

National Conference

On

ROLE OF ENGINEERS IN NATION BUILDING

(NCRENB-2015 Proceeding)

4th & 5th March, 2015

Organized by



Late Shri Vishnu Waman Thakur Charitable Trust's

VIVA Institute of Technology

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PREFACE

On behalf of VIVA Institute of Technology, I take great pleasure and pride to formally welcome you all to the third National Conference on Role of Engineers in Nation Building (NCRENB 2015) 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 2015 has received total 114 papers in 6 tracks. The selected full length papers will be sent for publication in IJCA and IIIE 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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Management of Channelization Codes of WCDMA

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ABSTRACT

Reconfigurations of downlink dedicated channels are often necessary during call setup to eliminate code blocking encountered in 3G WCDMA systems. Orthogonal Variable Spreading Factor (OSVF) is the management scheme used to assign codes. Considering single code operation, we have studied the performance of a code selection scheme called Recursive Fewer Codes Blocked scheme (RFCB). RFCB manages to mitigate code blocking and thus minimizes the fragmentation of the OSVF code tree capacity.

Keywords: Code reassignments, set up delay, WCDMA, code blocking, OSVF codes.

1. INTRODUCTION

Third Generation (3G) mobile devices and services will enable wireless communications to provide online, real-time connectivity and varied range of services. 3G wireless technology will allow an individual to have immediate access to location-specific services that offer information on demand. High-speed downlink packet access (HSDPA), has enhanced uplink and multimedia broadcast multicast services (MBMS) has significantly enhanced the performance of existing networks.

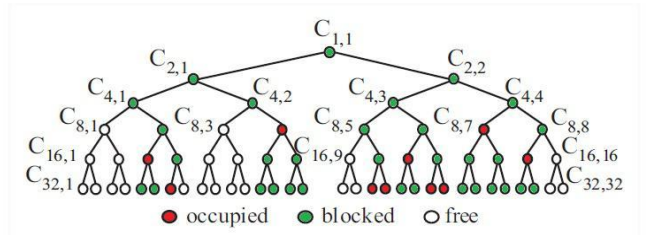
Wideband code-division multiple access (WCDMA) was initially proposed and engineered with a vision that already has shown that it is future proof. WCDMA was designed to provide high performance to applications that need a varying level of Quality of Service (QoS). The original design choice seems to be well aligned with the future, where all applications and services can be carried over IP networks using IP protocols. This trend favours new applications where mobile users have several parallel ongoing sessions based on one or several applications. At the same time WCDMA is developing and achieving targets set by 3G, far outperforming any other wireless technology. Furthermore, the possibility to complement WCDMA coverage and capacity wireless LAN (WLAN) solutions will be discussed briefly. Even though WCDMA is exceeding its initial capability targets, there is still a need for a quantum leap in air interface development in the longer term. The quantum leap can be seen as the fourth generation (4G).

Recently, there has been great interest in the OSVF code assignment problem encountered on the forward link of the WCDMA wireless interface. In this paper, we study an OSVF code selection scheme that can be used in the assignment process. We also study the use of RFCB scheme to minimize the fragmentation of the code tree [2]. But elimination of code

blocking leads to a set up delay in the incoming call. We study methods to decrease this set up delay with tolerable increase in the signalling overhead [3].

The paper is organized as follows Section II explains the system model and code blocking. Management of channelization codes and minimization of call set up delay are mentioned in Section III and IV respectively. Section V is the future scope. The paper is concluded by a brief summary, acknowledgement and references.

2. SYSTEM MODEL



performance of the system and steps should be taken to overcome this problem. Recursive Fewer Codes Blocked Scheme (RFCB) is used to overcome the problem of OVSF. We have studied two possible tie resolving criteria for various possible ties that may occur to reduce the code blocking.

3.1 TIE RESOLVING CRITERIA 1

In case we need 4R in the last row. We have three options. From the system shown in figure 1 we can select $C_{4,2}$, $C_{4,1}$ or $C_{2,2}$. We need to decide which one to select out of these three. The tie resolving criteria is that we select the branch that is fragmented the most. In this case we select $C_{2,2}$.

Consider the situation where we need simultaneous 4R. In this case we have only two options $C_{4,1}$ and $C_{4,2}$. We select the branch which is most fragmented. In the case of equal fragmentation, we select the branch with maximum blocked codes. Here we select $C_{4,1}$ as shown in figure 2.

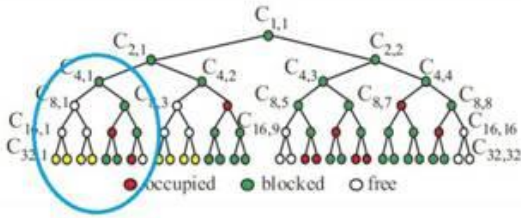


Fig. 2. Tie resolving criteria 1

3.2 TIE RESOLVING CRITERIA 2

Consider we need a capacity of only 2R. This is available at $C_{16,1}$, $C_{16,2}$, $C_{16,5}$, $C_{16,9}$ and $C_{16,16}$. Now we select the sub branch with maximum number of occupied codes. We continue with this procedure till the tie is resolved. We come down to only two options that are $C_{16,9}$ and $C_{16,16}$. Both of these have the same level of fragmentation. Therefore to resolve the final tie we select the option to the left that is $C_{16,9}$ as shown in figure 3.

4. MINIMIZING CALL SET UP DELAY

Using of RFCB to eliminate code blocking results in signaling overhead which leads to an unacceptable increase in the incoming call set up delay. We reconfigure the codes to decrease the set up delay with tolerable increase in signaling overhead. Consider the system shown in figure 4. In this system if we need a capacity of 8R the system has to be reconfigured.

In this system if we need a capacity of 8R it is not directly available. To reduce the incoming call set up delay and obtain a capacity of 8R we need to reconfigure the blocks. Since $C_{4,1}$, $C_{4,2}$, $C_{4,3}$ and $C_{4,4}$ are all blocked we need to vacate any one of this code. In case we vacate $C_{4,4}$ as shown in figure 5.

However the reconfiguration may fail due to the number of levels in the system. Each layer adds a delay of 220 ms. If all

the codes can be transmitted simultaneously the total incoming call set up delay will be only 220 ms. This is obtained by using the following algorithms.

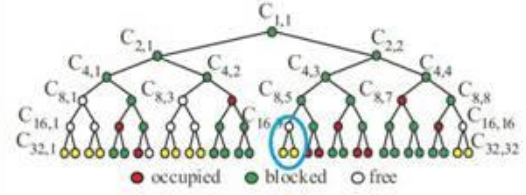


Fig. 3 Tie resolving criteria 2

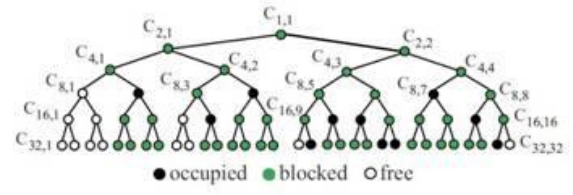


Fig. 4 System diagram for reconfiguration

For vacating the code we need to shift all the current ongoing calls to some new location. We allocate $C_{8,7}$, $C_{16,15}$ and $C_{32,31}$ to $C_{8,1}$, $C_{16,5}$ and $C_{32,17}$ respectively as shown in figure 6.

