nearly 8 to 10 parts to be put over plunger one by one, then this plunger must be kept under riveting machine. This process consumes lot of time, and also fatigues to operator due to repeated task. On this set up 95mm, 110mm of diaphragm size are assembled. Most of the times batch size of different configuration of diaphragm are more, that time it requires, over time to complete the demand of production, within proposed time. It indirectly enhances the labor cost of industry. In the new designed setup, all the manual mounting of small-small component in the diaphragm assembly has been eliminated and those are automated. In this new proposed setup it just oscillates about angle of 150 and one diaphragm comes out.

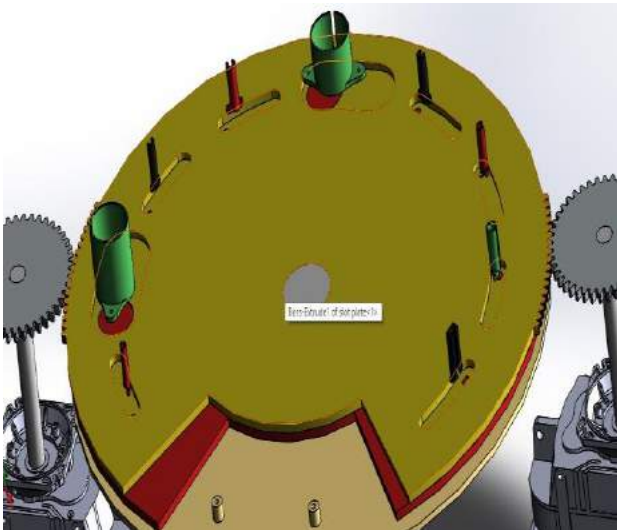


Fig. New Designed Setup Of Assembling Of Horn Diaphragm

Single Minute Exchange of Die (SMED) Methodology

- Reviewed Literature about SMED and lean principles by referring books, journals and manuals.
- A detailed study of the operations and existing changeover procedure done by video recording.
- Conversion of internal activity to external is carried out by ensuring availability of tools, fixture.
- Implemented 5 S systems for safety and serene workplace.
- Feasibility study done for the type of Quick Clamping Fixture to be used with respect to the machine clamping facility.
- Designed quick clamping fixtures for Stamping Tool with respect to the machines we are loaded.

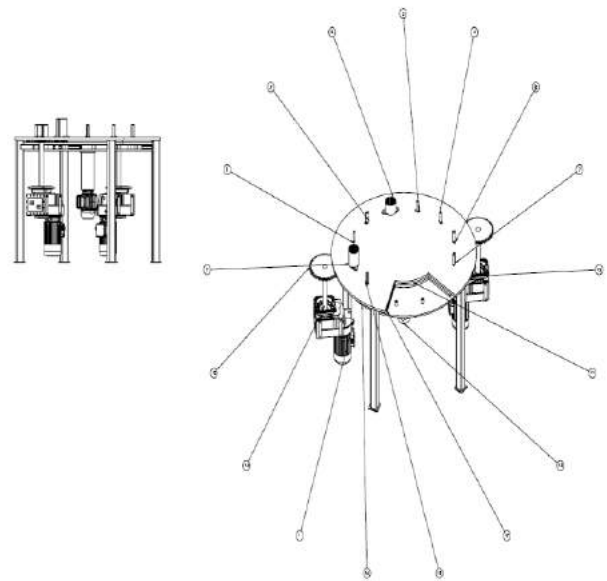


Fig. New Designed Setup Of Assembling Of Horn Diaphragm(various components)

Single minute exchange of dies helps us to reduce the processing time of existed process. In this I have been observed that the existed process of assembling the resonator and diaphragm takes average time of 30seconds to 40 seconds for per horn. Now above designed setup completes one horn within 5 seconds to 10 seconds. So by applying the new setup, it will reduce the time nearly 60% to 70%. So we can conclude that, here with the help such setup productivity enhanced. Only the Vibrant Industries required to invest initially, after installing this setup, productivity will definitely increase, it has been evaluated theoretically.

Assembly	30-40	5-10	~25
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CONCLUSIONS

Through the SMED, proposed model saves overall time about 25 second/ diaphragm. Due to which, enhancement in production from 100 horns to 350 horns/hour. In the Vibrant Industries, by application of above management tools i.e. These statistical tools are applicable on every components of horn and any others problem also. With the help of such tools, the core defective areas can be estimated and after that required corrective action to be taken, can be discussed to eliminate totally or reduced to zero defect in that areas.

FUTURE SCOPE

Management tools as described in this report are valid for not only at manufacturing industry but for service industry also i.e. education, customer care etc. These tools can be used as to deciding prominent cause of most of the problems and to correct various problems existing in that industry. As it doesn't need lot of money investment. It just requires the proper direction to guiding task, to the members of industry and consistently implementation. If there is constraint in the resources, then also these tool can be applicable as Lean tool to enhance productivity improvements

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Optimization of Batch Volume in a Multi-Part Manufacturing System

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ABSTRACT

Production of Printed Circuit Boards (PCBs) requires high-tech pick and place machines that can produce significant number of boards in short time. However, increase in the variety of boards causes interruptions in the production process. Frequent setups can lead to small lots and low inventories. In contrast, bigger batch sizes save production time by having fewer setups but they increase inventory value. Finding optimum batch sizes is a problem faced by many manufacturers in a High mix, Low volume production environment.

In this paper, the problem of finding optimum batch sizes is investigated using optimization techniques in Operations Research. It also increases production capacity and system's flexibility. Operations Research methods also showed to be very effective tools that can lead to significant savings in terms of money and capital.

Keywords

High mix-Low volume Production, Surface Mount Technology (SMT), Optimal Lot Sizing.

1. INTRODUCTION

Anyone involved in the practice of production planning and management of certain number of products is faced with two important questions that should be answered: when to produce and how much to produce? The advent of Enterprise Resource Planning (ERP) software like SAP (Systems Applications Products) or IFS (Industrial and Financial Systems) has made the answer to the first question very easy. However, the second question, how much to produce, still remains unanswered. The second question, famous as lot sizing problem, has an important role in plant's financial function. Inventories have long been seen as necessary evils. They are necessary since without them the customer service level of the plant falls down. They are evil because they tie up large amounts of capital to themselves and tend to decrease the plant's turnover rate. Finding an answer to this problem is quite complicated since there are many different variables involved in the process. Nonetheless, each manufacturing plant is unique, each production process is especial in its own way and they all involve different types of constraints and variables. Therefore, finding an answer that can be applied to all different situations is cumbersome.

Although there are numerous articles addressing the issue of lot sizing in different production environments, there is a lack of research on using mathematical optimization tools with respect to addressing the problem in the context of electronic manufacturing systems. A typical example of such a system is a high mix, low volume production system which produces a high variety of products with low volumes trying to meet a highly variant and lumpy customer demand. Many assumptions that are the bases of the previous models do not apply in this context. Therefore, there is a need to investigate this problem separately.

2. RESEARCH PROPOSAL

2.1 Problem Formulation

Today there is a lack of knowledge and competence in companies regarding the use of mathematical optimization for finding optimum batch sizes. The smaller batch sizes will reduce the inventory and help the company toward production according to customer orders which is one of the aims of Lean manufacturing. However, increased number of long setups may decrease the available production time and expose the production line with the danger of unmet customer demand. Bigger batch sizes will reduce the number of setups and increase the available production time but they will also increase the inventory value. More products will be in stock for a longer period of time and they are exposed to deterioration. There will also be a need for a larger storage for keeping the items in stock. In addition, bigger batches are an obstacle for producing a high mix of products. Due to longer production time of bigger previous batches; each job should wait for a longer time until it can enter the line. The focus of this paper is to answer this question: What are the optimum batch sizes for a High mix, Low volume production line? In order to answer this question, two methods are used. Economic Order Quantities (EOQ) is the first method that is tested. Followed by that, the use of Operations Research (OR) techniques are investigated on lot sizing problem.

The aim is to explore the potential of utilizing mathematical optimization tools on a real case and to find a proper method to calculate the optimum batch sizes and to present the results.

2.2 Case Company

The case company chosen for this report is ATI Electronics Pvt. Ltd., an electronics manufacturing company. ATI Electronics was established in 1995.

Amongst different products of the company are the printed circuit boards (PCBs). Today, up to 188 different boards are produced in the company. High variety of boards and low volumes classify the production as High mix, Low volume. The need for frequent long changeovers forces the production line to produce the boards in batches. These boards are used as a component in company's other final products or they are delivered directly to the customers as finished products. The boards are produced in one of the company's production lines using Surface Mount Technology (SMT). The SMT assembly involves three basic processes: screen printing of the solder paste on the bare boards, automatic placement of components on the boards using two placement machines in series (one for small components and the other for large components), and solder reflow oven. There are inspections after the solder printing, placement machines and reflow oven. The boards are produced in batches. Batch sizes are specified in an ERP system called IFS. Whenever customer demand cannot be met by finished boards in inventory, a production order of a specified quantity is sent to the workstation through IFS.

2.3 Methodology and Data Collection

The nature of the batch sizing problem requires the description of the demand pattern, finding averages, dealing with large amount of numeric data and carrying on optimization procedures. Due to the nature of the research problem, it is necessary to continue with a quantitative approach.

The data required to solve the research problem was collected from company's ERP system. This data includes information related to demand patterns for each board, prices, production quantities, cycle times, capacity and etc. The data from ERP system was in raw form and had to be processed before turning into meaningful information, therefore a great deal of time was spent on processing and manipulation of raw data using Excel. To continue, an optimization model was created using genetic algorithm which enabled this data to be used. This model was used for calculating the optimum batch sizes for different parts.

3. ECONOMIC ORDER QUANTITY

3.1 EOQ Formula

Manufacturing companies face conflicting pressures to keep inventory level low enough to reduce inventory holding costs but at the same time high enough to avoid excess ordering or setup costs. A good starting point to balance out these two conflicting costs and to determine the best inventory level or production lot size is to find the economic order quantity (EOQ), which is a lot size that minimizes the sum of total annual inventory holding costs and setup. There are a set of assumptions that should be considered before calculating the EOQ:

1. The demand rate is constant and is known for certain.
2. No constraint is set for lot sizes (such as material handling limitations).
3. Inventory holding cost and setup cost are the only two relevant costs.

4. Decision for each item can be made independently from other items.

5. The lead time is constant and the ordered amount arrives at once rather gradually.

In order to calculate the EOQ, first we need to calculate the average quantity held as inventory over the year. When all the five assumptions of EOQ are held, the cycle inventory for an item behaves as shown in Figure.

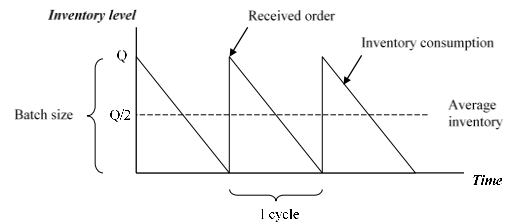


Fig 1: BATCH SIZES

The cycle begins by a batch size of Q held in inventory. As the time goes on, inventory is consumed at constant rate. Because the demand is constant and certain, the new lot can be ordered in time and be received precisely when inventory level falls into zero. Since inventory level varies uniformly between zero and Q , the average inventory level equals to half the lot size, $Q/2$.

$$\text{Annual Holding Cost} = (\text{Average cycle inventory}) \times (\text{Unit holding cost}) = \frac{Q}{2} \times H$$

And

$$\text{Annual Setup Cost} = (\text{Number of setups per year}) \times (\text{Setup cost}) = \frac{D}{Q} \times S$$

Where

C = total annual inventory cost

Q = lot size

H = cost of holding one unit in inventory for a year

D = annual demand in units

S = cost of setup for one lot

The number of setups per year is equal to annual demand divided by Q .

The total annual inventory cost which is depicted in Figure 11 is the sum of the two components of cost and is equal to:

$$\text{Total cost} = (\text{Annual holding cost}) + (\text{Annual setup cost})$$

Or

$$\text{Total Cost, } C = \frac{Q}{2} (H) + \frac{D}{Q} (S)$$

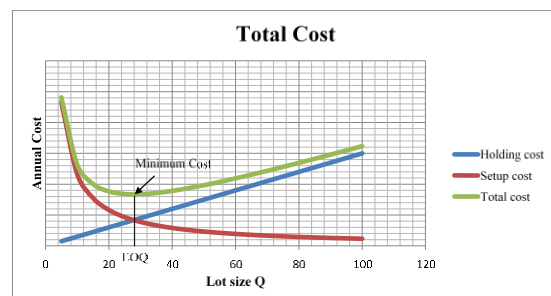


Fig 2: EOQ

The value of Q that minimizes the total annual cost is calculated by setting the first derivative of total cost formula with respect to Q, equal to zero (Hillier and Lieberman, 2001). Therefore:

$$\text{First derivative} = 0$$

$$\frac{dC}{dQ} = \frac{H}{2} - \frac{DS}{Q^2} = 0$$

$$Q^2 = \frac{2DS}{H}$$

$$\text{Economic Order Quantity} = Q = \sqrt{\frac{2DS}{H}}$$

3.2 Calculating EOQs

Through IFS system, we can find the current batch sizes used for different boards. In order to find the optimum batches for each board, the first idea was to calculate the EOQs for every board and compare them with the current batch sizes to get a general idea of the current situation. According to EOQ formula $\sqrt{\frac{2DS}{H}}$, there are three parameters that need to be identified for each board to calculate the economic order quantity: D, representing the annual demand for each board; S, representing the setup cost for each board and H, representing the annual inventory holding cost for each board. The annual demands for boards are obtainable through IFS.

The boards are represented by Xi in the table below. Minimum lot sizes are the current batch sizes used for production. They refer to the amount that should be produced if the demand cannot be met by the existing boards in inventory.

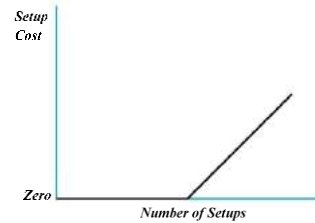
Some of the boards – which usually have low demand and high price – are produced only based on customer order quantity. Standard lot sizes are used to calculate the setup cost per each board. For example, if the standard lot size for a particular board is 30, the cost of setup for this type of board is divided over 30 to calculate the setup cost per board.

Table 1. Calculations of EOQs

Board s	Min Lot Size	Standard Lot Size	Annual Demand	Price	EOQ
X1	10	10	150	475.56	63
X2	20	30	24	338.64	30
X3	3	60	21	484.35	23
X4	10	10	62	737.79	32
X5	20	20	92	504.09	48
X6	20	20	328	247.47	129
X7	30	30	133	315.06	73
X8	30	40	690	187.92	214
X9	0	20	6	254.88	17
X10	3	3	24	1016.4	17

The logic behind economic quantities is to balance out the two costs of inventory holding and setups (Figure). The new economic quantities, as shown in the table above, are almost twice as big as the current batch sizes in most cases. As mentioned before, there is no doubt that the concept of economic lot sizes is entirely true. However, the value we choose as input data for the formula is our choice. The more accurate the data is, the more reasonable our answers will be.

If we assume that our defined setup cost is correct, then we should accept the results for these new batch sizes. In theory, if the setup cost is that high, then this conclusion is true. But the problem is that this definition of setup cost creates a problem in calculation of economic order quantities. If setup cost is the cost of lost production rather than salaries and overheads, then it is a variable quantity, not a fixed value. The number of setups can be increased without facing any cost as long as no production loss is created. The moment the capacity constraint is violated, a cost related to lost production is incurred. This cost increases linearly as production loss increases. The new defined setup cost can be assumed to have a pattern as illustrated in Figure:

**Fig 3: Setup Cost**

The economic order quantity formula requires us to assume a fixed value for setup cost. By contrast, the new definition of setup cost as the cost of lost production assumes setup cost to be a variable. As it was mentioned before in the theoretic framework, setup cost is a consequence of the solution rather than a fixed parameter of the problem. Having setup cost as a variable makes it impossible to use EOQ formula for calculating optimal batch sizes and therefore the EOQ formula should be put aside. A new way should be found for calculating optimum batch sizes.

4. OPTIMIZATION MODEL

4.1 Writing an Optimization Model

The annual inventory holding cost for an item is the result of multiplying its yearly average inventory level by its annual holding cost per unit. As it was mentioned before, based on the information from the financial department, the inventory holding cost per unit for an article (PCB board) is defined as 10 percent of its value. Therefore, if the price of a board is represented by C_i , its annual holding cost per unit can be expressed as $0.1 \times C_i$. If 0.1 is denoted by (a) , the expression can be written as $a \times C_i$. By denoting the average inventory level for the same board as $I_{ave,i}$, the annual inventory holding cost for that board can be calculated by $a \times C_i \times I_{ave,i}$. This expression for one board can be extended to other boards too. By calculating the holding cost for each board and adding them together, the total inventory holding cost for all boards is obtained. If C_i represents the price of board (i) and $I_{ave,i}$ represents the average inventory level for board (i), by having a 10 percent as a constant the total inventory holding cost for all the boards can be expressed as:

$$\text{Total inventory holding cost} = a \times C_1 \times I_{ave,1} + a \times C_2 \times I_{ave,2} + \dots + a \times C_n \times I_{ave,n}$$

Where, (n) is the total number of boards: $i = 1, 2, 3, \dots, n$.

This expression can be turned to the objective function of a minimization problem:

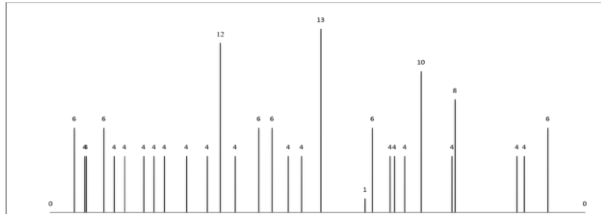
$$\text{Minimize } Z = a \times C_1 \times I_{ave,1} + a \times C_2 \times I_{ave,2} + \dots + a \times C_n \times I_{ave,n}$$

$$\text{for } i = 1, 2, 3, \dots, n.$$

In order to find the optimum batch sizes for the boards, one can pursue the goal of minimizing the total inventory value of

all boards. Since average inventory level for an item is in direct relation with its batch size, the I_{ave} for board i can be overwritten as a function of its batch size. As minimization tries to find the minimum value of Z , the optimal values for the batch sizes can be obtained. The only thing that remains is to find the relationship between each board's average inventory level (I_{ave}) and its batch size. After that, by adding appropriate constraints, this objective function can be turned into a complete optimization model in Operations Research.

In order to find the relationship between I_{ave} for board i and its batch size, one should start from probing the annual demand pattern for each board. The annual demands for a few of the boards are illustrated in Figures below:



As it is clear from the charts, the demand has a lumpy nature. This pattern applies for all other boards too. If demand was continuous and steady, it would be easy to calculate the average inventory. So we have to make an assumption of a simplified demand d which is in agreement with the average value.

Assuming that the number of intervals " \bar{t} " for each cycle is equal to n , the average inventory for one cycle is equal to the area below the graph for that cycle divided by sum of all intervals, $n \times \bar{t}$. Since there is going to be the same cycle repeated over and over throughout the whole time scale, the average inventory level for the whole year is equal to the average inventory level for one cycle. Let us assume that the batch size is big enough to cover all the demand during n period and is exactly equal to the demand in that period: $x = n \times \bar{d}$.

Therefore:

$$I_{ave} = \frac{\bar{t} \times (x + (x - \bar{d}) + (x - 2\bar{d}) + \dots + (x - (n-1)\bar{d}))}{n \times \bar{t}} = \frac{n \times \bar{d} \times \frac{n(n-1)}{2}}{n} = \bar{d} \times \frac{n(n-1)}{2} = x - \frac{\bar{d}(n-1)}{2}$$

Since, $x = n \times \bar{d}$, we have:

$$I_{ave} = x - \frac{x - \bar{d}}{2} = \frac{x}{2} + \frac{\bar{d}}{2}$$

In order to test the accuracy of this conclusion, some boards are randomly chosen and their average inventory level is calculated based on historical data. The results are shown in Table below:

Table 2. Calculations of Inventory Days

Date	Demand	Inventory level (batch size = 60)	Days in inventory	Inventory \times Days
01-01-15	0	60	3	180
01-04-15	8	52	6	312
01-10-15	4	48	1	48

01-11-15	24	24	4	96
01-15-15	32	52	2	104
01-17-15	8	44	6	264
01-23-15	12	32	5	160
01-28-15	20	12	7	84
02-04-15	4	8	2	16
Historical average inventory				29.2
Theoretical average inventory				36.9

The Mean Absolute Percentage Error (MAPE) for the approximation of " I_{ave} " can be worked out as shown below:

$$MAPE = \frac{100\%}{n} \sum_{t=1}^n \left| \frac{A_t - F_t}{A_t} \right| = \frac{100\%}{5} \left(\left| \frac{29.2 - 36.9}{29.2} \right| + \left| \frac{105.5 - 99.4}{105.5} \right| + \left| \frac{18.8 - 22.2}{18.8} \right| + \left| \frac{33.2 - 36.8}{33.2} \right| \right) = 15.27\%$$

Where A_t is the actual value and F_t is the forecasted value.

Although this is not a very close approximation, it is good enough for continuing the calculations. Now that the value of I_{ave} has been expressed based on the batch size x and the average demand " d ", it can be replaced in the objective function of our minimization problem:

$$\text{Minimize } Z = a \times C_1 \times \left(\frac{x_1}{2} + \frac{\bar{d}}{2} \right) + a \times C_2 \times \left(\frac{x_2}{2} + \frac{\bar{d}}{2} \right) + \dots + a \times C_n \times \left(\frac{x_n}{2} + \frac{\bar{d}}{2} \right)$$

Since " a " is a constant and it is present in all the sentences, it can be taken away from the objective function without affecting the optimization result:

$$\text{Minimize } Z = C_1 \times \left(\frac{x_1}{2} + \frac{\bar{d}}{2} \right) + C_2 \times \left(\frac{x_2}{2} + \frac{\bar{d}}{2} \right) + \dots + C_n \times \left(\frac{x_n}{2} + \frac{\bar{d}}{2} \right)$$

$\frac{\bar{d}}{2}$ and C_i are also both constants and when they are multiplied with each other, they form another constant $\frac{\bar{d}}{2} \times C_i$. Since their value is fixed and they do not affect the optimization result, they can be taken away from the objective function too:

$$\text{Minimize } Z = C_1 \times \frac{x_1}{2} + C_2 \times \frac{x_2}{2} + \dots + C_n \times \frac{x_n}{2}$$

Nonetheless, " $\frac{x}{2}$ " is a better approximation for average inventory level. By calculating the new MAPE for " $\frac{x}{2}$ ", the result will be:

$$MAPE = \frac{100\%}{n} \sum_{t=1}^n \left| \frac{A_t - F_t}{A_t} \right| = \frac{100\%}{5} \left(\left| \frac{29.2 - 30}{29.2} \right| + \left| \frac{105.5 - 90}{105.5} \right| + \left| \frac{18.8 - 20}{18.8} \right| + \left| \frac{33.2 - 30}{33.2} \right| \right) = 8.36\%$$

In addition, denominator 2 is also a common constant in all the expressions above and can be omitted. The final objective function will look like this:

$$\text{Minimize } Z = C_1 \times x_1 + C_2 \times x_2 + \dots + C_n \times x_n$$

Now that the objective function is prepared, the constraints should be added to complete the model. Within the available capacity, setups have a cost of zero. They create a cost when the capacity limit is violated and this week's orders have to be met next week. If the capacity is defined as the total time available for producing boards and performing setups, the constraint can be defined as shown below:

$$\text{Total Production time} + \text{Total Setup Time} \leq \text{Capacity}$$

If D_i is the total demand for board i and x_i is the batch size, then the number of setups for board i is the ceiling function of

their division. For example, demand of 100 and batch size of 30 requires a total number of $\left\lceil \frac{100}{30} \right\rceil = \lceil 3.33 \rceil = 4$ setups in total. By multiplying this number by the average setup time of 22 minutes – based on information from IFS – the total setup time for one type of board is calculated. For calculating the total production time, the total demand for each board has to be multiplied by its cycle time " $t_{pi(min)}$ " (t_p denotes the cycle time, "i" denotes the board i and "min" says that the times are in minutes). For example, if the demand for a board is 100 units and cycle time " $t_{pi(min)}$ " is two minutes, the total production time for that board is $100 \times 2 = 200$ min. The sum of these two times, for all boards should be less than or equal to available capacity in minutes " A_{min} ". Mathematical expression of capacity constraint is shown below:

$$\sum_{i=1}^n \left(22_{min} \times \left\lceil \frac{D_i}{x_i} \right\rceil + D_i \times t_{pi(min)} \right) \leq A_{min}$$

In order to complete the optimization model, the boundaries for the variables must be defined. All of the parameters in the objective function and constraint are constants except the batch sizes " x_i ". These batch sizes cannot be greater than total demand for each board $x_i \leq D_i$. At the other hand, based on previous assumptions that were set over calculating the average inventory, each batch should be big enough to meet the average demand. This can be expressed as $x_i \geq \bar{d}_i$. Therefore, the boundaries for batches can be written as follows:

$$\bar{d}_i \leq x_i \leq D_i \quad \text{for } i = 1, 2, 3, \dots, n$$

4.2 Final Model

The complete model with all its components is shown below:

$$\text{Minimize } Z = \sum_{i=1}^n C_i \times x_i$$

Subject to:

$$\sum_{i=1}^n \left(22_{min} \times \left\lceil \frac{D_i}{x_i} \right\rceil + D_i \times t_{pi(min)} \right) \leq A_{min} \quad \text{And}$$

$$\bar{d}_i \leq x_i \leq D_i \quad \text{for } i = 1, 2, 3, \dots, n$$

5. SOLVING THE OPTIMIZATION MODEL

A way to solve an optimization problem using exact methods is MATLAB. MATLAB provides different toolboxes for various engineering fields.

5.1 Using MATLAB Optimization Toolbox

Here, the optimization toolbox is shown:



The next step is to choose a solver. MATLAB provides us

with different options for different optimization problems. In order to choose a proper solver, MATLAB's Optimization Decision Table is used.

However, the solver fails to find an answer to this problem and responds with an error message. The reason for this failure is the constraint type of the problem. As it is clear from the table, *fmincon* is used for *smooth* linear or nonlinear constraints (general smooth). A smooth function is a function that has derivatives of all orders. Optimization solvers like those in optimization toolbox are derivative based. They are accurate and fast but they are designed to solve minimization problems that have *smooth* functions (functions that are continuously differentiable to some order) since they use derivatives to find direction of minimization (Mathworks.se, 2016). The constraint function of this problem is not smooth

because of the term $\left\lceil \frac{D_i}{x_i} \right\rceil$. Having the variable " x " in the denominator and inside the ceiling function makes the constraint function discontinuous and non-smooth in several points. The derivative of the function ceiling (x) is zero when x is not integer and is undefined when x is an integer number. As a result derivative based solvers in optimization toolbox are unable to solve such a problem. A simple version of the constraint function with only two variables is illustrated in Figure , to show the discontinuity of the function.

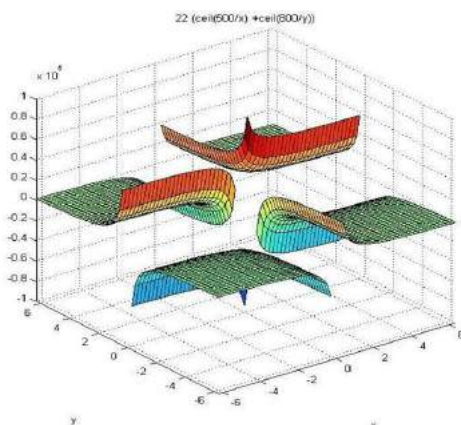
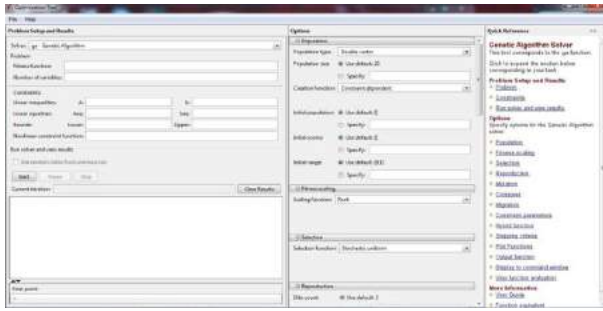


Fig 4: Discontinuity of Constraint Functions

With this attempt failing, the idea of solving the problem with exact methods should be put aside. The alternative is to use heuristic methods for finding a near optimum solution.

5.2 Heuristic Solution

As it was mentioned before, heuristic algorithms do not guarantee a global optimum solution but they provide an answer good enough in an acceptable amount of time. Fortunately, MATLAB has the ability to perform optimization using different heuristic solvers. The Global Optimization Toolbox in MATLAB is a tool that provides us with this opportunity.



As it is clear from above figure, the Optimization Tool requires many different input data for performing the optimization. In the solver text box, a series of different solvers are available. Different settings give different answers when running the optimization. From experience it can be said that higher mutation rates result in faster and more optimum solutions since they increase the diversity of the solution population and help the algorithm search a wider area to find the optimum answer. After running the algorithm for several times, the best answer for batch sizes was chosen and modified to adapt to multiple lot sizes (the number of boards in each panel) so that the technical side of the problem is considered too.

5.3 Results

The final result with the total inventory value of final batch sizes compared to current ones is shown in Table 10 below:

Table 3. Calculations of Final batch Sizes

Boards	Multiple Lot Sizes	Lower Bound	Demand	Price	GA Solution	Final
X1	2	10	52	475.56	17.5	18
X2	2	4.8	24	338.64	12	12
X3	2	10	62	737.79	12.6	14
X4	2	4.18	92	504.09	18.6	20
X5	2	4.7	170	247.47	34.1	36
X6	3	6.33	133	315.06	33.4	36
X7	2	7.3	532	187.92	76.4	78
X8	3	3	24	1016.43	3	3
X9	2	8.6	458	190.35	66.1	68
X10	2	9	36	462.48	12.2	14

The first column of the table simply indicates different boards. The second column, multiple lot sizes, is the number of boards in each panel. For example, if multiple lot size for a board is 6, there are 6 boards in each panel that goes through the production line. As a result, the batch size for this board can be 6, 12, 18, 24, etc. The third column, fixed values, is those boards that their lot size was predetermined as a fixed value so that they are not a decision variable anymore. The reason for these fixed values was discussed before. Fourth column is the lower bound for variables, meaning that the batch sizes cannot be less than this quantity. Lower bounds are the average demand quantity for each board. The fifth column is the modified annual demand for each board. Modified, meaning that the outlier data has been taken away. The sixth column is the price of each board. The seventh column is the current batch sizes for boards. The eighth column, GA Solution, is the answer given by MATLAB. This

answer was obtained after running the optimization for several times and changing the settings in order to improve the optimal solution. The reason that problem is not solved with integer values and batch sizes are not complete integers is that it is much easier and faster for MATLAB to solve problems with continuous values than integer ones. These values had to be modified to comply with multiple lot sizes. The results are shown in column ninth, "Final", as final optimum batch sizes.

The last row in the table shows the ratio of total inventory value resulted from new batch sizes over total inventory value resulted from current batch sizes. As it was mentioned before, the average inventory level for a board is considered to be half the batch size. At worst, it can be considered as a fraction of the batch size. However, when the total inventory values of new and current batch sizes are divided over to calculate the ratio, these constants cancel out. The formula used for calculating the ratio of total inventory value for two different batch sizes is shown below:

$$\text{Ratio of Total Inventory Value} = \frac{\text{Constant} \times \sum_{i=1}^{111} (\text{New Batch Sizes} \times \text{Price})}{\text{Constant} \times \sum_{i=1}^{111} (\text{Current Batch Sizes} \times \text{Price})} = \frac{\sum_{i=1}^{111} (\text{New Batch Sizes} \times \text{Price})}{\sum_{i=1}^{111} (\text{Current Batch Sizes} \times \text{Price})}$$

As a result, the new batch sizes will reduce the total inventory value by 21.21% (100% - 78.79%).

6. CONCLUSIONS

In this paper, the problem of finding the optimum batch sizes in a High mix, Low volume production line was investigated. The case was an SMT line producing a high mix of different circuit boards in different volumes. The first problem faced throughout the project was finding an alternative for EOQ method. Economic order quantities, traditionally used in many firms, were mainly developed for the purpose of inventory management and purchasing. Within those borders where there is a clear ordering cost including transportation, insurance and salaries for purchasing staff, the EOQ method makes perfect sense. Implementing the same principles in a different environment like production can mislead us enormously. Although many parameters like total demand and inventory holding costs are the same in both environments, the idea that setup cost is the proper equivalent of ordering cost in a procurement environment can lead us to many troubles. Setup costs are hard to measure in many cases and they are usually not fixed values. However, they are widely used in academic papers as a criterion for calculating the batch sizes. A good alternative for EOQ method was found to be OR models. By replacing setup cost with setup time and linking that time to the total available capacity, an OR model can be built that minimizes the inventory value and finds the optimum batch sizes..

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Fixture Design and Analysis for Orbital Welding

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ABSTRACT

The fixtures are the important part of the welding as fixtures are used in manufacturing of different products during welding to hold the different parts of that respective product. The joints of every part are not easy to weld because of their complex structure. Such as in case of orbital welding i.e. welding for pipe or tube joining, where the operator not able to weld continuous with equal proportion, the only way is to adjust that part. For such cases it requires specialized fixtures to accurately hold the work piece during the welding operation. In this project the fixture will be designed to hold the job and to rotate the job at required speed, i.e. depending on the diameter. The new fixture design reduces cycle time and operator labor while increasing functionality; and allows complex welding operations to be completed on simple rotational fixture. Further the design will be analyzed on the software.

General Terms

Your general terms must be any term which can be used for general classification of the submitted material such as Pattern Recognition, Security, Algorithms et. al.

Keywords

Welding fixture, orbital welding.

1. INTRODUCTION

A fixture is a device used for holding the work piece during machining operations or during welding process. It does not have provision to guide the tool as that of a jig. But it is always fastened to a machine table in a fixed position. Most of the machining operations can be performed by clamping the work piece directly on to the machine table without using a fixture, when only a few parts are to be machined. But when the number of parts is large enough to justify the cost of fixture, it is generally used for holding and locating the work piece. There are some new fixtures in the market which are used not only to hold the job but also to set in required position. The fixture plays the important role in the welding process as if fixture is not proper then there are chances of distortion and cracks in weld which is dangerous for the joints.

2. PROBLEM DEFINITION

In the manufacturing industries different products are manufactured. In every product at some of the joints there is requirement of welding to bind them together. These products or these parts undergo different stresses like tension, fatigue stresses etc. and hence these forces and stresses ultimately

affect the joints as stress concentration is maximum at joints. Hence for best performance of the product the joints need to be strong to carry these forces. Now these factors should be considered during the actual welding process i.e. during welding the extra care should be taken for alignment of the parts and the welding torch. That means the important part of the welding process is fixture which is used to hold the part to be joined in proper alignment.

3. PROPOSED METHODOLOGY

As the designed is required for the small scale industries according to their requirement the objectives of the design are set. The basic requirement of the industries is the fixture should able to do the orbital welding. Generally in small scale industries welders used to weld by rotating the pipes or tubes manually and welding simultaneously which takes more time to complete the job and as well as it is not smooth as stated in problem. This conventional method is fine with the small production but we are designing the fixture which will be used in mass production which will reduce the production cost and also the cost of machine will be also cheap so that it is easily affordable to the industries having turnover less as compare to the large scale industries.

Now to achieve these objectives we are working on the new design. In this, as the fixture is used in welding so the selection of material is the basic and important step. Hence the material selection will be depending on the comparative factors of the different materials. The important factors are cost of the material, strength of the material and most important factor is temperature gradient of the material as fixture will work under high temperature. As per the requirement the table where the fixture will be mounted should be designed so that the base of the fixture will be strong and capacity can be calculated to hold the job. For this design the size of the table should be accurate. As the welding is to joints of the pipes or the tubes so the length of the pipe or tube should be taken in consideration. As there are different sizes are available so in design there will be on chuck which will be fixed and the other will be movable on the table so that it can be used in any length. Now the chuck is rotated by the motor so the motor selection is the other important part in the design. As welding will be carried out on the rotating shaft directly so the rpm should be less and for that torque calculation is important. So first the torque will be calculated and then the motor will be selected. After selection of motor the transmission system will be design to transmit the power to the chuck. Transmission will be either by the gear or by the belt so next design will be of that transmission system. Also the design of the weld is important as all I am doing is for welding. The power transmitting shaft is the important design

so the according to required torque the shaft will be designed. Also the feeder mechanism is to be designed which will be able to weld with the rotating speed so the torque required for feeder is to be calculated. On that torque the motor for the feeder will be selected also to reduce the speed the gearbox design is also required.

4. MATERIAL SELECTION

Material used: Mild steel

Reasons:

1. Mild steel is readily available in market
2. It is economical to use
3. It has moderate factor of safety, because factor of safety results in unnecessary wastage of material and heavy selection. Low factor of safety results in unnecessary risk of failure
4. It has high tensile strength
5. Low co-efficient of thermal expansion.

5. DESIGN PROCEDURE

As the fixture is designed for welding and it is rotating so the important part is to select the motor for the rotary motion. So at the start of the design procedure we select the motor

Power of motor = 75 N- m /s

Rpm of motor = 1800 rpm

Out put rpm required = 24rpm

load on motor = 25 kg = 25 x 9.81 = 245 N

Max load of job = 30kg = 30x 9.81 = 294 N

Number of stage in gear box = 2

Ratio of gearing =1 : 74.8

Calculation of Final Speed & Torque of Jack

Power of motor = P = 75 watt.

$$P = \frac{2\pi N T}{60}$$

Where, N→ Rpm of motor = 1800

T →Torque transmitted

T = 0.39N-m

T = 398 N-mm

Calculation of Torque Obtain By Gear Box

In put torque of gear box = 990 N- mm

In put rpm of gear box = 1800 rpm

Torque & rpm obtain at gearing

As reduction ratio is 1:22

So,

Output rpm of gear box is

$$N_2 = N_1 / 22$$

$$N_2 = 81.8 \text{ rpm}$$

$$N_2 = 82 \text{ rpm}$$

TORQUE AT GEAR BOX OUT PUT

$$\frac{N_1}{N_2} = \frac{T_2}{T_1}$$

$$T_2 = 8736 \text{ N-mm}$$

$$T_2 = 8736 \text{ N-mm}$$

$$\text{TOTAL LOAD} = 55 \times 9.81 = 539 \text{ N}$$

We know $T = F \times R$

So

$$8736 = F \times 46$$

$$F = 379 \text{ N}$$

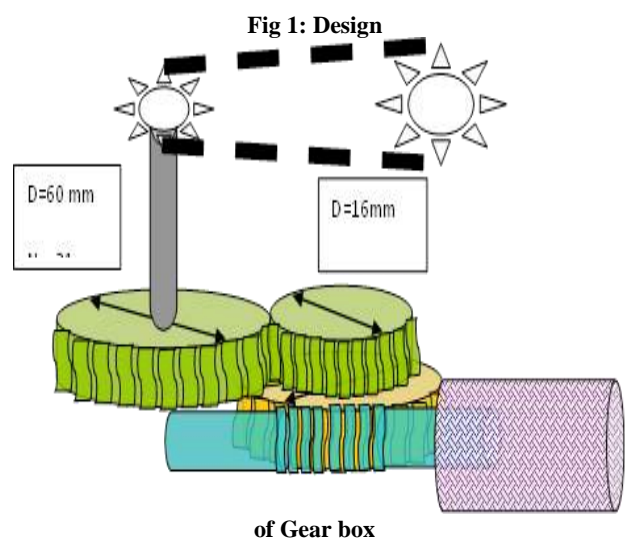
$$F = 379 / 9.81 = 38 \text{ kg}$$

As output of gearing system is insufficient to lift the total load of 55 kg so further more speed reduction is required to increase the torque value.

We use spur gearing having reduction ratio = 1: 3.4

So torque at output speed of spur gearing

As reduction ratio is 1:3.4



$$N_2 = N_1 / 3.4$$

$$N_2 = 24.1 \text{ rpm}$$

$$N_2 = 24 \text{ rpm}$$

TORQUE AT GEAR BOX OUT PUT

$$\frac{N_1}{N_2} = \frac{T_2}{T_1}$$

$$T_2 = 29848 \text{ N-mm}$$

Torque = force x distance

Torque = force x radius of out put gear

$$29848 = F \times 60 / 2$$

$$F = 29848 \times 2 / 60$$

$$F = 994 \text{ N}$$

$$F = 994 / 9.81 = 101 \text{ kg}$$

$$F = 101 \text{ kg}$$

This force value is sufficient to run machine for welding so transmission is safe.

But our machine is operated at very low rpm so for further reduction of speed we use chain drive with reduction ratio of 1:5.5 also further reduction is done by changing dc voltage of motor using variable dc element.

Design of Chain & Sprocket

We know,

$$\text{TRANSMISSION RATIO} = Z_2 / Z_1 = 66/12 = 5.5$$

For this transmission ratio number of teeth on pinion sprocket is in the range of 21 to 10, so we select number of teeth on pinion sprocket as 12 teeth.

So, $Z_1 = 12$ teeth

SELECTION OF PITCH OF SPROCKET

The pitch is decided on the basis of RPM of sprocket.

RPM of pinion sprocket is variable in normal condition it is = 4.3 rpm

For this rpm value we select pitch of sprocket as 6.35mm from table.

$$P = 6.35 \text{ mm}$$

CALCULATION OF MINIMUM CENTER DISTANCE BETWEEN SPROCKETS

THE TRANSMISSION RATIO = $Z_2 / Z_1 = 66/12 = 5.5$ which is less than 7

So from table,

$$\text{MINIMUM CENTER DISTANCE} = C' + (80 \text{ to } 150 \text{ mm})$$

$$\text{Where } C' = (D_{c1} + D_{c2})/2$$

$$C' = 79.5 \text{ mm}$$

$$\text{MINIMUM CENTER DISTANCE} = 79.5 + (30 \text{ to } 150 \text{ mm})$$

$$\text{MINIMUM CENTER DISTANCE} = 140 \text{ mm}$$

CALCULATION OF VALUES OF CONSTANTS K1 K2 K3 K4 K5 K6

Load factor $K_1 = 1.25$ (Load with mild shock)

Factor for distance regulation $K_2 = 1.25$ (Fixed center distance)

Factor for center distance of sprocket $K_3 = 0.8$

Factor for position of sprocket $K_4 = 1$

Lubrication factor $K_5 = 1.5$ (periodic)

Rating factor $K_6 = 1.0$ (single shift)

CALCULATION OF VALUE OF FACTOR OF SAFETY

For pitch = 6.35 & speed of rotation of small sprocket = 4.3 rpm

$$\text{FACTOR OF SAFETY} = 8.55$$

CALCULATION OF VALUE OF ALLOWABLE BEARING STRESS

For pitch = 6.35 & speed of rotation of small sprocket = 4.3 rpm

$$\text{ALLOWABLE BEARING STRESS} = 2.87 \text{ kg / cm}^2$$

$$= 2.87 * 981 / 100 = 28 \text{ N / mm}^2$$

CALCULATION OF COEFFICIENT OF SAG K

For horizontal position coefficient of sag $K = 6$

CALCULATION OF MAXIMUM TENSION ON CHAIN

As we know maximum torque on shaft = $T_{max} = T_2 = 29848 \text{ N-mm}$

Where,

T_1 = Tension in tight side

T_2 = Tension in slack side

O_1, O_2 = center distance between two shaft

From fig.

$$\sin \theta = \frac{R_1 - R_2}{O_1 - O_2}$$

O1O2

$$\sin P = 40 - 12.5$$

we know that,

$$T_1/T_2 = e\mu\theta$$

$$T_1/T_2 = e0.35 \times 2.7$$

$$T_1 = 2.57T_2$$

We have,

$$T = (T_1 - T_2) \times R$$

$$29848 = (2.57T_2 - T_2) \times 134/2$$

$$T_2 = 7882 \text{ N}$$

$$T_1 = 2.57 \times 7882$$

$$T_1 = 20256 \text{ N}$$

So tension in tight side = 20256 N

We know ,

$$\text{Stress} = \text{force} / \text{area}$$

$$\text{Stress induced} = 20256 / (3.14 \times 82 / 4)$$

$$\text{Stress induced} = 430 \text{ N/mm}^2$$

As induced stress is less than allowable stress = 650 N/mm² design of sprocket is safe .

Designing of Shaft

BENDING:

The material forces that are developed on any cross section of the shaft give rise to stresses at every point. The internal or resisting moment gives rise to so called bending stresses.

TORSION:

When the shaft is twisted by the couple such that the axis of the shaft and the axis of the couple coincides, the shaft is subjected to pure torsion and the stresses at any point of cross section is torsion or shear stresses.

COMBINED BENDING AND TORSION:

In practice the shaft in general are subjected to combination of the above two types of stresses. The bending stresses may be due to following

1. Weight of belt
2. Pull of belts
3. Eccentric Mounting
4. Misalignment

The torsional movement on the other hand may be due to direct or indirect twisting. Thus any cross-section of the shaft is subjected simultaneously of both bending stresses and torsional stresses.

Following stresses are normally adopted in shaft design

$$\text{Maxm tensile stress} = 150 \text{ N/mm}^2$$

$$\text{Maxm shear stress} = 120 \text{ N/mm}^2$$

Shaft design on basic of study

The shaft is subject to pure torsional stress

$$\text{Chain reduction} = 5.5$$

$$\text{So torque on shaft} = T \times 5.5$$

$$\text{Torque} = 164164 \text{ N-mm}$$

We know

$$T = 3.14/16 \times f_s \times d^3$$

$$164164 = 3.14/16 \times 120 \times d^3$$

$$D = 19.10 \text{ mm}$$

$$D = 20 \text{ mm standard dia of shaft}$$

Selection of bearing

For the shaft of the diameter 20mm the standard bearing is selected. So as per the requirement the pedestal bearing is selected as it is easily available in market and also can absorb the vibrations on the shaft an can sustain for these conditions

Bearing selected: P204 (pedestal ball bearing)

Design of Pulley:-

D = diameter of pulley

Ft = centrifugal stress or tensile stress in pulley rim. Due to engine force

$$F_t = 45 \text{ kg/cm}^2$$

Using the relation, $F_t = \rho v^2/g$

With the usual notation,

$$\text{substitute } \rho = \text{sp. Wt of C.I.} = 7.2 \times 10^{-3}$$

$$45 \times 981$$

$$V^2 = \text{-----}$$

$$7.2 \times 10^{-3}$$

$$V^2 = 6.1 \times 10^6$$

$$V = 2476 \text{ cm/sec}$$

$$V = 24.76 \text{ m/sec}$$

$$\Pi d N \quad [\text{for factor safety consider } N = 2N]$$

$$V = \text{-----}$$

$$60$$

$$2476 \times 60$$

$$D = \frac{2476 \times 60}{3.14 \times 2 \times 1000}$$

$$D = 23.65 \text{ cm.}$$

NUMBER OF V-BELTS

$$\begin{aligned} \text{We know that the power transmitted per belt} &= (T_1 - T_2) \times V \\ &= (112.98 - 53.167) \times 25 \\ &= 1495.32 \text{ W} \end{aligned}$$

Power transmitted per rop

$$N = \frac{\text{Total Power transmitted}}{\text{Power transmitted per rop}}$$

$$N = 0.25$$

Say 1 belt

So 1 belt is sufficient for transmission of power

CALCULATION OF LENGTH OF BELT:-

We know that radius of pulley on motor shaft

$$r_1 = d_1/2 = 100/2 = 50 \text{ mm}$$

Radius of pulley on arbor shaft

$$r_2 = d_2/2 = 50/2 = 25 \text{ mm}$$

We know length of belt

$$\begin{aligned} L &= \Pi (r_2 + r_1) + 2x + (r_2 - r_1)^2/x \\ &= \Pi (50 + 25) + (2 \times 225) + (50 - 25)^2/225 \\ L &= 688 \text{ mm} \end{aligned}$$

Design of C-Section

Material: - M.S.

The vertical column channel is subjected to bending stress

$$\text{Stress given by } \Rightarrow M/I = fb / y$$

In above equation first we will find the moment of inertia about x and y

Axis and take the minimum moment of inertia considering the channel of

ISLC 75 x 40 size.

We know the channel is subject to axial compressive load

In column section the maximum bending moment occurs at channel of section

$$M = F \times L/2$$

$$M = 30 \times 9.81 \times 1120/2$$

$$M = 164808 \text{ N-mm}$$

We know

$$fb = M/Z$$

$$Z = 37171 \text{ mm}^3$$

Now check bending stress induced in C section

$$fb_{\text{ induced}} = M/Z$$

$$fb_{\text{ induced}} = 164808 / 37171 = 4.43 \text{ N/mm}^2$$

As induced stress value is less than allowable stress value design is safe.

$$fb = \text{Permissible bending stress} = 160 \text{ N/mm}^2$$

$$fb_{\text{ induced}} < fb_{\text{ allowable}}$$

Hence our design is safe.

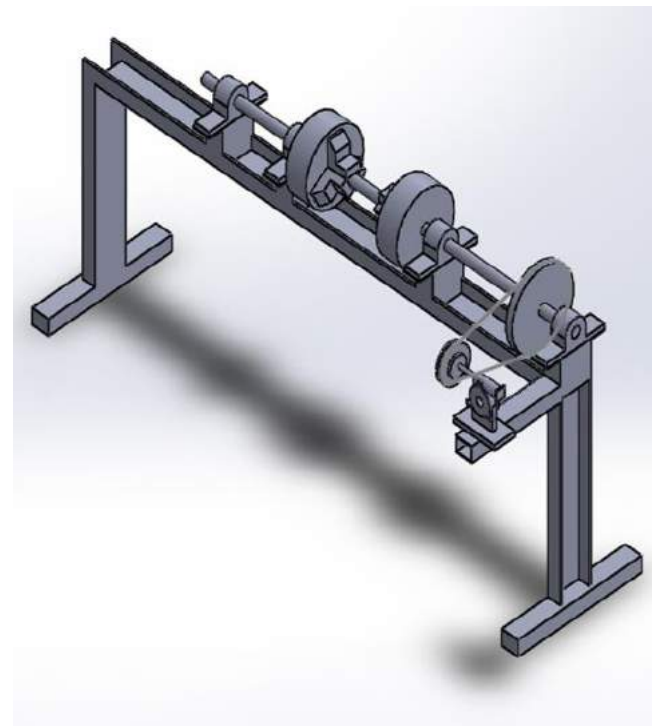


Fig 1: Complete assembly of machine

6. DESIGN ANALYSIS

In the design the power transmitting shaft is required to analyse as the chances of failure are at this shaft. Hence the shaft is analysed on the cad software.

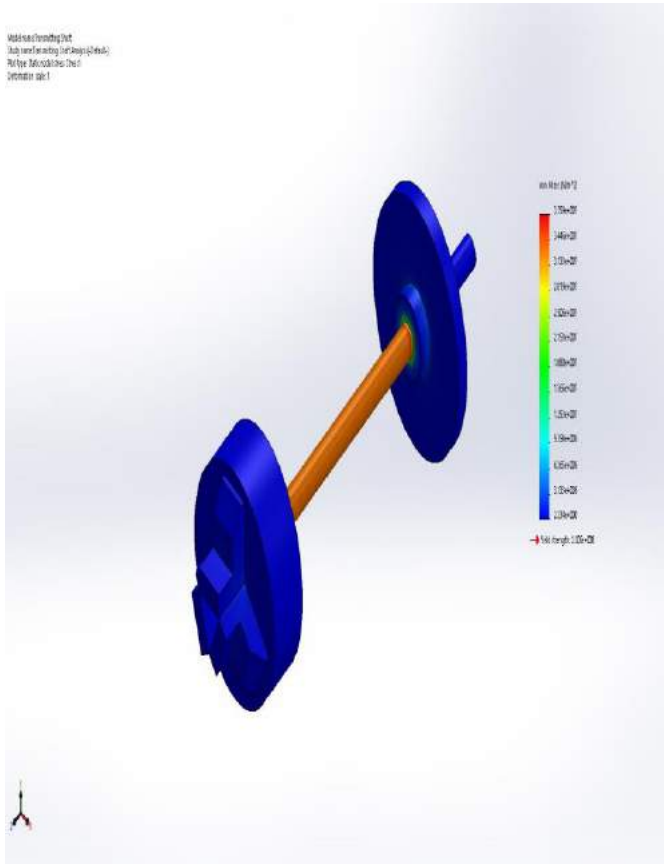


Fig 1: Transmitting shaft stress analysis

7. CONCLUSION

On the research it was found that the orbital welding takes much of the time when done manually. So because of this the production time increases and also the welding will not be continuous and hence there are chances of crack or distortion. For mass production the time factor is most important especially for the small scale industries as their turnover is also less as compare to large industries. For these problems some fixtures are available in market but either having large size or having high cost.

So the new design is made to solve these problems. The new design calculations are carried out. In these calculations some of the parts are standard so these are directly selected and the parts like frame are the requirement so separately designed. Also on the basis of new design the parts are drawn on CAD software and their assembly is also drawn on the same software.

With that the analysis is also carried out on the software. The designs are also checked for safety.

8. ACKNOWLEDGEMENT

It gives great pleasure to present this synopsis report on design and analysis of fixtures for welding. While working on this project I found great opportunity to express my sincere regards, deep sense of gratitude and thanks to my project guide Dr. Arunkumar for his valuable suggestion, support and timely guidance at every step during course of my seminar.

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COST EFFECTIVE IMPLIMENTATION OF ERPNEXT SOFTWARE IN SMEs

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ABSTRACT

Companies implement ERP systems to integrate the business processes of a company, and help organizations obtain a competitive advantage. Enterprise Resource Planning (ERP) is one of the solutions for the Small and Medium Enterprises (SMEs) in order to face the global challenges. ERP (Enterprise Resource Planning) is a way to integrate the data and processes of an organization into one single system. Its main goal is to integrate data and processes from all areas of the organization and unify it, to provide ease of access and an efficient work flow. ERP Systems usually accomplish this through one single database that employs multiple software modules. ERP NEXT is a software which has all the ERP modules and easy to use. ERPNext is an Open Source integrated Enterprise Resource Planning (ERP) software developed by Web Notes Technologies Pvt Ltd and is built on MySQL database system using a Python (software) based server-side framework.. Small and midsize scale firms can take the benefit of ERP NEXT software as it is free of cost for one user. This report provides detail information about ERPNext software.

Keywords

SME, ERPNEXT, Bill of materials.

1. INTRODUCTION

Small business are not so different from large ones. They contain most of the complexities of a large business but with many more constraints. Small businesses have to communicate with customers, do accounts, pay taxes, do payroll, manage timelines, deliver quality, answer questions and keep everyone happy just like large businesses. Large businesses have the advantage of using advanced data systems to manage their process efficiently. Small businesses typically struggle to keep things organized. They are often using a mix of apps like spreadsheets, accounting software, web CRM etc to manage but not everyone is on the same page. ERPNext changes that. ERPNext helps small businesses get things done. ERPNext helps you to manage all your business information in one application and use it to manage operations and take decisions based on data. Among other things, ERPNext will help you to:

1. Track all Invoices and Payments.
2. Know what quantity of what product is available in stock.
3. Identify open customer queries.

4. Manage payroll.
5. Assign tasks and follow up on them.
6. Maintain a database of all your customers, suppliers and their contacts
7. Prepare quotes.
8. Get reminders on maintenance schedules.
9. Publish your website.

ERPNext is a modern accounting plus everything system and has many benefits over both traditional accounting as well as ERP applications.

Benefits over traditional accounting software:

1. Do a lot more than just accounting! Manage inventory, billing, quotes, leads, payroll and much much more.
2. All data safe and in one place. Don't keep hunting for data when you need it across spreadsheets and different computers.
3. Everyone on the same page. All users get the same update data.
4. Stop repetitive work. Don't enter the same information from your word Processor to your accounting tool. It's all integrated.
5. Keep track. Get the entire history of a customer or a deal in one place.

2. Modules of ERP Next

ERPNext has a large number of built-in modules (or apps) to help you manage your business on one platform [7].

- Accounts
- Buying
- HR
- Manufacturing
- Sales
- Purchase
- Inventory

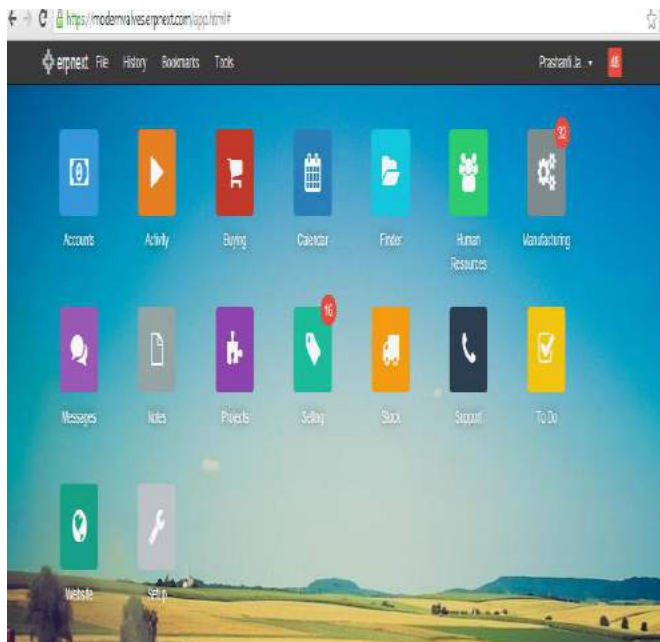


Fig 1 : Modules of ERPNext

2.1 Bill of Materials (BOM)

A bill of materials (BOM) is used to describe the parts list of components such as screw, bolt and nut that needed to complete a profitable product. BOMs are listed in hierarchical order with the top level representing the sub-assembly or end-item. The BOMs that describe the sub-assemblies are referred as a Modular BOMs. Modular Bill of Material (BOM) is a vital part that defines the product structure for an end-item. It also defines the parts, documents, component materials, and engineering drawings in order to complete a sub-assembly. Besides sub-assemblies, a BOM also can define products in the Engineering Bill of Material which called designed product or in the Sales BOM as they are ordered, Manufacturing bill of material as they are built in the industry, and as they are maintained which is Service BOM. These different types of bills of materials are depending on the business need and use which they are intended to use that are available in the ERP system features.[8]

2.2 Purchasing

Purchasing is defined as a business or organization attempt to purchase goods or services in order to achieve the goals for the enterprise. Although there are several organizations attempt to set standards in the purchasing process, it will create greatly different between the Organizations.

2.3 Logistic

Logistics acts as a managing system that control the flow of goods, energy, information and other resources like products, services, and people, from the source of production to the marketplace in order to meet the requirements of consumers. Logistics management contribute to the supply chain system which plans, implements and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of Consumption.

2.4 Open Source

ERPNext is Open Source and you are free to peek into the source code, copy it, host it on your own, tweak it and submit your update back to the community. ERPNext is available under the GNU General Public License. This license means that all derivative works must also have the same license and must also be Open Source. There are some alternatives for ERP Next but ERP Next is the cheapest and contains more modules than any of them the alternatives for ERP Next are Open bravo, Open ERP , Apache of Biz, X tuple, Compiere and forks. Comparison of ERPNext with above software is shown in the following table

YES	NO	ADD ON				
.						
Product	Accounting	Inventory	Sales	Mfg.	Open Source	Pricing (/user/month)
Quickbooks Online						\$10
Zoho CRM						\$12
Freshbooks						\$15
Xero						\$30
Work etc						\$40
Sugar CRM						\$45
Open ERP						\$50
Open Bravo						\$50
Sales Force						\$65
Bright Pearl						\$100
NetSuite						\$100
SAP ByDesign						\$125
ERPNext						\$5*

Fig2 : Comparison of ERP Next with other ERP software

3.0 Implementation of ERP

3.1 Company profile

Valvfit Engineering handles diversified engineering activities like designing and supplying of machinaries and process equipment manufacturing of RO and DM plants , Tanks , and about 300 types of valves. Company is Iso 9001-2000 certified company .

Need of ERP in Valvfit Engineers

- 1)communication with customors
- 2)Do accounts
- 3)Pay Taxes
- 4)Do Payroll
- 5)Manage Inventory

3.2 Manufacturing Item

I implemented ERP system on 15mm lift check valve. Description of the 15 mm lift check valve is given below.

15LCV800ST

15-Valve size in mm

LCV-Left Check Valve

800-Pressure STD

20BAR410

20-Size

410-Material STD

15PT800410

15-Size

PT-Piston.

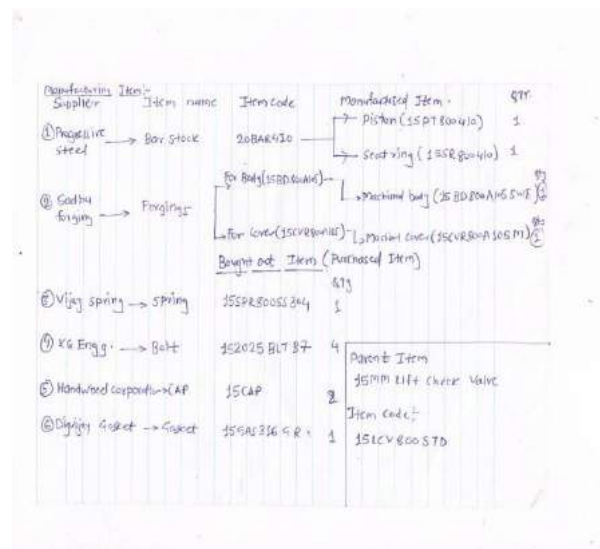
3.3 Test phase

1. Read the Manual
2. Create your first Customer, Supplier and Item. Add a few more so you get familiar.
3. Create Customer Groups, Item Groups, Warehouses, Supplier Groups so that you can classify your Items.
4. Complete a standard sales cycle - Lead > Opportunity > Quotation > Sales Order
> Delivery Note > Sales Invoice > Payment (Journal Voucher)
5. Complete a standard purchase cycle - Purchase Request > Purchase Order > Purchase Receipt > Payment (Journal Voucher).
6. Complete a manufacturing cycle (if applicable) - BOM > Production Planning Tool
> Production Order > Stock Entry (issue) > Stock Entry (back-flush).

3.4 Live Phase

1. Clean up the account of test data.
2. Setup all the modules with Customer Groups, Item Groups, Warehouses, BOMs etc.
3. Import Customers, Suppliers, Items, Contacts and Addresses using Data Import Tool.
4. Import opening stock using Stock Reconciliation Tool.
5. Create opening accounting entries via Journal Voucher and create outstanding.

Test phase for 15mm Lift check valve



3.5 Manufacturing

The Manufacturing module in ERPNext helps you maintain multi-level Bill of Materials (BOMs) for your Items, help you in Product Costing, plan your production via Production Plan, create Production Orders for your manufacturing shop floor and plan your inventory by getting your material requirement via your BOMs (also called Material Requirements Planning MRP).

3.5.1 Production planning

There are three types of production planning tool

1. **Make-to-Stock:** In these systems, production is planned based on a forecast and then the Items are sold to distributors or customers. All fast moving consumer goods that are sold in retail shops like soaps, packaged water etc and electronics like phones etc are Made to Stock.
2. **Make-to-Order:** In these systems, manufacturing takes place after an firm order is placed by a Customer.
3. **Engineer-to-Order:** In this case each sale is a separate Project and has to be designed and engineered to the requirements of the Customer. Common examples of this are any custom business like furniture, machine tools, specialty devices, metal fabrication etc.

At the heart of the Manufacturing system is the Bill of Materials (BOM). The BOM is a list of all material (either bought or made) and operations that go into a finished product or sub-Item. In ERP Next, the component could have its own BOM hence forming a tree of Items with multiple levels. To make accurate Purchase Requests, you must always maintain your correct BOMs. To make a new BOM:

Manufacturing > Bill of Materials > New BOM

In the BOM form:

1. Select the Item for which you want to make the BOM.
2. Add the operations that you have to go through to make that particular Item in the "Operations" table. For each operation, you will be asked to enter a Workstation. You must create new Workstations as and when necessary.
3. Add the list of Items you require for each operation, with its quantity. This Item could be a purchased Item or a sub-

assembly with its own BOM. If the row Item is a manufactured Item and has multiple BOMs, select the appropriate BOM.

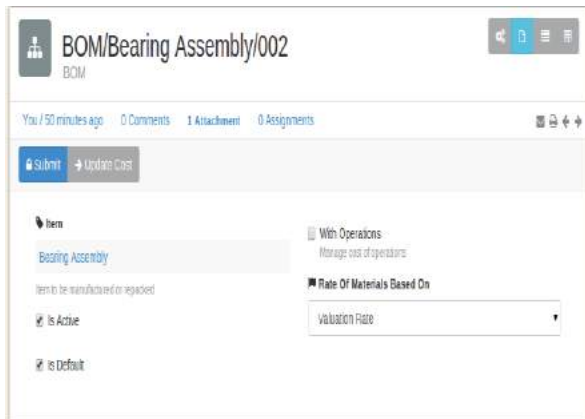


Fig 3 : Window of BOM for bearing assembly

3.5.2. Production Planning Tool

Production Planning Tool helps you plan production and purchase of Items for a period (usually a week or a month). This list of Items can be generated from the open Sales Orders in the system and will generate:

1. Production Orders for each Item.
2. Purchase Requests for Items whose Projected Quantity is likely to fall below zero.

To use the Production Planning Tool, go to:

The Production Planning Tool is used in two stages:

1. Selection of Open Sales Orders for the period based on “Expected Delivery Date”.
2. Selection of Items from those Sales Orders.
3. Click on “Raise Production Orders” to

The tool will update if you have already created Production Orders for this Item against this Sales Order (“Planned Quantity”).

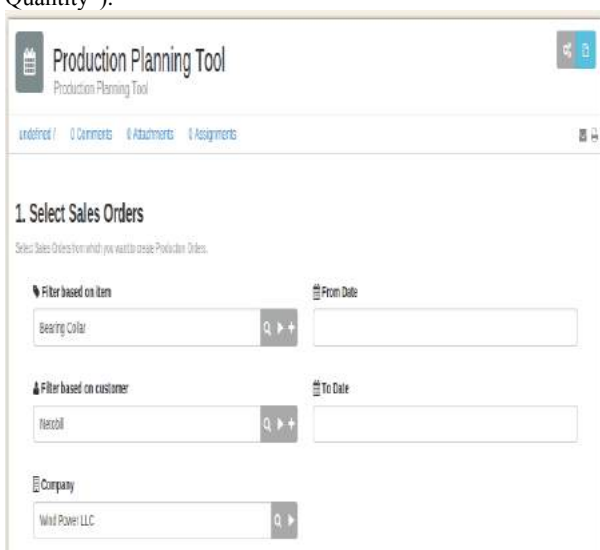


Fig 4 : Production planning tool window in ERP Next

3.5.3 Production Order

Production Order (also called as Work Order) is a document that is given to the manufacturing shop floor by the Production Planner as a signal to produce a certain quantity of a certain Item. Production Order also helps to generate the material requirements (Stock Entry) for the Item to be produced from its Bill of Materials. The Production Order is generated directly from the Production Planning Tool based on Sales Orders. You can also create a direct Production Order by:

Manufacturing > Production Order > New Production Order.Sales

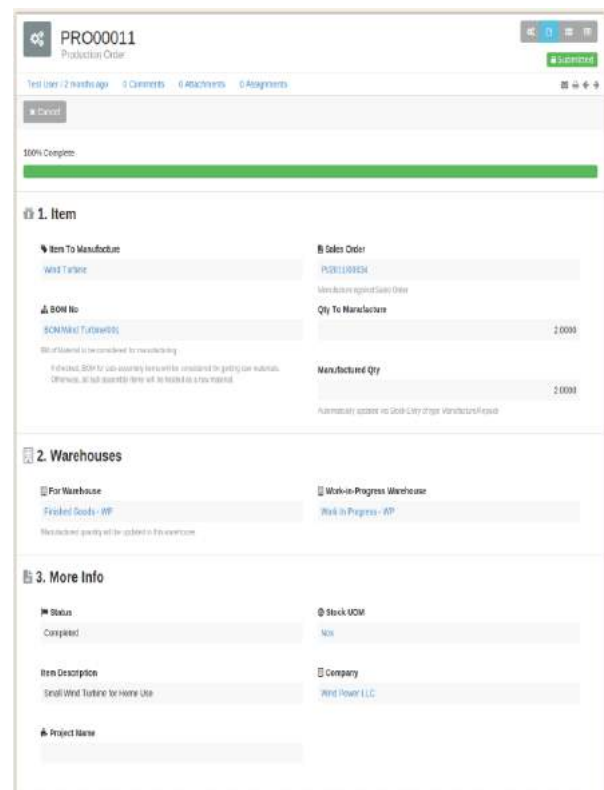


Fig 3.3 : Production planning window

4.0 Conclusion

A well-designed and properly integrated ERPNext system allows the most updated information to be shared among various business functions, thereby resulting in tremendous cost savings and increased efficiency and provide Competitive advantages. Lot of time is saved due to implementation of ERP Next. It increases time to value ratio. Due to its lower cost any small scale and midsize industries implement it also it is very easy to use anyone can use it.

Therefore ERP Next software is very beneficial for small and midsize scale industries.

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Comparison of Circular and Square Shaped Piston Head using analysis of Stresses Induced

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ABSTRACT

The piston is a very important part in various machines like IC engines, hydraulic pumps, air compressors, etc. So the piston design is very important in these machines. Design of a piston has a very important role in the performance of IC engines. In this paper we are considering pistons used in IC engines. Normally pistons with a circular cross section are used, but here a circular piston is compared with a square shaped piston (piston with square-shaped crown). In this comparison we are focusing mainly on mechanical parameters like stress induced, strain induced and deformation of the piston. The paper explains why square pistons cannot be used once the two are compared. The pistons have been designed using SolidWorks and the analysis has been done using ANSYS static structural neglecting the frictional losses.

Keywords

Square-shaped crown, Ansys.

1. INTRODUCTION

In recent years, digital simulation technology has been developing rapidly. Virtual piston is established by SolidWorks easily with the necessary material properties. As is well-known that virtual piston can simulate the product all kinds of character in the real environment. Piston is one of the key components in a motor and it closely relates to the machine performance, carbon emissions and the economy. With the engine, the higher speed and strength developing, its higher pressure ratio and higher power improve constantly. Pistons work condition is more and worse, so its reliability has become the key factors to improve engine reliability. Structure and working environment of pistons are very complex. In the working environment, the pistons will produce stress and deformation because of the periodic load effect, which are from high gas pressure, high speed reciprocating motion from the inertia force, lateral pressure, friction and so on. Burning of the high pressure gas products high temperature, which makes piston, expands in order that its interior produces thermal stress and thermal deformation. The thermal deformation and mechanical deformation will cause piston cracks, tortuosity, etc. Therefore, it is essential to reduce the stress field, temperature field, heat transfer, thermal load and mechanical load coupling of piston in order to lower the heat load and improve the thermal stress distribution and improve its working reliability during the piston designed. Analysis method of the finite element provides a powerful calculation tool, which is better than test method and theory analysis method and has become an important means for internal combustion engine performance study.

The efficiency and economy of the engine primarily depends on the working of piston. It must operate in the cylinder with minimum friction and should be able to with stand high explosive force developed in the cylinder and also the very high temperature ranging from 750K to 3100K(500°C to 2,800°C) during operation. The piston should be as strong as possible. However its weight should be minimized as far as possible in order to reduce the inertia due to its reciprocating mass. Among engine components exposed to thermal effects, the piston is considered to be one of the most severely stressed, where a high amount of the heat transferred to a coolant fluid goes through it, this amount depends on the thermal conductivity of the materials employed, average speed and geometry of the piston. Conventional pistons used everywhere are circular in shape. These pistons are easier to manufacture and have good stress distribution but if we use square piston instead, we will get good result as compared to circular because stress induced will be less. This is shown in this paper. To find the various dimensions of the piston some empirical relations are used.

2. MATERIAL PROPERTIES OF PISTON

Material of Piston: - Aluminum 6061

Young's Modulus [E] – 69 GPa

Poisson's ratio [μ] – 0.33

Ultimate Tensile strength – 310 MPa

Tensile Yield strength – 276 MPa

Shear strength – 207 MPa

Elongation – 12 %

3. SOLIDWORKS MODEL

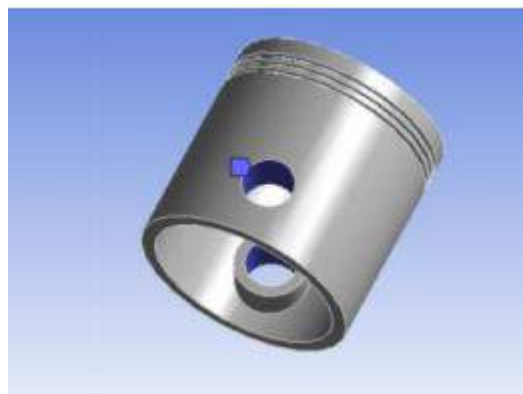


Fig 1: Circular Piston Head

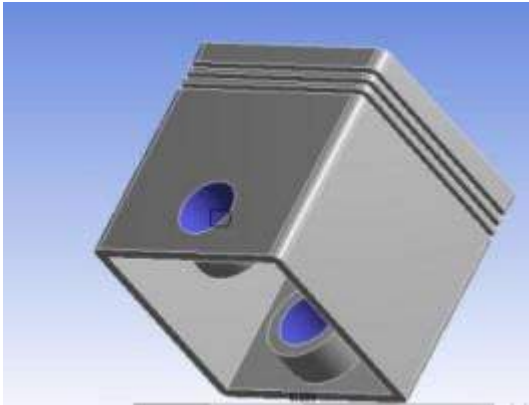


Fig 2: Square shaped Piston Head

4. MECHANICAL ANALYSIS OF THE PISTON

After the simulation model is established, we can get strain distribution and fatigue analysis under the effect of mechanical load by operating the mechanical program. The simulation results of the piston are shown in the figures below. Piston is affected by gas explosion pressure and the reciprocating inertia force and their common feature is that they affect along the axis direction of the piston, so the axis direction of piston bears the bigger load. The results of these simulations analysis provide a strong theory basis for failure problems of the piston.

4.1 Loading & Boundary Conditions

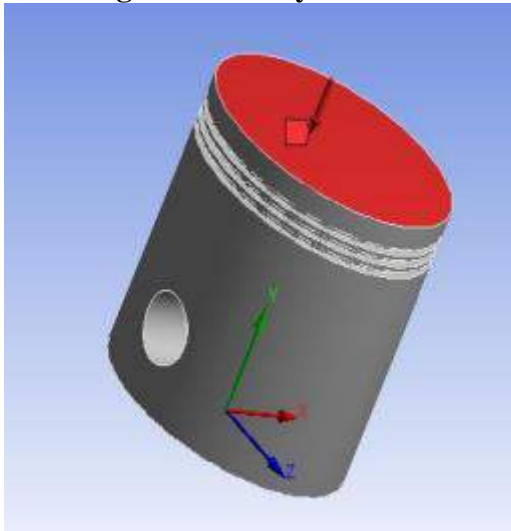


Fig 3: Load on Circular Piston

4.2 Total deformation

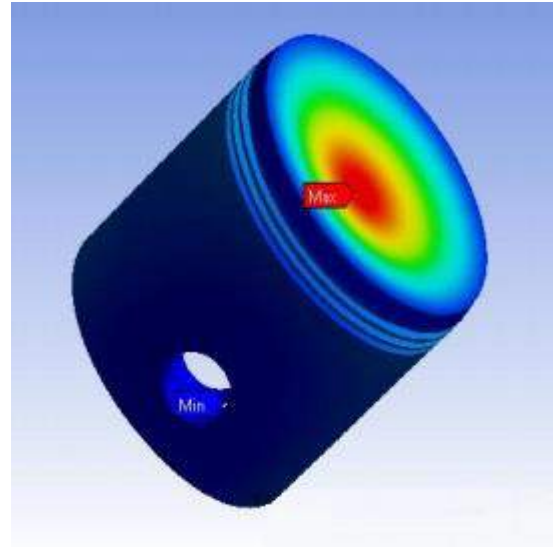


Fig 4: Total Deformation on Circular Piston

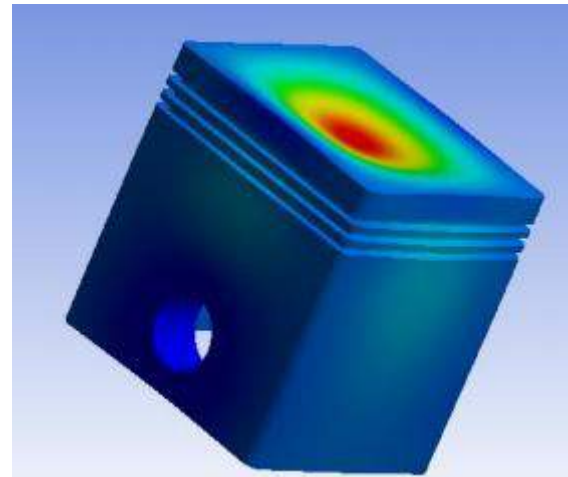


Fig 5: Total Deformation on Square shaped Piston

4.3 Equivalent Stress

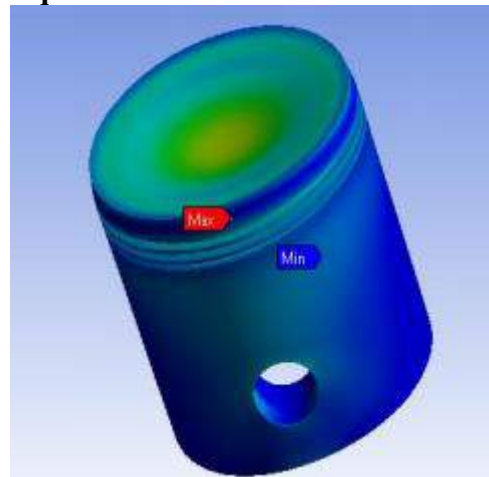


Fig 6: Equivalent Stress for Circular Piston

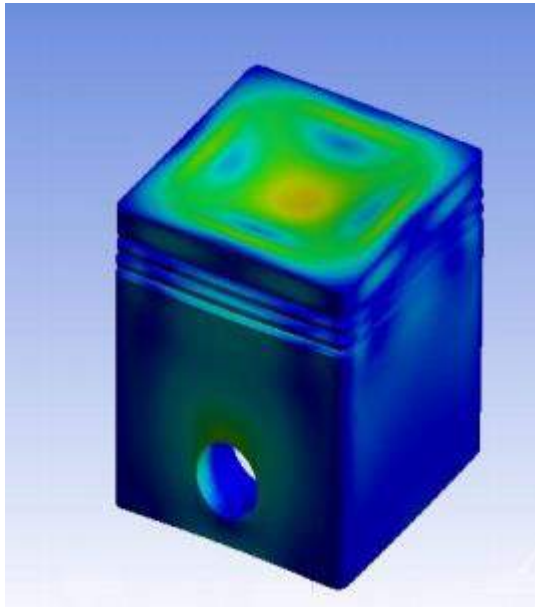


Fig 7: Equivalent Stress for Square Shaped Piston

4.4 Maximum principle stress

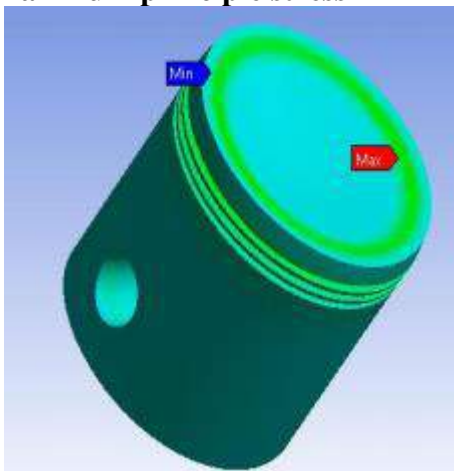


Fig 8: Maximum Principal Stress for Circular Piston

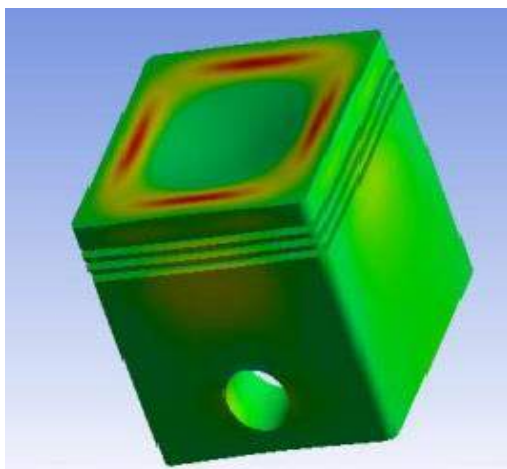


Fig 9: Maximum Principal Stress for Square Shaped Piston

5. DISADVANTAGES OF USING A SQUARE SHAPED PISTON HEAD

- Circular shaped pistons are much easier to bore and machine compared to a square shaped piston head.
- For a given cross-sectional area, a cylinder has the least amount of circumference when compared to any other shape. In pistons, leakage at the circumference is the biggest enemy, so to minimize this; a circular cross section should be used.
- It is much easier to seal a circular shape with O-rings.
- In the case of a combustion engine, the gases just prior to combustion-explosion will be much more evenly mixed in a circular cylinder than a square one, hence resulting in a more efficient explosion and better thrust. A square cylinder would have more turbulence, areas of poor mixing in the corners, etc.

6. RESULTS AND CONCLUSION

It is observed that although fatigue is not responsible for the biggest slice of damaged pistons, but the stresses induced are the major factor for piston failure. From the analysis it can be seen that for some instances a square piston is better. This is seen in case of the total deformation, equivalent stress and maximum principle stress. All these results have been formulated without considering friction and other losses. Although it might seem better to use a square shaped piston head instead of a circular shaped one after looking at these results, but it will require extra cooling arrangements and more maintenance. Square shaped pistons may have applications in some machines, but cannot be used in the modern day practical automobiles, as the losses incurred cannot be afforded. This paper thus explains the shortcomings of square shaped piston heads versus the circular shaped ones and it can be inferred that the circular type of piston heads should be preferred in most of the cases.

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Amphibian Vehicle

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ABSTRACT

This paper includes information about the working model of an amphibian vehicle. It also gives a brief idea of how we are going to proceed with our project 'Amphibian Vehicle'. It also includes how our project differs from the conventional amphibious vehicles. Problem definition and methodology have also been included so as to have a fair idea about the problems regarding the existing vehicles and how we are going to overcome those problems.

The aim of the project is to design and prototype an Amphibious Vehicle capable of operating on land and still fresh water bodies. This Project is to present conceptual design of an amphibious vehicle. It will use motor named as weed eater motor. It can carry up weight up to 120 kg. Total speed on land is 45 km/hr. and on water is 20 km/hr. Material used will be aluminum. It involves the process of design followed with the fabrication process. The total design method is used during the selection of the design stage and transformed into 2-dimensinonal and 3-dimensinal form using CATIA V5 software. Upon completion of design, the fabrication process is implemented to complete the bodywork of the amphibious vehicle.

1. INTRODUCTION

Firstly what does an amphibian means it is something that habitats on land as well as on still fresh water now coming to the amphibian vehicle it is a means of transport viable on both land and water. Amphibious bicycles, ATVs, cars, buses, trucks, military vehicles, and hovercraft are the examples of amphibious vehicles.

Two main categories of amphibious vehicle are immediately apparent: those that travel on an air-cushion (Hovercraft) and those that do not. Amongst the latter, many designs were prompted by the desire to expand the off-road capabilities of land-vehicles to an "all-terrain" ability, in some cases not only focused on creating a transport that will work on land and water, but also on intermediates like ice, snow, mud, marsh, swamp etc. This explains why many designs use tracks in addition to or instead of wheels, and in some cases even resort to articulated body configurations or other unconventional designs such as screw which use auger-like barrels which propel a vehicle through muddy terrain with a twisting motion.

Most land vehicles – even lightly armored ones – can be made amphibious simply by providing them with a waterproof hull and perhaps a propeller. This is possible as a vehicle's displacement is usually greater than its weight, and thus it will float. Heavily armored vehicles however sometimes have a

density greater than water (their weight in kilograms exceeds their volume in liters), and will need additional buoyancy measures. These can take the form of inflatable floatation devices, much like the sides of a rubber dinghy, or a waterproof fabric skirt rose from the top perimeter of the vehicle, to increase its displacement.