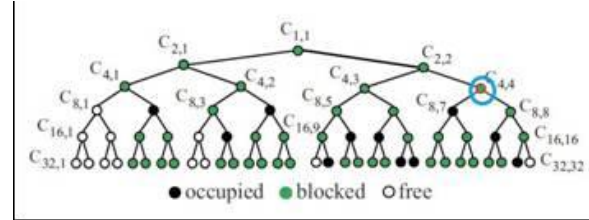


Fig.5 Reconfiguration of codes

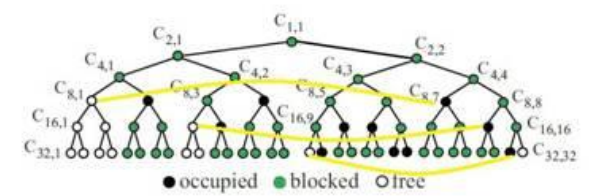


Fig. 6 System reconfiguration

4.1 Algorithm Code Pattern Search and Topology Search

This is the algorithm used to detect the code to be vacated in a way that the calls are not dropped. None for the existing calls should be dropped to place a new call. All the codes should be shifted in a way such that none of the existing calls are dropped.

4.2 Fewer Codes Blocked and Minimum Delay

If an incoming call of rate kR , $k = 1, 2, 4, 8, \dots$ arrives and the system has enough free capacity to serve it, then, if there is one or more free candidate codes to support a rate of kR , FCB selects the most appropriate one. Otherwise, there are no free candidate codes to support a rate of kR and MD selects the sub tree to be vacated.

5. FUTURE SCOPE

The system used to reduce code blocking is RFCB. This scheme reduces the blocking but does not completely eliminate it. Both the descendants and the ascendants are still blocked. We need to propose an algorithm that can completely eliminate the code blocking.

In the studied algorithms the incoming call set up delay is reduced only if all the calls are transferred simultaneously. However this may result in dropped calls. The delay is not reduced significantly. A system could be introduced that reduces the set up delay under all possible configurations.

6. CONCLUSIONS

We have studied Recursive Fewer Block Codes (RFCB) to minimize the code blocking that occurs due to Orthogonal Variable Spreading Factor (OVSF). This reduces the code blocking but does not completely eliminate it also it increases the incoming call set up delay by 220 ms at every level. We have studied algorithms to reduce this call set up delay by transferring all the codes at every layer simultaneously.

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COGNITIVE RADIO NETWORK – A New Paradigm in Wireless Communication

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ABSTRACT

In wireless Communication system, Radio Spectrum is the most valuable and limited resource. Due to traditional fixed spectrum allocation policy, there is a problem of spectrum under-utilization in licensed band whereas an unlicensed band is getting overcrowded. A new device called Cognitive Radio (CR) is introduced which allows unlicensed users to access licensed spectrum, without interfering with the operation of licensed user. Cognitive Radio follows Dynamic Spectrum Access Policy which makes it more vulnerable to the various attacks compared to traditional policy. An attacker can disrupt the basic functions of a Cognitive Radio Network (CRN) and cause harmful interference to the licensed user. Therefore security of CR is also a major concern. This paper provides a brief overview on operation, principles, architecture and security of Cognitive Radio. Finally, persistently unsolved challenges are highlighted.

General Terms

Cognitive Radio architecture, dynamic spectrum allocation, security, cognitive cycle

Keywords

Cognitive Radio network, functions, Spectrum sensing, Attack, open challenges

1. INTRODUCTION

RADIO frequency spectrum is the heart of wireless communication system 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 traditional fixed spectrum access policy [1]. This traditional scheme for spectrum assignment divides the frequencies into licensed and unlicensed band. In Licensed frequency spectrum, exclusive right is provided to a designated user or wireless service provider and other users are not allowed to access this band, even though it is free at particular time and location. It has been pointed out by the Spectrum Policy Task Force. (SPTF) that some portion of licensed spectrum is heavily utilized whereas some are very less or partially occupied at particular location and time [2]. Measurement were taken between Jan 2004 and Aug 2005 by Shared Spectrum Company (SSC) which shows that on the average only 5.2% of the spectrum between 30MHz and 3GHz is in use at 6 different locations in the U.S.A. The highest value was 13% at New York City and lowest was 1% at the National Radio Astronomy Observatory. All these measurements clearly show that large portion of licensed spectrum remains unutilized. Due to fixed nature of traditional spectrum policy, unlicensed users are prohibited

from accessing the spectrum band. This low utilization of frequency spectrum increases the cost of bandwidth and degrades performance of wireless communication systems [3]. Fig. 1 shows that some areas of licensed spectrum are highly used whereas some are very less utilized and can be used by other users.

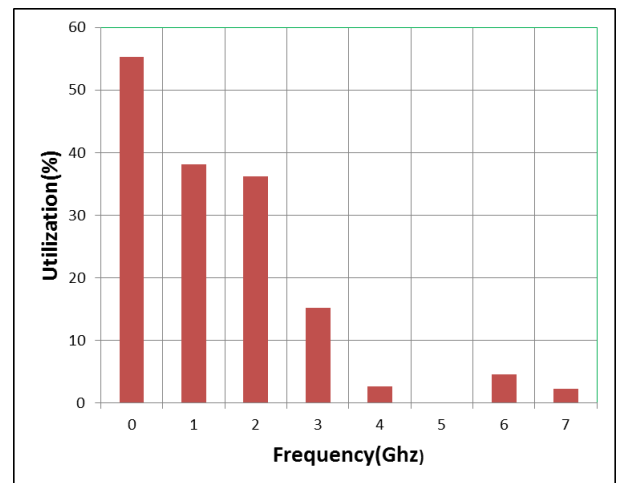


Fig 1: Spectrum Utilization

Unlicensed frequency bands are the portion of spectrum kept aside to access freely by the users. 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 [3].

On the other hand, due to new wireless technologies and services 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 inefficient utilization of licensed spectrum and spectrum shortage problem in unlicensed band forces Federal Communication Commission to modify the existing fixed spectrum allocation scheme. FCC decided to make the spectrum flexible by allowing unlicensed user to access licensed spectrum band when it is idle, without any interference with the licensed user transmission [4].

This new spectrum policy lead to the introduction of a device called COGNITIVE RADIO, which uses Dynamic Spectrum Access (DSA). Software defined radio is the key component

and platform for CR in which transmission parameters (frequency of operation, modulation mode, transmission power and protocols) can be coordinated dynamically to satisfy application requirement. This adjustability function is accomplished by software controlled signal processing algorithm. A transceiver is present which carry out all the functions at the physical layer in the software. The reconfigurability offered by SDR technology allows radios to switch functions and operations [10]. Cognitive Radio is called intelligent Radio because of its learning capability i.e. it understand and assumes the surrounding environment and takes actions in the direction of goal. An ideal CR is expected to sense and correct the problems before it takes place using machine learning technology incorporated in cognitive Engine [4].

2. FUNDAMENTAL CONCEPT

A Cognitive radio must have real element of cognition which deals with the way human recognize object in their surrounding environment in addition with the capability of filtering out some stimuli. Two main characteristic of CR

Cognitive Capability: It refers to the ability of the radio technology to capture or sense the information from its Surrounding radio environment [4], [5].

Reconfigurability: It is the capability of adjusting the operating parameters for the transmission in real time without any modification on the hardware components. This capability enables the cognitive radio to adapt easily to the flexible radio environment. Parameters which can be altered are operating frequency, modulation, transmission power, protocols. Thus Cognitive radio can change its transmission parameters according to user requirement on the fly which was not possible with the conventional radios [5]. The main objective of CR is 1) to achieve highly reliable and effective wireless communication system. 2) To improve frequency spectrum utilization. For achieving these objectives, CR senses the spectrum holes or White spaces and performs opportunistic spectrum access as shown in Fig 2.

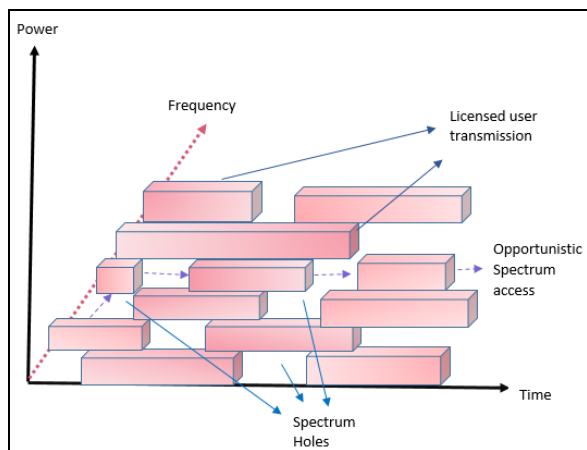


Fig 2: Spectrum Holes

Cognitive Radio is a rising technology, in which unlicensed users analyze the frequency spectrum to transmit the information without causing any interference to the licensed user. This is the fundamental meaning of CR according to many people; defining CR is still an ongoing effort. Different regulatory bodies and people have considered various factors to define cognitive Radio.

The US FCC provided with a confining definition

“A cognitive Radio is a radio that can change its transmission parameter based on the interaction with the environment in which it operates [2]”

The definition of Cognitive Radio presented by Joseph Mitola [7] is “A radio frequency transceiver designed to intelligently detect whether a particular segment of radio spectrum is in use and to jump into and out of temporarily unused spectrum very rapidly without interfering with the transmission of other authorized users. Cognitive radio enables secondary user to sense which portion of spectrum are available, select best available channel, coordinate spectrum access with other users and vacate the channel when a primary user reclaims the spectrum usage rights”

Another popular definition by Simon Haykin [1]: “Cognitive radio is an intelligent wireless communication system that is aware of its surrounding environment and uses the methodology of understanding-by-building to learn from the environment and adapt its internal states to statistical variations in the incoming RF stimuli by making corresponding changes in certain operating parameters in real-time, with two primary objectives in mind:

- highly reliable communications whenever and wherever needed;
- Efficient utilization of the radio spectrum.”

National Telecommunication and Information Administration (NTIA) also provided with a convincing definition, but it does not cover all the features of CR. International Telecommunication (ITU) considered CR capable of effective spectrum usage in mobile radio system. Maximum features are covered in the Joseph Mitola’s Definition [7], which is widely accepted.

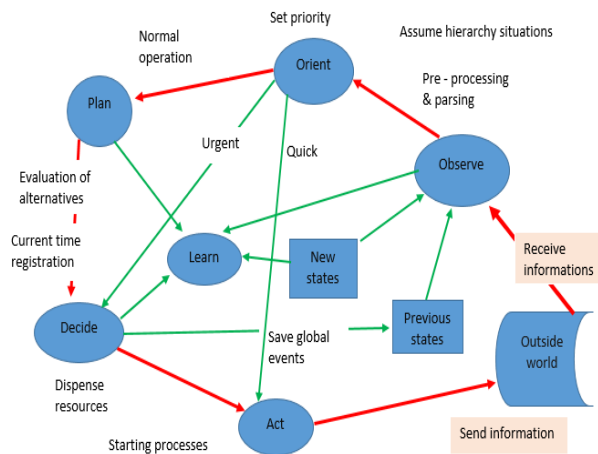
A table is displayed below which consist of parameters considered by different people while defining CR

Table 1. Definitions of Cognitive Radio

Definer	FCC	Haykin	Mitola	NTIA	ITU-R	IEEE 1900.1
Parameters						
Environment sensing	✓	✓	✓	✓	✓	✓
Autonomous	✓	✓	✓	✓	✓	✓
Transmitter	✓	✓	✓	✓	✓	✓
Receiver		✓	✓	✓	✓	✓
Awareness			✓		✓	
Intelligence	✓	✓	✓	✓	✓	✓
Learning Capability		✓	✓			
Application oriented		✓	✓	✓		
Interference avoidance						
Negotiate waveform			✓			

The necessary factors should be seen in the definition of CR [6]

- Sensing the environment
- Building a predictive model of such environment based on previous experiences; and
- Utilizing the sensed stimuli and the predictive model to adapt its transmitting configuration.



4. FUNCTIONS

4.1 Spectrum Sensing:

CR allows unlicensed user to access licensed spectrum band when the primary user is absent. To check the primary user transmission CR scans the spectrum and identify unoccupied frequency spectrum or white spaces without interfering primary user. This operation is called spectrum sensing.

Spectrum sensing can be performed in two ways: Proactive or reactive. In proactive sensing, spectrum is periodically monitored and record is maintained. So before starting with transmission, every time a database is checked which stores all the spectrum sensing information whereas in reactive sensing, on demand spectrum sensing takes place [5]

4.2 Spectrum decision:

After the identification of spectrum holes, CR should analyze the available frequency band and decide which band is best among the available spectrum band according to the requirement of user [5].