Some of the earliest known amphibious vehicles were amphibious carriages, the invention of which is credited to Sir Samuel Benthum in 1781. The first known self-propelled amphibious vehicle, a steam powered wheeled dredging barge, named the Orukter Amphiboles, was conceived and built by united states inventor Oliver Evans in 1805, although it is disputed to have successfully travelled over land or water under its own steam. In the 1870's , logging companies in eastern Canada and the northern United States developed a steam-powered amphibious tug called an alligator which could cross between lakes and rivers. The most successful Alligator tugs were produced by the firm of west and Peachey in Simcoe, Ontario.

One of the first reasonably well documented cases was the 1905 amphibious petrol powered carriage of T. Richmond (Jessup, Iowa, USA). Just like the world's first petrol powered automobile (1885, Carl Benz) it was a three wheeler.

Recently, Gibbs Amphibians has developed a new type of amphibian vehicle, one capable of high speed on both water as well as land. These are some previous case studies which are successful inventions of amphibious vehicles. By taking these references some parameters regarding amphibian vehicle can be improved which can give a compact, environment friendly as well as cost effective amphibian vehicle.

2. REVIEW

Development process involved in developing the composite bodywork of the Amphibious Vehicle and involvement of process of design followed with the fabrication process and total design method is used during the selection of the design stage.

Numerical simulations are carried out to introduce corrections to the body shape so that the water entry process is safe in respect of the possible flooding of the vehicle as well as the actual accelerations and instantaneous trim angles to be expected.

There are two Met centric heights of a ship, one for Rolling and the other for Pitching. The former will always be less than the latter and unless otherwise stated, the Met centric given will be for Rolling and says material selection is a very important part of the whole design.

3. COMPONENTS USED

This amphibian vehicle is cost effective hence the components used are not so costly.

3.1 Chasse

The chasse is the main body on which the whole vehicle will withstand or dependent. The frame made up of rods welded together and supported. On this chasse further components will be connected. A seat is provided for comfort of the operator or driver.

3.2 Wheels

As wheels are the part of the vehicle which will help the vehicle to float, are water tubes mounted and connected through chains for better grip on roads on the two coupled cycle wheels. These wheels will float on the water. The water displaced by the body will be the weight of entire vehicle body, Hence the amount of air filled in the water tubes is also a main aspect for floating.

3.3 Fans

Two Fans are provided at the back of the vehicle for forward thrust. These fans will be operated by motors driven by battery as a power source. These fans are controlled by operator through switches in operator's hands.

3.4 Motors and Battery

Motors are used to give the fans sufficient power required to move entire vehicle forward. Also Battery is used as a power source for motors.

4. WORKING

The working of Amphibian Vehicle is not so much critical. Two motors connected to fans at the back side of vehicle, are responsible for the thrust required for the forward movement of vehicle. Battery will be the power source for the motors.

As there is no handle or not any mechanical forces to turn the vehicle, the switching of motor will be done for that. When right turn is required left fan will be turned off by operator or driver and vice-a-versa. Accordingly turns are also operated and they are simple to operate, just by switches given in hands of the operator or driver.

5. STABILITY

On water there are in fact two Metacentric heights of a ship, one for Rolling and the other for Pitching. The former will always be less than the latter and unless otherwise stated, the Metacentric given will be for Rolling. The essence of stability calculations is finding the force couple between buoyancy. This is the moment of force which a stable ship develops to counteract the overturning moments arising from external forces. From the configuration of the body, it has positive stability for the Meta center is above the center of gravity. The blades should not touch water, so the heel angle is no more than 12 degrees for rolling motion. It is indicated that it can only float on calm water.

6. DESIGNING PHASE

Major design components include Vehicle Frame, Flotation, Drive Train and Propulsion.

Following fig 1 shows flow of designing phase.

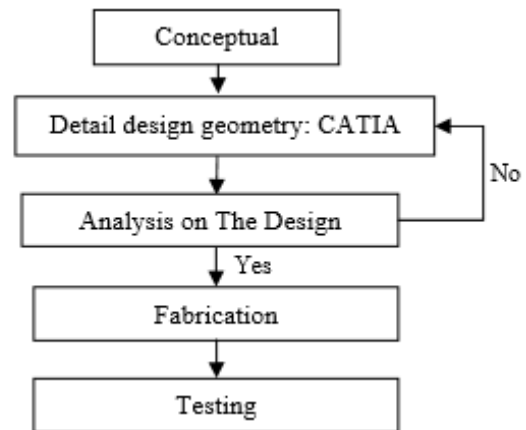


Fig 1: Design Phase

6.1 Frame

It will be designed with the lightest, safest, and most cost effective design possible. The frame incorporates major decisions for both materials and design. Some basic requirements for the material selection of the frame are high strength, light weight, durable, and corrosion resistant. The amphibious vehicle requires a strong frame to carry people and the additional weight of the paddle wheel and flotation device. The frame will also hold the gearing, steering, and peddling systems. The frame material should allow the passengers to access the seats by standing on the frame. The frame material cannot corrode easily on land or water.

6.2 Flotation

Flotation of the vehicle is crucial to the safety of the customer. It will need to provide adequate buoyancy and stability. The flotation will be difficult to construct if the chosen design is large and bulky. The flotation also has the potential to be expensive. The flotation system must keep the vehicle from sinking below the gears and chains so that rusting can be prevented. The flotation must be kept within the frame system in order to reduce the overall size of the AV.

6.3 Drive Train

It will be incorporating the simplest gear design possible. There will be separate gearing systems for both the paddle system and the vehicle movement. The amphibious vehicle will need to have the ability to go forward and reverse on land as well as forward and reverse in water. It is likely that the transmission of an amphibious vehicle will always be more complex than that of a vehicle that is designed for use only on land. For ease of use, the cycle will be designed so that it is powered by the rider using the same set of pedals when on land and water, giving a fluid transition from one medium to the next. The purpose of the transmission is to deliver the power from the rider to the output device to propel the cycle, with possible variation in gear ratios.

6.4 Propulsion

The amphibious vehicle requires propulsion that will provide the vehicle with enough power to navigate still waters. For smooth motion of the vehicle in water, it requires a propulsion system that is capable of generating under-water thrust in the opposite direction of the motion of the vehicle. The propulsion system designed for the AV should be integrated into the drive train for the vehicle. This will allow the efficient

transfer of power from the pedals to the propulsion system. The vehicle should be able to move forward and reverse in water.

7. METHODOLOGY

In fig 2 diagram shows flow of proposed methodology.

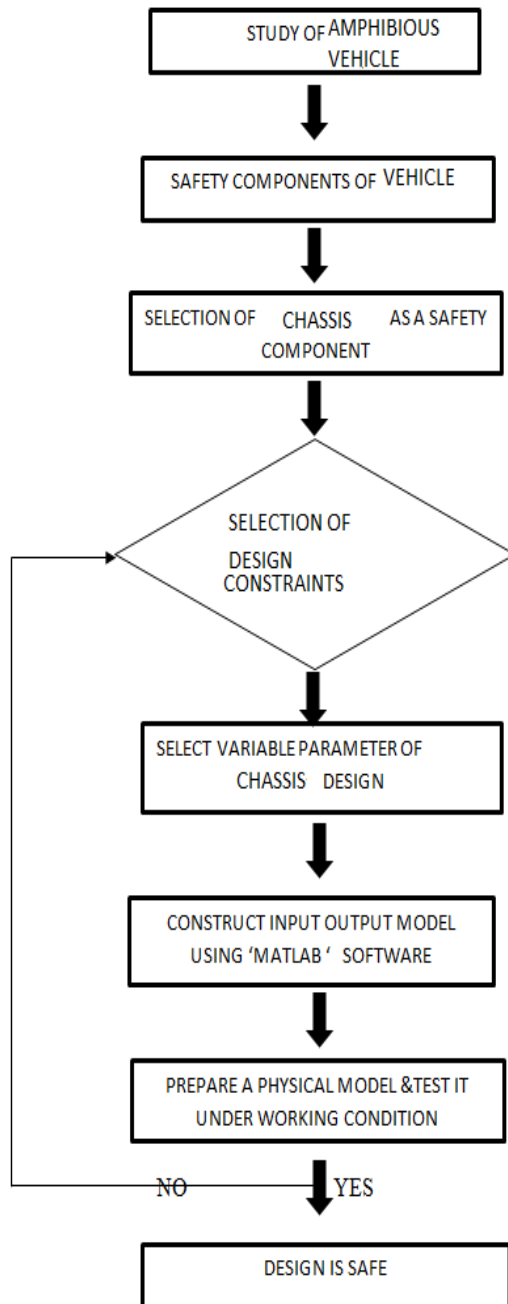


Fig 2: Proposed Methodology

7.1 Research

We went through many designs and studied them and then came to the conclusion of what we need in our project.

7.2 Highlighting the problems

We then came up with what all problems we have to overcome.

7.3 Design

Hence we finalized our design by considering all the problems and its solutions.

7.4 Components

After finalizing the design we decided which all components we should use in order to meet the specification.

7.5 Cost estimation

From the components that we decided to use then estimated the overall cost required for fabrication and assembly of our project.

7.6 Simulation

Then we analyzed our design by using simulation software and determined various load and temperature factors which would be acting on our current model.

7.7 Fabrication

Then we will be implementing all information which we gathered till now and finally fabricate our model.

7.8 Buoyancy test

Then will be finally doing the buoyancy test on our model.

8. ADVANTAGES OVER OTHER AMPHIBIAN VEHICLES

8.1 Design

The design is the major factor on which other factors are dependent so it should be such that it should be simple, compact, cost effective, easy to control, low maintenance etc. We have made our design such that it is compact and simple in construction and hence cost effective. Our design is basically innovative it includes two wheel drive which makes it easy to handle.

8.2 Components Used

The components which are used in the manufacturing of these vehicles are mainly costly and heavy and large number of components was used which in all corresponds to large cost and integration of all such components is time consuming as well as complicated.

8.3 Cost

The cost depends upon various factors such as design, components used, fabrication and process of manufacturing, etc. Hence the main factors would be fabrication cost, manufacturing cost, and also maintenance cost. In our project we have tried to minimize all these things by making the fabrication simple and cost effective also the maintenance cost have been tried to reduce to a great extent and as far as now the manufacturing process we have used is quite simple and cost effective.

8.4 Fabrication

The fabrication processes which existing vehicles have been using are much costlier and also tedious. Our project has simple parts and components of which fabrication is simple and does not cost much. Hence the fabrication cost has been reduced to a great extent.

8.5 Conventional Use

This problem is basically that it has been used only for non-conventional uses and not for daily or conventional use because the vehicles which are already there are not capable of using them on such a large scale and hence our model is very suitable for conventional usage.

8.6 Environmental Concern

This is one of the most concerning issue which has been neglected because the source of power which is used to drive these vehicles on land causes pollution and harms the environment in many other factors. Our project has motors as their drive source and hence no pollution also there are no other factors from which environment will be affected.

9. CONCLUSION

Hence we can conclude that the amphibian vehicle can be used as a better future application with convenient operation. The cities or regions where in case of emergency like floods the required stuff should be delivered on time as well as for the rescue, amphibian vehicle will be one of the options. It is advantageous than other costly vehicles and also environment friendly. It will not cause pollution and also it is cost effective than others.

10. ACKNOWLEDGMENTS

Our thanks to the experts who have contributed towards inventions and developments of amphibian vehicles.

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SELF CHARGING HYBRID BICYCLE WITH FLYWHEEL

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ABSTRACT

The Hybrid Bicycle System is a systems project that incorporates charging a lead-acid battery which is used to power a PMDC MOTOR (Permanent magnet DC motor) running a bicycle. It will be having regenerative charge system, which enables substantially longer distance power assist cycling by regenerating power from pedalling energy (human energy) and charging it in the battery. A flywheel can temporarily store the kinetic energy from the bicycle when the rider needs to slow down. The energy stored in the flywheel can be used to bring the cyclist back up to cruising speed. In this way the cyclist recovers the energy normally lost during braking. In addition to increased energy efficiency, the flywheel-equipped bicycle is more fun to ride since the rider has the ability to boost speed. The hybrid bicycle is a project that can promote both cleaner technology as well as a lesser dependence on oil.

Keywords

Hybrid Bicycle, PMDC MOTOR (Permanent magnet DC motor), Flywheel, Cleaner Technology

1. INTRODUCTION

In present scenario, with increasing number of automobiles the need for petroleum products is reaching the peak point. These petroleum products are non-renewable sources and it has a danger of exhaustion in future, so it is better to move to an alternate energy sources. The price of crude oil has increased significantly over the past few years and there seems to be no turning back. The environment has also been more of a focus throughout the world in the past few years, and it seems that cleaner alternatives have been steadily on the rise with no end in sight. The term "hybrid" usually implies that more than one energy source is used to power all or part of a vehicle's propulsion.

Rechargeable battery is used with long life for charging. DC electric motor is also used in this project.

The hybrid bicycle is a project that can promote both cleaner technology as well as a lesser dependence on oil. It will run on clean electric power with the ability to recharge the battery by generating power through the pedals of the bicycle.

1.1 Background

The basic idea is to attach a motor to the cycle for its motion. A motor that is powered by a battery and that can be switched on during difficult terrains and switched off and pedal to get the battery re-charged during motion in a flat terrain. The idea came into our mind as different stages of project planning, firstly we wanted to implement a simple moving system so the projection of cycle as a system came into our mind, and second stage was adding a necessarily useful component into it that can be beneficial in the future and for common people, falling into the current trend was that of hybrid system so we ended up planning to assemble a motor unit into the cycle drive. There were many issues that came up while making such a system major one of them being the power of the motor to be used, since no such previous systems were made we could not predict the type of motor which we should go for. Second thing being the weight factor, the addition of extra weight on to the system, which can cause discomfort to the rider while normal pedalling. Third was the type of battery to be used, we should go for a battery that has longer life, economically viable, and also has less maintenance issues. Fourth issue was that self-recharging a battery with a motor alternator unit that too with the simple cranking motion of the cycle was not viable, we had to utilize a mechanism that can come in handy here and that was by using the flywheel rotation technique.

1.2 Mechanical Design and System Integration

The main aim was to fabricate a prototype that would be very light and comfortable for the rider to handle. As the motor and other drive components would take in most of the free space in the system our design challenge was to make the motor-alternator unit as a single system. This was our major challenge, for this purpose we developed the motor cum alternator at its minimum possible size and also at the lowest possible cost. Mounting the battery was another challenge, the location of the mounting could have been anywhere in the rest of the space available near the motor or we could have used up the empty space near the carrier. Keeping in mind the comfort of the rider the battery casing was mounted behind the rider, near the carrier location. Looking at the complicated arrangement of the system one may easily think that the drive arrangement could have been completed in a single step i.e. the direct link from the motor to the drive. But the real fact is that this would make the cranking for self-recharging mechanism difficult, since the speed for alternator recharging cannot be achieved by simple cranking a flywheel has to be used to store the cranking energy and thus the rotation and cranking at normal cycling becomes easier .

2. HYBRID SYSTEMS

2.1 Overview

This section of the paper deals with the mechanical design of the system and the various parts used in the system integration. The power transmission system consists of the motor , the chain sprockets, flywheel, housing and the rear wheel. However, before we could select these components, we performed some basic calculations relating energy transfer through the system. Primarily we focused on the current requirements of the system, and a number of torque-speed relationships. Both the acceleration on flat ground and hill climbing ability of the system depend on how much torque can be delivered by the various system components. Before we could size the batteries, we needed to estimate when the motor would demand the most current and the duration that it would draw its peak current. These situations would be at start up (acceleration) and when climbing a gradient. The main components affected by the following calculations are the motor and the battery.

2.2 Components of Hybrid System

2.2.1. PMDC Motor (Permanent Magnet DC motor):

Permanent magnet DC brushed motors (PMDC motors) consist of permanent magnets, located in the stator, and windings, located in the rotor . The ends of the winding coils are connected to commutator segments that make slipping contact with the stationary brushes. Brushes are connected to DC voltage supply across motor terminals. Change of direction of rotation can be achieved by reversal of voltage polarity. The current flow through the coils creates magnetic poles in the rotor that interact with permanent magnet poles. In order to keep the torque generation in same direction, the current flow must be reversed when the rotor north pole passes the stator south pole. For this the slipping contacts are segmented. This segmented slip ring is called commutator. Figure 1(a) shows angular position just before commutation of rotor winding current and Figure 1(b) after it.

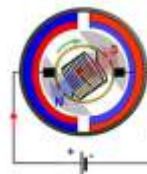


Fig.1 (a) PMDC Motor

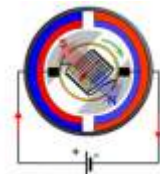


Fig.1 (b) PMDC Motor

2.2.2. Flywheel:

A flywheel is a rotating mechanical device that is used to store rotational energy. Flywheels have a significant moment of inertia and thus resist changes in rotational speed. The amount of energy stored in a flywheel is proportional to the square of its rotational speed. Energy is transferred to a flywheel by applying torque to it, thereby increasing its rotational speed, and hence its stored energy . Conversely, a flywheel releases stored energy by applying torque to a mechanical load, thereby decreasing its rotational speed. Flywheels are typically made of steel and rotate on conventional bearings; these are generally limited to a revolution rate of a few thousand RPM. Some modern flywheels are made of carbon fiber materials and employ magnetic bearings, enabling them to revolve at speeds up to 60,000 RPM. Our design, due to the simplicity of its application, uses a flywheel which is made up of cast iron having a diameter of 17cm. Carbon-composite flywheel batteries have recently been manufactured and are proving to be viable in real-world tests on mainstream cars. Figure 2 shows the CAD drawing of the flywheel.

2.2.3. Batteries:

3. ACKNOWLEDGMENTS

4. CONCLUSION

5. REFERENCES

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Practical application of Taguchi method for optimization of process parameters in Compression Molding Machine for Silicon Blue Rubber O Ring.

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1. ABSTRACT

Abstract- Compression molding is a very popular polymer processing methods due to its high production rate as well as its ability to produce complex shapes of Rubber product at very cheaper cost and in a limited period of time. The old concept of using the trial and error method to determine the process parameters for compression molding machine is no longer good enough because the complexity of product design is now increased and the requirement of multi-response quality characteristics is needed. For Determining optimal process parameter settings critically influences productivity, quality, and cost of production in the Rubber compression molding industry. This article aims to analyze the recent research in determining optimal process parameters of compression molding machine. These approaches, including Taguchi method, Design of Experiment, Finite Element Method, Non Linear Modeling, Response Surface Methodology,. The difficulty of optimizing ancompression molding process is that the performance measures usually show conflicting behavior. In this paper compression molding process parameter optimization for Silicon Blue Rubber material has been done using the Taguchi methodology. This methodology provides the optimum value of process parameter with the help of orthogonal array by conducting only few experiments. We used Processing Curingtemperature, Hydraulic pressure,

Curing time and Loading weight as a process parameter and optimized the process parameters by considering Hardness as a resulting factor.

Key Words: optimum value, and orthogonal array, process parameters.

2. INTRODUCTION

Introduction

compression molding is one of the most important processes for rubber polymer. Maximum amount of all the rubber products are manufactured by Compression molding machine.

A piece of uncured rubber is placed in die mould. The mould is closed up and held under hydraulic pressure while the rubber cures. When the mould opens the part can be removed. The excess rubber is called Flash, needs to be trimmed off the part.

experiments.

3. LITERATURE REVEIW

John S. Dick, "A Study Report on Compound Processing Characteristics and Testing", presents the study report on the compound processing characteristics and testing, The information about the **compound** processing along with the different machinery used is presented. The procesability characteristics of the rubber compound such as elasticity, time of scorch, viscosity etc. are defined and the methods of the determination of these characteristics are presented. The method of direct shrinkage measurement is presented as per ASTM

D1917.151

J. S. Bergstrom, "Constitutive Modelling of Elastomers - Accuracy of Predictions and Numerical Efficiency", outlines the current state of the art in finite element modelling of elastomers, and exemplifies the predictive capabilities of modern constitutive theories for filled elastomers. As commercial FE packages typically come with a selection of material models that are suitable for elastomers, under certain loading conditions. Most of the built in models which are hype realistic models, which are effective at predicting the average behaviour of an elastomer, but do not capture rate effects, dynamic loading, hysteresis, or Mullins effect. The study in this paper compares predictions from these different material model combinations with experimental data for two filled elastomers.

W. V. Mars, A. Fatemi, "Observations of the Constitutive Response and Characterization of Filled Natural Rubber under Monotonic and Cyclic Multiaxial Stress States", explores the monotonic and cyclic behaviour of filled, natural rubber. Results of stress-strain experiments conducted under stress states of simple, planar, and equibiaxial tension are presented. The ability of hyper elastic models to capture the observed response, as well as the recent developments in constitutive modelling of filled rubber such as the consequences of the Mullins effect, are discussed.

1.1 Taguchi's Concept

Taguchi's concept is based on the effective application of engineering approach rather than advanced statistical analysis. It focused on both upstream and

shop-floor quality engineering concept. Upstream methods effectively reduce the cost and variability by use of small-scale experiments, and used robust designs for large-scale production and market aspect. Shop-floor techniques facilitate economical, real time methods for monitoring and maintaining quality aspects in production.

Taguchi proposes an off-line strategy for quality improvement as an alternative to an attempt to inspect quality into a product on the production line.

His approach gives a new experimental strategy in which a new developed form of design of experiment is used. In other words, the Taguchi approach is a form of DOE with some new and special application approach. This technique is helpful to study effect of various process parameters (variables) on the desired quality and productivity in a most economical manner. By analyzing the effect of various process parameters on the results, the best factor combination taken [10]. Taguchi designs of experiments using specially designed tables known as "orthogonal array". With the help of these experiments table the design of experiments become the use of these tables makes the design of experiments very easy and consistent [11] and it requires only few number of experimental trials to study the entire system. In this manner the whole experimental work can be made economical. The experimental outcomes are then transformed into a S/N ratio. Taguchi suggest the use of the S/N ratio to investigate the quality characteristics deviating from the standard values. Usually, there are three type of classification of the quality characteristic in the study of the S/N ratio, i.e. the-lower-the better, the-higher-the-better, and the nominal-the-better. The S/N ratio for each category of process parameters is computed based on the S/N analysis. Regardless of the category of the quality characteristic, a greater S/N ratio corresponds to better quality characteristics. Therefore, the optimum level of the process parameters is the level with the greatest S/N ratio, so in this manner the optimal

combination of the process parameters can be predicted.

1.2 Process parameters

There are a number of machine settings that allows the control of all steps of slurry or melt preparation, Some important parameters of them are like Curing temperature, Curing Time, Loading Weight, Hydrualic Pressure, All of these process parameters we have selected process parameters

2. Experimentation

2.1 Selection of process parameters

There are a number of machine settings that allows the control of all steps of slurry or melt preparation, injection in to a mold cavity and subsequent solidification. Proper selections of all the process parameter put direct impact on the quality and productivity of the Rubber product so by considering all these factors some important process parameters like Curing temperature, Curing Time, Loading Weight, Hydrualic Pressure are selected and for conducting the experiments some set of definite values of all the process parameters are taken in the Table-1. The values of process parameters are taken by the proper discussion with the industry .After confirming about the significance of all the process parameters the values of the process parameters are listed as a table.

S.NO.	Process Parameters	Unit	Level 1	Level 2
1	Curing temperature	°C	170	180
2	Hydraulic Pressure	PSI	2500	2700
3	Curing time	min.	6	5.5
4	Loading weight	Grams	3	5

TABLE:1 Selected values of process parameter

2.2 Orthogonal Array Preparation After selection of definite values of the process parameter L9 orthogonal array has been selected depending upon the total degrees

of freedom for the parameters. Rubber Compression

S. N .	A (C.T)	B (C.Tm.)	C (H.P)	D (L.W)	Hardness
1	170	6	2500	3	60
2	170	5.5	2700	5	68
3	170	4	3000	6	68
4	180	6	2700	6	69
5	180	5.5	3000	3	64
6	180	4	2500	5	63
7	190	6	3000	5	68
8	190	5.5	2500	6	64
9	190	4	2700	3	67

molding experiments were carried out on a Compression molding machine

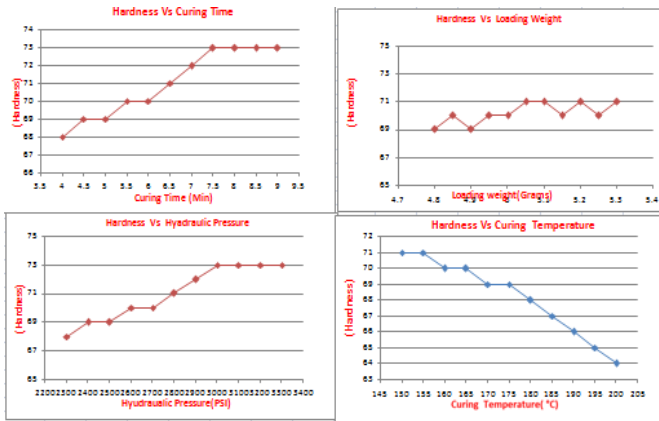


FIGURE : Compression Molding Machine

For conducting the experiments the setting of the process parameters has been done as per the given values in Table-1

TABLE-2: Experimental result for Hardness

Here in the Table -1 nine set of experiment has been designed for selected process parameters like Curing Temperature (A), Hyaudralic pressure (B), Curing time (C) and Loading Weight (D) as per the Taguchi L9 orthogonal array design system, for optimization of process parameters Hardness is considered as a result parameter and hence it is measured Graphically Calculated Mean Value.



Level	A (C.T)	B(H.P)	C(C.Tm.)	D(L.W)
1	0.6222	0.4941	0.6102	0.5866
2	0.5019	0.5794	0.6453	0.5560
3	0.5734	0.5742	0.7251	0.5840
Delta	0.1281	0.1433	0.1516	0.0305
Rank	3	2	1	4

TABLE-3: The main Effect of the factors on Grey Relational Grade.

3. CONCLUSIONS

The main Effect of the factors on Grey Relational Grade is given in table 3, and the best set of combination parameter can be determined by selecting the level with highest value for each factor. As a result, the optimal process parameter

combination for silicon Rubber is A3, B2, C3, D2. The difference value given in table 5 denotes which factor is the most significant for Hardness of Silicon Blue Rubber O-Ring, The Optimal combination was Curing Time (C) – Hydraulic Pressure(B), Loading Weight (D), Curing Temperature(A)

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SIGNIFICANCE OF TOTAL QUALITY MANAGEMENT IN EDUCATION SYSTEM

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ABSTRACT

Total Quality Management (TQM) is recognized as an important management philosophy and is widely used in industries. TQM is the art of managing the whole to achieve excellence. It is the application of quantitative methods and human resources to improve all the processes within an organization. The overall objective of this paper is to highlight the general principles of TQM involved and to point out how this approach has been and can be used to improve the quality of an academic institution. The 14 Points of Dr. W. Edwards Deming, which form a framework for the implementation of the TQM are explained.

Keywords

Total Quality Management, management philosophy, human resources, quality, and academic institution.

1. INTRODUCTION

Higher education faces a new era as a result of changes in the way people view colleges and universities. Expectations for better performance in terms of teaching and producing competent college graduates are increasing. One model for higher education is the success of many companies that have bettered their overall performance and products using "total quality management" (TQM). TQM is primarily concerned with increasing customer satisfaction through an integrated framework that examines the relationships between various system wide elements and makes data-driven decisions to reduce errors and waste in processes.

TOTAL Quality Management (TQM) was first espoused by Dr. W. Edwards Deming in the late 1950's. His ideas were not accepted by US industry but were heartily endorsed by Japan in their recovery from World War II. Largely as a result of the implementation of TQM, 'Made in Japan' has changed from a derogatory term to high praise. In the 1980's, US industry began to see the value of a TQM approach. Such companies as Motorola and Federal Express have turned failing companies into world leaders. Motorola now do a good deal of business selling to Japan. Universities, however, have been slower to see the value of using TQM in their business.

While the educational "product" is not the same as that of industry, higher education can improve the way it offers and delivers courses, provides student services, and manages and conducts research. TQM can help universities find solutions as

it stresses continuous improvement of processes and products. It is important to note that every organization implementing TQM must define it in a way that fits its culture. Instead of "customers", "workers" and "products", university personnel might prefer to simply speak of "students". Students, like customers, are provided a service; like workers, they are asked to produce research papers, homework problem sets, projects, etc.; and like products, they are "sold" to business, industry, government and service agencies after graduation. There are other customers, however, because faculty members could think of themselves as customers of administrators, support staff and students; faculty are also processors of raw materials, like students and research ideas; and suppliers of services to students, parents, administration, businesses, scholars, and legislators or others with political power. Moreover, university faculty also have management responsibilities. Whatever terminology is adopted TQM requires looking at the interdependence of roles people play in a system of continuous improvement.

2. PRINCIPLES OF TQM

The one factor that is the most influential in the success or failure of a TQM implementation effort is universal endorsement, in particular at the top. If management is not completely sold on TQM, it is unlikely that an implementation effort will be successful. Endorsing TQM represents a fundamental change in the way one does business. Less than full support by anyone in the chain of authority essentially condemns the effort to failure.

3. DEMING'S 14 POINTS

The 14 points of Dr. W. Edwards Deming form a framework for the implementation of TQM [1]. We have used this list as a checklist of sorts in our effort. These 14 points are general enough that an implementation at one school would probably look considerably different from one at another school. The way that these 14 points should be used is to come to a consensus as to the application of each point to the particular situation at hand. In the following paragraphs, we will present some suggestions on how each point might be applied to the university setting in the administration of the university and in the curriculum. Realize that these are just suggestions, many of which will be totally inappropriate at a particular university. Our purpose here is to give some food for thought and suggest by comparison a methodology one could use to apply TQM to a unique situation.

3.1 Create constancy of purpose

Develop a mission statement as your corporate purpose or aim. For example, the mission statement for a university might be, 'To develop the skills, attitudes, and motivation in our students so they will become responsible citizens and be capable of making positive contributions to society.' The mission statement for a college of engineering might be, 'To develop the skills, attitudes, and motivation in our students so they will perform in a technically competent, socially responsible, and ethical manner as engineers entrusted with the safety and comfort of their clients.' Developing a mission statement is not a trivial task; it requires a real understanding of just why the organization exists. The mission statement is also hierarchical; the department's mission depends on the college's mission, which depends on the University's mission, and so on. Once the mission statement is developed, everyone (not just the faculty and administration, but everyone employed by the University) must know how they contribute to the mission. The analysis suggested here is to assess the value added by a process. If a process or a position does not add value, that is, does not contribute to the mission, it should be eliminated.

3.2 Adopt a new philosophy

Insist on quality in everything-classroom instruction, bookstore service, campus policing, restroom cleaning and interactions with the legislature -everything. To achieve this quality, an atmosphere of cooperation as opposed to competition must be instilled. This is particularly true in the classroom; management must ensure that the processes put in force encourage cooperation at every level student to student and faculty to student. Do away with the 'us versus them' attitude. Instead ask questions like, 'What can we, the faculty and staff, do to make the learning experience in this classroom better?' or 'What can we, the teacher and the students, do to ensure every student has the best opportunity to learn this material?' It is a completely different approach than most of us experienced in school as students.

3.3 Cease dependence on mass inspection

Focus on the product or service process. Don't depend on audits, tests, or inspections to build quality. Inspections will only keep bad products from hitting the market, but there are large costs incurred with each bad piece. The analogy in education is that the failed student is scrap that must be either reworked (take the course again or get extra tutoring) or discarded. We need to develop processes in which there is less testing but more focus on progress in learning. For example, ask yourself why you are giving a particular test. If the answer is to evaluate your students, then ask yourself if you need this extra piece of evaluative information. There is evidence that we test far more than is needed to evaluate our students [7]. On the administrative side of the university, are there too many checks and balances? Can a process be changed to make inspections unnecessary or at least to reduce the need for inspections? Statistical process control can be an important tool in developing processes that do not require much inspection [8].

3.4 End the practice of conducting business on cost

The lowest bid usually does not result in the lowest life-cycle cost. In all our processes, we need to focus on long-term costs

and benefits. That may mean that the trendy new course not be offered if it means the failure of a course with more long-term value. Awarding the printing contract to an off campus vendor may have lower first cost, but the inability to get adequate turn-around time or poorer quality may make the overall cost of that decision very high. University professors often complain about the poor job the high schools are doing in preparing students for college. The long term costs of supplying educated people to society may be less if some of the resources of the university were spent on improving high and junior high schools.

3.5 Constantly improve processes

Are your customers (the students and their future employers) more satisfied than they were last semester? Are the faculty members happier? Are the secretaries happier? Are the suppliers of the University happier? If the answer to a question is no, find out why and fix the situation immediately. If the answer is yes, determine what it was in the process that made it so. In any case, analyse the process to determine what changes can be made to make it better. Incremental improvements must be made every semester. This is essentially the Kaizen philosophy to encourage innovation, but insist upon incremental improvements, especially after the innovation [9]. The phrase, 'if it's not broke, don't fix it,' does not apply. To help decide where to look for things to improve, use course grades, student performance on 'anchor' problems, student critiques, faculty and staff organizational climate surveys, inputs to suggestion boxes, summaries of complaints, etc. Carefully designed questions on anonymous surveys can be very valuable, but talking directly to the customer is still the best way to find out what the barriers are. There is a side benefit to talking directly to the students about their problems they appreciate it and make the 'us versus them' attitude much less likely.

3.6 Institute training

Everyone needs to know their job. The faculty is certainly well educated in their disciplines but maybe not in the art of teaching. Faculty development programs help teachers know their jobs. Word processing classes help secretaries do their job better. Money spent on faculty and staff training has long-term payback. In addition, you should teach TQM to everyone faculty, staff, and especially students. The more everyone knows about the management principles used on a daily basis, the easier it is for everyone to buy into the idea.

3.7 Institute leadership

Emphasize leadership instead of management. Everyone at the university has a leadership role of some sort. Each person in a supervisory role (including the faculty) should try to be a coach and teacher, not a judge and overseer. As put by the leader should be a designer, a creator of an environment [6]. Effective leaders will search for barriers to communication and productivity and remove them. A poorly lit classroom can have a significant effect on student performance. A teacher who is an effective leader will see to it that the lighting problems are fixed. A teacher, who will adjust the due date on a project based on special student situations, will probably increase the learning of his students.

3.8 Drive out fear

In the academic setting, fear is often a big factor in student and faculty performance. For students, any steps that can be taken to reduce the fear involved in taking a test will pay large benefits in student performance and attitude. Allowing for a make-up exam, points for reworking missed problems on an exam, and dropping a low grade are examples of little things that can be done to reduce student fear. Teachers must balance their roles as educators versus evaluators. When asked, most professors will readily say that their job is to educate their students; however, the amount of time they spend on evaluation tends to contradict this view. On the faculty and staff side, fear can also play an important role. If a high price must be paid for failure, few people will be willing to risk experimenting with a promising new innovation, thus keeping a process improvement out of the system. If a teacher would like to try an innovative teaching technique, the effort should be applauded even if it is a failure. Certainly something of value will have come from the experiment. Researchers must have the opportunity to fail without the fear of demotion or lack of promotion opportunity. Fear is a powerful emotion and can have very negative effects on the performance of an organization.

3.9 Break down barriers

Encourage cooperation, not competition. Encourage the forming of cross-function teams to address problems and process improvements. A team made up of faculty, staff, and students (perhaps from more than one department) will have a broader perspective in addressing issues than a more narrowly composed committee. When addressing a problem in the registration process, address it with a team consisting of representatives from every involved organization: faculty, advisors, students, registrar, computer services, etc. A solution devised by only one organization will usually have a negative impact on some other organizations. Bringing everyone in on the decision process will usually result in a better solution, and certainly one that is easier to accept.

3.10 Avoid obsession with goals and slogans

Just telling someone to do well is meaningless without the means to achieve that goal. Management must improve the processes so that the goals can be achieved. Stating that 80% is the minimum acceptable score on an exam will not by itself achieve that goal. Stating that goal and then providing excellent instruction, arranging for study teams, giving extra help where needed, etc. will give the students a much better chance for success.

3.11 Eliminate numerical quotas

For It is often said that numbers are the crutches of poor supervision. On the assembly line, this principle is easy to see; in the academic setting, it is not as obvious but just as true. If there are quotas established for 'x' number of papers per year or 'y' number of majors enrolled, quality will decrease. The number one priority should be quality. Only after the process is designed so that quality is assured should the questions of quantity be addressed.

3.12 Remove barriers to pride of workmanship

Pride is a strong motivator. In the academic setting, pride certainly flows from personal and group achievements, but there is also a good deal of pride in the institution as well. Often this institutional pride is a result of having survived the program, but it can also stem from having had a part in the development of that program. If the students are included in some of the decision making processes, they will develop a strong pride of ownership that can have a significant impact on their attitudes. A step as simple as talking to student representatives about their concerns can change an antagonistic faculty/student relationship into a cooperative one. Using some of the elements of cooperative learning also empowers the students by sharing some of the teaching role with the faculty. A secretary who is allowed to choose how the work is to be done and has a voice in some of the administrative decisions that affect secretarial work will be a much more productive and happy worker. Barriers between departments and colleges should be dismantled; each professor can learn a lot by studying the operation of another department.

3.13 Organization-wide involvement

Everyone in the institution must be included in the education process and be aware of and concerned for their immediate 'customer'. Lab technicians who sit in on the courses that they support will have a much better idea of how their work contributes to the mission. Secretaries who learn about new techniques and technologies for use in the office are much more likely to suggest improvements to the processes they are exposed to. Professors should audit courses in other departments, particularly those courses that are prerequisites for their own courses. Faculty members who learn about TQM are much more likely to endorse the concept and to suggest new ways to implement TQM in their jobs. One cannot predict just what piece of knowledge will spark the idea that will lead to a significant process improvement.

3.14 Define management's responsibilities to make it happen

Management, at every level but particularly at the very top, must take and show pride in adopting the TQM philosophy. The meaning of each of the 14 points as related to the mission must be clear to all involved. This is not a trivial process; a good deal of time must be spent in analysing the various processes and discussing how the 14 points relate to those processes. The time spent in this effort forms the foundation for all of the TQM implementation.

4. APPLICATION OF THE 14 POINTS

The above 14 points are very general. When TQM is successfully applied, it is a result of a careful study of each point and a clear determination of how each applies to the situation at hand. No two applications of TQM will be the same. The form that a particular implementation takes is dependent on many factors such as the size of the institution, whether the institution is private or public, and the strengths of the people involved, but the most important variables are the maturity of the students and the involvement of the employer. Careful consideration of all aspects of the

educational system will help determine just how the TQM implementation will ultimately look. The principles of TQM can also be applied to high school, middle school, and elementary school educational processes as well as to training situations. The principle differences in the implementation of TQM will be the result of the relative weight assigned to each of the customers at the different levels of education. The weighting that is applied is primarily the result of the maturity of the students, but there are other considerations as well. For example, in elementary schools the most important customers, listed in order of importance, are the parents of the students, the students themselves, and the middle school to which the students are headed. As the maturity of the students increases, the students replace the parents as the most important customer. In a training situation, the most important customer is the organization that needs the individuals trained. Regardless who your primary customer is, it is essential that the students be included in the list of customers.

5. CONCLUSIONS

TQM can be a powerful tool in the educational setting even though it was developed with manufacturing processes in mind. The key elements to a successful implementation are (1) gain the support of everyone in the chain of supervision, (2) identify your customers, (3) focus on refining the process, and (4) use Deming's 14 Points as a guide and checklist during the implementation effort. The final result will be a more efficient operation and a teamwork attitude between faculty and students.

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Pedalled Refrigeration

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Abstract— Adsorption refrigeration system is eco-friendly and non-hazardous refrigeration and has greater potential to act as an alternative to conventional refrigeration system, for domestic as well as vaccines preservation purpose, with no or less electricity consumption. This refrigeration system has and will replace the conventional refrigerants with a pair of adsorbent and adsorbate which will be non-toxic. The condenser, compressor units will no longer be part of this refrigeration system adding to decreased power consumption leading to eco-friendly refrigeration. It will also serve the purpose of mobile refrigeration unit which can thus widen the scope of refrigeration which was limited to a static place with source of electricity.

Key Terms—

Adsorption, Evaporator, Zeolite, Water

I. INTRODUCTION

The job of a refrigeration plant is to cool articles or substances and maintain them at a temperature lower than the ambient temperature. Refrigeration can be defined as a process that removes heat. Refrigeration is a process in which work is done to move heat from one location to another. The work of heat transport is traditionally driven by mechanical work with use of electricity. Refrigeration has many applications, including, but not limited to : household refrigerators, industrial freezers, cryogenics, and air conditioning. Economizing energy, environmental protection and sustainable development are all the main themes of the contemporary world in the 21st century. In order to protect the ozoneosphere in the atmosphere and the ecological environment, the treaty of ozone layer protection was implemented. But the deterioration still continues. According to the newly observation of NASA, the holes in the ozoneosphere over the North and South Poles has surprisingly enlarged to about 28,600,000km² since this holes with 29,800,000km² as per survey in 2006.

This unprecedented growth in speed of the hole formation in the ozoneosphere which indicates that depleting of ozone has not been effectively controlled. The utilization of CFC will be restricted more severely. Therefore, many attempts have been made to replace the traditional CFCs vapour compression refrigeration. However, the adsorption refrigeration machine can use natural working fluids as the refrigerants. There is a large demand for cooling of food and vaccines in the developing countries. Vapour compression refrigerator requires electricity supply, which is often only available in urban areas. Indian scenario, as per 2014, over 24.6% Indian citizens had no access to electricity. Over 32.8% of Indian's rural population lacked electricity, as did 6% of the urban population. Of those who did have access to electricity in India, the supply was intermittent and unreliable. In 2014, blackouts and power shedding interrupted irrigation and manufacturing across the country. With such current scenarios been faced by the country vapour adsorption system if gets into a reality then many problems of power consumption can be solved.