4.3 Spectrum Sharing:

Multiple users are trying to access the spectrum at the same time; therefore network coordination is required to avoid collision between spectrums [4]

4.4 Spectrum mobility:

Secondary user should vacate the spectrum band when the primary user arrives and search for another spectrum band to continue its transmission. This switching between spectrum bands is called spectrum mobility. It is still an open and challenging issue because there should not be any delay between spectrum handoff. No suitable models are proposed for reducing the latency between switching [6].

5. ARCHITECTURE

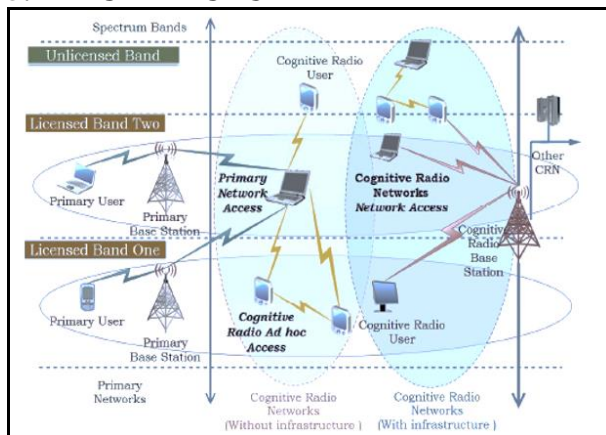


Fig 4: Cognitive Radio Architecture [7]

The architecture [4], [7] of CR is divided into

- 1) Infrastructure
- 2) Sharing of spectrum
- 3) Type of network
- 4) Access type

According to infrastructure, there are two types of CR, Centralized and distributed network architecture.

In Centralized network architecture, there is a central controller which coordinates and controls the allocation of resources to secondary users or cognitive users. All the decision of spectrum allocation and spectrum mobility is taken by this centralized controller. Whereas, In distributed or adhoc architectures, Individual nodes sense the spectrum and make their own decision about spectrum access strategy based on observing locally on the spectrum dynamics.

According to sharing, there are two types Cooperative and Non cooperative sharing

In Cooperative spectrum sharing, secondary users sense the spectrum and share the sensing information with the other users and take spectrum access decision cooperatively. In non-cooperative spectrum sharing, users individually sense the spectrum and take their own decision. Every user is maximizing its own benefit and no sharing of information takes place [4].

According to type of network, there are primary and cognitive network

Primary network also called licensed network consist of a set of primary users and a primary base station. Primary user has exclusive right to the spectrum and cognitive users are not allowed to disturb the primary user transmission. Cognitive network also called unlicensed network consist of a set of secondary users with cognitive base station. The spectrum allocation of cognitive users is controlled by cognitive base station which act as a hub of secondary network. These secondary users and base station are allotted with the capabilities like sensing, decision making, and learning for spectrum access. If many secondary users are sharing common spectrum band, then their spectrum usage can be managed by a central entity called spectrum broker. The spectrum broker accepts the request of secondary users and provide with required resources for efficient spectrum utilization [7].

According to access, there are two types, spectrum underlay and spectrum overlay.

In spectrum underlay, cognitive or secondary users are transmitting their data below the interference limit, where primary users are not taking part in transmission. Interference temperature limit is imposed on SU transmission. Therefore secondary user is not performing spectrum sensing. In spectrum overlay, secondary user can access the spectrum band when primary user is inactive. So there is no interference temperature limit imposed on secondary user's transmission. SU have to detect the presence of primary users to initiate their transmission [7]

6. SECURITY

Due to dynamic nature of CR, it is more vulnerable to attacks as compared with the traditional wireless system which is based on fixed spectrum allocation. According to FCC rule, there should be no modification to the primary user's transmission. So the techniques implemented to detect and mitigate the attacks in CR, cannot allow interaction between primary and secondary users. There are various techniques in existing literature for detection and removal of attacks in CR taking place at different layers of OSI model [12].

Physical layer is the lowest and crucial layer which provides an interface to all the upper layers. The operation of CR network is based on sensing and switching of spectrum depending on environment conditions. Thus signals are

transmitted and received on different frequencies across wide frequency spectrum which makes the operation of physical layer more cumbersome. Spectrum sensing is the fundamental operation of Physical layer which is affected by a dangerous attack called Primary User Emulation (PUE) attack. In this attack, an attacker copies the characteristics of primary user and arrives to access the spectrum. This forces secondary user to leave the channel so that there is no interference to the primary user. As Spectrum Sensing is the basic operation of CR, this PUE attack detection is the biggest challenge for smooth transmission and efficient channel utilization. The first work done by Chen et al to detect PUE attack [16] was based on location verification. Trusted location verifiers were used which consist of a primary user location database. Then this stored database is compared with the received primary signals. If it does not match, the suspect is considered as an attacker. Objective Function attack is also a physical layer attack. This attack creates problem in cognitive Engine of CR which consists of the entire learning algorithm and the core element which makes CR an Intelligent Radio [12].

Cognitive radio is called smart radio because it senses the surrounding environment; modify its parameters such as bandwidth, transmission power, coding, protocols, frequency of operation, and packet size. This radio parameters adjustment is performed by the cognitive engine inside the CR. When these parameters are modified by the Cognitive Engine after solving objective functions, an attacker can manipulate the parameters so that the result is according to attacker's requirement [14]. Additionally, these attacks affect the learning algorithm that use objective functions and force radios to believe that some frequencies, modulation types or bandwidth are less optimal and should be avoided. Till now, no good techniques are available to mitigate this attack [13].

Another physical layer attack is jamming attack. In this attack, a malicious user send continuous packet of information so that the spectrum seems busy to the other secondary users. Next layer is the link layer, above the physical layer. The key function of this layer is to ensure reliable transmission of packet from source node to destination node. The major attack which takes place at link as well as physical layer is called spectrum sensing data falsification attack (byzantine attack). There are two ways of performing spectrum sensing in CR: Centralized and distributed spectrum sensing. In Centralized Spectrum Sensing, there exist a fusion centers which collect the result of spectrum sensing of all the secondary users and then make decision whether primary user is present or absent. In distributed spectrum sensing, individual secondary user senses the spectrum and sends the information to the neighbor and they cooperatively decide on spectrum availability [12], [13].

Byzantine attack takes place when some malicious user provides wrong spectrum sensing result to the neighbor or fusion central i.e. central controller. This attack result in wrong spectrum sensing decision, disruption to primary users and delay in transmission of information. After the spectrum sensing, path is determined to deliver the packets to the destination [12]. An attacker can modify the routing path by giving wrong information to the honest node which transfers the packet traffic from the corrupted path. Table 2 describes all the attacks taking place at different layer of OSI model.

7. OPEN CHALLENGES

7.1 Quality of service

Spectrum mobility should be carried out with negligible latency. To reduce delay and loss of information during spectrum handoff, new mobility methods is required to be designed. Due to spectrum handoff in CR network link state parameters are affected which leads to network instability problem - clogging or link error. Therefore, maintaining service quality for the complete cognitive operation is still an ongoing issue [4].