I. LITERATURE SURVEY

[1]. Adsorption heat pumps have considerably sparked attentions in recent years. The present paper covers the working principle of adsorption heat pumps, recent studies on advanced cycles, developments in adsorbent-adsorbate pairs and design of adsorbent beds. The adsorbent-adsorbate pair features for in order to be employed in the adsorption heat pumps are described. The adsorption heat pumps are compared with the vapor compression and absorption heat pumps. The problems and troubles of adsorption heat pumps are classified and researches to overcome the difficulties are discussed. Adsorption heat pumps (AHP) which have gained remarkable attention in recent years offer an alternative method for cooling and heating systems and for storing energy while considering environmental aspects which is one of the vital issues of novel technology. This study includes the working principle of adsorption heat pumps, a detailed literature survey, general information about adsorption phenomena, experimental results of two designed and constructed AHPs, the numerical analysis for modeling the systems and microcalorimetric research for obtaining isosteric heat of water vapor - silica gel pair. Based on the obtained

numerical and experimental results, following remarks can be concluded from the study;

1- One of main problems in the application of adsorption heat pumps is leakage. This problem was overcome in the first and second designed and constructed adsorption heat pumps. Thus, the repetition of the cycle under the same pressure levels in spite of many connections such as valves, pressure transducers, and thermocouples were provided. The COP of cooling of the AHP-1 was found between 0.41 and 0.44. For the presented cycles, the SCP and SHP values were found as 0.25-0.37 and 0.83-1.17 W kg⁻¹ respectively. The period of the cycles was around 6600 minutes.

2- In order to increase COP, SCP and SHP values of the adsorption heat pump, the second intermittent adsorption heat pump was designed and manufactured. The heat transfer area of adsorbent bed of AHP-2 was increased from 0.74 m², which is heat transfer area of adsorbent of AHP-1, to 4.08 m² by using the fins. Additionally, heat exchangers were mounted in the evaporator and condenser to provide cold and hot water. The experiments were performed by the AHP-2 and two representative cycles were presented. The COP of presented cycles was achieved around 0.53 which is 22% higher than that of AHP-1. The SCP and SHP values were also found as 1.34 and 1.76 W kg⁻¹, respectively. These values are 200% and 170% greater than the SCP and SHP values of AHP-1. The improvement of heat transfer rate increased the SCP and SHP values of the system, since the period of cycle was reduced. The period of presented cycle was around 6000 minutes. However, the period of cycle of the second AHP-2 still 130 was long which may constitute an obstacle for commercial application. The results of the AHP-2 showed that the use of fins for enhancing heat transfer through the bed is not sufficient and hence another solution is required to accelerate the heat transfer. The use of fins decreased the ratio of mass of adsorbent over metal mass of bed, therefore the most of the energy is consumed to heat and cool the metal mass of bed.

3- In order to achieve higher SCP and SHP, the thermal conductivity of the adsorbent bed should be improved to possess a higher rate of heat transfer through the adsorbent bed of AHP-2. For the enhancement of thermal diffusivity of the silica gel bed, metal pieces were added to the adsorbent bed. The silica gel granules were mixed separately with four different metal pieces as aluminum, copper, brass and stainless steel (AISI-304). The experiments were performed for two size ranges of metal pieces as 1 – 2.8 mm and 2.8 – 4.75 mm. The obtained results showed that, the heat transfer rate in the bed containing aluminum additive of 1-2.8 mm size, is higher than other additives because of the higher thermal diffusivity. The thermal conductivity and thermal diffusivity of pure silica gel were enhanced by 153.5% and 90.5%, respectively with loading 15wt% aluminum additive. The increase of thermal diffusivity and conductivity of silica gel – Al can increase the performance criteria of adsorption heat pump. For enhancing the heat transfer rate through the adsorbent bed without decreasing the COP of AHP-2, 10wt% of Al additive was mixed with silica gel adsorbent. The difference between the thermal diffusivity values of 10wt%

and 15wt% Al loaded adsorbent bed was not significant. Moreover, the adsorption capacity for 10wt% Al-silica gel mixture is higher than that of the 15wt% Al-silica gel mixture due to the high amount of silica gel for 10wt% of Al addition. The addition of 10wt% of Al into silica gel in the adsorber increased the heat transfer rate and the cycle period was significantly reduced from 6000 min to 2800 min. However, the decrease of the COP of system compared to the AHP-2 without Al pieces was only 15%. The amount of silica gel in the adsorber was reduced from 40kg to 32kg. The SCP and SHP values of Al loaded AHP-2 were found as 1.1 and 3.3 W kg⁻¹ and an increase around 250% for SCP and SHP values were observed.

4- The isotherms, kinetics and heat of adsorption of water vapor adsorption on silica gel were provided by using Tian-Calvet type microcalorimeter which is a volumetric system. The amount of adsorbate decreased with the increasing adsorption temperature. The silica gel adsorbed 0.6, 0.98, 1.1, 1.4, 2, 3.5, 11, 13 and 14 %wt water vapor at 120, 110, 100, 90, 75, 60, 40, 35 and 30°C, respectively. Therefore the maximum water adsorption capacity of silica gel was found as 14% for 30°C adsorption temperature. The increasing adsorption temperature decreased the differential heat of adsorption due to the reducing adsorbate-adsorbent interactions as shown in Figure 6.3. The isosteric heats of adsorption were calculated by using Classius-Clapeyron equation from isotherms. The Classius – Clapeyron diagram of water-silica gel pair was also drawn by using obtained isotherms as shown in Figure 6.6. The obtained curves in the Classius – Clapeyron diagram were modeled (Equations 6.4 and 6.5) for using in numerical study. The diffusivities of water vapor inside the silica gel for short and long range periods were described by using kinetics data as a function of temperature (Equation 6.7 and 6.8) in Arrhenius form. For further study, the short range water vapor diffusivity can be used. The Biot mass numbers were estimated for the temperatures of cycle processes. The Biot numbers indicate that the intraparticle mass transfer resistance is dominant relative to the external mass transfer resistance around the adsorbent granule. For considering importance of heat or mass transfer inside adsorbent bed, the Lewis numbers were determined at four temperatures. The results indicate that the thermal resistance in the adsorbent bed is important relative to the mass transfer resistance in the bed.

5- The governing equation for heat and mass transfer in an annular adsorbent bed filled with the adsorbent granule were derived and these equations were numerically solved for two cases. In the first case, the temperature and concentration profiles of a dried adsorbent bed during the adsorption process were obtained. The obtained numerical results showed that the increase of porosity reduced the bed thermal conductivity and consequently heat transfer rate through the bed. Even for porosity of 0.1, heat transfer controls the period of adsorption process. At the beginning of adsorption and desorption process, a steep pressure gradient in the radial direction of the bed having low porosity occurs but the gradient decreases after a short period. In the second case; the numerical results for a complete cycle of adsorption heat pumps

involve isobaric adsorption, isosteric heating, isobaric desorption and isosteric cooling were successfully obtained. The permanent cycle can be obtained after two cycles, in other words at least two cycles should be performed to reach the permanent cycle. The period of cycle takes 152h for the simulated annular adsorbent bed.

[2] Solid sorption refrigeration is a type of environmental benign and energy saving technology and the sorbents utilized can be divided into physical, chemical and composite sorbents, according to the nature of the forces involved in the adsorption process. The types, characteristics, advantages and disadvantages of different adsorbents, refrigerants and working pairs are summarized in this paper, together with the models that describe the adsorption equilibrium. Moreover, some of the procedures to prepare composite adsorbents are presented. The application of different working pairs for different situations is related with the adsorption heat, the adaptability to the driving temperature and to the desired working pressure. The methods to measure the adsorption quantity of different working pairs are compared, and future research directions of adsorption working pairs are also analyzed.

[3] During the last 25 years, interest in the closed adsorption heat pump and refrigeration systems has increased steadily. Nevertheless, these systems have inherent drawbacks and are not able to compete with the well-known vapor compression system. Solar adsorption refrigeration is realized using a combination of adsorbate and adsorbent. The pressure and concentration of the adsorbate are cycled by varying the temperature of the adsorbent to produce cooling and hot water. In recent years several papers have been published in this area and many aspects of the system were addressed. We begin by looking at the basic requirement of the adsorption system.

[4] Two adsorption refrigeration working pairs of zeolite with water and ethanol were studied and the parameters of Dubinin-Astakhov model were regressed using the experimental data of equilibrium. The coefficient of heterogeneity varied from 1.305 to 1.52 for the zeolite-water pair and from 1.73 to 2.128 for zeolite-ethanol pair. The maximum adsorption capacity varied from 0.315 to 0.34 for zeolite-water and 0.23 to 0.28 for zeolite-ethanol, respectively. The results showed that the zeolite-water pair is suitable for solar energy cooling not only because of the high latent heat of vaporization of water but also because of the better equilibrium performance. On the other hand, zeolite-ethanol gives a high adsorption capacity at high regeneration temperature, which means it can be used in heat engine systems like buses and cars. In the design of adsorption refrigeration, one of the key factors is the choice of the adsorbent-adsorbate pair, because the characteristics of both adsorbent and adsorbate play an important role in the adsorption cycle. From the experimental results reported in this paper, the coefficient of heterogeneity of the zeolite-ethanol is higher than that of zeolite-water but the adsorption capacity of the last one is higher than that of the first one.

ethanol is not. At regeneration temperature less than 100 °C the zeolite-water adsorption capacity is greater than that of the zeolite-ethanol but at the temperature higher than 100 °C the zeolite-ethanol is higher than that of the water-zeolite. On the other hand, water is convenient in adsorption cooling because of its high latent heat of vaporization but for an application below 0 °C it cannot be used while ethanol can be.

[5] The synthesis of zeolites (molecular sieves) with a wide variety of engineered structures and properties requires profound theoretical and laboratory experiments. Recently, there is an increasing interest in the field of designing and preparation of synthetic zeolites in three main directions (by treatment of natural zeolites, which preserves their initial crystalline structure; by natural clay minerals; and by conventional hydrothermal synthesis). An objective of this work is to review the current trends in zeolite synthesis as well as their structure and classification. Attention is given to the zeolite synthesis from industrial wastes, particularly from fly ash, and their role in solving environmental problems.

II. ADSORPTION

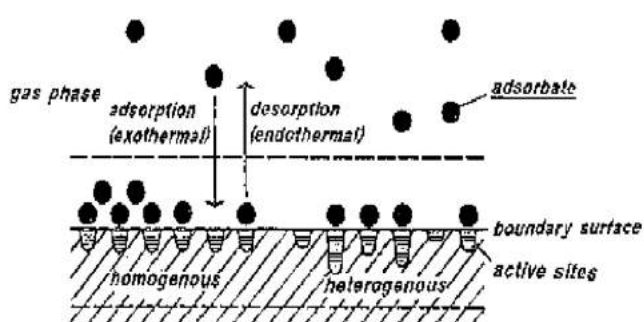
Adsorption is a process that occurs when a fluid (gas or liquid substance which is called as adsorptive) interacts with the surface of a solid (adsorbent). Two types of interactions occur between adsorbent surface and fluids which are physical adsorption (physisorption) and chemical adsorption (chemisorption). Physical Adsorption involves physical bonding (H-bonds, Van der Waals, dipole-dipole interactions etc...). Chemical adsorption takes place with chemical bonding (covalent bonds). Chemical and physical adsorption can be distinguished by following properties.

- Physisorption generally occurs multilayer adsorption, chemisorption only takes place as monolayer adsorption
- Physisorption is a non-specific which means interactions (dispersion attractive and/or short range repulsion) between adsorbate and adsorbent does not specified. Contrarily, chemisorption is specific due to polar nature of the adsorbent or adsorptive.
- Physisorption occurs with polarization of adsorbate. In chemisorption, there is bond formation between adsorbate and surface of adsorbent.
- Physisorption is generally reversible process but chemisorption is irreversible process.
- Physisorption is always exothermic and evolved energy is not much larger than the energy of condensation of adsorptive. The energy of chemisorption is the same as the energy change in chemical reaction.

- At low temperature, in chemisorption the system can not be reach thermodynamic equilibrium but in physisorption the system attain equilibrium rapidly (Rouquerol et al. 1999, Ruthven 1984)

III. ETHODOLOGY

1. Initially vacuum is created in adsorbent (zeolite) unit using vacuum pump.



2. Valve connecting vacuum pump & evaporator chamber is opened and that of adsorbent container is kept closed.
3. Vacuum is generated in the evaporator chamber containing adsorbate (methanol), with help of vacuum generating system.
4. This reduces the partial pressure of water, as a result phase transformation takes place from liquid to vapour state
5. Heat utilised in the phase transformation is extracted from the refrigerator.
6. Now the vacuum system valve is closed and that of zeolite to evaporator is opened, this makes the passage for zeolite to adsorb the vaporised particles over its surface area in an evaporator box, viz. Physical adsorption phenomena.
7. On completion of above five steps a slight depression of temperature is observed over the surface evaporator chamber.
8. By repeating the whole cycle for number of times we can obtain considerable cooling effect in the cooling unit.

III. EQUIPMENTS

- **Vacuum Pump**
Vacuum pump is being used in this procedure to create natural suction vacuum. Vacuum is required to decrease vapor pressure of adsorbent to decrease the boiling point of adsorbent. Adsorbate will be naturally sucked into the adsorption chamber for adsorption process to start
- **Zeolite container**
It will consist of adsorbate of the process. It will be connected to the adsorption chamber by means of valves which will be manually controlled.
- **Refrigeration Unit**
The adsorbent will receive heat from the refrigeration unit which will lead to decrease in temperature of the unit leading to refrigeration
- **Power Unit**
The vacuum pump can be powered by manually or by providing electricity to the vacuum pump. The process of providing power to vacuum pump manually is to connect shaft to vacuum pump. By rotating the shaft the power can be transmitted to the vacuum pump.
- **Evaporating Chamber**
The major process of this experimental setup i.e Adsorption will be carried out in this totally sealed chamber. This chamber will carry water which is going to be boiled in the chamber in presence of vacuum which will help reduce the boiling temperature of water which will be adsorbed by the incoming zeolite

IV. ADVANTAGES

- Sustainability
- Environment friendly approach
- Cost efficient
- Non-hazardous
- Innovative (which is global demand right now)
- Can utilize waste heat as main driving energy
- High reliability
- Large energy saving potential

V. FUTURE SCOPE

This concept of refrigeration will bring out a new advent in the industry of refrigeration. It will lead to concept of Mobile Refrigeration to surface. It also aims to bring the Fridge which is kept at a perfect place to open air thus leading to big future in this industry. This concept can also be used for highly remote places where electricity is just a dream.

VI. CONCLUSION

Zeolite-Water pair was selected among the other pairs because it undergoes Physisorption which is reversible and can work in low temperatures also.

After looking out for various pairs of adsorbent and adsorbate it seems that the methanol-zeolite 13x pair and water zeolite 13x/4A/5A can help in optimized utilisation of refrigeration system based on adsorption. The references that are being mentioned also hint that there is a possibility of conducting this experiment on a successful note by selecting the right adsorbent and adsorbate pair. There is another option of optimizing the parameters using different pairs and evaluating the results.

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COMPACT WHEELS

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ABSTRACT

In present scenario, with increasing number of automobiles the need for petroleum products is reaching the peak point. These petroleum products are non-renewable sources and it has a danger of exhaustion in future, so it is better to move to an alternate energy like electrical energy. Moreover, electric power is the most efficient, reliable and economical energy of all the forms of sources available.

As we are using fuel combustion engines in all automobiles, which releases huge amount of greenhouse gases like CO₂, CO...etc., results in global warming. Considering, the environmental aspects, the "E-Bicycle" can considerably bring down the percentage of pollution produced by automobiles. Diesel and petrol vehicles should be replaced by their respective requirements such as tricycle for auto-rickshaw, tram cars for buses etc.

The main objective behind handling this project is towards providing efficient and simple method for control speed of DC motor along with its compact design that makes it portable.

There are several methods for controlling the speed of DC motors. One simple method is to add series resistance using a rheostat. As considerable power is consumed in the rheostat, this method is not economical.

This project deals with the principle of conversion of electrical energy into mechanical energy by using D.C motor installed in the front wheel of a bicycle. Here the motor is powered by a rechargeable battery. The speed of the D.C motor will be controlled by using speed controller, which varies the average D.C voltage applied to the motor. This bicycle is driven electrically. The main objective of this project is to make the design compact as well as to show how efficient, economical and eco-friendly this "E-Bike" could be.

Keywords

Compact, E-BIKE (Electric bike), PAMD (Portable assisted mobile device), DC (Direct current).

1. INTRODUCTION

The compact wheels is a light weight private electric bike. It is small in size compared to typical bikes.

It has foldable design that makes it compact and portable, thus can be carried along to places where normal bikes and bicycles cannot be carried.

2. PRINCIPLE

The basic principle used is conversion of electric energy into mechanical energy by means of a DC motor.

3. MODEL DESCRIPTION

The inspiration was penny farthing, it consists of a big front wheel and small rear wheel. The modifications in the design were, front wheel is to be made hub less and the space inside it was to be used for placing its motor and electronic components.

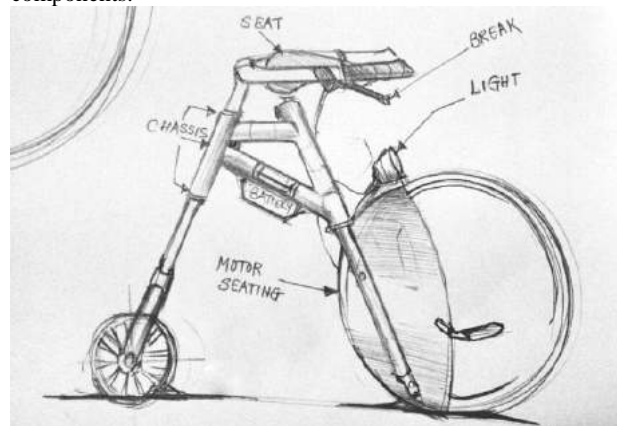


Fig 1: Prototype design

3.1 Frame materials

Materials available for frame are steel, Aluminum alloys, titanium, carbon fiber, Thermoplastic, magnesium, scandium, beryllium, bamboo, wood, combination. Various parameters like strength, flexibility, fatigue strength and endurance limit etc. were considered for selecting the material for the frame.

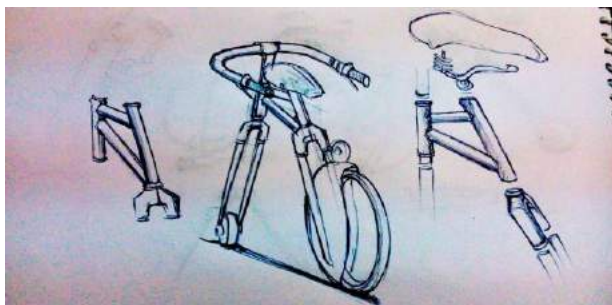


Fig 3: frame

3.2 Hubless wheel

Hub-less wheel is wheel with no Centre, more More specifically, the hub is actually almost as big as the wheel itself. The axle is hallow following the wheel at very close tolerance.

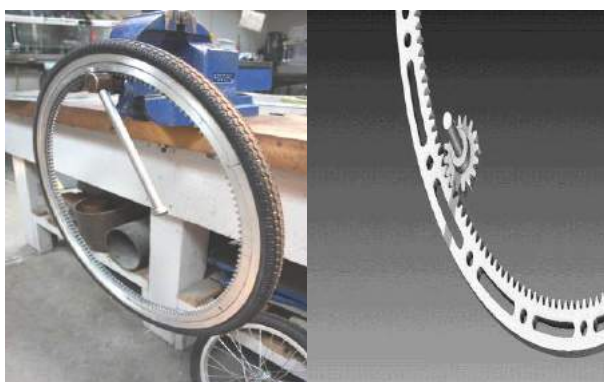


Fig 2: Hubless wheel

3.3 Electronic components

- A 200-250Watt ,30-36V DC motor
- Battery 30-36V
- Driver for charging
- Electronic speed controller

4. CAD Design

In cad design the frame was made according to the load carrying capacity and was covered to make the design look esthetically and ergonomically correct also the front wheel was covered to hide the electronic components. The following are the parts that are designed in cad and manufactured for the assembly.

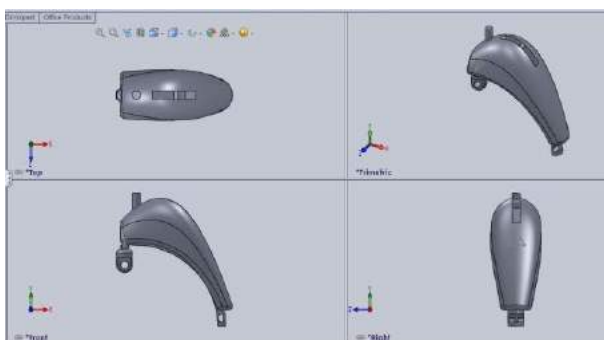


Fig 4: chassis

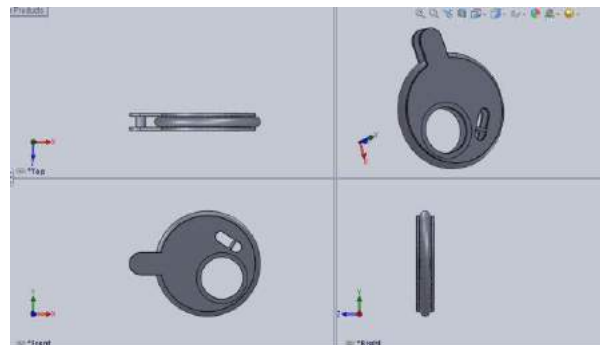


Fig 5: front wheel

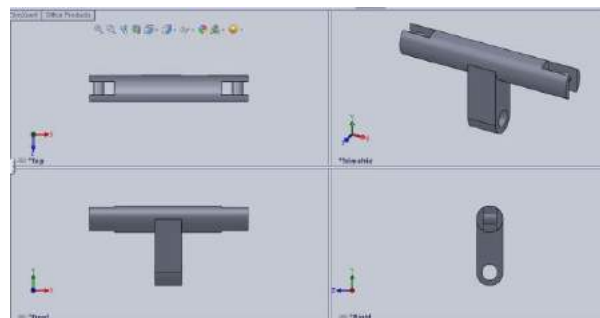


Fig 6: handle part 1

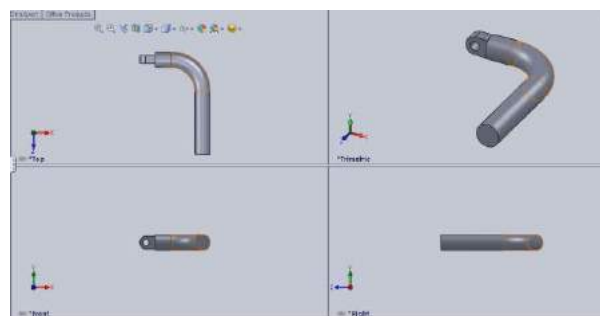


Fig 7: handle part 2

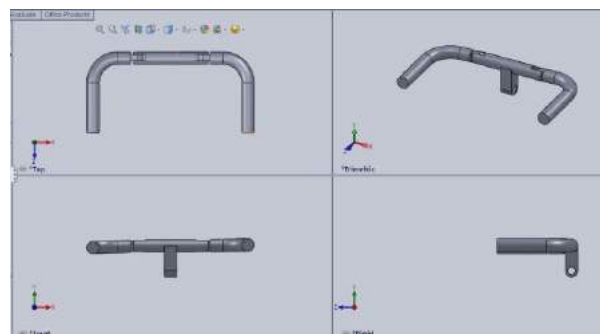


Fig 8: complete handle

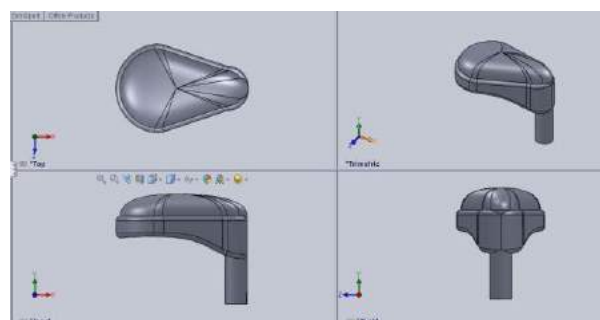


Fig 9: saddle

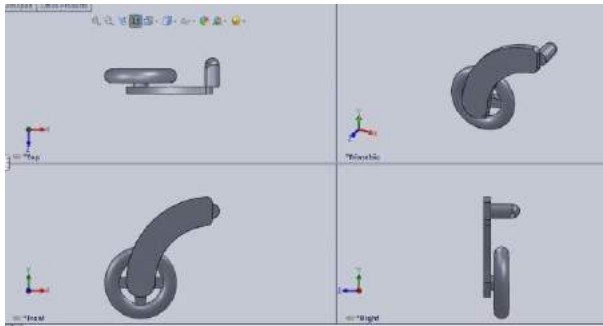


Fig 10: rear wheel

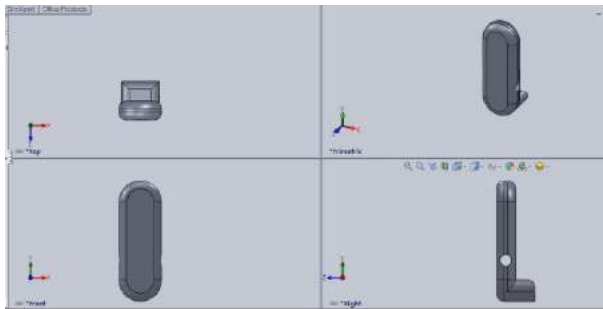


Fig 11: foot pegs

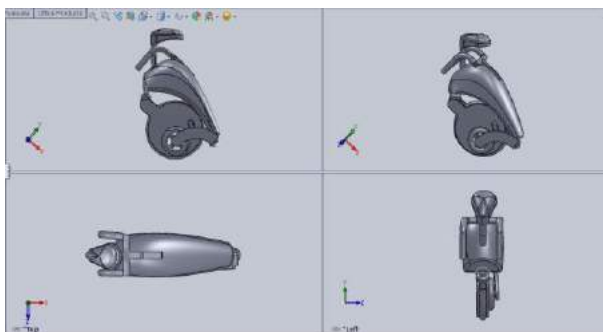


Fig 12: assembly (fold)



Fig 13: assembly (unfold)

5. ADVANTAGES

- New small design makes it stable and easy to drive.
- Easy to accelerate and brake/stop.
- Affordable price
- Limited speed adds a safety point.
- Easy to drive no professional skills are required.
- Easy to ride on incline and decline surface.
- It is foldable and portable.
- If rider hits pedestrians then no serious accident takes place because of its light weight

6. FUTURE SCOPE

INDIA is a developing country but along with the development there is increase of pollution every year. Indian government thus decided to promote eco-friendly vehicles the FAME India - Faster Adoption and Manufacturing of Hybrid and Electric vehicles in India ,offering incentives on electric and hybrid vehicles of up to Rs 30,000 for bikes and Rs 1.30 lakh for cars.

A scheme has been formulated by the ministry to promote hybrid and electric vehicles. Indian government will going to spend about Rs 14,000 crore on this scheme, under the scheme, public transport system in metropolitan cities would be encouraged to use hybrid and electric models.

Therefore this project is adopted considering the future need of the individual and also it contributes to environment by producing no emission, its ecofriendly.

7. CONCLUSION

After going through a lot of various electric bikes along with their advantages and disadvantages we came up to final conclusion that Compact Wheels can become a favourite choice for Indians amongst various electric bikes present in INDIA.

Study of various materials finally landed us to a right material for our design, which helped for reducing the cost of the product, when compared to other electric bikes. which is the most important factor of our design. It is possible to use less material but with accurate design, for the structure/chassis of the e-bike.

It can be useful in alleviating the urban transportation problem. It successfully provides an alternate way for large city commuters to travel short distances within cities. Our design also proved to be an improvement on the existing devices in the realms of speed, portability, comfort, and price.

8. ACKNOWLEDGMENTS

Firstly, I would like to thank our project supervisor, prof. Swapnil Raut, for his help in the project and for providing a surprisingly open door for meetings, despite his busy schedule.

In addition, we would like thank to all other professors for their help with the engineering difficulties we had and also for creating the CAD drawings seen throughout the project.

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Progressive Tool Design and Development for Productivity Improvement of Limit Switch Component

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ABSTRACT

A progressive die performs a series of operations on sheet metal at two or more stations during each press stroke in order to develop a work piece. Each working station performs one or more distinct die operations as strip moves from the first station to last station for producing a complete part. The linear travel of the strip stock at each press stroke is called the “progression”, “advance” or “pitch” and is equal to the infestation distance. The main advantage is that it improves accuracy of product as computer-aided design and machining is used to build precision tooling in less time and at a lower cost.

In this paper main steps are Design, Analysis and Productivity Improvement. In this die there are Six stages combined together to get the component by optimal design. By using this design we can produce accurate components. The steps in manufacturing of Limit Switch Component are Side cropping-1, Piercing Hole-2, Notching-3, Corner Bending-4, U Bending-5 and Slitting-6. In this project the complete tools is designed, according to American Society of Mechanical Engineers (ASME) standards. The Static analysis of the tool is done considering boundary condition as load on punch and die. The Modeling, Assembly, Analysis and Drafting is done by using Solid-Works and AutoCAD software.

General Terms

Piercing, Notching, Bending, Slitting.

Keywords

Progressive Die, Design, Analysis.

1. INTRODUCTION

In progressive die multiple stations are align in a row. In this die two or more operations are performed simultaneously at a single stroke of the press by mounting separate of dies & punches at two or different stations. The metal sheet is progressed from one station to the other till the complete part is obtained. The progressive punching & banking die is shown in Figure 1.1.

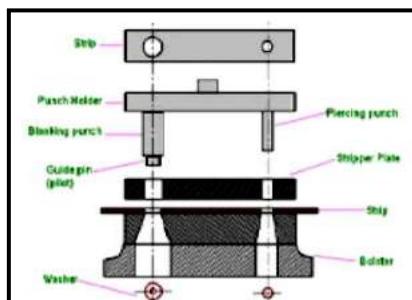


Figure1.1 Simple Progressive Punch and Die

In progressive tool the final component is obtained by progressing the sheet metal or strip in many stages. In each and every stage the component will get its shape stage by stage the full shape will be obtained at the final stage. Progressive dies provide an effective way to convert raw coil stock into a finished product with minimal handling. As material feeds from station to station in the die, it progressively converts into a completed part. Progressive dies usually run from right to left. The part material feeds one progression for each press cycle. Early stations typically perforate holes that serve as pilots to locate the stock strip in later stations each station. Between strokes the piece in the metal strip is transferred to the next station. The progressive tool is used in mass production.

1.1 Objective

1. To develop a standard design procedure for reduce the process time.
2. To improve the production rate.
3. To design and analyze the progressive tool for Limit switch component as shown in Figure1.2

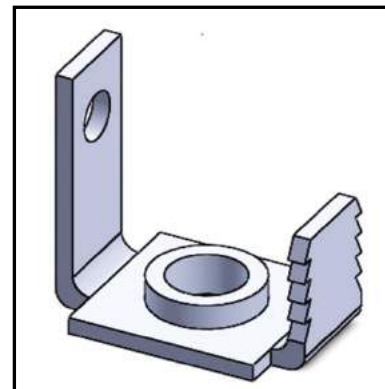


Figure1.2 Limit Switch Component

1.2 Strip Layout

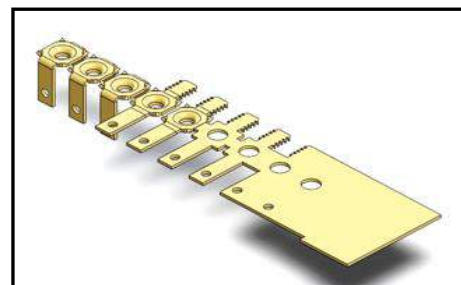


Figure 1.3 Strip Layout

The strip layout is being designed for Progressive tool so that, we can maximize the production, reduce the tooling cost and save labor cost. By using this strip layout we are able to get 54 pieces / strip. The strip size used is 29 mm x 300 mm.

1.3 Construction

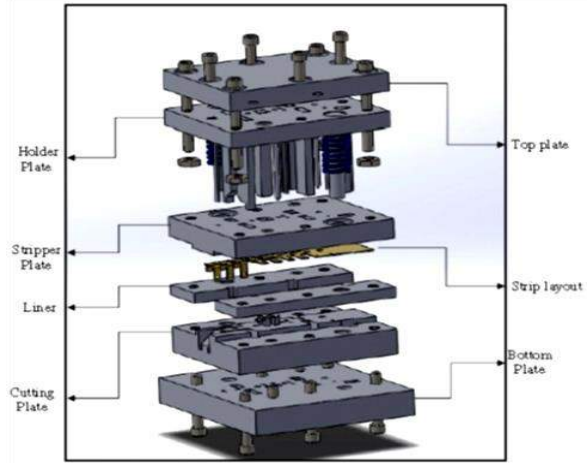


Figure 1.4 Construction of Progressive tool for limit switch component.

The general nomenclature of tool used in press is called Dies. The various components of die set are as follows.

a. Top plate b. Punch holder plate c. Stripper Plate d. Strip layout e. Liner guiding f. Die plate g. Bottom Plate h. Side Stopper i. Piercing Punch j. Notching Punching k. Bending Punch l. Slitting Punch m. Other accessories like Allen screw, spring, Guide pins, Dowel pins, etc.

1.4 Working

In progressive die, multiple stations are applied in rows.

1. In this die, two or more operation are performed simultaneously at a Single stroke of the press by mounting separate dies and punches at two or more different station.
2. In this die there are Six stages combined together to get the component as Output.
3. The metal sheet made of brass is progressed from one station to the other till the complete part is obtained.
4. In first stage side cropping punch crops the sheet to its required size.
5. In second Stage Piercing of holes with 5mm and 2mm diameter.
6. In third stage notching operation takes place.
7. In fourth stage corner bending takes place.
8. In fifth stage U bending takes place.
9. In sixth operation slitting takes place and component is ready for next

2. DESIGN OF PROGRESSIVE TOOL

General steps of designing progressive tool are Strip Layout, Material utilization Factor, Tool Selection according to Quantity, Tool Costing.

2.1 Steps in Design of Progressive Tool

Main steps to design Progressive Tool are as follows:

1. Part Specification.
2. Determination of force required for the operation.
3. Selection of press for required force, work piece size and shape.
4. Strip Layout & Material Utilization.
5. Design Clearance for cutting plate.
6. Thickness of die block & margins.
7. Selection of Stopper & Stripper.
8. Design of Screw.
9. Design of Dowel.
10. Strip Guides.
11. Elimination of Back plate.
12. Thickness of Bolster plate.
13. Tool shut height & Punch Length.
14. Selection of Die Set.

1. Part Specification:

Sheet size = 29 x 300mm
Material = Brass
Ultimate shear strength = 30 kg/mm²
Material thickness = 0.8 mm

2. Determination of force required for the operation:

a. Cutting Force for $\phi 5$ mm

$F_1 = \text{Perimeter of Cut} \times \text{Thickness} \times \text{Shear Strength}$
 $F_1 = \pi \times 5 \times 0.8 \times 30 = 376.99 \text{ kg}$

b. Cutting Force for Work Piece $\phi 2$ mm

$F_2 = \text{Perimeter of Cut} \times \text{Thickness} \times \text{Shear Strength}$
 $F_2 = \pi \times 2 \times 0.8 \times 30 = 150.79 \text{ kg}$

c. Cutting Force for Side Stopper

$F_3 = \text{Perimeter of Cut} \times \text{Thickness} \times \text{Shear Strength}$
 $F_3 = 29.48 \times 0.8 \times 30 = 707.52 \text{ kg}$

d. Cutting Force for Notching Punch

$F_4 = \text{Perimeter of Cut} \times \text{Thickness} \times \text{Shear Strength}$
 $F_4 = (45.83 + 37.20) \times 0.8 \times 30 = 1992.72 \text{ kg}$

e. Cutting Force for Notching

$F_5 = \text{Perimeter of Cut} \times \text{Thickness} \times \text{Shear Strength}$
 $F_5 = (2 \times 8.50) \times 0.8 \times 30 = 408 \text{ kg}$

f. Cutting Force for Slitting

$F_6 = \text{Perimeter of Cut} \times \text{Thickness} \times \text{Shear Strength}$
 $F_6 = 11.20 \times 0.8 \times 30 = 268.8 \text{ kg}$

g. Bending force

$F_7 = (2.6L/t \times ft)/W = (2.6 \times 27 \times 0.82 \times 30)/5$
 $F_7 = 269.56 \text{ kg}$

Where, L= transverse length, T=Thickness of blank
ft = Tensile strength (N/mm²), W =Width (mm)

Total Cutting Force = $F_1 + F_2 + F_3 + F_4 + F_5 + F_6 + F_7$
 $Tf = 4443.94 \text{ kg}$

Total Cutting Force = 4.443 Tones

3. Selection of Press for Required Force

Assume 33% more force

Total force = $4.443 \times 2 = 8.886 \approx 10 \text{ Tones}$

Press selected is of 10 Tones

4. Strip Layout & Material Utilization

% Material utilization = $\text{Area of blank on strip} / \text{Area of strip before blank}$

Area of strip before blank = $29 \times 300 = 8700 \text{ mm}^2$

Area of component = 146.46 mm²

No of component = 34

% Material utilization = $(146.46 \times 34) / 8700 \times 100$

Material utilization = 57.23%

5. Design Clearance for cutting plate

Assuming Clearance = 0.6% of thickness
 $= 0.06 \times 0.8 = 0.048 \text{ mm}$

Die size = Hole size + (2 x 0.048)

For $\phi 5 = 5 + (2 \times 0.048) = 5.096 \text{ mm}$

For $\phi 2 = 2 + (2 \times 0.048) = 2.096 \text{ mm}$

Punch size = Hole size

For $\phi 5 = 5 \text{ mm}$

For $\phi 2 = 2 \text{ mm}$

For Notching

Die size = Blank Size

Punch size = Blank Size – Clearance

For Notching punch = $(5.30 \times 13.30) - (2 \times 0.048) = 5.20 \times 13.20 \text{ mm}$

Bending Allowance

$B = (\alpha \times 2 \times \pi) / 360 (R + kt)$

Where,

α = Bending Angle

R = Inside Radius

K = location of neutral axis from bottom surface

$t = 0.33$ when $R < 2t$ = 0.50 when $R > 2t$

$B = 90/360 \times 2 \times \pi (1 + 0.33 \times 0.8) = 1.57 \times (1.264)$

$B = 1.98 \text{ mm}$

6. Thickness of die block & margins

$Tr = \sqrt{3v/ft} [(B/A)^2 / 1 + (B/A)^2]$

Where, Tr = Thickness of rectangular die,

V = vertical force (N)

ft = Tensile strength (N/mm²) (160 N/mm²),

A = length of blank slot

$Tr = (27.8/43.7)^2 / 1 + (27.8/43.7)^2$

$Tr = 461.017 = 21.47 \text{ mm}$

Die Thickness = $Tr + 3 = 21.47 + 3 = 24.47 \approx 25 \text{ mm}$

For progressive tool margin 1.2 times Tr

Margin (M) = $1.2 \times Tr = 1.2 \times 25 = 30 \text{ mm}$

Let us check the shear stress on die

2.2 Analyses of Progressive Die Parts

Simulation of Die Plate

Designed Using: Solid Works 2012

Study Name: Simulation Xpress Study

Analysis type: Static

The following is the details for analyzing the 3 parts of progressive die.

1. Cutting Force - 87190 N
2. Pressure - 20 Bar
3. Mass: 1.50237 kg
4. Volume: 0.000194104 m³
5. Density: 7740 kg/m³
6. Weight: 14.7232 N
7. Material: 1.2082 (X42Cr12) D2
8. Yield Strength- $1.2 \times 10^9 \text{ N/m}^2$
9. Tensile strength- $1.5 \times 10^9 \text{ N/m}^2$

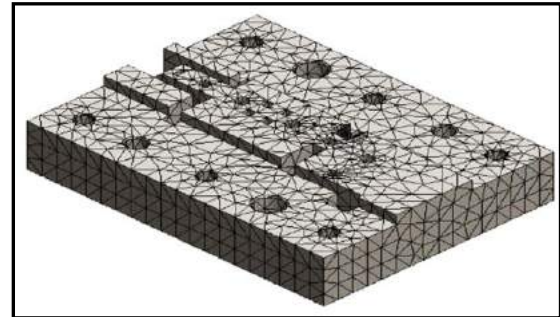
Table No 2.1 Mesh Information

Mesh type	Solid Mesh
Meshes Used:	Curvature based mesh
Jacobian points	4 Points
Maximum element size	0 mm
Minimum element size	0 mm
Mesh Quality	High

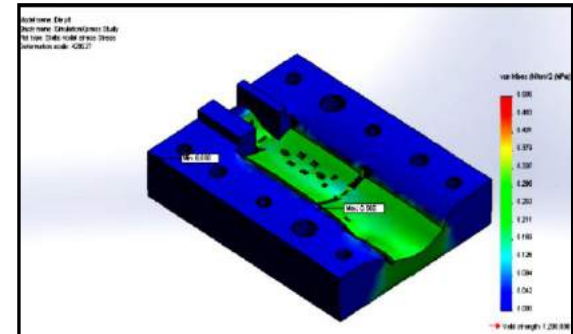
Table No 2.2 Mesh Information – Details

Total Nodes	27509
Total Elements	16910
Maximum Aspect Ratio	17.477

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% of elements with Aspect Ratio < 3	90.1
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% of elements with Aspect Ratio > 10	0.118
% of distorted elements (Jacobian)	0

Figure 2.1 Die Plate with Solid Mesh

Figure 2.2 Die Plate Stress Analysis

Table No 2.3 Stress – Details

Name	Type	Min	Max
Stress	VON: Von Mises Stress	5.08484e-005 N/mm ² (MPa) Node: 764	0.50549 N/mm ² (MPa) Node: 21870

Figure 2.3 Die Plate Displacement Analysis

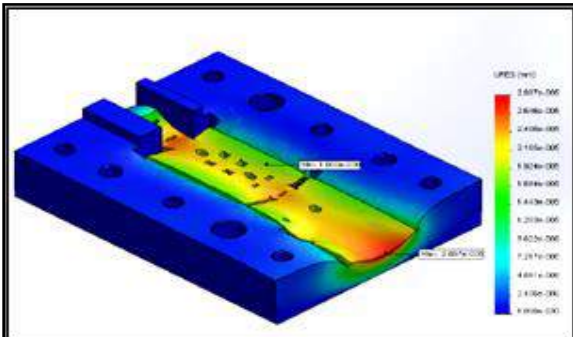


Table No 2.4 Displacement – Details

Name	Type	Min	Max
Displacement	URES: Resultant Displacement	0 Mm Node: 4	2.88673e-005 Mm Node: 21024

Table No 2.5 Factor of safety – Details

Name	Type	Min	Max
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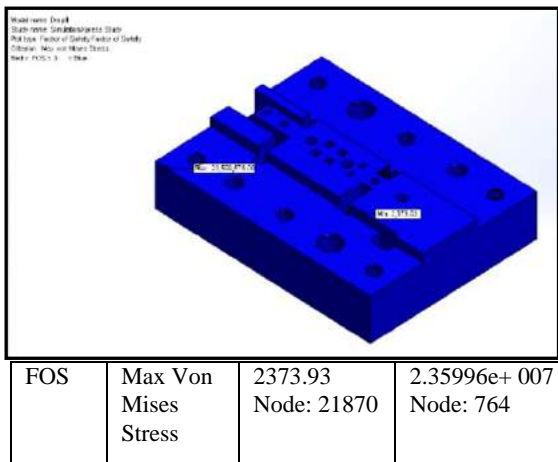


Figure.2.4 Factor of Safety Analyses

2.3 Production Data

The following calculations are done based on the information's collected from "Prakash Die Works" only for three operations and by using one tool for each operation. By referring to work study following information were noted down.

Table No 2.6 Work Study for Simple Tool

Sr. No.	Operation	Operation Time (min/Pc)	Mat. Handling Time (min/Pc)
1	Piercing	0.05	0.05
2	Blanking	0.08	0.04
3	Bending	0.1	0.05

2.3.1 Cycle Time

Cycle time can be calculated by using the equation:

$$T_c = T_o + T_h + T_{th} \text{ -----(1)}$$

Where T_c = cycle time, T_o = operation time,

T_h = mat. handling time, T_{th} = tool handling time.

1. For Normal Die

Since in normal die tool is already arranged that tool handling time becomes zero. That $T_{th} = 0$ Therefore equation (1) becomes $T_c = T_o + T_h$

2. For Progressive Die

Since in progressive die material handling is made automatic so, it is neglected. That is $T_h = 0$. Therefore equation (1) becomes $T_c = T_o$.

2.3.2 Batch Production

Batch production can be calculated by using the equation:

$$T_b = T_{su} + Q(T_c) \text{ -----(2) (min/cycle)}$$

where T_b = batch production time, T_{su} = set up time,

Q = number of parts taken for each set of operation.

1. For Normal Die

By referring the work study of industry it is found that set up time they taken

as 10 sec that 0.166 min/pc.

That is equation (2) becomes $T_b = 0.166 + 1000(T_c)$

2. For Progressive Die

Since in progressive die set up time is not needed so it is taken as zero.

That is $T_{su} = 0$.

The following result can be plot after calculation.

For normal die batch production time $T_b = 370.0166$ (min/cycle)

For progressive die batch production time $T_b = 300$ (min/cycle)

2.3.3 Production Rate

Production rate can be calculated by using equation:

$$T_p = T_b/Q \text{ -----(3)}$$

Where T_p = production time.

For both the dies equation remains the same.

After calculation results will be as followed

For normal die production time $T_p = 0.37$ (min/1000pc)

For progressive die production time $T_p = 0.3$ (min/1000pc)

To calculate rate of production rate use the equation:

$R_p = 60/T_p$ (min/hr)----(4) Equation remains same for both the die

After calculation rate of production

For normal die $R_p = 331.187$ (min/hr)

For progressive die $R_p = 871.20$ (min/hr)

2.3.4 Net Increase In Production Rate

By Comparing The Rate Of Production i.e.

(871.20-331.187)

$R_p = 540.0$ (min/hr)

Table No 5.9 Work Study for Progressive Tool

Sr. No.	Operation	Normal Die (min/pc)	Progressive Die (min/pc)
1	Piercing	0.1	0.1
2	Blanking	0.12	0.1
3	Bending	0.15	0.1
Total Cycle Time		0.37	0.3

2.3.5 Results

By Above Calculations the Results is as follows

- For One Hour: It is shown that for 1 hour rate of production increased by $r_p = 37.84$ (min/hr)
- For One Batch:
Taking 8 Hours Production Rate Will Be,
 $R_p = 37.84 * 8 = 302.72$ (Min/Batch)
- For One Day:
Taking 2 Batches Then The Production Rate Will Be,
 $R_p = 302.72 * 2 = 605.44$ (Min/Day) 5.2.1.4
- For One Month:
If we consider an average of 30 days production rate will be,
 $R_p = 605.44 * 30 = 18163.2$ (Min/Month)
- For A Year:
By Taking 12 Months Production Rate Will Be,
 $R_p = 18163.2 * 12 = 217958.4$ (Min/Annum)

3. CONCLUSIONS

In this work some significant aspects of press tool design for Limit Switch component is discussed and also detail study and analysis were carried out. In Tool analysis the design was found to be safe. Both in punch and die maximum stress

4. FUTURE DEVELOPMENT

For future development we can go for automation with following processes.

- Feeders can be used for continuous production.
- It can be used Auto press machine.



Figure 4.1 Auto Press

5. ACKNOWLEDGMENTS

The authors would like to express his deep gratitude to Prakash Die Works for providing manufacturing facility and good topic for productivity improvement.

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MAGLEV WINDMILL

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ABSTRACT

This report discusses about the method which is used to analyse the effect of certain process. This project dwells on the implementation of an alternate configuration of a wind turbine for power generation purposes. Using the effects of magnetic repulsion, spiral shaped wind turbine blades will be fitted on a rod for stability during rotation and suspended on magnets as a replacement for ball bearings which are normally used on conventional wind turbines. Power will then be generated with an axial flux generator, which incorporates the use of permanent magnets and a set of coils. A SEPIC converter will then be used to regulate the varying voltage from the rectifier to output a steady DC voltage. Also we are showing solar tracking circuit with solar panels. The circuit will be placed to provide the necessary movement for tracking. Also the daylight sensor is placed to sense the presence of light and the street light arranged for night vision.

KEYWORDS

Magnetic levitation, renewable energy, turbines

1. INTRODUCTION

Process is one of the most important manufacturing sectors for the preferred output and also to maximize the same by using the available resources. Renewable energy is generally electricity supplied from sources, such as wind power, solar power, geothermal energy, hydropower and various forms of biomass. These sources have been coined renewable due to their continuous replenishment and availability for use over and over again. The popularity of renewable energy has experienced a significant upsurge in recent times due to the exhaustion of conventional power generation methods and increasing realization of its adverse effects on the environment. This popularity has been bolstered by cutting edge research and ground breaking technology that has been introduced so far to aid in the effective tapping of these natural resources and it is estimated that renewable sources might contribute about 20% – 50% to energy consumption in the latter part of the 21st century. Facts from the World Wind Energy Association estimates that by 2010, 160GW of wind power capacity is expected to be installed worldwide which implies an anticipated net growth rate of more than 21% per year.

This project focuses on the utilization of wind energy as a renewable source. The aim of this major qualifying project is to design and implement a magnetically levitated vertical axis wind turbine system that has the ability to operate in both high and low wind speed conditions.

(magnetic levitation) vertically on a rotor shaft. This maglev technology, which will be looked at in great detail, serves as an efficient replacement for ball bearings used on the conventional wind turbine and is usually implemented with permanent magnets. This levitation will be used between the rotating shaft of the turbine blades and the base of the whole wind turbine system. The conceptual design also entails the usage of spiral shaped blades and with continuing effective research into the functioning of sails in varying wind speeds and other factors, an efficient shape and size will be determined for a suitable turbine blade for the project.

With the appropriate mechanisms in place, we expect to harness enough wind for power generation by way of an axial flux generator built from permanent magnets and copper coils. The arrangement of the magnets will cultivate an effective magnetic field and the copper coils will facilitate voltage capture due to the changing magnetic field.

Our choice for this model is to showcase its efficiency in varying wind conditions as compared to the traditional horizontal axis wind turbine and contribute to its steady growing popularity for the purpose of mass utilization in the near future as a reliable source of power generation. Unlike the traditional horizontal axis wind

2. PROBLEM DEFINITION

This section introduces and provides a brief description of the major components and factors that will contribute to an efficiently functioning wind turbine. These factors are wind power, the generator, magnet levitation and the DC-DC converter. Later sections will provide an in-depth look into the essence of each factor and its function and importance to the overall operation of the vertical axis wind turbine.

2.1. Wind Power

Undoubtedly, the project's ability to function is solely dependent on the power of wind and its availability. Wind is known to be another form of solar energy because it comes about as a result of uneven heating of the atmosphere by the sun coupled with the abstract topography of the earth's surface. With wind turbines, two categories of winds are relevant to their applications, namely local winds and planetary winds. The latter is the most dominant and it is usually a major factor in deciding sites for very effective.

The former is the type you will find in regular environments like the city or rural areas, basically where settlements are present. This type of wind is not conducive for effective power generation; it only has a lot of worth when it accompanies moving planetary winds. In later chapters, more focus will be placed on the power of wind and effective ways to design wind turbines for optimal wind power production.

2.2. Generator

The basic understanding of a generator is that it converts mechanical energy to electrical energy. Generators are utilized extensively in various applications and for the most part have similarities that exist between these applications. However the few differences present is what really distinguishes a system operating on an AC motor from another on the same principle of operation and likewise with DC motors. With the axial flux generator design, its operability is based on permanent magnet alternators where the concept of magnets and magnetic fields are the dominant factors in this form of generator functioning.

These generators have air gap surface perpendicular to the rotating axis and the air gap generates magnetic fluxes parallel to the axis. In further chapters we will take a detailed look into their basic operation and the configuration of our design.

2.3. Magnetic Levitation

Also known as maglev, this phenomenon operates on the repulsion characteristics of permanent magnets. This technology has been predominantly utilized in the rail industry in the Far East to provide very fast and reliable transportation on maglev trains and with ongoing research its popularity is increasingly attaining new heights. Using a pair of permanent magnets like neodymium magnets and substantial support magnetic levitation can easily be experienced.

By placing these two magnets on top of each other with like polarities facing each other, the magnetic repulsion will be strong enough to keep both magnets at a distance away from each other. The force created as a result of this repulsion can be used for suspension purposes and is strong enough to balance the weight of an object depending on the threshold of the magnets. In this project, we expect to implement this technology for the purpose of achieving vertical orientation with our rotors as well as the axial flux generator.

2.4. DC-DC Conversion

In order to begin the analysis of DC-DC converters it is important to first understand the concept behind a converter. Over the years, alternating current has been the common choice of power supply. AC is popular because the voltage can be easily stepped up or down using a transformer. Due to the inherent properties of a transformer,

DC voltage cannot be altered using this type of equipment. Transformers operate due to a changing magnetic field in which the change in magnetic flux induces a current. Direct current cannot provide a changing magnetic field therefore a transformer with an applied DC input would only produce heat.

The concept of DC-DC conversion emerged after the development of fast switching transistors. By varying the duty cycle of the pulse that is applied to the gate of the transistor for switching, these converters can buck or boost the voltage as if it were a DC transformer. When accurate feedback is applied to this type of circuit, the converter will not only transform a supply voltage to the desired output but also maintain it given a varying input. These qualities of DC-DC converters are the foundation of the circuit that will be chosen for this project.

2.5. Advantages of maglev windmill over ordinary windmill

We've seen a couple innovative wind power solutions pop up, but none that claim to offer the benefits of maglev wind turbines, which use full-permanent magnets to nearly eliminate friction by "floating" the blades above the base. According to developers, the technology is capable of scaling to massive sizes, with a proposed \$53M turbine able enough to replace 1000 traditional windmills and power 750 thousand homes. Additional benefits include the ability to generate power with winds as slow as three miles per hour, operational costs some 50 percent cheaper than windmills, and an estimated lifespan of 500 years. That all sounds great, but the real proof will come when these things get put to use, which may happen sooner than you'd think: Development is proceeding rapidly in both the US and China, with Chinese power company Zhongke Hengyuan Energy Technology currently building a \$5M factory to produce the turbines in capacities from 400 to 5,000 watts.

3. CONCLUSION

Final conclusion about the project, Overall, the magnetically levitated vertical axis wind turbine was a success. The rotors that were designed harnessed enough air to rotate the stator at low and high wind speeds while keeping the center of mass closer to the base yielding stability. The wind turbine rotors and stator levitated properly using permanent magnets which allowed for a smooth rotation with negligible friction. At moderate wind speeds the power output of the generator satisfied the specifications needed to supply the LED load. Lastly the SEPIC circuit operated efficiently and to the specifications that were slated at the beginning of the circuit design. After testing the project as an overall system we found that it functioned properly but there are many things that can be improved upon. The generator itself had some design flaws which we feel limited the amount of power it could output. These flaws start at the coils which were initially made too thick and limited how close the magnets attached to the stator could be positioned from each other. If the

magnets were pulled in closer to one another, the magnetic field density would be much greater allowing for more power to be induced into the coils. Another setback was that the wire that was used to wrap the coils as 30 AWG and because of its small cross section it restricted the amount of current that could be drawn from the generator. Lastly, the plexi-glass that was used for the frame of the wind turbine was too elastic. Due to the fact it was not as strong as we had hoped, there was some sag in frame about the central axis where the majority of the weight and force was located. If a more heavy duty material was used in future design then it would allow for more precision in magnet placement.

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[4] Regenedyne maglev wind power generation. I Vishal dhar

LPG REFRIGERATION SYSTEM

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ABSTRACT

This work investigates the result of an experimental study carried out to determine the Coefficient of performance of domestic refrigerator when a propane-butane mixture is liquefied petroleum gas (LPG) which is available and comprises 56.4% butane, 24.4% propane, and 17.2% isobutene. This paper also presented an experimental investigation of COP by the effect of changing capillary tube length, capillary tube inner diameter and capillary coil diameter on the mass flow rate of refrigerant in an adiabatic helical capillary tube. Large amount of electricity supply is not available easily in large part of underdevelopment country like India. It will also prove to be an effective for remote area such as research sites ,mines, & deserts where electricity is generally not available. The LPG is cheaper and possesses an environmental free in nature with no ozone depletion potential (ODP). Also LPG is available as a side product in local refineries. The results of the present work indicate the successful use of this propane-butane mixture as an alternative refrigerant to CFCs and HFC s in domestic refrigerator. It *would include Experimental setup of working model and detailed observation of the LPG refrigerator and represents its application refinery, hotel, chemical industries where requirement of LPG is more..*

Keywords

LPG refrigerator ,domestic refrigerator, eco friendly refrigerants,Mixed Refrigerant

1.INTRODUCTION

The energy crisis persists all across the globe. We think of recovering the energy which is already spent but not being utilized further, to overcome this crisis with no huge investment. The climatic change and global warming demand accessible and affordable cooling systems in the form of refrigerators and air conditioners. Annually billions of dollars are spent in serving this purpose. Hence forth, we suggest NO COST Cooling Systems. Petroleum gas is stored in liquefied.

state before its utilization as fuel. The energy spent for pressurizing and liquefying is not recovered afterwards. If it is expanded in an evaporator, it will get vaporized and absorb heat to produce cooling. This property has been used for refrigeration and air conditioning. So that the liquefied form of LPG can be used for cooling and the expanded gas (LPG) can be further used for combustion as a fuel. The ozone depletion potential(ODPs) of HFC-134a relative to CFC-11

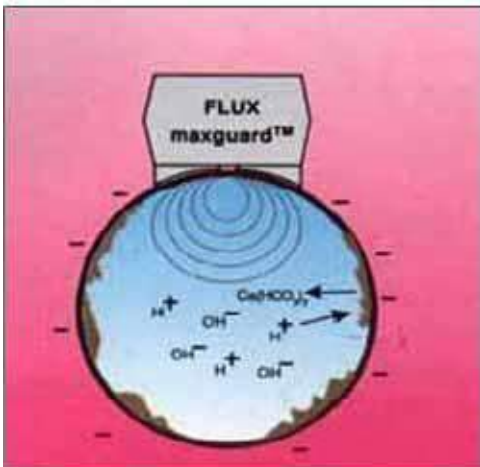
are very low ($<5 \cdot 10^{-4}$), the global warming potentials (GWPs) are extremely high (GWP/41300) For this reason, the production and use of HFC-134a will be terminated in the near future. The applications of new refrigerant mixtures to replace conventional refrigerants in domestic refrigerators have been studied by a number of researchers. Jung and Radermacher [3] performed a computer simulation of single evaporator domestic refrigerators charged with many pure and mixed refrigerants. The study attempted to find the best potential replacement for CFC- 12.

1.1 Background

In march 1989, the Institute of Hygiene in Dortmund Germany needed anew cold storage room. The young idealistic director, Dr Harry Rosin, could not consider using a CFC refrigerant and

so tried propane and iso butane. Greenpeace Australia imported a Foron refrigerator in February 1993 and in December 1993 Email Ltd, Australia's largest appliance manufacturer, displayed prototype LPG refrigerators. In 1994, German manufacturer announced one by one their intention of switch to LPG refrigerants.

The US EPA may not approve this either but OZ's petition (OZ 1994) is convincing, comprehensive and technically sound especially on safety. Calor released Care 30 in June



2.ACKNOLEDGEMENTS

The success of our paper on the whole does not depend on an individual student but on the creative team work of the entire group and faculty members. This would have been difficult without their support. So we acknowledge the precious guidance and help from those who willingly supported us.

4. CONCLUSION

Finding from literature we conclude that:

- Propane is an attractive and environmentally friendly alternative to CFCs used currently.
- Mass flow rate increases with increase in capillary inner diameter and coil diameter whereas mass flow rate decreases with increase in length. It was observed that the COP of system increases with similar change in geometry of capillary tube.
- The coefficient of performance of refrigeration appliances improves in case of retrofitting the capillary tube.
- Cooling capacities were obtained order of about three- to fourfold higher for LPG than those for R- 12.
- COP of LPG refrigerator was higher than that of R134a by about 7.6%. LPG seems to be an appropriate long-term candidate to replace R134a in the existing refrigerator,

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SELF SUSTAINABLE HYDRO-HYBRID VEHICLES

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ABSTRACT

In this paper we explore the possibilities of Brown's Gas as secondary source of fuel. By using such hybrid fuel mixture (Gasoline + Brown's Gas) the fuel efficiency of the engine can be improved. All the existing hydrogen hybrid vehicle rely on storing hydrogen in tanks and then using along with gasoline. Instead hydrogen can be generated on-board by using a auxiliary device which extracts hydrogen from water (H₂O) thus making the tedious hydrogen refilling stations redundant. Also the risk associated with storing pure hydrogen is minimized. The proposed Hydrogen generating device is compact and can be installed in the engine compartment. It is an early estimate that around 20% reduction in fuel consumption will be achieved by using gasoline-HHO and appreciable amount of reduction in emission of pollutants such as CO, unburned hydro carbons and CO particularly during the idle condition.

Keywords

Hybrid, gasoline, electrolysis, HHO, Brown's Gas, hydrogen, emission.

1. INTRODUCTION

The increasing demand for petroleum fuel associated with limited non-renewable stored quantities has resulted in a huge increase in crude oil prices. In the last few years, ordinary people experienced this by paying more at the pumps. Consequently we have seen a shift toward automobiles that consume less fuel. This has encouraged researchers to seek an alternative fuel that can be used in engines without the need for a dramatic change in the vehicle design. It has been shown that using pressurized hydrogen gas as a fuel in internal combustion engines (IC engines) has many advantages such as more engine power and lower pollutant concentrations in exhaust gases.

An auxiliary device can be made to run on the battery power of a vehicle. The said device will bring about the electrolysis of water splitting the water molecule in its constituents hydrogen + oxygen which in turn can be used as an supplementary fuel to IC Engines.

The proposed auxiliary device helps to reduce the amount of fossil fuel by improving fuel efficiency of an engine. Also the amount of hydrocarbon emission by an engine is reduced boosting the environmental sustainability. In the bigger picture the dependence on crude oil will go down.

2. THEORATICAL BACKROUND

2.1 Properties & use of Hydrogen

- Density: 0.0899g/l at STP and 0.085g/l at 15°C
- Energy density : 120-140 MJ/kg at STP
- Critical pressure : 12.96 bar
- Triple point temperature : -259.19°C
- Critical temperature : -240°C
- Molecular weight : 2
- Triple point pressure : 0.077 bar
- If hydrogen gas doesn't leak, it'll produce 3X much energy comparison to natural gas.
- Octane no. : +130

There is a considerable research effort in the United States, Europe, and Japan directed towards developing a "hydrogen economy", in which hydrogen would replace oil and natural gas for most uses, including fuel for transportation.

Hydrogen is the most abundant element in our universe. In addition to being a component of all living things, hydrogen and oxygen together make up water, which covers 70 percent of the earth. In its pure form, a hydrogen molecule is composed of two hydrogen atoms (H₂) which is a gas at normal temperature and pressure with only seven percent the density of air. Moreover, it is not a corrosive gas and can be used in engines with no toxic effects to humans. It ranks second in flammability among other gases, but if and when it leaks, hydrogen rises and diffuses to a non-flammable mixture quickly. Hydrogen ignites very easily and burns at a high temperature, but tends to burn out quickly. A mixture of hydrogen and air will burn when it contains as little as four percent up to as much as seventy five percent of hydrogen in the mix giving a very versatile air- fuel mixture ratio. Such wide range of flammability makes it useful to be used as a supplementary fuel where the A/F ratio corresponding to H₂ would be minuscule.

2.2 Hydrogen production method

In this paper we use electrolysis process to produce the required amount of hydrogen. The device consists of a electrolysis chamber containing demineralised or distilled water. Metallic electrodes are also dipped in the electrolytic solution. Since the volume of gas evolved is a function of the amount of current and surface area for constant amount of time and since the amount of current which can be drawn from a automobile battery is limited, the only option which remains is increasing the surface area of electrodes. Thus, the electrodes are cascaded together

Since water in its purest form is a very bad conductor of electricity small amount of sodium

hydroxide(NaOH) has to be added into the electrolytic

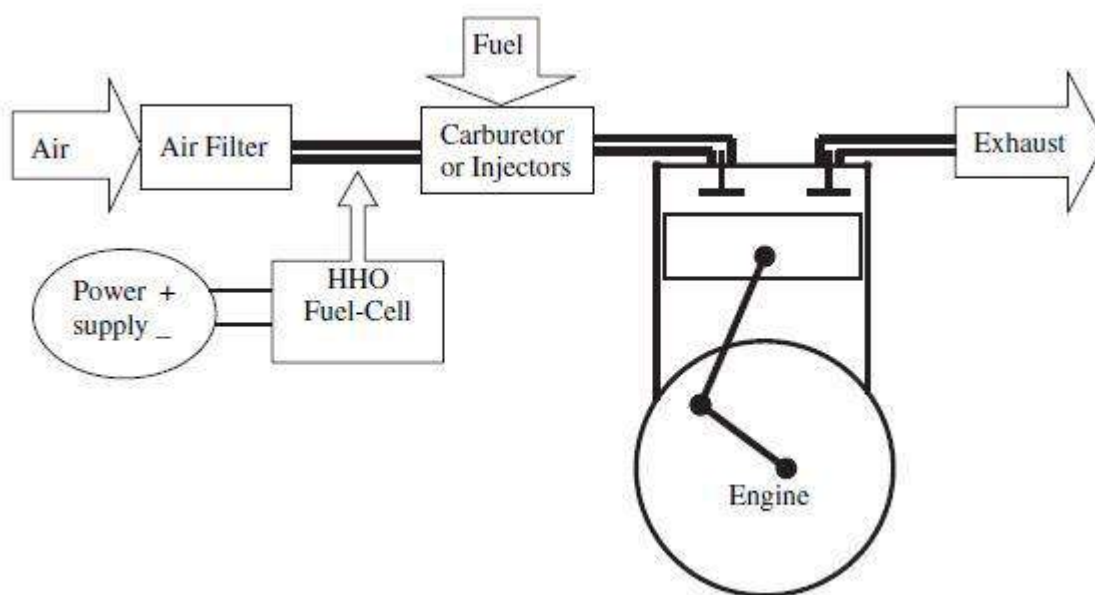
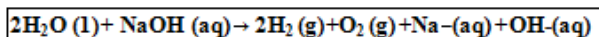


Fig. 1 Schematic illustration of the designed fuel cell installed on the engine.



solution to start the initial reaction. To control the amount of hydrogen which will be evolving out of the electrolytic chamber an electronic device Pulse Width Modulator (PWM) has to be incorporated in the design. The end gas which will be obtained will be a combination of Hydrogen and oxygen. But along with these constituent gasses it will also consist of small amounts of water vapor which can cause corrosion of different parts of engine such as intake manifold. Thus, a dehydrating agent/ device should be connected at the very end of such a plant. An observation yields the result that the resulting gas doesn't require any atmospheric oxygen for combustion since the gas contains in its interior all oxygen needed for that scope. By recalling that other fuels (including hydrogen) require atmospheric oxygen for their combustion, thus causing a serious environmental problem known as oxygen depletion, the capability to combust without any oxygen depletion (jointly with its low production cost) render the gas particularly important on environmental grounds.

3. METHODOLOGY

The gas being lighter than air will rise to the top of the electrolytic chamber. After obtaining the dehydrated mixture of oxygen and hydrogen from the electrolysis cell. It will be introduced in the intake manifold of the IC engine. During suction stroke when the piston moves from TDC to BDC the resulting suction will draw fresh air along with the dehydrated mixture. The amount of primary fuel i.e. gasoline has to be reduced for maintaining the rated power output.

Adding HHO to the fuel-air mixture has the immediate effect of increasing the octane rating of any fuel. Octane rating indicates how much a fuel can be compressed before it ignites. This fact causes the fuel-air mixture (without

HHO) to ignite long before it reaches the top dead centre (TDC). This process makes it less efficient because the explosion of gas fumes pushes the piston down and out of sequence. It goes too early a little in reverse, and therefore

causes a "knocking" noise and produces less power. HHO makes regular low-grade fuel ignite with higher performance like a high-octane gasoline. A higher octane rating produces more power because combustion is much closer to TDC. The new mixture (air, gasoline and HHO) has a chance to turn into mechanical torque (rotary push) without knocking. Each piston transfers more energy during its combustion cycle, so combustion becomes more efficient. More efficient combustion means less fuel consumption.

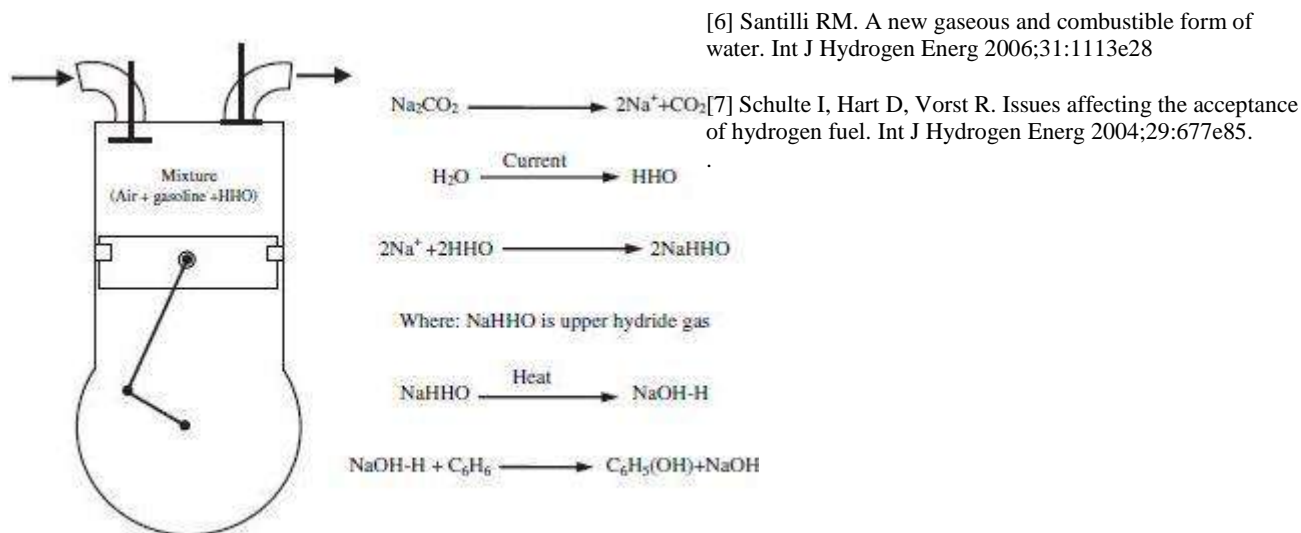


Fig. 2 Schematic sketch of the engine showing the chemical reactions between air, gasoline, and HHO that take place inside the engine.

4. ACKNOWLEDGMENTS

We would like to express our most sincere gratitude towards our faculty and principal Dr. Arun Kumar for granting an opportunity to express our ideas.

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Design & Analysis Of The Pressure Vessel Nozzle For Branch Reinforcement As Per ASME Sec Viii Div. 1, Edition 2010 & Smpv(U) Rule-1981

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ABSTRACT

In this report there is a Process of designing & analyzing Branch reinforcement of Pressure vessel Nozzle which is handling Ethylene oxide. The various parameters are taken into a consideration as per ASME SEC VIII DIV. 1, EDITION 2010 & SMPV (U) RULE-1981 guidelines. Ethylene oxide, properly called oxirane by IUPAC (International Union of Pure and Applied Chemistry), is the organic compound with the formula C_2H_4O . It is cyclic ether also colorless flammable gas at room temperature. The Design pressure & temperature for the Pressure Vessel is 7.2 Kg/cm² & 55°C. The main area of focus is to design by analyze which is a powerful software technology for simulating physical behavior on the computer, because design analysis can minimize or even eliminate the need for physical prototyping and testing. One of the nozzle (N9: Size 150NB) of the same vessel which is connected to the Vessel Shell by Stub in type connection also called Branch reinforcement. In case of reinforcement in branch connections, reinforcement is material around a branch opening that serves to strengthen it. The material is either integral in the branch components or added in the form of weld metal, a pad, a saddle, or a sleeve. In Welding, reinforcement is welding metal in excess of the specified weld size.

Keywords

Finite element analysis (FEA), Design by formulae (DBF) & Design by Analysis (DBA).

1. INTRODUCTION

The need for high pressure and temperature vessels for petroleum refineries and chemical plants gave rise to vessels joined with welding instead of rivets (which were unsuitable for the pressures and temperatures required) and in 1920s and 1930s the BPVC included welding as an acceptable means of construction, and welding is the main means of joining metal vessels today. With large Shell dimensions to form a TEE intersection by cutting a hole in the straight run (the header) and welding in the leg perpendicular (the branch), this is

called a STUB-IN. Similarly, nozzles are installed on pressure vessels by cutting a hole in the side of the vessel and welding in an appropriately sized pipe to form the nozzle. These intersections ensure a "Hole weakening" on the vessel or piping system, due to the metal removed and the stress concentration created.

Piping codes provide specific design criteria such as permissible materials of construction, allowable working stresses, and load sets that must be considered in design. In addition, rules are provided to determine the minimum wall thickness and structural behavior due to the effects of internal pressure, deadweight, seismic loads, live loads, thermal expansion, and other imposed internal or external loads.

2. LITERATURE REVIEW

A study of Literature shows that the Codes and Standard gives proper rules for the any design & research processes, & also helps to establish uniqueness in terms of Material availability, Fabrication techniques & comfort in terms of Dimensions. Various researcher presented research paper this topic such as, (Apurva R. Pendbhaje, Mahesh Gaikwad, Nitin Deshmukh, Rajkumar Patil, (IJRTS)) presents design, and analysis of pressure vessel for high pressure rise is developed to withstand severe forces. (Dubal, S.V.; Gajjal, S.Y. 26-27 Feb. 2015, Finite Element Analysis of Reactor Pressure Vessel under Different Loading Conditions.) Reactor Pressure Vessel is a closed container designed to hold gases or liquids at a pressure above 0.10 MPa, higher than atmospheric pressure. In this work an approximate stresses that exist in cylindrical pressure vessels supported on two saddles support are calculated under the different boundary conditions by using Finite Element tool. (Daowei Bi; Jiangtao Bu; Dongling Xu, 23-27 June 2013, A novel thermal-mechanical detection system for reactor pressure vessel bottom failure monitoring in severe accidents.) Following the Fukushima Daiichi nuclear accident in Japan, there is an increased need of enhanced capabilities for severe accident management (SAM) program. (Guian Qian, Vicente Gonzalez Albuixech, Markus Niffenegger and Medhat Sharabi, August 04, 2015, Parabolic pts analysis for a reactor pressure vessel considering plume cooling effect.)

In this paper, both deterministic and probabilistic methods are used to assess the integrity of a model RPV subjected to PTS. (Kedar A. Damle, Pratik S. Gharat, Rudolf Neufeld and Wilhelm Peters (Nov 19, 2015) Effect of Nozzle Junction and Equipment Stiffness on Absorption of Pipe Thermal Loads.) As an industry norm, the nozzle local loads are considered to be local and are not considered in foundation design. A mathematical model is developed to demonstrate the actual system. (Ren Haidong; Peng Erbao, 12-14 Aug. 2011A study on the stress distribution of pressure vessel and saddle support.) This article uses finite-element analysis to know the stress distribution of the horizontal type pressure vessel and saddle support by setting up 1/4 pressure vessel model and single saddle support model. (Manfred Lengsfeld, Ken Bardia, Jaan Taagepera, Kanajett Hathaitam, Donald La Bounty and Mark Lengsfeld January 23, 2006; Revised September 27, 2006 Analysis of Loads for Nozzles in API 650 Tanks.) The analysis of tank nozzles for API 650, (American Petroleum Institute, 1998, API Standard 650, 10th ed.) tanks is a complex problem. Appendix P of API 650 provides a method for determining the allowable external loads on tank shell openings. (M. D. Xue, D. F. Li and K. C. Hwang (Jun 05, 2005) A Thin Shell Theoretical Solution for Two Intersecting Cylindrical Shells Due to External Branch Pipe Moments.) A theoretical solution is presented for cylindrical shells with normally intersecting nozzles subjected to three kinds of external branch pipe moments. (N. Mani, G. Thanigaiyarasu and P. Chellapandi (Jan 25, 2012) Leak Before Break Analysis of Steam Generator Shell Nozzle Junction for Sodium Cooled Fast Breeder Reactor.) LBB (leak before break) analysis is reported for 500 MWe sodium cooled fast reactor (SFR) in this paper. (Senthil Anbazhagan, A.M.; Dev Anand, M. (10-11 July 2014) A study: Important needs to be followed during pressure vessel fabrication and operation for avoiding failures.) In this report during pressure vessel design, fabrication and operation with respect to international codes and standard recommendations. (Tao Zhang, Frederick W. Brust, Gery Wilkowski, Heqin Xu, Alfredo A. Betervide and Oscar Mazzantini (October 20, 2012) Welding Residual Stress in a Large Diameter Nuclear Reactor Pressure Vessel Nozzle) Understanding the residual stress distribution from welding is important to evaluate the reliability of pipe and nozzle joints with welds. In this paper, a large-diameter reactor pressure vessel (RPV) hot-leg nozzle was analyzed. (Xuefei Qiao; Bin Wang; Wen Liu; Junfeng Yang, 24-26 Aug. 2010, The Mechanical Analysis of a New Multi-Channel High-Pressure Vessel.) This type of multi-channel single-cylinder high-pressure vessel is based on the structure and then put on several layers of internal and external radius slightly larger than the previous layer and the overall shape of a cylinder with a similar structure.

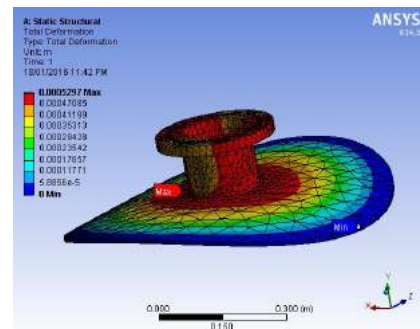
3. PROBLEM DEFINITION

3.1 Requirement of Branch reinforcement

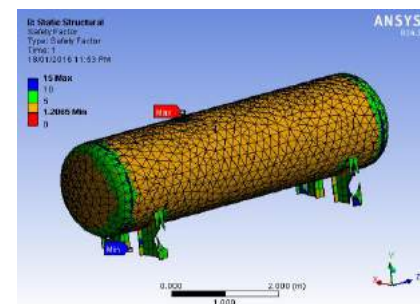
Nozzles draw the fluids in & out the vessel, based on the flow rate & capacity of the Vessel tank the size of Nozzle being decided. In case of pressurized system not only internal pressure, but Wind, Seismic, acoustic vibrations etc. do play their part to generation of stresses at various points during operating process. Most amounts of loadings are transferred on the nozzles of vessels or tanks. While most of the time vessel loadings & piping loadings are analyzed at different

points. If the values of these external loadings are more than that of permissible, the stresses generated will cause the failure of entire vessel. Also the shell side of any pressure vessel is fabricated by forming the flat metal sheet into a cylindrical shell. When the hole is made to weld Nozzle neck on shell, Hoop stresses are generated at the joint & Hole will be weak. If these stresses are not being compensated the Weld joint failure might take place. That will be quite hazardous for the personnel safety & Process plant occupancy. The necessary action must have to be taken during the design stages only, if the analysis being performed hand in hand the chances of failure are negligible.

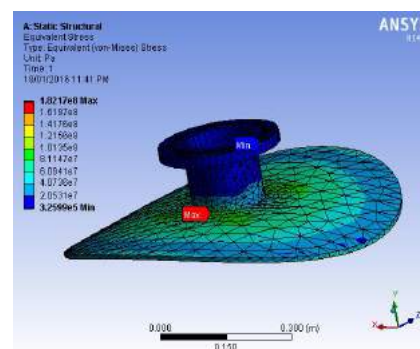
a) TOTAL DEFORMATION:

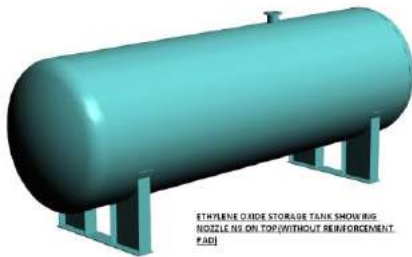


b) FACTOR OF SAFETY:



c) EQUIVALENT VON MISES STRESS:

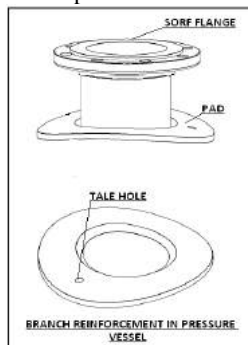




3.2 Proposed Methodology

To resolve the problems which is observed above the critical systems, the systems where the MAWP & MAWT values are quite a large. The precautions must be taken care of at the design stages only, the latest software are available for pressure vessel designs are used (for E.g. PV-lite). In order to handle any analysis software, number of variables (Load cases) is to be considered. Manual methods of analysis may lead to various types of errors & difficult to debug, also one cannot deny the fact that the results are more towards safer side by increasing the dimensions of the parameters.

Personal safe guard is also necessary as during the accidents the safety of the personal is also matters the most. In this type of problem the area which is being removed from the shell creates weakness at the hole side. One cannot rely on the analysis results over a period of time. Since these Pressure Vessels serves everyday & operates under the pressurized conditions. This weakness must be compensated, and can be restored with a Reinforcing Pad, to strengthen the piping branch connection or the pressure vessel nozzle.



3.3 The steps for the assembly of a reinforcing pad

Determine the location of the branch, and make a round hole in the run pipe where the diameter should be equal to the inside diameter of the branch. Finish the branch equal to outside diameter of run pipe and make a welding bevel of around 30°. Place the branch with a gap by about 3 to 4 mm about the hole location on the run pipe, and tack weld the branch on a sufficient number of places. Then the new branch can be completely welded. If the weld is ready, depending on the requirements Non Destructive Examination (NDE) must be done. Then the reinforcing pad can be placed by slide him over the branch. The pad must be positioned so that around the branch is overall the same open space, and that the pad is fully in line with the run pipe. Tack weld the pad on a sufficient number of places, and after that the pad can be inside and outside fully welded; depending on the prescribed quality requirements, then again NDE must be done. By threading the hole, a test gauge can be thread for a "air/soap" test to check for leakage. The thread, mostly 1/4" NPT will be used. Weep holes serves as a vent during welding for

entrapped gasses and prevents the reinforcing pad from becoming a "jacketed" vessel.