7.2 Spectrum sensing techniques

Spectrum sensing algorithm implemented is energy detection; match filter detection and cyclostationary feature detection are implemented for spectrum sensing. In matched filter detection, primary user location has to be known in advance and also many assumptions are required, which is very difficult to implement practically. Also, these techniques give less accurate result which fails in certain conditions.

7.3 Complex Circuitry

For reliable detection of primary user transmission, a complex circuit is needed for analog to digital converter to sample wideband signal with large dynamic range. It becomes difficult to balance between high speed and high accuracy; therefore it is important to decrease the dynamic signal range before analog to digital conversion [3].

7.4 Security

Network security has become a major issue and also open challenge in Cognitive Radio network. There are various attacks in CRN as described in the previous section. The major attack which affects spectrum sensing operation is Primary User Emulation (PUE) attack. A stationary as well as primary user suffers this attack. Stationary primary user's examples are TV bands and cellular network whereas mobile primary users are wireless microphone. There are various techniques for detection of PUE attack for stationary primary users. But for mobile primary user, only two techniques by author Chen [15] are implemented. Thus, there is a need of a technique which can detect PUE attack for both stationary as well as mobile primary users [3], [14].

7.5 Sensing period

Spectrum efficient sensing: two periods exist in transmission process. Sense period and quiet period. Sensing cannot be performed while transmitting packets. Hence CR users should stop transmitting while sensing which decreases spectrum efficiency. For this reason, sensing accuracy and balancing spectrum efficiency is an important issue [3].

7.6 Energy Consumption

Energy efficiency is major concern in wireless communication as it presents battery life. In Cognitive Radio lot of time is consumed for spectrum sensing operation. To improve energy consumption without any compromise with the spectrum sensing operation, quality of service and seamless communication is a topic of interest.

Table 2. Attacks in CR

Sr.No.	ATTACKS	LAYER	DESCRIPTION
1	Primary User Emulation (PUE) Attack	Physical	A malicious user mimics the signal characteristics (modulation type, carrier frequency, transmission power) of primary user and this makes secondary user believe that primary user has arrived and vacate the channel [16]
2	Objective Function Attack	physical	Cognitive engine consist of learning process and attacker try to attack through manipulation of cognitive radio parameters. If these parameters are manipulated , then learning capability of CR is affected badly [13]
3	Jamming	Physical	Attacker unnecessarily send packet of data on the channel and make secondary user believe that channel is occupied.
4	Spectrum Sensing Falsification Attacks	Link	Also called Byzantine attack ,it takes place when a malicious user send wrong spectrum sensing result to its neighbor or to fusion center, which lead to false alarm and degradation of performance [13], [17]
5	Control channel saturation Denial of Service attack	Link	When multiple secondary user want to transmit at the same time, common control channel becomes a problem as the channel can support only a limited number of data channels. An attacker generate forged MAC control frames for saturating the control channel and therefore reducing performance of network and increase
6	Selfish Channel negotiation	Link	In multihop environment, secondary user sometimes refuse to send the data to other host to save its energy and increase its own throughput [12]
7	Hello flood attack	Network	In this attack, a malicious user send a broadcast message to all the other nodes that it is their neighbor and then all the data will be routed through this path which is corrupted [12], [18]
8	Sinkhole	Network	In this attack, an attacker claims the best way to send the packet to the destination. This attack is more serious in infrastructure base network as all information is passed through base station which allows the malicious user to falsely claim that it is the best route got forwarding the packet [18]
9	Lion attack	Transport	It is cross layer attack performed at basically physical link layer and targeted at the transport layer where imitating a primary user transmission will force a CRN to perform frequency handoffs and thus degrading TCP performance [12], [13]

8. CONCLUSION

This paper outlines the definition and incitement of Cognitive radio Technology, as well as presented the background knowledge and advances of cognitive radios. A brief overview on security threats, including physical, link, network and transport layer attacks is presented Finally issues in cognitive Radio which needs further development are highlighted. The major challenge till now is need of a technique which can avoid interference to stationary as well as mobile primary users. Also seamless communication during the spectrum mobility stage needs further development. The research on cognitive radio is still on its earlier stage. Thus its other entire area is required to be explored for smooth and secure operation of upcoming next generation system.

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TRAFFIC OVERRIDE LICENSE PLATE RECOGNITION

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ABSTRACT ABSTRACT

LPR (License Plate Recognition) is an image-processing technology used to identify vehicles license plates. LPRs scan the license plates of moving or parked vehicles and can do so while either mounted on a moving patrol car or attached to a fixed location, such as a toll plaza. Once a plate is scanned and its alphanumeric pattern is read by the LPR system, the technology compares the license plate against an existing database of plates that are of interest to law enforcement. Plates “of interest”, for example, might include those on vehicles which have been recently stolen, or whose registered owners have open warrants. When a match is made, a signal alerts the officer to proceed with further confirmation, investigation and action. Hundreds of cars can be scanned and checked in very short periods of time.

LPR technology thereby automates a process that, in the past, was conducted manually, slowly, tag-by-tag, and with much discretion.

Keywords

License plate recognition (LPR)., optical character recognition (OCR), Image Processing.

1. INTRODUCTION

License Plate Detection and Recognition System is an image-processing technique used to identify a vehicle by its license plate. The license plate recognition is a mass surveillance method that uses character recognition on images to read the license plates on vehicles. They are used by various police forces and as a method of electronic toll collection on pay-per-use roads and monitoring traffic activity, such as red light adherence in an intersection. The paper deals with vehicles which override the traffic signal. It uses LPR to recognize characters on the license plate. It is divided into two parts, first to locate the license plate in images and separate characters on the plate. By using the following techniques, such as Sobel edge detection, noise filters, threshold, and projection, to the captured images; characters and dash on license plate are located and divided. The second part is character recognition. Characters are recognized by using the character end-point position, direction of end points, four quarter locations, and vertical as well as horizontal characteristic categorization. The proposed license plate recognition (LPR) method mainly consists of pre-processing, plate location, and character segmentation & recognition. At first, the possible regions of license plate are enhanced

from the captured images through the proposed edge detection method and gradient-based binarization. Then, the correct plate regions are selected by analyzing the horizontal projection and the corner distribution. A vertical Sobel processing is performed on the segmented license-plate region and then the proposed weighted-binarization method is employed to segment each character of the license, followed by the skew correction.

The complexity of smart license number plate recognition work varies throughout the world. For the standard number plate, LPR system is easier to read and recognize. In India this task becomes much difficult due to variation in plate model and their size. Character recognition part is also very difficult in Indian number plate. So flexible algorithm required for solved this task. Nowadays vehicles play vital role in transportation. Also the use of vehicles has been increasing because of population growth and human needs in recent years. Therefore, control of vehicles is becoming a big problem and much more difficult to solve. License Plate Recognition systems are used for the purpose of effective control.