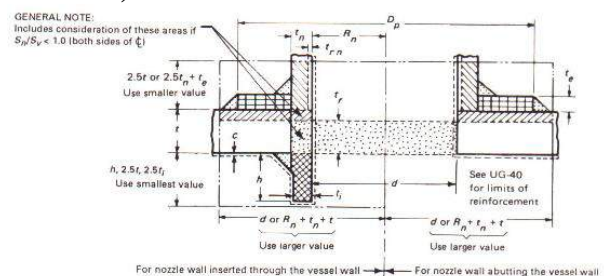
3.4 Branch Connection with Reinforcing Pad (Set-On type)

Dimensions Reinforcing Pad

For the dimensions of a reinforcing pad you can handle as rule:

- Material = same material as the run pipe
- Width = half a diameter of the branch pipe (at least 50 mm)
- Thickness = same thickness as the run pipe, with a min. of 3 mm and a max. of 20 mm

3.5 Check for Reinforcement requirement for 150NB Nozzle opening on Shell :(Nozzle No. - N9)



(Ref : UG 37 & UG -39)

Material of construction of Nozzle neck / Shell	=	SA 312 TP 304L / SA 240 Gr 304L
Max.allow. stress at design temp. for Shell	=	16700 Psi
Max.allow.str ess at design temp. for nozzle neck	=	16700 Psi
Size of opening in Shell	=	6.066 in
Shell thickness	=	0.315 in = 8 mm
Minimum required Shell thickness	=	0.236 in = 6.001 mm
Nozzle wall thickness	=	0.28 in = 7.11 mm
Min.required Nozzle wall thickness	=	0.236 in = 6.001 mm
Nominal thickness of inside projection nozzle	=	0 in

fr1	Sn/Sv:For nozzle wall inserted through vessel	=	1
fr2	Sn / Sv	=	1
E1,	Joint efficiency for an opening in solid plate	=	1
F,	Correction factor for variations of Int.Pressure	=	1

Required cross sectional area of reinforcement,

$$A = d \text{ tr } F + 2 \text{ tn tr } F (1 - fr1) \\ = 1.433 \text{ Inch}^2$$

Area available on Shell, A1 (Use larger value)

$$d(E1t-Ftr)-2tn(E1t-Ftr)(1-fr1) \text{ OR } = 0.478 \text{ Inch}^2 \\ 2(t+tn)(E1t-Ftr)-2tn(E1t-Ftr)(1-fr1) = 0.094 \text{ Inch}^2$$

$$\text{Hence, A1} = 0.478 \text{ Inch}^2$$

Area available in nozzle projecting outwards, A2 (Use Smaller value)

$$5 (tn - trn)fr2 t \text{ OR } = 1.747 \text{ Inch}^2 \\ 5 (tn - trn)fr2 tn = 0.061 \text{ Inch}^2$$

$$\text{Hence, A2} = 0.061 \text{ Inch}^2$$

Area available inward nozzle, A3 (Use Smaller value)

$$5 t ti fr2 \text{ OR } = 0.000 \text{ Inch}^2 \\ 5 ti ti fr2 \text{ OR } = 0.000 \text{ Inch}^2 \\ 2 h ti fr2 = 0.000 \text{ Inch}^2$$

$$\text{Hence A3} = 0.000 \text{ Inch}^2$$

A41, Area available in outward nozzle

$$\text{Fillet weld size Min}(t, tn) = 0.280 \text{ Inch} \\ leg^2 * fr2 = 0.078 \text{ Inch}^2$$

A43, Area available in inward nozzle

$$leg^2 * fr2 = 0.000 \text{ Inch}^2$$

Total available reinforcement area

$$A1 + A2 + A3 + A41 + A43 = 0.617 \text{ Inch}^2$$

$$(A) 1.440 \text{ Inch}^2 > 0.620 \text{ Inch}^2 \text{ (i.e. A1 + A2 + A3 + A41 + A43)}$$

Required area for Reinforcement > Total available reinforcement area

*Hence additional reinforcement is required

$$\text{Required additional area for reinforcement} = 1.44 - 0.62 \\ = 0.820 \text{ Inch}^2$$

$$\text{Assume Reinforcement Pad thickness} = 8.00 \text{ mm} \\ = 0.31493 \text{ Inch}$$

$$\text{Required width of the R.F. Pad} = \text{Required additional area for reinforcement} / \text{Assumed Reinforcement Pad thickness} \\ = 2.61 \text{ Inch} \\ = 66.294 \text{ mm} \\ = d + \text{Reqd.}$$

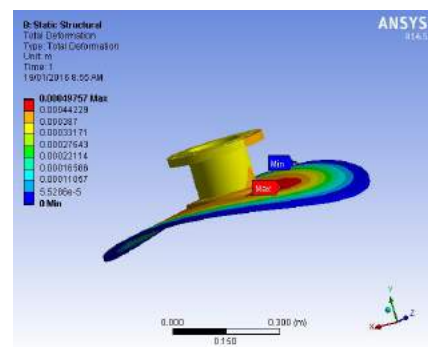
$$\text{R.F. Pad O.D.} \\ \text{width of R.F. Pad} \\ = 6.07 + 2.61 \\ = 8.676 \text{ Inch} \\ = 220.374 \text{ mm}$$

Provided R.F. Pad O.D. = 235 mm
Maximum Permissible O.D of R.F. Pad = 308.16 mm
(i.e. limits of reinforcement measured parallel to vessel wall)
Hence the provided R.F Pad O.D and Thickness is within safe limits.
Hence the provided R.F Pad size is O.K

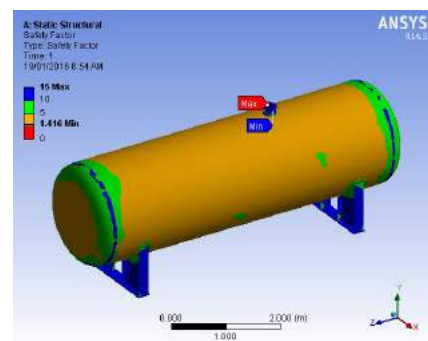
4. FEA Analysis

The previous techniques of Design by formulae (DBF) methods were used to give design on safer side & thereby lead to more thick materials or rather more strong material selections. Because of which the overall cost of Vessels or Tanks etc., was too high & design used to be very Bulky & heavy. In any Process or Power industry the Cost is more important & safety associated with the same. Here in this design the analysis are performed on ANSYS software & the Table given below shows how the results of with & without addition of branch reinforcement increases the overall safety of Vessel. Material used for the reinforcement shall have an allowable stress value equal to or greater than that of the material in the Vessel wall, in case such material is unavailable lower strength material is used, provided with area of reinforcement is being increased. Vessel to nozzle or pad to nozzle attachment weld metal within the vessel wall or within the pad may be credited with a stress value equal to that of the vessel wall or pad, respectively.

d) TOTAL DEFORMATION:



FACTOR OF SAFTY:



e) EQUIVALENT (VON MISES)STRESS:

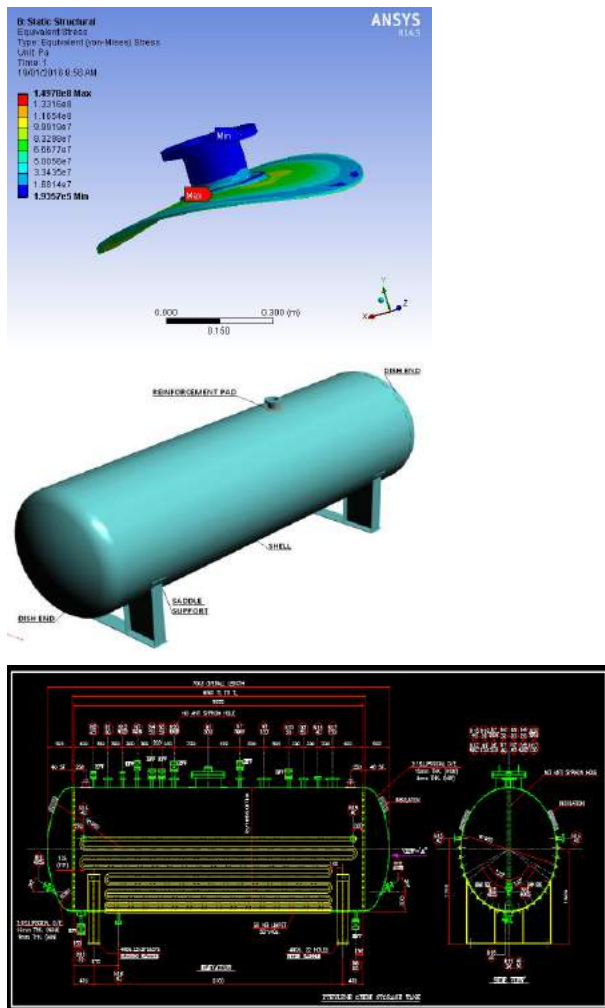


Fig 1: AutoCAD Drawing of the Vessel Tank.

4.1 CONCLUSIONS

SR. NO.	TYPES OF FACTORS	Shell without pad	Shell with pad
1	TOTAL DEFORMATION	2mm	0.09mm
2	FACTOR OF SAFETY	1.2065	1.416
3	VON MISSES STRESS	171Mpa	146Mpa

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AUTOMATIC PNEUMATIC BASED PUNCHING AND BENDING SYSTEM

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ABSTRACT

The purposed describes the design of Automatic Pneumatic Based Punching and Bending System, which is controlled by PLC and hardware structure of system. Both Punching and Bending operations are belong to press working which is useful in sheet metal industries. The main objective of this project is to reduce manual effort in existing method by automated approach through Control Valva. Automation can be achieve through computers, hydraulic, pneumatic, robotics etc. Of these sources, pneumatic is attractive medium for low cost automation. The main advantages of all pneumatic systems are economy and simplicity. Due to automation effective control on operation can be possible. This project can results in increasing safety, reducing cost and reducing lead time which will help in increasing production of an industry.

Keywords

Punching And Bending System, Pneumatic, solenoid , control valve

1. INTRODUCTION

The reason for using pneumatics, or any other type of energy transmission on a machine, is to perform work. The accomplishment of work requires the application of kinetic energy to a resisting object resulting in the object moving through a distance. In a pneumatic system, energy is stored in a potential state under the form of compressed air. Working energy (kinetic energy and pressure) results in a pneumatic system when the compressed air is allowed to expand. For example, a tank is charged to 100 PSIA with compressed air. When the valve at the tank outlet is opened, the air inside the tank expands until the pressure inside the tank equals the atmospheric pressure. Air expansion takes the form of airflow. To perform any applicable amount of work then, a device is needed which can supply an air tank with a sufficient amount of air at a desired pressure. This device is positive displacement compressor.

This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased.

2. THEORY OF PUNCHING AND BENDING

2.1 Press working

Press working may be defined as a chip less manufacturing process by which various component are made from sheet metal. This process is also termed as cold stamping. Press working operations are performed at room temperature. Both the punching and bending operation are belong to press working.

2.2 Punching

It is a cutting operation by which various shaped holes are made in sheet metal. Punching is similar to blanking operation except that in punching, the hole is desired product, the material punched out to form the hole being waste.

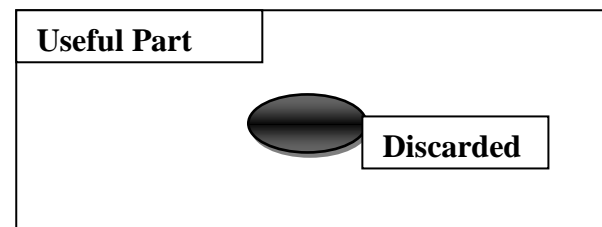
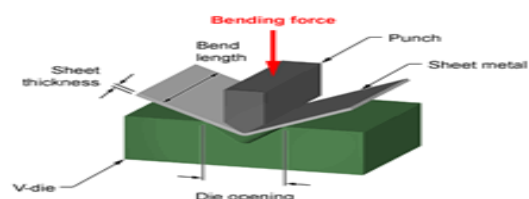


Fig. 1 Punching Operation

2.3 Bending

In this operation, the material in the form of flat sheet or strip, is uniformly strained around a linear axis which lies in the neutral plane and perpendicular to the lengthwise direction of the sheet.



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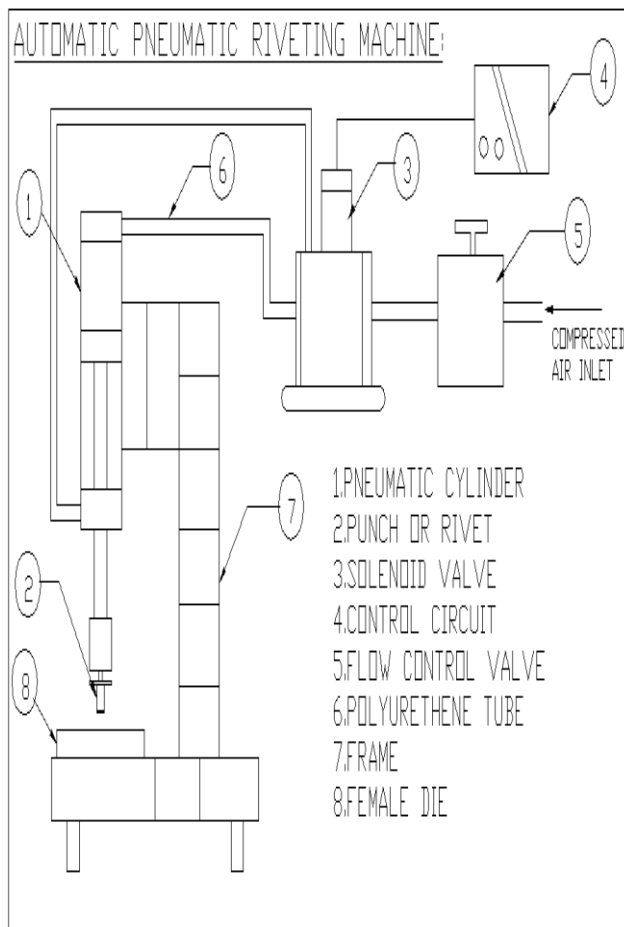
Fig. 2 Bending Operation

3. WORKING PRINCIPLE

The compressed air from the compressor is used as the force medium for this operation. There is pneumatic Single acting cylinder, Control valve and Compressed air used. The arm from the compressor enters to the control Valve. The controlled air from the control valve enters to the Pneumatic Actuator. In one position air enter to the cylinder and pushes the piston, so that the Can Crushing stroke is obtained.

The next Control valve is open then return for cylinder exhaust air from the Pneumatic Single acting cylinder, so cylinder piston is return back.

4. DESIGN



5. TECHNICAL SPECIFICATION

- Compressor – 2 bar
- Pneumatic cylinder 40x50
- Solenoid valve ¾
- Gate control valve
- Machine operated feeder
- Motor – 60 watt

6. METHODOLOGY

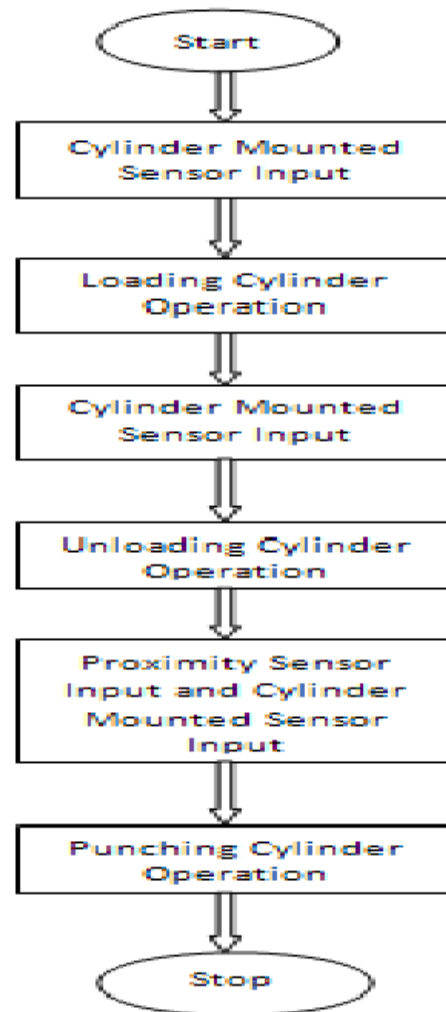


Fig. 3 Working Methodology

7. Analyse Result

- The pneumatic is more efficient in the technical field
- Quick response is achieved
- Simple in construction, easy to maintain and repair.
- Cost of the unit is less when compared to other machine
- No fire hazard problem due to over loading
- Comparatively the operation cost is less
- Operate is air.

8. ACKNOWLEDGMENTS

We would like to express our most sincere gratitude towards our faculty and principal Dr. Arun Kumar for granting an opportunity to express our ideas and to all of them who directly or indirectly help us.

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OFFSHORE WIND AND WAVE ENERGY GENERATION

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ABSTRACT

This report enlightens about our project of obtaining power and energy from the sea, the infinite resource. Offshore wind is one of the most fascinating possibility in the renewable energy sector and has promising growth. Offshore wind energy generation offers an opportunity in the race to decrease the dependence on fossil fuels, reduce greenhouse emissions, increase energy security and also create employment opportunities. We have to reduce costs of renewable energy procurement and explore new technologies of energy generation which can be easily substituted for a part of the present share of power generation. This will increase carbon credits, bring positive changes in climate control and reduce pollution from usage of fossil fuel. Tidal energy has the potential to play a valuable role in a sustainable energy in the future. Its main advantage over other renewable sources such as solar, is its predictability and availability 24x7; tidal movements can be predicted years in advance and can be monitored. The energy extracted from the tides can come from both, the vertical movements of the water associated with the rise and fall (potential energy) and from the tidal currents (kinetic energy). A tidal stream turbines capture the energy from tidal currents. We propose a concept of a wind turbine that is specially designed for an offshore environment. In the proposed concept, a floater of revolutionary technology supports the load and mechanical requirements of the wind turbine and wave turbine axis.

General Terms

Technology, renewable energy, fossil fuels, offshore environment, wind turbine, wave turbine, combined setup.

Keywords

Offshore, wave generator, wind generator, renewable energy, adaptability, predictability.

1. INTRODUCTION

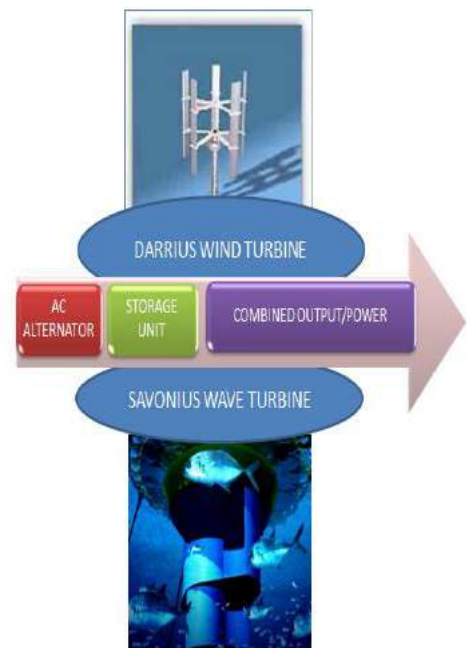
The renewable energy market is seen an upswing with companies with varied technologies making an introduction and subsequent installations. In India, the use of solar energy is the highest followed by wind energy.

This could be due to the economics of installations, energy conversion efficiency and final cost/unit output. The cost of energy produced by offshore wind turbines is considered to be higher than land based ones because of the difficulties in

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construction, operation and maintenance on offshore sites. To exploit wind and tidal power from the vast Indian coastline which is available day and night, we propose a concept of a wind turbine that is specially designed for an offshore environment. In the proposed concept an offshore unit which integrates wind and wave turbines, energy generation and storage unit is designed and executed. The simplicity of the system leads to further cost reduction of offshore power generation making it a preferred choice.

2. DESIGN OF THE CONCEPT



3. VERTICAL AXIS WIND TURBINE

Vertical-axis wind turbines (VAWTs) are a type of wind turbine where the main rotor shaft is set vertically. Among the advantages of this arrangement are that generators and gearboxes can be placed close to the ground, and that VAWTs do not need to be pointed into the wind. Major drawbacks for

the early designs (Savonius, Darrieus, Giromill and cycloturbine) included the pulsatory torque that can be produced during each revolution and the huge bending moments on the blades. Later designs solved the torque issue by using the helical twist of the blades almost similar to Gorlov's water turbines. A VAWT tipped sideways, with the axis perpendicular to the wind streamlines, functions similarly. A more general term that includes this option is "transverse axis wind turbine". For example, the original Darrieus patent, includes both options. Drag-type VAWTs, such as the Savonius rotor, typically operate at lower tip speed ratios than lift-based VAWTs such as Darrieus rotors and cycloturbine.

3.1 DESIGN OF WIND TURBINE

DESIGN OF BLADE

In the project three blades with vertical shaft are used, it has a height & width of 18 inches & 13 inches respectively. The angle between two blades is 60 degrees. If one Blade moves other blades comes in the position of first blade, so the speed is increased.

SHAFT DESIGNING

While designing the shaft of blades it should be properly fitted to the blade. The shaft should be as possible as less in thickness & light in weight for the six blade, the shaft used is very thin in size are all properly fitted. So no problem of slipping & fraction is created, it is made up of hollow Aluminium which is having very light weight. Length of shaft & diameter are 18 inches & 2.54cm respectively. And at the top and bottom ends mild steel of length 1 inch each are respectively are fixed to give strength to the hollow shaft.

3.2 DESIGN OF BEARING

For the smooth operation of Shaft, bearing mechanism is used. To have very less friction loss the two ends of shaft are pivoted into the same dimension bearing. The Bearing has diameter of 2.54cm. Bearing are generally provided for supporting the shaft and smooth operation of shaft. We have used ball bearings for the purpose of ease of maintenance.

3.3 AN ELECTRIC DYNAMO

For generation of electricity from the designed our vertical axis wind turbine, we chose a Bicycle dynamo which has the capacity to light a bulb of 12 V. This electric dynamo has the capacity.

SPECIFICATIONS

BASE DIMENSIONS

Height 24 inches
Width 21 inches

BLADE DIMENSIONS

Height 18 inches
Diameter 13 inches
Thickness 0.125 inches
Angle 45°
Angle b/w blades 60°

SHAFT DIMENSIONS

Diameter 2.54cm
Length 18 inches

3.4 FABRICATION TECHNIQUES VARIOUS OPERATIONS INVOLVED IN FABRICATION PROCESS

The following were the fabrication techniques involved

1. Gas Cutting
2. Arc Welding
3. Riveting

4. CALCULATIONS

THEORETICAL CALCULATIONS

The windmill works on the principle of converting kinetic energy of the wind to mechanical energy.

The kinetic energy of any particle is equal to one half its mass times the square of its velocity,

$$K.E = \frac{1}{2} mv^2 \dots \dots \dots (1)$$

K.E = kinetic energy

m = mass

v = velocity,

M is equal to its Volume multiplied by its density of air

$$M = \rho AV \dots \dots \dots (2)$$

Substituting eqn(2) in eqn(1)

We get,

$$K.E = \frac{1}{2} \rho AV.V^2$$

$$K.E = \frac{1}{2} \rho AV^3 \text{ watts}$$

ρ = density of air (1.225 kg/m³)

$$A = \frac{\pi d^2}{4} (\text{Sq.m})$$

D = diameter of the blade

$$A = \frac{\pi (1.22)^2}{4}$$

$$A = 1.16 \text{ Sq.m}$$

$$P = \frac{1}{8} \rho \pi d^2 V^3$$

$$\text{Available wind power } P_a = (12 \pi \rho D^2 V^3) / 4$$

TRAIL 1

FOR VELOCITY 4.5m/s

$$P_a = (\frac{1}{2} \rho \pi D^2 V^3) / 4$$

$$P_a = (\frac{1}{2} * 1.225 * \pi * 1.222 * 4.5^3) / 4$$

$$P_a = 65.244 \text{ watt}$$

TRAIL 2

FOR VELOCITY 5.5m/s

$$P_a = (\frac{1}{2} \rho \pi D^2 V^3) / 4$$

$$P_a = (\frac{1}{2} * 1.225 * \pi * 1.222 * 5.5^3) / 4$$

$$P_a = 119.12 \text{ watt}$$

TRAIL 3

FOR VELOCITY 7.5m/s

$$P_a = (\frac{1}{2} \rho \pi D^2 V^3) / 4$$

$$P_a = (\frac{1}{2} * 1.225 * \pi * 1.222 * 7.5^3) / 4$$

$$P_a = 302.06 \text{ watt}$$

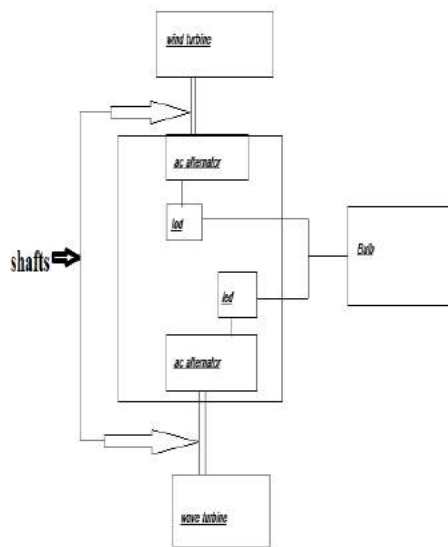
TRAIL 4

FOR VELOCITY 10m/s

$$P_a = (\frac{1}{2} \rho \pi D^2 V^3) / 4$$

$$P_a = (\frac{1}{2} * 1.225 * \pi * 1.222 * 10^3) / 4$$

Pa = 716.00watt.



5. CASE STUDY

THE WIND AND WAVE OFFSHORE UNIT WAS INTRODUCED BY JAPAN GOVERNMENT FOR POWERING THE TOKYO CITY'S EVER INCREASING DEMAND FOR POWER. THIS IS AN INITIATIVE FOR PURE AND GREEN ENERGY WHICH COLLABORATES TECHNOLOGY TO THE TOUGHEST WITH ENVIRONMENTAL CONSERVATION PRINCIPLES. THE FOLLOWING ARTICLE WAS PUBLISHED IN THE GIZMAG MAGAZINE AND THE PROJECT WAS ALSO INTRODUCED IN THE NATIONAL GEOGRAPHIC CHANNEL.

Combining a three-bladed Darrieus turbine on top, a Savonius turbine underneath, and a generator in between, the SKWID power generation concept is claimed to be the world's first hybrid system "capable of maximizing the harvesting of ocean energy from wind and current".

The SKWID, from the Japanese company Mitsui Ocean Development & Engineering Company (MODEC), is designed to capitalize on the energy potential available both in the winds above the ocean, and in the currents flowing beneath the waves. The device uses an omnidirectional Darrieus wind turbine siting 47 meters above the sea on one end of a vertical shaft, with a different type of omnidirectional turbine design, a 15 meter diameter Savonius, spinning at the other end under the surface.

The Darrieus wind turbine efficiently harnesses the ocean wind: The omnidirectional Darrieus turbine rotates regardless of the wind direction. Due to the location of the generator, the system has excellent stability with a low center of gravity, as well as excellent maintainability with easy access. The Darrieus' rectangular swept area catches twice as much wind when compared to the circular swept area of typical onshore wind turbines of the same diameter and is therefore capable of

delivering twice as much power from a single installation - far more power from the same wind farm area. The Savonius current turbine harnesses the current: The split-cylinder-shaped buckets of the Savonius current turbine can harness any weak current and will rotate in one direction regardless of current direction. This turbine is insensitive to marine growth on the buckets and is harmless to the marine ecosystem, as it rotates slowly at the speed of the current. - MODEC The floating unit is said to be stable and self-righting, thanks to a gimbal-like support structure that isolates the generator unit from the motion of the waves, as well as the underwater turbine acting as a ballast or keel. According to CBS News, a prototype SKWID unit will be deployed off the coast of Japan this fall.

6. CONCLUSION

In this pre-synopsis we have proposed the concept of an offshore wave and wind turbine. This concept is a hybrid system and is capable of harvesting of ocean energy from wind and current. This floating unit is stable and self-righting due to low center of gravity. The structure isolates the generator unit from the motion of the waves, as well as underwater turbine, thus making the design safe and dependable. Electric generators are installed above the water surface at a low altitude to provide easy maintenance access. Preliminary estimation and comparisons indicate that economic performance of the new concept can be higher than those of horizontal and vertical axis offshore wind turbines. These include optimum stability of the floater, bending moment and fatigue strength of the blades, dynamic fluid-structure interactions and the minimization of viscous loss. Though the merits and demerits of the proposed concepts have not yet been examined fully, we think it will be a breakthrough in the present high energy cost of offshore wave and wind power generation.

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ADVANCES IN Autonomous Underwater Vehicles FOR DEEP OCEAN EXPLORATION: A review

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ABSTRACT

This report gives review of Advances in Autonomous Underwater Vehicles for Deep Ocean Exploration. Even though underwater robots are being used from many years, this technology is in developing stage. First Autonomous Underwater Vehicles and their need is discussed. Second, a brief summary of history of AUVs is listed. Then different AUV technologies along with some special feature Vehicles are enumerated. Third Current activities in AUVs along with its research and development are mentioned. Also focussed on AUVs as culture Issue. Then Future of AUV Technology is discussed along with guidelines. These AUVs are Very useful for underwater operations and in the future application areas will be widened with new technology.

Keywords

AUV's, Underwater Robot, UUV's

I. Introduction

An Autonomous Underwater Vehicle (AUV) is a robotic device that is driven through water by a propulsion system, controlled and piloted by an onboard computer, and manoeuvrable in three dimensions. This level of control, under most environmental conditions, permits the vehicle to follow precise pre-programmed trajectories wherever and whenever required. Sensors on board the AUV sample the ocean as the AUV moves through it, providing the ability to make both spatial and time series measurements. Sensor data collected by an AUV is automatically geospatially and temporally referenced and normally of superior quality. Multiple vehicle surveys increase productivity, can insure adequate temporal and spatial sampling, and provide a means of investigating the coherence of the ocean in time and space.

Autonomous underwater vehicle fall in to mobile robotics sector and are of brilliant importance to the present world military and commercial requirements. The need to find cutting edge in military research induces the invention of AUVs. This paper gives a glimpse on autonomous underwater vehicles and its applications.

An autonomous underwater vehicle (AUV) is a robot which travels underwater without requiring input from an operator. AUVs constitute part of a larger group of undersea systems known as unmanned underwater vehicles, a classification that includes non-autonomous remotely operated underwater vehicles (ROVs) \pm controlled and powered from the surface by an operator/pilot via an umbilical or using remote control. In military applications AUVs more often referred to simply as unmanned undersea vehicles (UUVs).

The concept of a submersible vehicle is not a new idea. The first American submarine was called "Turtle." It was built at Saybrook, Connecticut in 1775 by David Bushnell and his brother, Ezra. The Turtle was a little egg-shaped wooden submarine held together by iron straps. Turtle bobbed like a cork in rough surface winds and seas even though she was lead weighted at the bottom. In this hand and foot-operated contraption, one person could descend by operating a valve to admit water into the ballast tank and ascend with the use of pumps to eject the water. Two flap-type air vents at the top opened when the hatch was clear of water and closed when it was as not. The air supply lasted only 30 minutes. The Turtle's first engagement, which took place in New York Harbor in 1776, was also the first naval battle in history involving a submarine. [Pararas]

In November of 1879, the Reverend George W. Garrett designed, what was considered by some to be the world's first practical powered submarine, the "Resurgam." It was built at the Britannia Engine Works and Foundry of J. B. Cochran in Birkenhead, England and was powered by a Lamm 'fireless' steam engine, and could travel for some ten hours on power stored in an insulated tank.

After these historic underwater vehicles, there have been many more submersibles developed and used operationally for a number of different tasks. With these submarines, came the development of torpedoes. Torpedoes are truly the first (AUVs) Autonomous Underwater Vehicles. Although there are a number of AUV-like systems that were considered prior to the 1970s, most never were used for extended periods of time or discussed in open literature. Since that time a great deal of development has occurred.



Figure 1.1 Autonomous Benthic Explorer (ABE), Woods Hole Oceanographic Institution (WHOI)

There are different types of underwater vehicles. One method of categorizing these vehicles is to identify them as members one of two classes of vehicles; manned and unmanned systems. We are all familiar with the manned systems. They can be described simply as falling into two sub-classes; military submarines and non-military submersibles such as those operated to support underwater investigations and assessment. The navies of the world utilize a number of different classes of submarines to conduct their missions. On the other hand, Alvin (USA), Epaulard (France), Mir (Russia) and Shinkai 6500 (Japan) are all familiar names of small submarines that allow a few individuals to descend into the ocean to gather data and information from observations of the water column and ocean bottom. Unmanned submersibles also fall in to a number of different sub-classes. The simplest and most easily described are those submersibles that are towed behind a ship. They act as platforms for various sensor suites attached to the vehicle frame. A second type of submersible system is called a Remotely Operated Vehicle (ROV). An ROV is a tethered vehicle. The tether supplies power and communication to the



ROV and is controlled directly by a remote operator.
Figure 1.2 AUTOSUB Southampton Oceanography Center

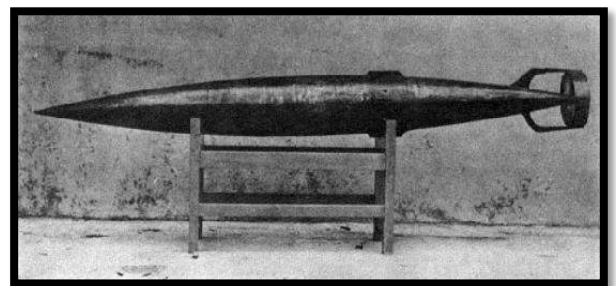
A third type of unmanned submersible is an Unmanned Untethered Vehicle (UUV). This untethered vehicle contains its own onboard power, but is controlled by a remote operator via some type of a communications link. An AUV is an undersea system containing its own power and controlling itself while accomplishing a pre-defined task. A further distinction between the AUV and UUV is that the AUV requires no communication during its mission whereas the UUV requires some level of communication for it to complete its assigned mission. Another difference between the AUV and the UUV is in the genesis of the acronyms. AUV was a term coined by the AUV development community. When the US Navy got involved, with AUV technology development they coined the acronym of UUV. This became an all encompassing term to include both ROVs and AUVs.

2. LITERATURE REVIEW

2.1 History

The first AUV was developed at the Applied Physics Laboratory at the University of Washington as early as 1957 by Stan Murphy, Bob Francois and later on, Terry Ewart. The "Special Purpose Underwater Research Vehicle", or SPURV, was used to study diffusion, acoustic transmission, and submarine wakes. The torpedo had a two-cylinder reciprocating engine, operated by compressed air, which drove a 1-foot diameter, four-bladed propeller.

A hydrostatic depth control mechanism was also used. The first torpedo trial was in 1871. The torpedo did run, but difficulty was encountered in obtaining a water-tight hull and an air-tight air flask. Azimuth control was a problem although the depth mechanism worked well. The origin of AUVs should probably be



linked to the Whitehead Automobile 'Fish' Torpedo.

Fig 2.1. Newport's Auto-Mobile "Fish" Torpedo (1871)

Robert Whitehead is credited with designing, building, and demonstrating the first Torpedo in Austria in 1866. Torpedoes are named after the Torpedo fish, which is an electric ray capable of delivering a stunning shock to its prey. Whitehead's first torpedo achieved a speed of over 3.0 m/s and ran for 700 m. The vehicle was driven by compressed air and carried an explosive charge. If one ignores the fact that it carried an explosive charge, it might be considered the first AUV. Other early AUVs were developed at the Massachusetts Institute of Technology in the 1970s. One of these is on display in the Hart Nautical Gallery in MIT. At the same time, AUVs were also developed in the Soviet Union (although this was not commonly known until much later).

A brief chronological history of AUV development :

- It is informative to understand what has happened over the past few decades relative to the development of AUVs. It is clear that the process has led to a technology whose time has arrived.
- ➔ Prior to 1970 - Special Applications of AUVs :
- ❖ Initial investigations into the utility of AUV systems.
AUV development began in the 1960s. A few AUVs vehicles are built mostly to focus on very specific applications / data gathering. There are not a great amount of published papers that describe these efforts.
- ➔ 1970 - 1980 - AUV's advanced greatly through technology
- ❖ There is a shift towards understanding the predictability of

ocean activity

➔ 1980 - 1990 - Explore the Potential of AUVs :

❖ Technology development; some test beds built.

During the 1970s, a number of test beds were developed. The University of Washington APL developed the UARS and SPURV vehicles to gather data from the Arctic regions. The University of New Hampshire's Marine Systems Engineering Laboratory (now the Autonomous Undersea Systems Institute) developed the EAVE vehicle (an open space-frame AUV) in conjunction with a complementary effort undertaken at the US Navy's facility in San Diego. Also at this time the Institute of Marine Technology Problems, Russian Academy of Sciences (IMTP, RAS) began their AUV program with the development of the SKAT vehicles, as well as, the first deep diving AUVs L1 & L2. Other AUV test beds were also fabricated. This was a time of experimentation with technology in hopes of defining the potential of these autonomous systems. There were some successes and many failures. The vision shared by the development community far exceeded the technology available to implement that vision. None the less, there was significant advancement in AUV development.

➔ 1990 - 2000 - Experiment with Prototypes

❖ Advances in technology reinforce development efforts.

❖ Proof of Concept prototypes are developed / tested /used.

In the 1980s there were a number of technological advances outside of the AUV community that greatly affected AUV development. Small, low power computers and memory offered the potential of implementing complex guidance and control algorithms on autonomous platforms. Advances in software systems and engineering made it possible to develop complex softwaresystems able to implement the vision of the system developers. Even with these technological advances, it became quite clear that a number of technology development problems had to be solved if AUVs were to become operational systems.

The Future of AUVs ... a forecast ???

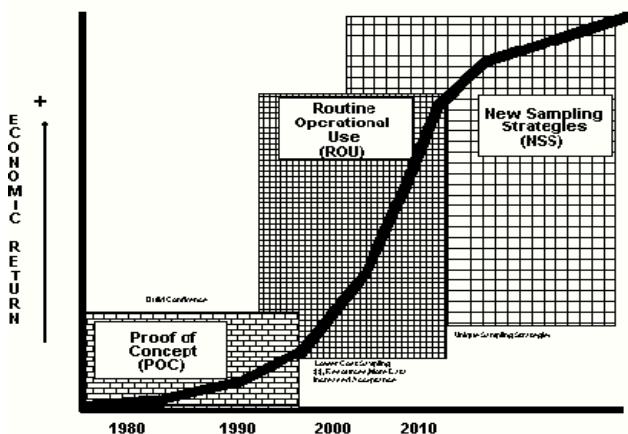


Figure 2.2 A possible timetable for the transition of AUV technology from prototype systems to operational vehicle systems is described by the characteristic "S" curve associated with the introduction of new technology into the marketplace. The year 2000 should see this technology expand into operational use and produce an economic return for developers.

In 1980, the first "International Symposium on Unmanned Untethered Submersible Technology" (UUST) was held in Durham New Hampshire, USA Twenty-four technologists attended this meeting. 1987, the attendance had grown to more

than 320 people representing more than 100 companies, 20 Universities and 20 federal agencies. Nine countries were represented at the meeting.

Most importantly in the USA, research programs were begun which provided significant funding to develop proof of concept prototypes. The most published program was the effort at Draper Labs that led to the development of two Large AUVs to be used as testbeds for a number of Navy programs. This decade was indeed the turning point for AUV technology. It was clear that the technology would evolve into operational systems, but not as clear as to the tasks that those systems would perform.

➔ 2000 - 2010 - Goal Driven Tech. Development

❖ Broader based funding of technology development.

❖ Many AUVs developed internationally. Users awake.

During this decade, AUVs grew from proof of concept testbeds into first generation operational systems able to be tasked to accomplish defined objectives. A number of organizations around the world undertook development efforts focused on various operational tasks. Potential users surfaced and helped to define mission systems necessary to accomplish the objectives of their data gathering programs. This decade also identified new paradigms for AUV utilization such as the Autonomous Oceanographic Sampling System (AOSN) [Curtin] and provided the resources necessary to move the technology closer to commercialization.

➔ 2010 - 2014 - Commercial markets grow

First truly commercial products become available.

As this decade begins, the utilization of AUV technology for a number of commercial tasks is obvious. Programs are underway to build, operate and make money using AUVs. Markets have been defined and are being assessed as to viability. This will be the decade that sees AUV technology move from the academic and research environment into the commercial mainstream of the ocean industry. There are still technological problems to be solved. The economic viability of the technology has still to be proven. The AUV must be proven in an operational regime in order for the technology to continue its advance and for industry to embrace its potential.



Figure 2.3 Maridan 600, Maridan A/S, Denmark

2.2 Some special classes of AUVs :

Till 2014 many special class AUVs are developed ; some of them are listed below.

i. *Odyssey*-Class of AUV is the new generation in ocean exploration :

It can hover in a place like a helicopter an invaluable tool for deep water oil explorers, marine archaeologists, oceanographers and others.

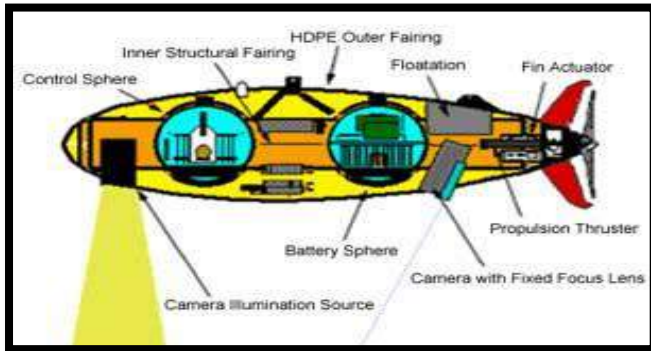


Fig. 2.4 ODYSSEY-CLASS OF AUV

A torpedo-like six and a half-foot long robot with sensors that detect both oil and chemical dispersants to protect the area against encroaching oil plumes.

iv. *Flippers for locomotion :*



Fig. 2.7 FLIPPERS

Madeleine, an underwater robot, is helping scientists and engineers better understand the most energy-efficient way to use flippers for locomotion as well as to design more efficient underwater autonomous vehicles. Credit: John Long, Vassar College. An underwater robot is helping scientists understand why four-flipped animals such as penguins, sea turtles and seals use only two of their limbs for propulsion, whereas their long-extinct ancestors seemed to have used all four.

When researchers put a robot named Madeleine through her paces, they found that her top cruising speed did not increase when she used four flippers instead of two -- apparently because the front flippers created turbulence that interfered with the rear flippers' ability to generate forward propulsion. Maintaining the same speed with four flippers also took significantly more energy. Results from experiments such as these aid engineers in designing underwater autonomous vehicles and help scientists understand why certain traits survived over others during the process of evolution.

ii. AMOUR (Autonomous Modular Optical Underwater Robot)

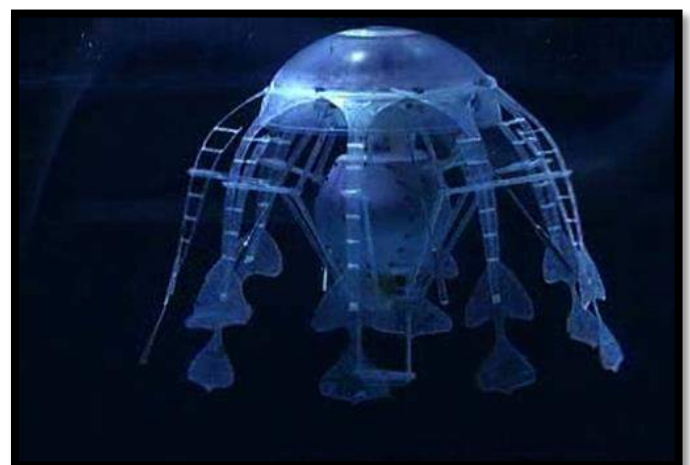
Fig. 2.5 AMOUR

AMOUR with sensors in Moorea. We designed, developed and deployed an underwater sensor network capable of multi-modal perception, dual communications and mobility in the ocean. The hardware consists of static sensor network nodes and mobile robots that are dually networked: optically for point-to-point transmission at 300kb/s and acoustically for broadcast communication over hundreds of meters range at 300b/s. We have demonstrated the system during experiments with this system in the ocean, in rivers, and in lakes.



iii. NRDC's underwater robot –WALDO :

Fig. 2.6 NRDCs underwater robot – WALDO



v. Biomimetic underwater robot :

Fig. 2.8 FESTO'S AQUA JELLY

From 2008 new class of AUVs are being developed, whose mimic found in nature. They are able to achieve higher degrees of

efficiency in propulsion by copying designs in nature. E.g. Festo's AQUAJELLY, Evologic's BIONIC MANT.

2.3. AUV Technology :

Over the years, the focus of technology development has changed as new ideas surfaced to address technology problems. Some of the problems have been solved, others remain that must be addressed, and other, previously unrecognized problems, have surfaced. It is hard to list those technologies that are needed for AUV systems. Any list that is developed will be incomplete. It could be suggested, however, that the following list represents many of the technologies that have been addressed over the past three decades.

- Autonomy
- Energy
- Navigation
- Sensors
- Communications

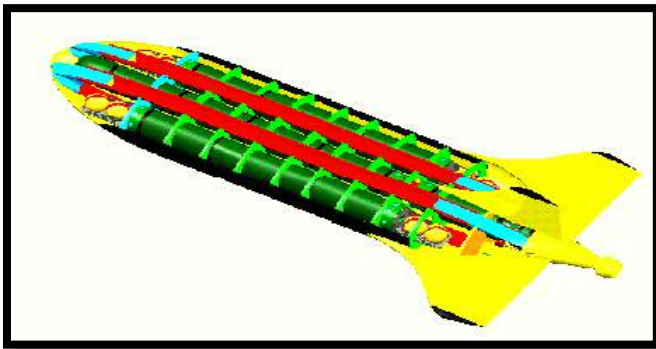


Figure 3.1 STDV (Manta AUV NUWC Newport)

The interesting aspect of this list is that although there have been advances in these technical areas, a number of these technologies still remain the technology long poles" associated with AUV systems. Limits in these technologies limit the capability of AUV systems.

A. Technology "Long Poles"

- Autonomy / Cooperation / Intelligent Systems and Technologies
- Energy Systems / Energy management
- Navigation
- Sensor Systems and Processing
- 3D Imaging
- Communications.

i. Autonomy / Cooperation / Intelligent Systems and Technologies:

In the 1980s there was a considerable effort placed into understanding how to give an AUV a level of intelligence necessary to accomplish assigned tasks. Issues such as intelligent systems architectures design, mission planning, perception and situation assessment were investigated. These are all hard problems and there were few successes that led to in-water evaluation. As the capabilities required by the first generation AUVs became clear, the tasks the AUVs were to perform seemed not to demand a high level of intelligent behaviour. In fact many of the tasks being assigned to

today's AUVs required only a list of pre programmed instructions to accomplish a task. For this reason, there has not been a significant level of development, recently, that is focused on AUV autonomy.

The problem of autonomy still remains unsolved. There have been some successes with other autonomous systems, but those advances have not been brought into the AUV community. There are very few programs funded to address these issues and the problem remains. As AUV operations increase, it will become apparent that more investigation is needed. This will again emphasize the need for more development along the lines of making AUV systems more intelligent and better able to adapt to the environment within which they exist.

The use of multiple cooperating AUVs was first considered in the 1980s. Some work was undertaken, but not completed. Since that time, there has been little funded work on this technological issue. In the past few years, there has been increased recognition of the potential of multiple cooperating AUVs. Currently some work is underway to investigate cooperating AUVs tasked to meet some of the needs of mine clearance. Many more investigations are required as the problem is a significant problem and far from being solved.

Energy Systems / Energy management::

Endurance of AUVs has increased from a few hours to 10s of hours. Some systems now contemplate missions of days and, a very few, of years. This extended endurance, however, is at the expense of sensing capability, as well as very limited transit speeds. In the majority of early AUV systems, Lead Acid batteries were the workhorse for energy systems. Some AUV designs included Silver Zinc batteries, but, for the most part, the cost was prohibitive. Some applications, such as the ABE vehicle, utilized Lithium primary batteries. A number of other chemistries were tried for different applications. Recent advances in NiMH batteries have provided new opportunities for AUV and this technology is being used in many of the current AUV systems. In 1987 the use of an Aluminium / Oxygen "semi-cell" was proposed to DARPA for use in an AUV. A number of years later a similar system development was funded and dramatically increased the endurance of the DARPA UUV. Currently the ALTEX [altex] program is underway to utilize similar technology to allow an AUV to transit under the Arctic ice. Solar Energy is now being used to



power an AUV [AUSI].

Fig. 3.2 The Solar Powered AUV (SAUV), AUSI & IMTP, RAS, FEB

This system demands a detailed design of onboard energy management; both during the acquisition phase, as well as, the utilization phase of operations. It is an inexhaustible energy source but requires an AUV to surface while recharging. The Glider AUVs [Simonetti] utilize heat energy to vary the buoyancy of an AUV that

can glide up and down in the water column. The potential endurance of such a system is measured in years.

Navigation:

Early AUV systems relied on dead reckoning for their navigation. Acoustic transponder navigation systems provided greater accuracy but at a significant logistics cost. Inertial navigation systems were available for more expensive AUVs, but costs were prohibitive for the non-military user. With advances in inertial platform technology, the cost has dropped significantly to a point where it is possible to utilize these systems for lower cost AUVs. Navigation systems continue to improve in accuracy as well as precision. In the past few years, many AUVs have taken advantage of Global Positioning Systems (GPS). When the vehicle surfaces, it is possible to obtain an accurate position and update onboard inertial systems. Still, there is strong interest in being able to navigate relative to the environment within which the system exists. This environment referenced navigation utilizing bottom features, gravimetric variations or other similar characteristics is an objective to be attained. A successful system will provide a significant increase in AUV capability.



Fig. 3.3 Long Base Line navigation system (LBL)

Discription: Operation of a Long Baseline (LBL) underwater acoustic positioning system for ROV. Interrogator (A) mounted on the ROV transmits an acoustic signal that is received by baseline transponders (B, C, D, E). The reply of the baseline transponders is received by (A). Either the time-of-flight or the corresponding distances A-B, A-C, A-D and A-E are transmitted via the ROV umbilical (F) to the surface, where the ROV position is computed and displayed on a tracking screen.

AUVs can navigate using an underwater acoustic positioning system. When operating within a net of sea floor deployed baseline transponders this is known as LBL navigation. When a surface reference such as a support ship is available, ultra-short baseline (USBL) or short-baseline (SBL) positioning is used to calculate where the subsea vehicle is relative to the known (GPS) position of the surface craft by means of acoustic range and bearing measurements. When it is operating completely autonomously, the AUV will surface and take its own GPS fix. Between position fixes and for precise maneuvering, an inertial navigation system on board the AUV measures the acceleration of the vehicle and Doppler velocity technology is used to measure rate of travel. A pressure sensor measures the vertical position. These observations are filtered to determine a final navigation solution. An emerging alternative is using an inertial navigation system in

conjunction with either a GPS receiver, or an additional magnetic compass for Dead Reckoning whenever the GPS signal is lost.

B. Sensor Systems and Processing / 3D Imaging:

An AUV is simply a platform on which to mount sensors and sensing systems. Initial efforts to develop AUV technology was more concerned about the basic technologies required to allow reliable vehicle operation. As that reliability was achieved, sensors were added to the vehicle system to acquire data from the ocean environment. Most of these efforts to date have been to integrate existing sensors and sensor processing to the sometimes unique constraints of the AUV. This paradigm has proven to work reasonably well. Recently it has been recognized that we must develop entirely new sensors based on the constraints imposed by an AUV. This would change the paradigm of sensor integration. It would encourage the development of sensors specifically for AUVs; smarter, lower power, highly reliable, smaller in size, etc. It is also becoming clear that AUVs can be used in groups to act cooperatively to acquire needed data. By maintaining a common spatial and temporal reference, data acquired by multiple AUVs can be aggregated and processed to obtain synoptic, high resolution data describing a process of interest.

Much work continues on the development of higher and higher resolution imaging systems, both optical and acoustic. With the new processors it has been possible to obtain very high resolution images over longer and longer ranges [LENS]. The roadblock to much of this work is the ability to analyze the acquired data autonomously such that the AUV can utilize this data for guidance and control decisions. This perception ability is still beyond the current capabilities of AUVs.

Sonar (originally an acronym for Sound Navigation And Ranging) is a technique that uses sound propagation (usually underwater, as in Submarine navigation) to navigate, communicate with or detect other vessels.

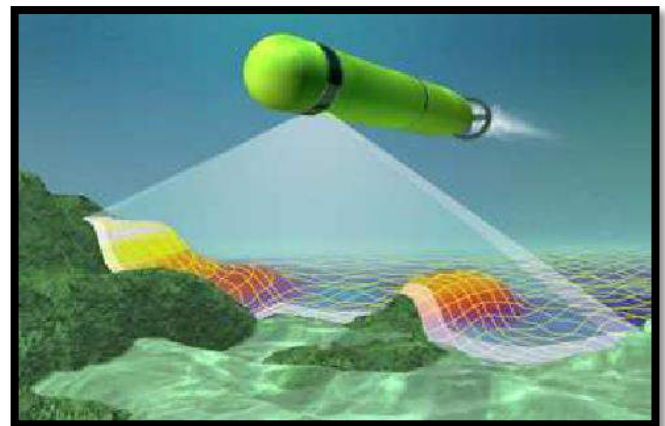


Fig. 3.4 AUV Model with SONAR scanning

Two types of technology share the name "sonar":

- Passive sonar is essentially listening for the sound made by vessels;
- Active sonar is emitting pulses of sounds and listening for echoes. Sonar may be used as a means of acoustic location and of measurement of the echo characteristics of "targets" in the water.

Acoustic location in air was used before the introduction of radar. Sonar may also be used in air for robot navigation. AUVs carry sensors to navigate autonomously and map features of the ocean. Typical sensors include compasses, depth sensors, side scan and

other sonars, magnetometers, thermistors and conductivity probes. A demonstration at Monterey Bay in California in September 2006 showed that a 21-inch (530 mm) diameter AUV can tow a 300 feet (91 m) long Hydrophone array while maintaining a 3-knot (5.6 km/h) cruising speed.

C. Communications:

In the underwater environment acoustic communications is probably the most viable communication system available to the system designer. Some development programs have investigated and evaluated other technologies such as laser communication at short range and relatively noise free communications over larger ranges using RF current field density techniques. In the past 10 years there has been significant advances in acoustic communications such that relatively low error rate communications is possible over ranges of kMs at bit rate of a few kbps [Comms]. This remains an active area of investigation. Another aspect of communication is the issue of connecting multiple vehicles and/or bottom mounted instrument platforms via a networked-based communication infrastructure. This subsea network can then be connected to a surface vehicle that will act as a gateway to the terrestrial based communication infrastructure such as the internet [Welsh]. Efforts are underway to investigate how to implement such a network and be able to have effective communications among and between multiple underwater systems.

Other technologies have been investigated over the years such as those below. There have been a number of significant advances in these areas and, although there is still much to be learned, they do not represent major stumbling blocks to the further advancement of AUV technology at this time. These technologies continue to be investigated and refined in the development of operational systems. There remain some important advances to be made such as in the area of autonomous manipulation but the emphasis of current activities are not along these lines.

- Guidance /Low Level Control
- Hydrodynamics and Control Systems
- Autonomous Manipulation / Work Systems
- User Interface / Development Tools / Emulation / Modeling

There are also issues associated with the basic system design. It is clear that the system design must result from an understanding of the mission to be undertaken by the system. Over the past few decades, there has been an increased effort to standardize such that advances in system design can be shared by the community. This move toward standardization has increased dramatically over the past few years as AUV systems move closer and closer to operational systems. Another aspect of the system design that has become commonplace is the tendency to think in terms of modularity. This is seen in current efforts to design distributed control systems architecture both in terms of software and hardware. The concept of “plug & play” is becoming a buzz word for AUV developers as well as PC users. In an environment where new sensors are added to AUV systems on a regular basis, it is obvious that a simple method for managing the impact on the vehicle software system is important.

As AUV systems mature to a point where they are being commercialized, the importance of cost reliability and robustness are gaining increased importance. These are the characteristics that are best optimized by industry. The next few years will undoubtedly see AUVs undergo a strong systems design process to optimize these features. This will benefit the community as a whole and should be well received by the potential user community of the future.

- Software System Architecture / Distributed Control
- Hardware System Architecture / Standardization
- Platform Design
- Cost / Reliability / Robustness.

2.4. Current activities in AUV development

At one point in time it was relatively easy to identify all of the ongoing efforts related to the development of AUV technology. The players were few and, more than not, professional acquaintances and friends. Some of the more advertised efforts can, however, be summarized. The community though international in scope, was well aware of each other's work. In the late 80s the number of individuals and organizations increased significantly. Since then, the number of players has continued to increase. It is now quite impossible to understand the full breadth of ongoing technology development or, even more impossible, to assess progress in the area of commercialization.

Current activities fall into two categories. First there is a significant amount of research underway to investigate enabling technologies paving further development of AUV systems. Secondly, there is considerable effort to design, fabricate and evaluate AUV systems under operational conditions. This development activity is being driven somewhat by the evolving markets for AUV technology.

✓ *Research & Development:*

Fig.4.1 DORADO, ISE, Canada



Current AUV development programs are, in many cases, being supported by funding that results from the political process as opposed to market need or technical merit. This, however, is a current reality within which development of AUV technology advances. Although these programs are very visible due to the level of activity, it is short sighted to over emphasize some of these activities over smaller, less advertised work. There are a number of organizations in the USA, and elsewhere, actively working on important research problems. As mentioned above, there is much to be understood regarding technologies such as Autonomy, Energy, Navigation, Sensors, and Communications. These are very much open research topics.

✓ *Evolving markets:*

At this point in time we are seeing a number of markets beginning to form. Although not clearly defined the level of enthusiasm of a number of individuals and organizations suggests that we will see many opportunities for commercializing AUV technology over the next few years. Individual companies, as well as teams of organizations, have begun efforts to make operational AUVs part of the oil & gas industry toolkit. Missions have been defined, contracts let, vehicle systems designed, and fabrication of the operational systems begun. The next few years will provide insight into the real capability of the commercial AUV [Hasan].

In the area of Ocean Science, the potential for AUV systems is clearly recognized by most researchers. Successes of ABE, AUTOSUB [GRIF97] and other vehicles in gathering scientifically significant data has made a positive impact on the community. New sensors, uniquely suited for AUVs, are being developed. Indeed, the worry is that too much is expected from this evolving technology. Clearly the success and failures of the next few years will help adjust system capabilities and user expectations. This is sign of a maturing technology. It is generally agreed that AUV technology has an important role to play in the future ocean science data acquisition programs.

The US Navy is encouraging and supporting a coordinated effort sometimes referred to as the AOSN [Curtin]. This effort suggests that multiple AUVs can be networked together to acquire oceanographic data and information in spatial and temporal resolution far exceeding current capabilities. It emphasizes coastal areas but, conceptually, a long term view would envision a similar system obtaining required information throughout the oceans of the world.

International efforts are perhaps further along the path to truly operational systems. Almost from the start, AUV development has encouraged collaboration among academic, industrial and government

to catalogue AUV systems lists 145 different types of AUV. In the final analysis, an AUV system design must be driven by a specific mission. ISE has taken this philosophy one step further by constructing a web-based tool that allows a potential user to design a specific AUV to meet his/her needs. As operational experience increases, preferred types of AUVs will undoubtedly be identified. The only trend that can be seen now is the two paths that the marketplace has established. The first is the development of small, low cost AUVs. It is envisioned that these systems can eventually be used in groups of cooperating vehicles. The second type of AUVs are much larger systems containing complex sensor suites configured to meet specific user needs. These are not low cost systems but they are able to undertake tasks that, if done in other ways, would be far more expensive to accomplish. It will be interesting to watch the evolution of these two trends in AUV development.

As clearly as AUV development will be driven by the market place, it will be further impacted by the decisions made as to how the businesses that provide AUVs will be structured. Many business models are surfacing. Individual companies spun off from academic efforts have formed. Other models suggest that the appropriate structure is to form a consortium approach that teams multiple academic organizations in some fashion with a commercial organization. Still another model teams large corporations to focus on a specific market. Some individuals state that since AUV technology is so expensive requiring diverse expertise, only a large company or group of organizations can compete. Others suggest that since technology changes so quickly only small organization have the flexibility to adapt quickly. In this final analysis, both models may be right for difference markets. The next few years will tell. AUV systems are at a transition point. They are moving from the Science and Technology communities into the commercial marketplace. They must now show a return on the dollars invested over the last 30 years.

3 Applications:

partners. This has focused development to address real market needs. Again, it will be interesting to see where many of these efforts will provide an economic impact.

Fig.4.2 The Slocum AUV Webb Research Inc

2.5 AUVs ; as Culture Issue :

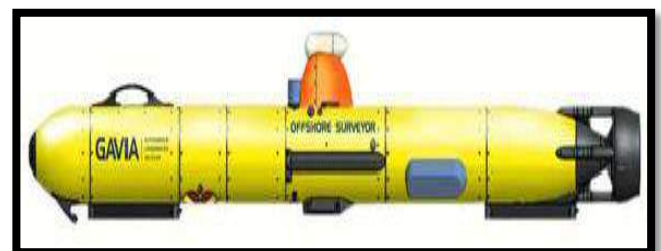
The use of autonomous systems is a revolutionary concept in that the user has very little, if any control over the system as it performs its task. Even space-based satellites can be reached by high data rate communications. The user never really loses control of the system except for very small periods of time. AUVs, on the other hand, by definition, will control themselves over extended periods of time. How soon the user will accept the idea of giving up real time control is unknown. In the short term, that control will be implemented over low data rate communication links. If AUV technology is to truly prove its value, that near real time control function must be eliminated or, at least, minimized. Applications requiring higher levels of autonomy will pace this evolution.

Over the years it has become reasonably clear that there will be no single AUV concept that meets all user needs. A number of workshops have suggested a number of different types of AUVs (size, complexity, and capability). In the 1970s it was possible to count the number of AUV systems on the fingers of your hands. A recent effort

Until recently, AUVs have been used for a limited number of tasks dictated by the technology available. With the development of more advanced processing capabilities and high yield power supplies, AUVs are now being used for more and more tasks with roles and missions constantly evolving.

Commercial:

The Gavia is the global provider of commercial AUVs known for its performance and adoptability. Best for surveying work as well as oil



rig maintenance.

Fig.4.3 GAVIA Commercial AUV for oil rigs

The oil and gas industry uses AUVs to make detailed maps of the seafloor before they start building subsea infrastructure; pipelines and sub sea completions can be installed in the most cost effective manner with minimum disruption to the environment. The AUV

allows survey companies to conduct precise surveys of areas where traditional bathymetric surveys would be less effective or too costly. Also, post-lay pipe surveys are now possible.

Military:

A typical military mission for an AUV is to map an area to determine if there are any mines, or to monitor a protected area (such as a harbor) for new unidentified objects. AUVs are also employed in anti-submarine warfare, to aid in the detection of manned submarines

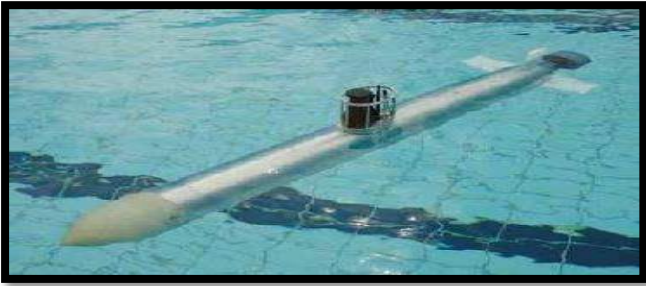


Fig. 4.4 Starfish 2 U.S.A. navy

On the military side of the equation, AUVs have been under development for decades, and they are now reaching an operational status. Their initial fleet application will be for mine hunting, which was also the case for fleet introduction of ROVs. However, in the case of AUVs, they will operate from a submarine and not a surface ship. The U.S. Navy's submarine launched AUV is the Long Term Mine Reconnaissance System (LMRS), which is scheduled for initial operation in 2003.

Research:

Sea duane 2 AUV from Flinders University Adelaide Australia. There is a ton of development in research sector of AUVs but the latest goes to Sea Duane 2 of Flinders University Australia. SD2 is used for underwater surface scanning and life assessment of deep sea organisms. Scientists use AUVs to study lakes, the ocean, and the ocean floor. A variety of sensors can be affixed to AUVs to measure the concentration of various elements or compounds, the absorption or reflection of light, and the presence of microscopic life.

Hobby:

Many robot cists construct AUVs as a hobby. Several competitions exist which allow these homemade AUVs to compete against each other while accomplishing objectives. Like their commercial brethren, these AUVs can be fitted with cameras, lights, or sonar. As a consequence of limited resources and inexperience, hobbyist AUVs can rarely compete with commercial models on operational depth, durability, or sophistication. Finally, these hobby AUVs are usually not oceangoing, being operated most of the time in pools or lakebeds.

3.1 USES OF AUVs:

- Search and Recovery of Government Property
- Commercial offshore (oil & gas)
- Military application (battle space preparation)
- Readings for depth, salinity, pressure and temperature
- Pictures of visual light, bioluminescence
- Discovery of never seen before species and footage
- Collecting under water samples.
- Detecting poisonous gases.
- Water pollution control in ports.
- Blockage detection in drainages
- Catching fishes.

4. Future of AUV technology

AUV technology has followed a path not unlike other technologies. It has gone through stages where academic curiosity was followed by research investigation and prototype development. Applications have recently surfaced that seem to have sufficient financial backing to develop operational systems. Certainly the timing of AUV technology was good. It has been able to leverage its development by utilizing many technologies developed for other markets. The next five years will see the expansion of AUV technology into the commercial marketplace. The size of that market is unclear but the move into the marketplace has begun.

There are still many important research investigations to be undertaken. Autonomy is probably the most important issue to be addressed but others, such as those described above, certainly must be addressed. It is clear that the limit to the capability of any AUV is the amount of energy it has onboard. There have been many discussions that suggest that fuel cell technology has reached a point where it may well be possible to use this technology in AUV systems. The increase in endurance will be substantial. Is this the "silver bullet" for AUVs? I would suggest that there is no "silver bullet," but rather a continuum of activity that spans a wide spectrum. Basic research into some of the enabling technologies must be supported. The development of operationally reliable systems must be undertaken. Unique markets where AUV technology can make a significant impact must be identified. Most important, the AUV community must educate the user community of the future about AUV systems capabilities and operational reliability

The future of the AUV is open to a wide variety of possible models, applications, configurations and uses. Autonomy is the most important issue to be addressed in AUV's.

NeMo's application –

NeMo can be contacted via satellite and sent to active underwater volcanic activity in a timely manner as shown in fig.5.1 This technology is very much useful in predictions of natural disasters in oceanographic region which will further leads to earthquakes and tsunamis.

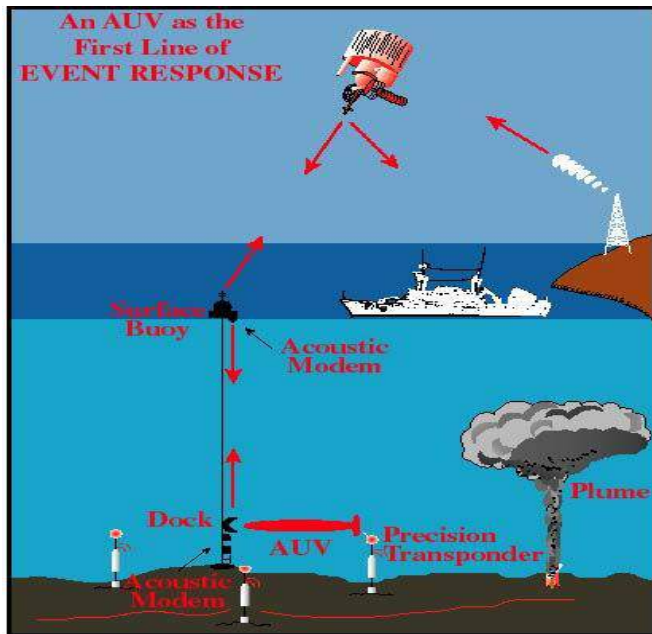


Fig 5.1 NEMO APPLICATION

5. Future Possibilities:

The trouble with our times is that the future is not what it used to be. Paul Valéry AUVs are now at an early stage of acceptance. As they work their way into the phase of operational acceptance on a commercial level, their numbers will grow. Academia is not only using AUVs but also spinning off firms to supply commercial versions. And the US Navy is gearing up to push the technology, ensuring that cost-effective systems are available for use by the fleet in the future.

Finding better ways of observing and reporting on the interior of the ocean, its seafloors and coastal boundaries remain principal objectives of the oceanographic community. Utilizing productive and affordable technologies that offer a new perspective of the ocean by providing sampling methodologies that merge the high spatial resolution of ship-based surveys with the endurance and temporal resolution of moorings may be one 'better way'. The broad use of this technology by the ocean science community is hopefully in our future.

C&C Technologies, Inc.'s AUV Hugin has proven that the cost of deep water survey operations can be reduced by 40% to 60% by using AUVs rather than conventional methods, while improving the quality of the data that is collected. Given the budgetary constraints that face the oceanographic community and the need for high quality data, it is unwise to ignore this potential.

6. Conclusion

Even though underwater robots are being used from many years, this technology is in developing stage. To reduce the resistance to signals while going through water is challenge in front of scientists. Very useful for underwater operations and in the future application areas will be widened with new technology.

After working on Advances in AUVs for Deep Ocean Exploration finally i conclude that very less research is carried out in this area.

Actual research along with commercialization is started from 2010; so there is a scope for improvement in AUV Technology in following areas,

- ✓ Guidance / Low Level Control
- ✓ Hydrodynamics and Control Systems
- ✓ Autonomous Manipulation / Work Systems
- ✓ User Interface / Development Tools /Emulation / Modeling
- ✓ Cost / Reliability / Robustness
- ✓ Software Symtem Architecture / Distributed Control
- ✓ Hardware System Architecture / Standardization
- ✓ Platform Design

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Analysis of influence of Shaping process parameters on MRR and Surface Roughness of Al 6061 using Taguchi Method

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ABSTRACT

This paper investigates the parameters affecting the Material Removal Rate (MRR) & Roughness of surfaces produced in the shaping process for the material 6061 Aluminium. Design of experiments was conducted for the analysis of the influence of the shaping parameters such as cutting speed, feed rate and depth of cut on the surface roughness. The results of the machining experiments for Al 6061 were used to characterise the main factors affecting surface roughness by the Analysis of Variance (ANOVA) method. Feed rate founds to be a most influencing parameter for the surface roughness in the shaping process whereas depth of cut is found to be significantly affecting the MRR.

Keywords

Al-6061, Shaping Process, MRR, surface roughness, DOE, ANOVA,

1. INTRODUCTION

Primary objective of machining operations is the efficient production of accurate parts. In case of shaping process particularly, significant research has focused on the ways to increase material removal rate without sacrificing work piece accuracy. MRR can be improved by varying the three parameters – feed rate, speed & depth of cut. The shaping machine highly used in the industries for metal removal operation. Also, from the literature it is learnt that limited efforts have been made to optimize the machining parameters on shaping machine. In order to improve the machining efficiency, reduce the machining cost and improve the quality of machined parts, it is necessary to select the most appropriate machining conditions. In this work, shaping operation has been carried out on shaping machine for given parameter levels. Desired cutting parameters were selected based on the maximum & minimum capacity of machine for the cut.[1]

Material of the workpieces, Al 6061 with its light weight & high corrosion resistance properties is widely used for construction of air crafts, Yacht constructions including small utility of boats, Used in automotive parts such as wheel spacers, scuba tank etc.

Taguchi parameter design offers a systematic method for optimization techniques of various parameters with regard to the performance, quality and cost. Taguchi methodology optimized parameters of shaping machine. It is necessary to determine optimal cutting parameters in order to achieve minimal expenses or minimal cost/production time.

L₉ orthogonal array have been employed to analyse experimental results of machining obtained from 9 experiments by varying three process parameters viz cutting speed, depth of cut and feed rate. ANOVA has been employed and analysis results have been compared with experimental results from Taguchi method. [2]

2. METHODOLOGY

Taguchi's design of experiments is a simple robust technique for analysing and optimizing the process parameters. In this method, main parameters which are assumed to have influence on process results are located at different columns in a designed orthogonal array. The major steps in Taguchi experimental design are: selection of output response, selection of independent variables and the design of orthogonal array (OA). The machining parameters were selected on the basis of the information available in the literature and past experience of the present authors. In the Taguchi design of experiments, the signal to noise ratio (η) represents quality characteristics for the observed data (Ross 1996). Depending on the experimental response, there are several quality characteristics. In the case of MRR and surface roughness, higher value of MRR & lower value of surface roughness are desirable[3]. So, smaller the better "SB" ratio is selected. The S/N ratio for minimum responses type of characteristics can be calculated as follows: $S/N = -10 \log(\text{mean square deviation})$

The S/N ratio for the smaller-the-better is:

$$S/N \text{ ratio} = -10 \log \left(\frac{1}{n} \sum_{i=1}^n y_i^2 \right) \quad (1)$$

The S/N ratio for larger-the-better is:

$$S/N \text{ ratio} = -10 \log \left(\frac{1}{n} \sum_{i=1}^n \frac{1}{y_i^2} \right) \quad (2)$$

where y_i is the observed data at i^{th} trial and n is the number of trials. From the S/N ratio, the effective parameters having influence on process results can be seen and the optimal sets of process parameters can be determined.

ANOVA can be useful for determining influence of any given input parameter for a series of experimental results by design of experiments for machining process and it can be used to interpret experimental data. While performing ANOVA, the degrees of freedom should also be considered together with each sum of squares. In ANOVA studies, a certain test error, error variance determination is very important. Obtained data are used to estimate F value of Fisher Test (F-test). Variation observed (total) in experimental results attributed to each significant factor or interaction is reflected in percent contribution (P), which shows relative power of factor or interaction to reduce variation.

3. EXPERIMENTATION

Shaping operation was carried out on Shaping Machine (Kirloskar Shaping master 35) using high speed steel tool. Al 6061 was used as a work material for experimentation. The chemical composition of Al 6061 is shown in Table 2. Properties of the material are shown in the following table 1.

Long Rectangular bar of the material was cut in the required size of 100×25×25 mm³ using hacksaw & then ends of specimens were turned on lathe for proper aligning & right angle position of edges. The tool, High speed steel (HSS has point angle is 118°. At room temperature, in their generally recommended heat treatment, HSS grades generally display high hardness. The composition of high speed steel are carbon (0.6%to0.75%), tungsten (14%to20%), Chromium (3%to5%), vanadium (1%to1.5%), Cobalt (5%to10%) and remaining is iron .Shaping machine used is 1 H.P., 1440 rpm, Kirloskar shaping master 35 (weight 350 kg). The input parameters are depth of cut , Speed, feed rate as shown in table 3 and the responses considered are material removal rate (MRR) and surface roughness (Ra).

Table 1.. PROPERTIES OF Al 6061

Physical Properties	Mechanical Properties
Density 2.7 g/cm ³	Young's modulus is 56.1 Gpa
Melting point 580 0c	Tensile strength 125 Mpa
Poisson's ratio 0.33	Yield strength 202.92 Mpa
Modulus of elasticity 70-80 Gpa	Ultimate tensile strength 251.66 Mpa

stop watch. On completion of machining on first specimen, it was removed from the vice. File was used for removing burr present on it & then it's weight is measured on the balance. In this way all 9 workpieces were machined with their parameter levels. Care should be taken while fixing the specimen on the vice & while setting the required feed on it. Before starting the machine, it must be confirmed that depth of cut is not so large[3]. The surface roughness is measured using Surftest SJ-400 SERIES 178 — Portable Surface Roughness Tester with 25 mm of measuring range. The MRR was calculated on the two basis:- 1) by using the difference between weights of work materials before and after shaping 2) by theoretical formula.

a) Theoretical Material Removal Rate (MRR)=

$$fdNL \times (1 + \frac{1}{Q})$$

b) MRR on Weight Basis =

$$\frac{(\text{initial weight} - \text{final weight})}{(g * t)}$$

$$Q = \frac{\text{time of cutting stroke}}{\text{time of return stroke}}$$

Where f = feed rate (mm/double stroke), d= depth of cut (mm), N = no. of double strokes/ min,L = length of workpiece, Q = quick return ratio (mm),b = width of workpiece, t = cutting time (min), g = density of material [4]

The obtained values of responses are then compared with predicted values of regression equations. Minitab 15.0 version statistical software is used to generate regression equations and performing ANOVA method. [5]



Fig. 1: Pictorial view of shaping machine

Table 2. Composition of Al 6061

SAE Designation	%Al	% Cr	% Fe	% Mg	% Mn	% Si	% Zn	% Ti	Other
Al 6061 (Actual)	98.81	0.0003	0.178	0.493	0.15	0.475	0.0006	0.0135	0.05

Table 3. Machining Parameters and Levels:

Machining Parameters	Level 1	Level 2	Level 3
Cutting speed (rev/min)	31.3	47.1	70
Depth of cut (mm)	0.3	0.5	0.7
Feed rate (mm/rev)	0.18	0.3	0.4

Significance of machining parameters (difference between max. and min. values) of surface roughness indicates that feed is significantly contributing towards the machining performance as difference gives higher values. Plot for S/N ratio shown in Figure 2 explains that there is less variation for change in depth of cut where as there is significant variation for change in feed rate. But in case of MRR, variation in depth of cut is more significant as compared to other parameters. Also there is less variation in MRR for change in speed.

Taguchi method cannot judge and determine effect of individual parameters on entire process while percentage contribution of individual parameters can be well determined using ANOVA. MINITAB software of ANOVA module was employed to investigate effect of process parameters (cutting speed, Depth of Cut, Feed rate).[6]

4. RESULTS AND DISCUSSION

Table 4 shows orthogonal array and response values calculations for Al 6061. S/N ratio is calculated using Lower the better characteristics for surface roughness and larger the better characteristics for MRR. Responses for Signal to Noise Ratios of both responses are shown in Table 5 & 6.

Table 4. Orthogonal Array & Calculations For Response Variables

Specimen No.	Feed rate (mm/rev)	Cutting Speed (rpm)	Depth of Cut (mm)	Workpiece Weight difference (kg)	Surface Roughness (Ra) μm	S/N Ratio of Ra	Material Removal Rate (mm ³ /min)		S/N Ratio of MRR
							Theoretical	Practical (Weight basis)	
1	0.18	31.3	0.3	0.0025	2.68	-8.5627	309.8	290.45	49.2614
2	0.18	47.1	0.5	0.0035	2.57	-8.19866	777.1	668.64	56.5038
3	0.18	70	0.7	0.0058	2.69	-8.59505	1616.7	1645.9	1645.9
4	0.3	31.3	0.5	0.0035	1.57	-7.71213	860.59	830.67	58.3886
5	0.3	47.1	0.7	0.005	1.76	-4.91025	1813	1779.6	1779.6
6	0.3	70	0.3	0.002	2.43	-3.91799	1154.7	1118	1118
7	0.4	31.3	0.7	0.0045	2.42	-7.67631	1606.4	1631.2	1631.2
8	0.4	47.1	0.3	0.002	3.03	-9.62885	1036	1062.1	1062.1
9	0.4	70	0.5	0.004	1.6	-4.0824	2566.2	2487	2487

Table 5 & 6. Response Tables

Table 5. Signal To Noise Ratios Of Surface Roughness
SMALLER IS BETTER

Level	Feed rate	Speed	Depth of cut
1	-8.452	-7.984	-7.37
2	-5.513	-7.579	-6.664
3	-7.129	-5.532	-7.061
Delta	2.939	2.452	0.705
Rank	1	2	3

Table 6. Signal To Noise Ratios Of Mrr
LARGER IS BETTER

Level	Feed rate	Speed	Depth of cut
1	56.7	57.3	56.92
2	61.45	60.68	60.94
3	64.23	64.4	64.53
Delta	7.53	7.1	7.61
Rank	2	3	1

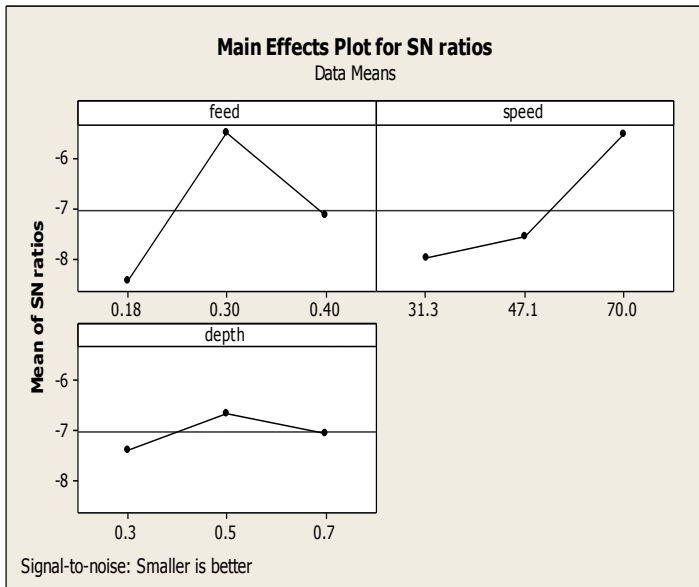


Fig 2 : Effect of Feed, Speed & Depth of cut on Ra

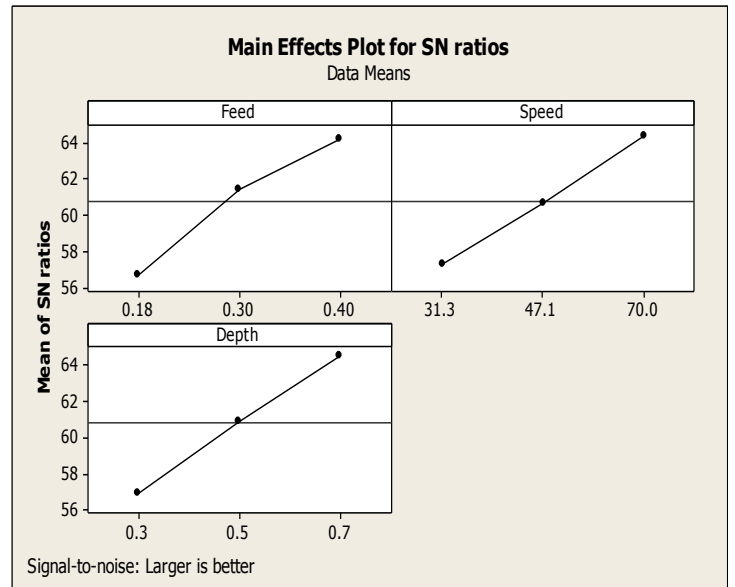


Fig 3: Effect of Feed, Speed & Depth of cut on MRR

Table 7 & 8. Analysis of Variance for S/N ratios

Table 7. Surface Roughness Analysis

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Feed rate	2	12.9966	12.9966	6.4983	1.04	0.491
Speed	2	10.3674	10.3674	5.1837	0.83	0.548
Depth of cut	2	0.7503	0.7503	0.3751	0.06	0.944
Residual error	2	12.5533	12.5533	6.2767		
Total	8	36.6676				

Table 8.. MRR Analysis

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Feed Rate	2	87.044	87.0437	43.5219	215.47	0.005
Speed	2	75.748	75.7485	37.8742	187.68	0.005
Depth of cut	2	86.967	86.9666	43.4833	215.66	0.005
Residual Error	2	0.404	0.4036	0.2018		
Total	8	250.162				

Table 5 & 6 shows S/N ratios for responses. Now from surface roughness analysis (table 7), F value (1.04) of parameter indicates that feed rate is significantly contributing towards surface finish & machining performance. F value (0.06) of parameter indicates that depth of cut is contributing less towards surface finish. It can be



Fig. 4: Surface texture for smooth surface (cutting speed 31.3 rpm, depth of cut 0.5 mm, feed 0.3 mm/rev)

observed from rough surface from photographs taken for the specimen No. 8 (cutting speed:- 47.1 rpm; depth of cut:- 0.3 mm; feed :- 0.4 mm/rev) and smooth surface for the specimen No. 4 (cutting speed:- 31.3 rpm; depth of cut:- 0.5 mm; feed :- 0.3 mm/rev) as shown in fig. 4 & 5.



Fig. 5: Surface texture for rough surface (cutting speed 47.1 rpm, depth of cut 0.3 mm, feed 0.4 mm/rev)

From MRR analysis (table 8), F value (215.66) of parameter indicates that feed rate is significantly contributing towards MRR & machining performance. F value (187.68) of parameter indicates that depth of cut is contributing less towards Material removal rate. the specimen No. 9 (cutting speed - 70 rpm; depth of cut – 0.5 mm; feed – 0.4 mm/rev) has highest Material removal rate and the specimen No. 1 (cutting speed – 31.3 rpm; depth of cut – 0.3 mm; feed – 0.18 mm/rev) has lowest MRR (table 4).

5. CONCLUSION

Taguchi method of experimental design has been applied for optimizing multi response process parameter for shaping Al 6061 are optimized with L9 orthogonal array. Results obtained from Taguchi method closely matches with ANOVA. Best parameters found for surface finish machining are - cutting speed: - 31.3 rpm; depth of cut: – 0.5 mm; feed: – 0.3 mm/rev. The parameters found for rough machining are cutting speed:- 47.1 rpm; depth of cut :- 0.3 mm; feed:- 0.4 mm/rev. Feed is most influencing parameters corresponding to the quality characteristics of surface roughness.

Best parameters found for MRR are: cutting speed - cutting speed:- 70 rpm; depth of cut :- 0.5 mm; feed :- 0.4 mm/rev. The parameters for very less MRR are cutting speed, cutting speed :- 31.3 rpm; depth of cut :- 0.3 mm; feed :- 0.18 mm/rev with depth of cut being most affecting parameter [2].