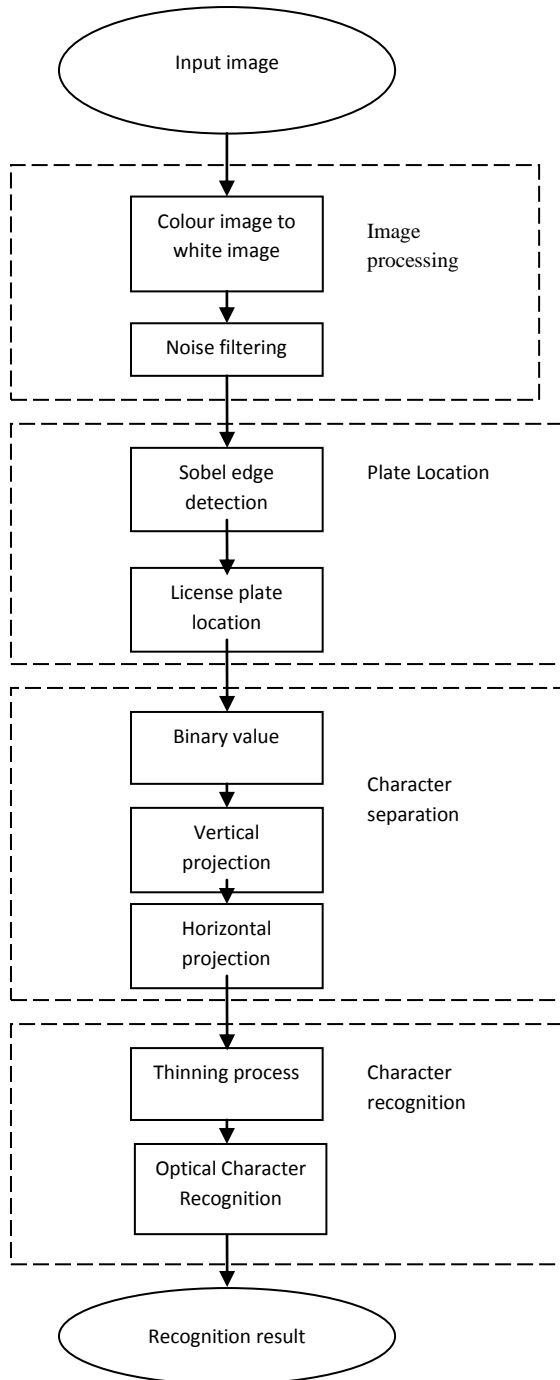
The research uses character structure to identify the characters on the vehicle license plates. The advantage is that structure skeleton is not influenced by size. Using the classification process proposed in this paper, the success ratio of character recognition is 94.3%. The success ratio of license location is 92%. Among one hundred samples, usually the plate widths having more than 97 pixels can get satisfactory results and those having less than 97 pixels cannot. If the number of the image pixels can be increased, the success ratio will be improved. Using better camera with more pixels will increase the success ratio of license plate recognition.

Fig 1: License Plate Recognition Flow Diagram

2. DESIGN METHODOLOGY

2.1 Image Processing

The image obtained from camera is initially processed and noise filtering is done. The RGB(red green blue) image is converted into binary image(black and white).



2.2 License plate position

Before identifying the characters on the license plate, we need to locate the license plate in the image. An RGB color picture is converted to the Gray-level image.

The binary value method is used to convert the images to have only black and white colors. The thresholds can be obtained by using Otsu method or threshold method, the next is to eliminate the screw and the place where the vehicle registers.

After removing the redundant area in the plate the vertical projection is applied.[1]



Fig 2: RGB camera image



Fig 3: Gray-level and Sobel edge detection

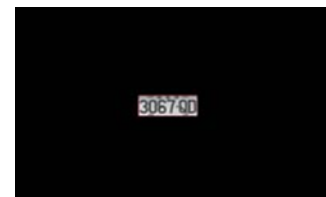


Fig 4: Located Plate

2.3 Character Separation

2.3.1 Vertical Projection

Vertical Projection is used for separation of character. The peak and valley of the license plate vertical projection are obvious, so the characters can be separated easily.



Fig 5: Vertical projection

2.3.2 Horizontal projection

Horizontal projection is used to remove the unwanted area and noise filtering from image plate.



Fig 6: Horizontal projection

2.4 Character Coding and Recognition

2.4.1 Thinning Process

After separating each letter or number, the character skeleton can be found by using the thinning process. The width is only one pixel and the structure is then used to recognize the letters and numbers[11].

2.4.2 Optical character recognition

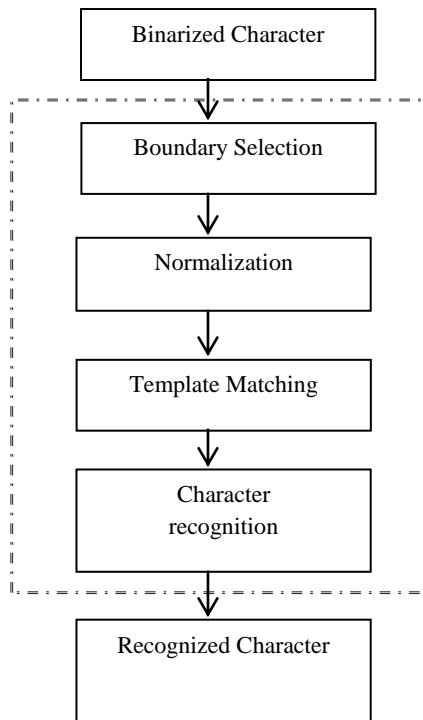


Fig 7: Flow chart of character recognition

2.4.2.1 Boundary selection

Boundary selection is used to identify the boundary of the character or the object in a given particular image. The required parts of an image can be extracted from the original image using various algorithms. The extracted image is processed further to obtain the image with higher boundary range. As the region of boundary can be very high it can be easily being extracted.[14]



Fig 8: Boundary Selection

2.4.2.2 Normalization

Normalization is a process that changes the range of [pixel](#) intensity values. Normalization is sometimes called contrast stretching or [histogram](#) stretching. The motivation is to achieve consistency in dynamic range for a set of data, signals, or images to avoid mental distraction or fatigue. For example, a newspaper will strive to make all of the images in an issue share a similar range of [grayscale](#).

2.4.2.3 Template matching

Template matching is a technique in [digital image processing](#) for finding small parts of an image which match a template image. It can be used in manufacturing as a part of quality control, a way to navigate a mobile robot, or as a way to detect edges in images. If the template image has strong

features, a feature-based approach may be considered; the approach may prove further useful if the match in the search image might be [transformed](#) in some fashion. Since this approach does not consider the entirety of the template image, it can be more computationally efficient when working with source images of larger resolution, as the alternative approach, template-based, may require searching potentially large amounts of points in order to determine the best matching location. It is also possible to improve the accuracy of the matching method by template based matching.[13]

2.4.2.4 Character recognition

It is a process of conversion of [images](#) of typewritten or printed text into machine-encoded text. It is a common method of digitizing printed texts so that it can be electronically edited, searched, stored more compactly, displayed on-line, and used in machine processes such as [machine translation](#), [text-to-speech](#), key data and [text mining](#). It is a field of research in [pattern recognition](#), [artificial intelligence](#) and [computer vision](#). [13]

3. RESULTS OF CHARACTER SEGMENTATION

The character of a licensed plate are being segmented and individual characters are shown below. This character which are being presented are being cropped by using horizontal and vertical projection.



Fig 9: Character Segmentation Result

4. CONCLUSION

LPR can give user quick and inexpensive data in the field of automated data acquisition. The advantage is that it can successfully extract licence plate characters from any part of a captured image without using information on the luminance of the surroundings, the size or inclination of the licence plate, or the colour of the vehicle.

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FAKE CURRENCY DETECTION USING IMAGE PROCESSING

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ABSTRACT

Counterfeit notes are a problem of almost every country but India has been hit really hard and has become a very acute problem. Fake Indian currency of 100, 500, 1000 rupees seems to have flooded the whole system and there is no proper way to deal with them for a common person. There is a need to design a system that is helpful in recognition of paper currency with the fast speed and in less time. Automated paper currency recognition system can be a very good utility in banking system and other field of commerce. The recognition systems compose of preprocessing, including detecting edges, compressing data dimensionalities, and extracting feature. We are going to use the MATLAB image processing toolbox to develop a software for this purpose. Image processing involve changing the nature of an image in order to improve its pictorial information for human interpretation, for autonomous machine perception.

General Terms

Fake currency detection

Keywords

Image processing, Edge detection, Image segmentation.

1. INTRODUCTION

With development of modern banking services, automatic methods for paper currency recognition become important in many applications such as in automated teller machines and automatic goods seller machines. The needs for automatic banknote recognition systems encouraged many researchers to develop corresponding robust and reliable techniques. Processing speed and recognition accuracy are generally two important targets in such systems.

A Digital Image processing is an area characterized by the need for extensive experimental work to establish the validity of proposed solutions to a given problem. It encompasses processes whose inputs and outputs are images and encompasses processes that extract attributes from images up to and including the recognition of individual objects. MATLAB is the computational tool of choice for research, development and analysis. The image formats supported by MATLAB are BMP, HDF, JPEG, PCX, TIFF, XWB, PNG etc. Characteristic extraction of images is challenging work in

digital image processing. It involves extraction of visible and some invisible features of Indian currency notes. [2]

A good characteristic extraction scheme should maintain and enhance those characteristics of the input data which make distinct pattern classes separate from each other. The approach consists of a number of steps including image acquisition, gray scale conversion, edge detection, feature extraction, image segmentation and comparison of images. Image acquisition is the creation of digital images, typically from a physical scene. In the proposed work, the image will be acquired by using simple digital camera by providing some backlighting so that all the features of the currency can appear on the image properly. The image is then stored in the computer for further processing. Edge detection and image segmentation are the most important tasks performed on the images.

The major technique of this system is image analysis and image processing, which are part of cognitive and computer science. Image processing is a signal processing after pre-processing. The output can be either an image or a set of characteristics or parameters related to the image. Actually the image is treated as 2-dimensional signal and applies some standard signal processing techniques with image-processing techniques involved. Image analysis is a means that the meaningful information from an image is extracted mainly from digital images by means of digital image processing techniques. Image analysis tasks can be as simple as reading bar coded tags or as sophisticated as identifying a person from their face.[1]

We are going to develop an interactive system that generates currency recognition system using localization and color recognition with the help of MATLAB. The proposed system will be useful in day to day life of every common man where people have to suffer for change at many public places. As mentioned in the applications this project is a real time application for all real time places. In the future this system can also be applied in the buses itself. This will be a relief for the conductors and passengers.

2. DESIGN METHODOLOGY

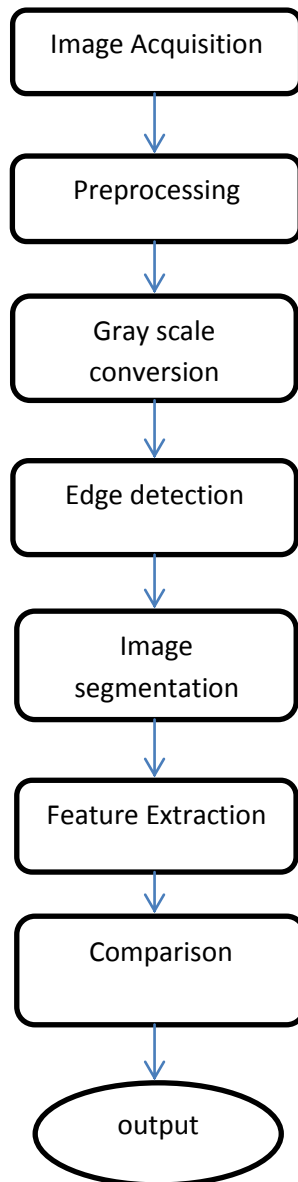


Fig 1: Fake currency detection flow diagram

2.1 Image Acquisition

The image acquisition process consists of three steps; energy reflected from the object of interest, an optical system which focuses the energy and finally a Sensor which measures the amount of energy, Character Coding and Recognition.

Image is acquired by digital camera by applying the white backlighting against the paper currency so that the hidden attributes are able to appear on the image of the currency.

2.2 Gray-scale conversion

Photography and computing a gray-scale digital image is an image in which the value of each pixel is a single sample, that is, it carries only intensity information. Images of this sort,

also known as black-and-white, are composed exclusively of shades of gray, varying from black at the weakest intensity to white at the strongest.

Gray-scale images are distinct from one-bit bi-tonal black-and-white images, which in the context of computer imaging are images with only the two colours black, and white (also called *bilevel* or *binary images*). Gray-scale images have many shades of gray in between.

Gray-scale images are often the result of measuring the intensity of light at each pixel in a single band of the electromagnetic spectrum and in such cases they are monochromatic proper when only a given frequency is captured. But also they can be synthesized from a full colour image; see the section about converting to gray-scale.

2.3 Edge Detection

Edge detection is a very important area in the field of computer vision. Edges define the boundaries between regions in an image, which helps in object recognition. They can show where shadows fall in an image or any other distinct change in the intensity of an image.