By observing table 4, the surface roughness value corresponding to highest MRR of specimen no 9 is 1.6. This value of surface roughness is nearer to the Ra value of smooth surface (1.57). Hence Combination of parameters of specimen no 9 gives optimum MRR with smooth surface finish. Desired values of parameters are cutting speed: - 70 rpm; depth of cut: – 0.5 mm; feed: – 0.4 mm/rev. As a result, the optimisation of complicated multiple performance characteristics can be greatly simplified using this approach.

6. ACKNOWLEDGMENT

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WELDABLE MATERIALS AND MATHEMATICAL MODEL OF FRICTION STIR WELDING

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ABSTRACT

This paper focusses on Friction stir welding (FSW) invented by Wayne Thomas in The Welding Institute (TWI) at London in 1991. Friction stir welding (FSW) is a solid state joining process which means joining of metal plates without reaching the melting point of the material to be welded. FSW uses a non-consumable rotating tool which is plunged into workpiece material due to which heat is generated between tool shoulder and workpiece surface which results in plastic deformation of material to be welded. This technique of joining metal is energy efficient, environmental friendly and can be used to join high strength aluminium alloys and other alloys that are hard to weld by conventional fusion welding. This work depicts study of mechanism of FSW, weldable materials, welding tool and various other factors affecting welding.

General Terms

Friction stir welding, Friction stir processing, microstructure, welding parameters.

Keywords

Friction stir welding, Friction stir processing, microstructure, welding parameters.

1. INTRODUCTION

Now in aerospace, shipbuilding and automotive industries materials which have good mechanical strength and low weight are preferred so in most cases aluminum alloys are used. Now joining of aluminum alloys is a serious issue as it has excellent thermal and electrical conductivity which causes issue in fusion and resistance welding of aluminum alloys. This led to the development of FSW which is a solid state joining technique in which a non-consumable rotating tool is plunged into the joining edges of sheets or plates to be joined and then traversed along the line to be joined. Welding occurs below the melting temperature of the workpiece to be welded so FSW has several advantages as compared to fusion welding techniques.

2. WHY FRICTION STIR WELDING

2.1 FSW Benefits over Fusion Welding

FSW has many advantages as compared to traditional fusion welding. Mishra et al. has named some benefits of FSW.

- Low distortion of workpiece & low residual stresses
- Good dimensional stability and repeatability
- No loss of alloying elements
- Excellent metallurgical properties in the joint area

- Fine microstructure & absence of cracking
- Can join variety of metals such as, aluminium, titanium, steel, copper & magnesium alloys
- Can join two different metals
- High repeatability
- No shielding gas required
- No surface cleaning required
- No fumes or spatter
- Eliminate grinding wastes
- Eliminate solvents required for degreasing
- Improved materials use
- Less energy required for generating weld

FSW has better mechanical properties as compared to conventional fusion welding process. But the result of the mechanical properties depends upon different process parameters such as downward force of the tool, tool rotational speed, tool traverse rate and tool design.

2.2 FSW as Riveting Substitution

FSW eliminates the use of rivets which results in better quality of weld. Rivets add weight to space vehicles as space vehicles use millions of rivets. As FSW doesn't use any filler material it is a better substitution to rivets. Use of rivets also introduces unwanted stresses, can introduce a crack.

3. FSW Mechanism

The basic concept of FSW is simple. Non-consumable rotational tool with pin and shoulder shaped to provide required weld properties is inserted in between abutted edges of plates to be joined and traverse along the joint line. Joint is created by stirring the material of the two pieces by the tool pin, plastic deformation caused by the pin and friction between the base material and tool shoulder creates heat that softens the base material, thus eases the stirring process. There is no melting of the base material involved. The main source of heat in the weld is the friction between shoulder and base material. The principle is illustrated on the schematic drawing.

FSW tool serves the purpose of heating and movement of plasticized material in the weld zone. Heating of the workpiece surface is accomplished due to friction between tool shoulder and workpiece surface and movement of material flow is accomplished due to stirring action of the tool pin. If FSW tool rotates in clockwise direction and travels with a linear velocity in the direction as shown in figure 1. Then the advancing side is on right side as tool rotational direction is same as tool travel direction and retreating side is on left side as tool rotational direction is opposite to the travel direction. During FSW material goes into plastic deformation resulting in fine equiaxed recrystallized grains. FSW is a green technology as it uses less energy as compared to conventional fusion and resistance welding also no flux is required making it environmental friendly.

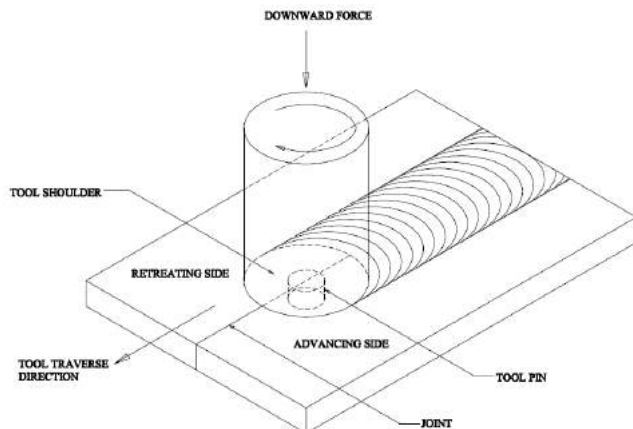
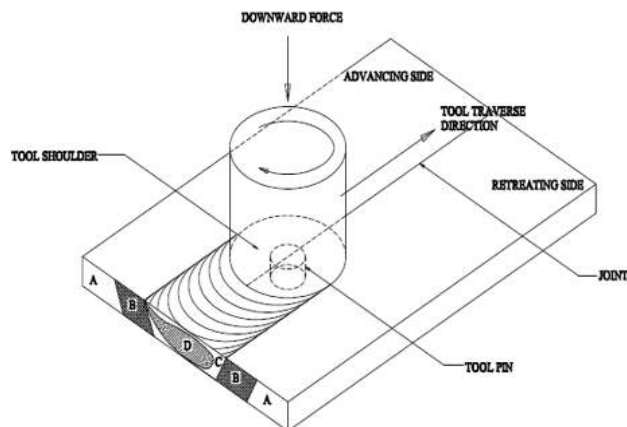


Fig 1: Schematic diagram of Friction stir welding

4. Weld Microstructure

Typical friction stir weld in its cross-section consists of three main zones: (a) Nugget, stirred zone, (b) thermo-mechanically affected zone (TMAZ) and (c) heat affected zone (HAZ). The three zones pose distinct mechanical properties. The stir zone (also called nugget) is a region of deeply deformed material that corresponds approximately to the location of the probe during welding. The grains within the nugget are often an order of magnitude smaller than the grains in the base material. The thermomechanical affected zone (TMAZ) occurs on either side of the stir zone. The strain and temperature levels attained are lower and the effect of welding on the material microstructure is negligible. The heat affected zone (HAZ) is common to all welding processes. This region is subjected to a thermal cycle but it is not deformed during welding. Weld microstructure is represented in Figure 2.



A - BASE MATERIAL

B - HEAT AFFECTED ZONE (HAZ)

C - THERMO-MECHANICALLY AFFECTED ZONE (TMAZ)

D - NUGGET, STIRRED ZONE

Fig 2: Schematic diagram of cross-section of weld

5. Weldable Materials

FSW is used for different materials as given below:

5.1 Aluminum

FSW was first invented for welding aluminum as some grades of aluminum are considered difficult to weld by conventional

welding technique (2XXX & 7XXX series of alloy are unweldable). Aluminum and its alloys undergoes volume changes during melting and solidification process, this can give rise to solidification cracking due to stresses involved. FSW being a solid state joining process, does not encounter these problems to the same degree and produces good quality weld.

5.2 Magnesium

LDS test and measurement an international company based in UK which manufactures electro dynamic vibration test systems had range of products which included large vibration tables often made to customer specification, the tables need to be light weight but high strength so material chosen was magnesium as it has vibration damping properties. The manufacturing process used by LDS did not offer required results so they requested assistance from TWI for suitable alternative. Once FSW was demonstrated to produce excellent weld quality to weld 75 mm thick aluminium plates, trials were conducted on magnesium plates of same thickness. After performing series of welding trials, the welding process proved to be success.

5.3 Copper and copper alloys

The high thermal and electrical conductivity of copper have long made it a difficult material to weld, particularly in thick sections. As FSW does not melt the workpiece and applies mechanically generated heating very locally, it was seen as a potentially useful process for welding copper. SKB manages the storage and disposal of Sweden's nuclear waste. To manufacture the canister from 50mm thick copper and the sealing on these canister require a thick section copper joining process. SKB commissioned TWI to develop FSW in 50mm thick copper. TWI demonstrated that TWI designed and built FSW machine can produce high integrity full circumferential lid to canister welds.

5.4 Hafnium and zirconium

Hafnium and zirconium are metals with specialist applications in the petro-chemical, oil refining and power generation industries. Research has shown that both can be friction stir welded.

5.5 Steel and ferrous alloys

FSW of steels provides excellent mechanical properties and exceed to those of fusion welds. The process shows a degree of robustness, suiting it to industrial application, and can weld some steels, for example ODS steels, that are currently considered unweldable.

Table 1. Steels welded at TWI

Carbon steels	Stainless Steels	ODS & Others
AISI 1018, 1060, 1085	304, 304 L, 316	20Cr5Al, PM2000, MA957
A36	420A, 420B, 420C	PH14, PH17
S275, S355, S690	RWL34	Armour steels
API X 65, X80, L80, X100	12C27	
EH36, DH36, EH46	S32205 duplex	
HSLA-65		
HY-80, HY-100		

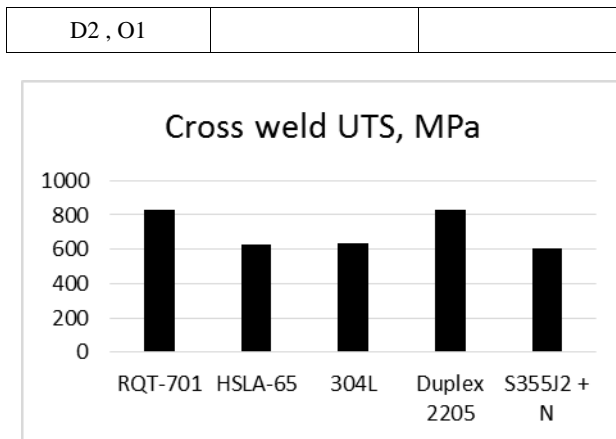


Fig 3: Joint efficiencies of FSW in Five welds

5.6 Titanium

Most of the titanium alloys are generally weldable by conventional fusion welding process but some of the titanium alloys such as Ti-6246 and Ti-17 can be difficult to weld by conventional fusion welding process. First trials on FSW of Ti were carried out as early as 1995, as part of TWI's internal research programme. These initial welds were conducted on commercially pure (grade 2) titanium, and proved the potential of applying FSW to Ti alloys.

5.7 Dissimilar metals

As FSW is a solid-state process that mechanically mixes metals together to form a bond between them, it can be used to join dissimilar metals. This is most easily achieved when the metals to be joined have similar thermal properties and plasticisation temperatures.

5.8 Thermoplastics

Thermoplastics soften and flow as they are heated, and then regain their stiffness as they cool. They can therefore be friction stir welded. Friction stir welding of thermoplastics is more complex than the FSW of metals as thermoplastics comprise long chain molecules rather than individual atoms and so have very different flow characteristics. Process parameters and tool designs for the FSW of thermoplastics are therefore quite different from those required for metals.

6. Process Parameters

FSW involves complex material movement. The welding parameters and tool geometry has significant effect on material flow and temperature distribution

6.1 Tool geometry and Material flow

Optimum tool design will produce the desired joint quality as well as enable higher traverse speed and longer tool life. FSW tool consists of tool shoulder and tool pin. The shape of the bottom of the tool shoulder affects material flow around tool pin, it can be flat or concave. A concave shoulder has advantage over flat bottom, it directs the plasticized material to the center of the tool pin. Tool geometry is an important aspect of FSW. Tool geometry plays important role in material flow. FSW tool has two primary functions, localized heating and material flow. FSW is performed in three stages (a) plunge, (b) dwell, (c) traverse. In the initial stage tool is plunged into abutting edges of material to be welded till the tool shoulder touches workpiece material. In the dwell period tool shoulder is in contact with the material surface and the

tool rotates in same place without any traverse speed, heating results primarily from the friction between pin and workpiece, additional heat is generated due to friction between tool shoulder and workpiece due to which workpiece material goes into plastic deformation. The tool shoulder also provides confinement for the plasticized material. Now the tool stirs the material and moves the material from advancing side to trailing side. Once the workpiece/tool interface is sufficiently heated up, the tool is traversed along the desired direction to accomplish joining. The tool geometry has evolved significantly. Complex features have been added to improve material flow and mixing. WhorlTM and MX TrifluteTM tools developed by TWI are as shown in figure 4. The design features of WhorlTM and MX TrifluteTM are believed to reduce welding force, enable easier flow of plasticized material. It has been demonstrated that aluminium plates with a thickness of upto 50mm can be successfully welded in one pass by using either of these two tools. A 75 mm thick plate can be welded using WhorlTM tool in two passes each giving about 38 mm penetration.

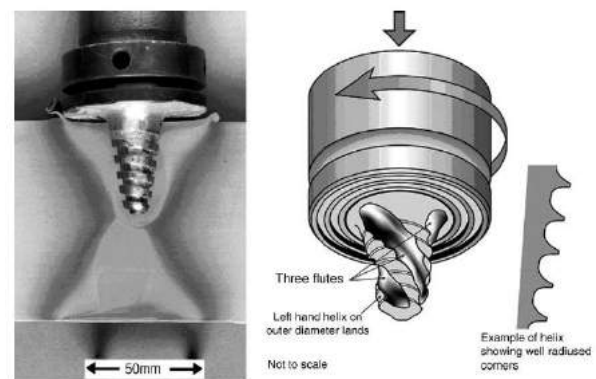


Fig 4: WhorlTM and MX TrifluteTM tools developed by TWI.

Two more tool geometries—Flared-TrifluteTM with the flute lands being flared out and A-skewTM with the pin axis being slightly inclined to the axis of machine spindle were developed for improved quality of lap welding. The design features of the Flared-TrifluteTM and the A-skewTM are believed to increase the ratio between of the swept volume and static volume of the pin, thereby improving the flow path around and underneath the pin. Compared to conventional threaded pin, Flared-TrifluteTM and A-skewTM pins resulted in: (a) over 100% improvement in welding speed, (b) about 20% reduction in axial force.

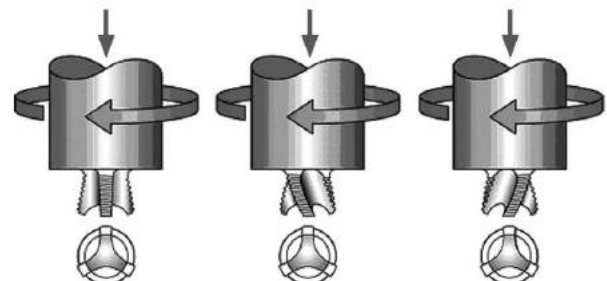


Fig 5: Flared-TrifluteTM tools developed by The Welding Institute (TWI), UK: (a) neutral flutes, (b) left flutes, and (c) right hand flutes

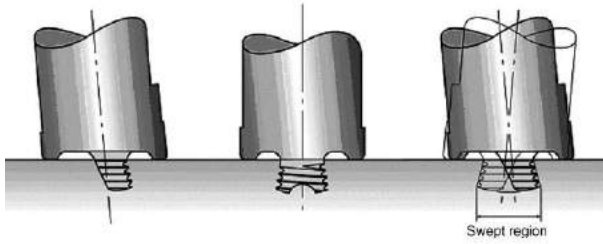


Fig 6: A-Skew™ tool developed by The Welding Institute (TWI), UK: (a) side view, (b) front view, and (c) swept region encompassed by skew action

6.2 Weld Parameters

To get better quality of weld in FSW, following parameters are important, tool rotational speed & tool traverse speed and downward force of the tool along the line of joint. The rotation of the tool helps in stirring and mixing of material around the rotating tool and translation of tool helps to move the stirred material from front to back of the tool and finishes the welding process. Higher tool rotational speed and downward force of tool will generate higher temperature and will result in more intense stirring and mixing of plasticized material while the higher traverse speed will induce lower heat generation in the weld zone. The rotational speed determines the quality of heat production and degree of plastic deformation. Due to increase in temperature due to heat generation caused by friction between tool shoulder and workpiece surface, residual stresses are likely to occur however there is enough time for stress relaxation due to long cooling time. Travel speed influences rate of heat input, higher the travel speed less is the rate of heat input. Higher traverse speed affects material flow around tool pin.

As localized heat is generated in FSW, primary heat loss is conduction through tool material. There is no radiation loss because heat generated in FSW is much less. The welding efficiency is also affected by heat loss through tool as well as the backing plate. Using a tool material having low thermal conductivity along with suitable non conducting backing plate will reduce the heat loss substantially and will enable increasing the welding speed. Also increasing the welding speed will now also will require to increase the rotational speed to get better quality of weld.

Other factors affecting weld quality are dwell period of tool, shoulder radius and angle of tilt of the tool. The period between the instant the tool contacts the workpiece and the instant the tool begins moving along the joint is the dwell period of tool. Dwell period can usually range between 5 to 30sec. during this period generated heat spreads in the vicinity of the tool pin, softening the adjacent material and stabilizing material flow around tool pin. If the dwell period is too short then defects can occur in initial part of the weld. Angle of tilt of tool allows gradual increase of the pressure on top surface of workpiece.

7. Applications

- The original application for friction stir welding was the welding of long lengths of material in the aerospace, shipbuilding, railway and automotive industries.
- Examples include large fuel tanks and other containers for space launch vehicles, cargo decks for high-speed ferries, and roofs for railway carriages.

8. Mathematical Model of FSW

The purpose of the model is to calculate the transient temperature fields developed in the workpiece during friction stir welding. In the thermal analysis, the transient temperature field T which is a function of time t and the spatial coordinates (x, y, z) , is estimated by the three dimensional nonlinear heat transfer equation (1).

$$k \left(\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} + \frac{\partial^2 T}{\partial z^2} \right) + Q_{int} = c\rho \frac{\partial T}{\partial t} \quad (1)$$

Where

k is the coefficient of thermal conductivity

Q_{int} is the internal heat source rate

c is the mass-specific heat capacity

ρ is the density of materials

This heat produced by the friction contact between the pin tool and the plates is concentrated locally, and propagates rapidly into remote regions of the plates by conduction according to Eq. (1) as well as convection and radiation through the boundary. It is assumed that the heat flux, $q(r)$, is linearly distributed in the radial direction of the pin tool shoulder, and has the following form

$$q(r) = \frac{12Qr}{\pi(d_o^3 - d_i^3)} \text{ for } \frac{d_i}{2} \leq r \leq \frac{d_o}{2} \quad (2)$$

where d_o is the outside diameter of the pin tool shoulder, d_i is the pin diameter, and Q is the total heat input energy. In Eq. (2), the heat generated at the pin of tool is neglected because this heat is very small, e.g. in the order 2% of the total heat as reported by Russell and Sheercliff. As such, in the analysis $d_i = 0$ in (2) was used. On the boundary or the surfaces of the workpiece, convection and radiation in heat transfer are responsible for heat loss to the ambient. To consider such heat convection and radiation on all plate surfaces except for the bottom surface, the heat flux loss is evaluated by

$$q_s = \beta(T - T_0) + \epsilon\sigma(T^4 - T_0^4) \quad (3)$$

Where T_0 is the room temperature, β is the convection coefficient, ϵ is the emissivity of the plate surfaces. The heat loss from the bottom surface is practically heat conduction from the workpiece to the support base plate. However, the complicated unknown contact resistance between the workpiece and support base presents difficulty in modeling. To circumvent the problem and simplify the analysis, we modeled this heat loss *approximately* using the heat flux loss by convection as

$$q_b = \beta_b(T - T_0) \quad (4)$$

Considering the boundary value problem of the heat transfer in the workpiece, if the total heat input energy, Q , and the fictitious convection coefficient, β_b , are known as in the heat transfer analysis for conventional fusion welding, one can numerically solve the differential equation (1) using the boundary conditions of (2)–(4).

9. CONCLUSION

Friction stir welding of aluminium is now a mature and robust process, which is becoming increasingly well established in the fabrication of critical components. It is true to say that FSW has extended the use of welding in certain materials and applications.

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SELF BALANCING VEHICLE

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ABSTRACT

Self balancing robots are increasingly becoming popular because of their unique ability to move around in two wheels. This project describes the design and testing of a self balancing robot that balances on wheels. Self-balancing robot is based on the principle of Inverted pendulum, which is a two wheel vehicle balances itself up in the vertical position with reference to the ground. It consist both hardware and software implementation. According to the situation we have to control both angle of pendulum and position of cart. Mechanical design consist of two motor, one arduino microcontroller, Sensor and motor driver as a basic need. MPU 6050 consists of accelerometer and gyroscope gives the reference acceleration and angle with respect to ground (vertical).

Keywords

Gyroscope, self balancing, Accelerometer

1. INTRODUCTION

Unlike an ordinary robot, a two wheel self balancing robot requires just two point of contact with the floor surface. The unique stability control that is required to keep the robot upright differentiates it from ordinary robots. Such robots are characterized by the ability to balance on its two wheels.

The basic idea of a self-balancing robot is simple: drive the wheels in the direction in which the robot tilts. If the wheels can be driven in such a way as to stay under the robot's center of gravity, the robot remains balanced. This is similar to the inverted pendulum model in control theory. The pendulum is usually mounted on a cart through a hinge. The cart moves forward or backward to ensure that the pendulum remains vertical. To drive the cart either forward or backward, knowledge of the angle and rate of tilt of the inverted pendulum is required. This can be measured using an MPU6050 sensor.

The project is aimed at making a two wheeled self balancing electric vehicle. A processor and electric motors in the base of the device keep the vehicle upright when powered on with balancing enabled . Switches are used to control the movement of vehicle in forward or backward direction. Gyroscopic sensors are used to detect tilting of the device which indicates a departure from perfect balance. Motors driving the wheels are commanded as needed to bring the vehicle back into balance. The dynamics of the vehicle are identical to a classic control problem, the inverted pendulum. The vehicle has electric motors powered by batteries. It balances with the help of a microcontroller , one tilt sensors, and one gyroscope.

2. PROBLEM DEFINITION

Challenges over controlling the bicycle: Balancing the two wheeler bicycle without support of any extra legs or wheels is one of the biggest challenges for human also from long time. A bicycle remains upright when it is steered so that the ground reaction forces exactly balance all the other internal and external forces it experiences, such as gravitational if leaning, inertial or centrifugal if in a turn, gyroscopic if being steered, and aerodynamic if in a crosswind. Steering may be supplied by a rider or, under certain circumstances, by the bike itself. One other way that a bicycle can be balanced, with or without locked steering, is by applying appropriate torques between the bike and rider similar to the way a gymnast can swing up from hanging straight down on uneven parallel bars, a person can start swinging on a swing from rest by pumping their legs, or a double inverted pendulum can be controlled with an actuator only at the elbow. A bicycle remains upright when it is steered so that the ground reaction forces exactly balance all the other internal and external forces it experiences, such as gravitational if leaning, inertial or centrifugal if in a turn, gyroscopic if being steered, and aerodynamic if in a crosswind. Steering may be supplied by a rider or, under certain circumstances, by the bike itself. This self-stability is generated by a combination of several effects that depend on the geometry, mass distribution, and forward speed of the bike. Tires, suspension, steering damping, and frame flex can also influence it, especially in motorcycles.

2.1 Self Balancing

Stability Analysis of a Two-wheeler during Curve Negotiation under Braking:

Two-wheelers have some different dynamic characteristics. They are statically unstable but the roll instability disappears as the forward speed increases. A simplified model has been considered to analyze the effects of forward speed and braking force on the roll instability during cornering of a two-wheeler. It helps to understand some important concepts about a two-wheeler negotiating a turn under applied braking force.

One method of establishing the proper lean is counter-steering in which handlebar is turned counter to the desired turn and thus developing a centrifugal torque that leans the two-wheeler appropriately.

2.2 Arduino

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform

based on a simple microcontroller board, and a development environment for writing software for the board.

Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can communicate with software running on your computer (e.g. Flash, Processing, MaxMSP.) The boards can be assembled by hand or purchased preassembled; the open-source IDE can be downloaded for free.

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.

2.3 Motor driver

Since motors require more current than the microcontroller pin can typically generate, you need some type of a switch (Transistors, MOSFET, Relay etc..) which can accept a small current, amplify it and generate a larger current, which further drives a motor. This entire process is done by what is known as a motor driver.

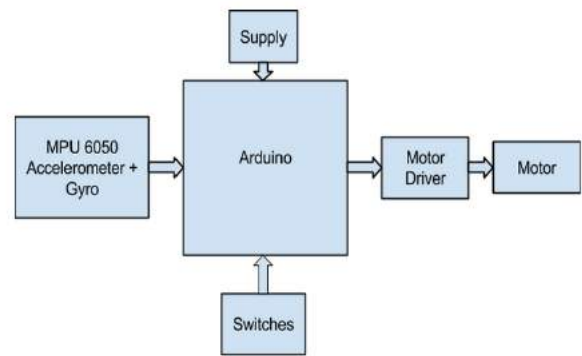
L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive in either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC, Dual H-bridge Motor Driver integrated circuit (IC). The L293d can drive small and quiet big motors as well.

2.4 MPU 6050

The MPU-6050 is a serious little piece of motion processing tech! By combining a MEMS 3-axis gyroscope and a 3-axis accelerometer on the same silicon die together with an onboard Digital Motion Processor™ (DMP™) capable of processing complex 9-axis MotionFusion algorithms, the MPU-6050 does away with the cross-axis alignment problems that can creep up on discrete parts. The parts' integrated 9-axis MotionFusion algorithms can even access external magnetometers or other sensors through an auxiliary master I2C bus, allowing the devices to gather a full set of sensor data without intervention from the system processor.

For precision tracking of both fast and slow motions, the MPU-6050 features a user-programmable gyro full-scale range of ± 250 , ± 500 , ± 1000 , and $\pm 2000^\circ/\text{sec}$ (dps) and a user-programmable accelerometer full-scale range of $\pm 2g$, $\pm 4g$, $\pm 8g$, and $\pm 16g$.

3. PROPOSED METHODOLOGY



4. PARTS

Motor operated bicycle, Gyro meter sensor kit, Accelerometer Sensor Kit, AVR Development Board, ISP Programmer, LCD screen, Servo motor controller, Servo motors are hardware used in the project. The programming language used for development is 'C' (For Atmega16 Programming).

5. CONCLUSION

In this project, we could see the self-balancing techniques based on by maintaining the center of gravity, done by controlling falling angle based on proportional-integral controller (PID). A bicycle remains upright when it is steered so that the ground reaction forces exactly balance all the other internal and external forces it experiences, such as gravitational if leaning, inertial or centrifugal if in a turn, gyroscopic if being steered, and aerodynamic. This self-stability is generated by a combination of several effects that depend on the geometry, mass distribution, and forward speed of the bike. Tires, suspension, steering damping, and frame flex can also influence it, especially in Bicycle. If the steering of a bike is locked, it becomes virtually impossible to balance while riding. On the other hand, if the gyroscopic effect of rotating bike wheels is cancelled by adding counter-rotating wheels, it is still easy to balance while riding. One other way that a bicycle can be balanced, with or without locked steering, is by applying appropriate torques between the bike and rider similar to the way a gymnast can swing up from hanging straight down on uneven parallel bars, a person can start swinging on a swing from rest by pumping their legs, or a double inverted pendulum can be controlled with an actuator only at the elbow.

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ABSTRACT

The aim of this project is to design a device that will allow humans to move on the surface of water. Our target market is the recreational user, someone who will use the device as an enjoyable and unique mode of transportation. Selecting the hydrofoil shoe as our alpha design, we revised the concept to use rotating hydrofoils instead of fixed hydrofoils propelled through the body of water. This concept allows the user to be stationary on the water's surface as well as to move, where the original concept required constant forward movement. Our design uses a DC motor powered by a battery pack and three hydrofoils that rotate at approximately three-hundred rotations per minute. The size and parameters of this shoe were determined using engineering analysis concerning lift, drag, power and strength of materials.

General Terms

Hydro Shoes, Buoyancy shoes

Keywords

Hydro, shoes, water walking, buoyancy

1. INTRODUCTION

We have undertaken the challenging task of designing a device that will allow humans to move on the surface of water. This project, sponsored by Professor Nikos Chronis, broadly aims to create some device that is close in size to a human footprint to allow such a feat. Our target market is the recreational user, someone who will use the device as an enjoyable and unique mode of transportation. Though attempts have been made by inventors previously, no satisfactory design has been created that allows a person to walk on the water's surface with ease and fluidity. In our previous reports we detailed the initial findings on the topic, the customer specifications, and possible concepts that could achieve our goals. We ultimately settled on a design utilizing rotating hydrofoil blades to produce lift. We then proceeded to manufacture and test a prototype device. Though humans may be biologically limited to walking on terra firma, the animal kingdom can claim a variety of creatures capable of walking on the water's surface. Taking a biomimetic approach to design, the team has sought to understand the physics behind these animals' abilities. A large body of scholarly research from the biology world exists trying to understand this behavior. The most familiar example of water surface locomotion is the water strider. The water strider insect, family Gerridae, is an insect often seen gliding across the surface of ponds, rivers and the ocean. These arthropods, weighing in at a mere 1-10 dynes are capable of supporting

their weight above the water's surface. Being denser than water, buoyancy alone could not account for such a feat. Instead, the insects use surface tension to support their body weight. Recently, research has suggested that this ability is largely related to the micro-structure of the insect's legs as opposed to their waxy coating as was previously believed. The study found that Nano-scale grooves on the hairs covering the insect's legs contribute to their hydrophobicity and thus the strong surface tension achieved.

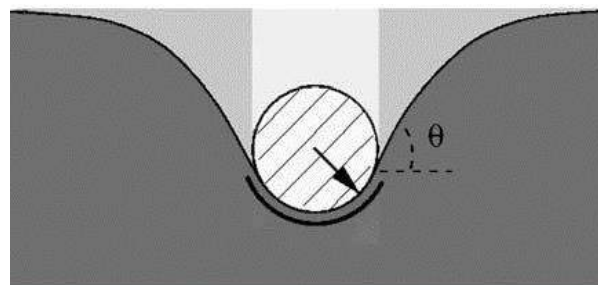
2. Concept

2.1 Surface tension effectiveness

It is possible to maximize the effective surface tension force at the interface by using hydrophobic or super-hydrophobic materials. Some examples of hydrophobic surfaces in the natural world are water strider legs and the surfaces of leaves which induce beading of water. Hydrophobic materials result in a higher surface tension force due to a larger contact angle with water. For super-hydrophobic materials, this contact angle is over 150. The surface tension force exerted on a floating body normal to the flat surface of liquid can be calculated by following equation

$$F = \sigma L \cos \theta$$

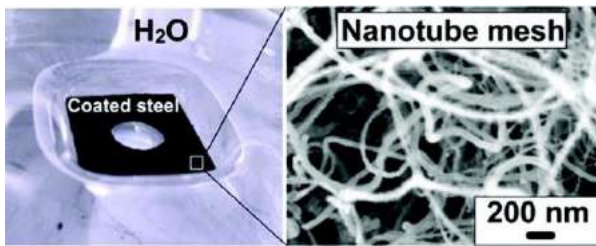
Where F is the force exerted perpendicular to the liquid surface, L is the length that contacts the liquid surface, θ is the contact angle and σ is the surface tension of water. The contact angle is measured as the angle of the meniscus at the liquid-solid interface relative to the flat free surface of the liquid as shown in Figure 1 below:



(Figure 1: The contact angle of an object on liquid surface)

By increasing the contact angle using a non-wetting super-hydrophobic material, the surface tension force is effectively

increased. Some of the recent improvements in super-hydrophobic materials involve nanofabrication and application to nonorganic material such as stainless steel (Figure 2)



(Figure 2: Super-hydrophobic conductive carbon nanotube coatings on steel)

A commonly used metric for determining the surface walking ability of an animal is the Baudoin number:

$$Ba = \frac{Mg}{\sigma P}$$

Where Mg is the weight of the creature, σ is the surface tension of water and P is the contact perimeter of the legs². A Baudoin number of $Ba < 1$ indicates a creature capable of resting on the water's surface¹. The natural form of a human being results in a Baudoin number far above one.

Aside from the Baudoin number, another physical constraint of the surface tension effect is apparent upon review of a 1998 paper by Joseph Keller which proves, as an extension of Archimedes' principal, that the upward force on a body partially submerged in water is equal to the weight of water displaced by the body and the surface tension meniscus combined. There are some animals with a Baudoin number of larger than one that are capable of water surface locomotion. This would mean that a 70 kg human would have to displace 70 liters of water in order to support himself regardless of whether through surface tension effects or buoyancy. This truth may impose a limit on the scaling of surface tension effects which could prohibit its use by larger animals.

There are some animals with a Baudoin number of larger than one that are capable of water surface locomotion. Most notable is the Basilisk lizard which can run across the surface of the water with quick slapping motions of its feet at speeds of approximately 1.6 m/s but only for a short distance². A study of this behavior revealed that the lizard uses its pad-like feet to create a bubble of air in the water below it. The vertical component of the drag force achieved counterbalances the lizard's weight and the air cavity allows for the foot to be lifted at the end of each stroke

2.2 Hydrofoils

A hydrofoil is a lifting surface, or foil, which operates in water. They are similar in appearance and purpose to aero foils used by aero planes. Boats using hydrofoil technology are also simply termed hydrofoils. As speed is gained, hydrofoils lift the boat's hull out of the water, decreasing drag and thus allowing greater speeds.

The hydrofoil usually consists of a Wing -like structure mounted on struts below the hull, or across the keels of a catamaran in a variety of boats (see illustration). As a hydrofoil-equipped watercraft increases in speed, the hydrofoil elements below the hull(s) develop enough lift to

raise the hull out of the water in order to greatly reduce hull drag. This gives a further corresponding increase in speed and efficiency of operation in terms of fuel consumption.

A wider adoption of the technical innovations of hydrofoils is prevented by the increased complexity of building and maintaining them. Hydrofoils are generally prohibitively more expensive than conventional watercraft. However, the design is simple enough that there are many human-powered hydrofoil designs. Amateur experimentation and development of the concept is popular.

Since air and water are governed by similar fluid equations, albeit with vastly different levels of viscosity, density, and compressibility, the hydrofoil and airfoil (both types of foil) create lift in identical ways. The foil is shaped to move smoothly through the water causing the flow to be deflected downward which according to Newton's Third Law of Motion exerts an upward force on the foil. This turning of the water causes higher pressure on the bottom and reduced pressure on the top of the foil. This pressure difference is accompanied by a velocity difference, via Bernoulli's principle, so the resulting flow field about the foil has a higher average velocity on one side than the other.

When used as a lifting element on a hydrofoil boat, this upward force lifts the body of the vessel, decreasing drag and increasing speed. The lifting force eventually balances with the weight of the craft, reaching a point where the hydrofoil no longer lifts out of the water, but remains in equilibrium. Since wave resistance and other impeding forces such as various types of drag (physics) on the hull are eliminated as the hull is lifted clear, turbulence and drag act increasingly on the much smaller surface area of the hydrofoil, and decreasingly on the hull, creating a marked increase in speed.

Early hydrofoils used V-shaped foils. Hydrofoils of this type are known as "surface-piercing" since portions of the V-shape hydrofoils will rise above the water surface when foil borne. Some modern hydrofoils use inverted T-shape foils which are fully submerged. Fully submerged hydrofoils are less subject to the effects of wave action, and are therefore more stable at sea and are more comfortable for the crew and passengers. This type of configuration, however, is not self-stabilizing. The angle of attack on the hydrofoils needs to be adjusted continuously in accordance to the changing conditions, a control process that is performed by sensors, a computer and active surfaces.

2.3 Dominant physics

For the purpose of this project two explanations will be presented in a general and basic way. These theories are the application of Bernoulli's Equation and Euler's Equation for Streamline Curvature Effect.

2.3.1 Bernoulli's Equation:

$$P_0 = P_1 + \frac{1}{2} \rho V_1^2 + \rho g z_1 = P_2 + \frac{1}{2} \rho V_2^2 + \rho g z_2$$

This equation applies to flows along a stream line which can be modeled as: inviscid, incompressible, steady, irrotational and for which the body forces are conservative. Also the difference on the height of the foil (the distance from the bottom section to the upper one) is small enough so that the difference $\rho g z_2 - \rho g z_1$ is negligible compared to the difference of the rest of the terms. What is left is that the

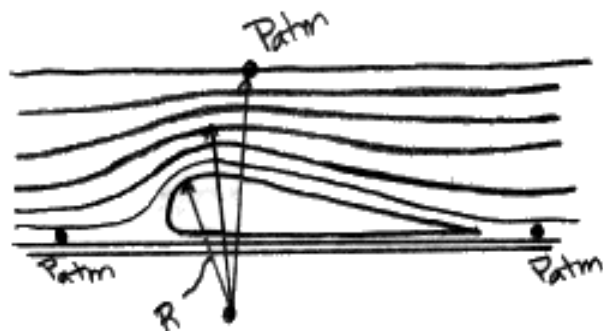
pressure plus one half the density times the velocity squared equals a constant (the stagnation pressure)

As the speed along these streamlines increases, the pressure drops (this will become important shortly). The fluid that moves over the upper surface of the foil moves faster than the fluid on the bottom. This is due in part to viscous effects which lead to formation of vortices at the end of the foil. In order to conserve angular momentum caused by the counter-clockwise rotation of the vortices, there has to be an equal but opposite momentum exchange to the vortex at the trailing edge of the foil. This leads to circulation of the fluid around the foil. The vector summation of the velocities results on a higher speed on the top surface and a lower speed on the bottom surface. Applying this to Bernoulli's it is observed that, as the foil cuts through fluid, the change in velocity produces the pressure drop needed for the lift. As it is presented in the diagram, the resulting or net force [force=(pressure)×(area)] is upward.

This explanation can be enriched with the Principle of Conservation of Momentum. (Momentum = (mass) × (velocity)) If the velocity of a particle with an initial momentum is increased, then there is a reactant momentum equal in magnitude and opposite in direction to the difference of the momentums.

2.3.2 Euler's Equation:

$$\rho \left[\frac{\partial v}{\partial t} + v \frac{\partial v}{\partial s} \right] = - \frac{\partial p}{\partial s} - \rho g \frac{\partial z}{\partial s}$$

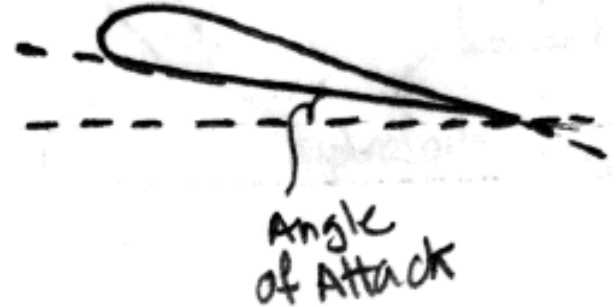


Here again, the term referring to the height is assumed negligible compared to the other terms in the equation. This equation says that as you go further from the center of the radius of curvature of a streamline, the pressure on the streamlines increases. The upper surface of the foil is closer to the center of curvature of the streamlines, therefore there will be a lower pressure than the ambient pressure above the foil. The difference between the pressure on the top surface and the ambient pressure at the bottom surface will produce a net pressure that will cause the lift.

2.4 Angle of attack

As it has been presented, lift comes from the dynamics of the fluid in the area surrounding the foil. But the lift can be optimized by positioning the hydrofoil at an angle (relative to the incoming fluid flow) called the angle of attack (See diagram). The goal is to optimize the lift to drag ratio. This ratio depends on the shape of the foil, which in this case is considered to be a thin foil. With a small angle of attack, the

lift increases rapidly while the drag increases at a small rate. After an angle of $\sim 10^\circ$ the lift increases slowly until $\sim 15^\circ$ where it reaches a maximum. After $\sim 15^\circ$ stall can set in. When the angle of attack is 3° to 4° the ratio of lift: drag is at its maximum. So the foil is more efficient at those angles (3° and 4°) with lift to drag ratios of ~ 20 to $25:1$.



3. Literature Review

Jie Hu, Spencer Slam, Brian Whitney [1], A review of scholarly literature and patents provided background on several topic areas relevant in the design of water-walking shoes. Initially, we reviewed examples of water-walking behavior in nature in an effort to understand how such locomotion is achieved by various animals. This led to studies of hydrophobicity and how it can be used to amplify surface tension effects using modern materials. Finally, we reviewed existing designs for water-walking shoes, all of which use buoyancy to achieve flotation.

Par Odin Lothman, Andy Ruina [2], Glasheen and McMahon correctly calculated that some small lizards should be able to run on water, large ones might have difficulty and people can't. However, Minetti et al have shown that humans probably could run on water in reduced gravity. And here we show that humans can also run on water, at least in the sense that Glasheen and McMahon calculated, if they have big shoes that they don't have to lift at each step.

Leroy L. Peterson [3], An apparatus for providing enhanced traction for an inflatable device is disclosed. The apparatus includes an inflatable gear assembly attachable to the inflatable device. The inflatable gear assembly defines an outside diameter that is greater than the largest cross-sectional distance of the inflatable device. The inflatable gear assembly and the inflatable device may be configured as totally integrated, partially integrated, or totally separated air chambers.

4. Proposed methodology

DC motor is mounted on a housing. This housing will contain the power transmission by belt/gear drive. This motors output shaft is coupled with the gear train enclosed in the housing.

The speed of the motor is increased or decreased according to the requirement. The output from the gear train is given to the hub shaft assembly through a bearing. The rotating motion of the hub assembly which in turn will rotate the hydrofoil blades will create a lift in the water.

5. Conclusion

This project's overarching object was to create a device allowing humans to walk on water. The purpose of this device, within the scope of the project, is for recreational use. Many ideas were considered using concepts from buoyancy to surface tension to a biological approach. The design that we settled on was a rotational hydrofoil device. The concept is that rotating hydrofoil blades spin through the water at a high velocity to generate lift capable of supporting a walker. It consists of one shoe for each foot and uses a control system to help keep the user balanced.

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