It will perform the following operation

1. Image analysis
2. Enhance and detect edges.
3. Properties such as area perimeter and shape can be measured.

It uses algorithm of multiple edge detectors for edge detection. That is the goal of our project. Edge detection refers to the process of identifying and locating sharp discontinuities in an image. The discontinuities are abrupt changes in pixel intensity which characterize boundaries of objects.

2.3.1 Methods used for Edge Detection

1. Prewitt method
2. Laplacian of Gaussian Method
3. Zero-cross method
4. Canny method
5. Sobel method

2.4 Image segmentation

This involves subdividing an image into constituent parts, or isolating certain aspects of an image:

1. Finding lines, circles, or particular shapes in an image,
2. Aerial photograph, identifying cars, trees buildings or roads

2.4.1 Methods use for image segmentation

- Thresholding
- Compression-based methods
- Edge detection

2.7 Feature Extraction

Feature extraction involves simplifying the amount of resources required to describe a large set of data accurately. When performing analysis of complex data one of the major problems stems from the number of variables involved. Analysis with a large number of variables generally requires a large amount of memory and computation power or a classification algorithm which over fits the training sample

and generalizes poorly to new samples. Feature extraction is a general term for methods of constructing combinations of

the variable to get around these problems while still describing the variables to get around these problems while still describing the data with sufficient efficiency.

2.8 Comparison

Lastly the extracted features of test currency image are compared with the extracted features of original currency image, if it matches then the currency is original otherwise fake.

3. RESULTS AND DISCUSSION

This is test currency image scanned by the scanner having resolution 300 dpi.



Fig 2: Test image scanned by the scanner.

Original image is then converted into gray scale image using matlab image processing toolbox. Gray scale image is used to find edges of an image.

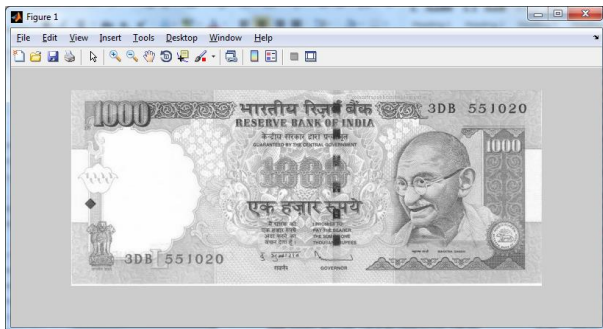


Fig 3: Gray scale image

Then above gray scale image is converted into edge detected image using sobel edge detection operator. Edge detected image is required for image segmentation.

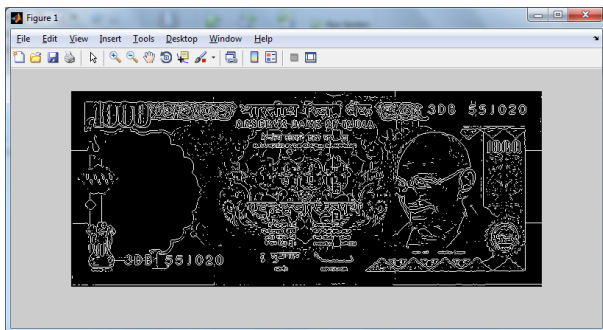


Fig 4: Edge detected image

Using image segmentation algorithm, image is divided into several parts as shown in figure 5 & 6. Then the characteristics of segmented images are compared with characteristics of original currency image.

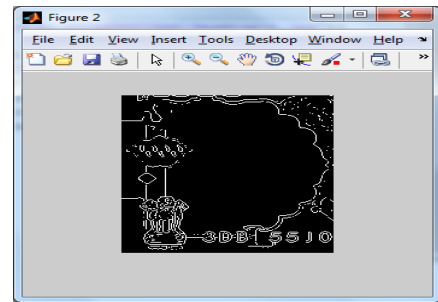


Fig 5: Image after segmentation

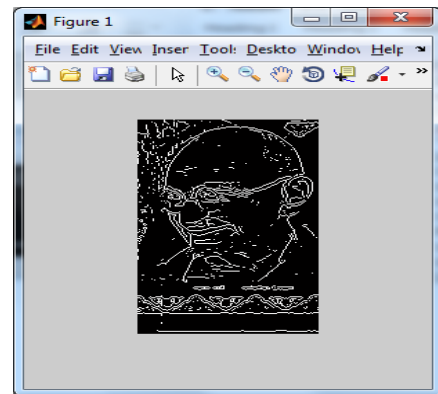


Fig 6: Image after segmentation.

4. CONCLUSION

The authentication of Indian paper currency is described by applying image processing techniques. The process begins from image acquisition and ends at comparison of features. The features are extracted using edge-based segmentation by the sobel operator and work well in the whole process with less computation time.

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FABRIC FAULT DETECTION USING IMAGE PROCESSING IN MATLAB

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ABSTRACT

The main objective of this paper is the processing of the different defective fabric such as hole, scratch, oil spot etc. In Textile industry automatic fabric inspection is important to maintain the quality of fabric. This paper proposes an approach to recognize fabric defects in textile industry by thresholding method for minimizing production cost and time since the work of inspectors is very tedious and consumes time and cost. Wastage reduction through accurate and early Stage detection of defects in fabrics is also an important aspect of quality improvement. The recognizer acquires digital fabric images by image acquisition device and converts that image into binary image by restoration and threshold techniques.

General Terms

Fabric fault detection

Keywords

Image Processing, Gray Image, Histogram, Thresholding

1. INTRODUCTION

Quality is an important aspect in the production of textile fabrics. Fabric quality is consisting of two components, i.e. fabric properties and fabric defects. Fabric property depends on the raw material, construction parameters and processing methods. Whereas a fabric defect can occur right from raw material selection to finishing stage, because of improper input parameters with respect to material, machine and man. Any variation to the knitting process needs to be investigated and corrected. Defects fall into the category, since when they appear, repair is needed, this is time consuming and sometimes results in fabric rejection. Fabric defect detection has been a long – felt need in the textile and apparel industry. Surveys carried out in the early 1975 shows that inadequate or inaccurate inspection of fabrics has led to fabric defects being missed out, which in turn had great effects on the quality and subsequent costs of the fabric finishing and garment manufacturing processes. Digital image processing is the use of computer algorithms to perform image processing on digital images. As a subcategory or field of digital signal processing, digital image processing has many advantages over analog image processing. It allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the build-up of noise and signal distortion during processing. Since images are defined over two

dimensions (perhaps more) digital image processing may be modeled in the form of multidimensional systems. Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods to them. Image processing basically includes the following three steps.

1. Importing the image with optical scanner or by digital photography.
2. Analyzing and manipulating the image which includes data compression and image enhancement and spotting the patterns that are not to human eyes like satellite photographs.
3. Output is the last stage in which result can be altered image or report that is based on image analysis.

1.1 Analysis

The brief description and the detailed working of each and every block is summarized as follows:

1.1.1 Input of the Fault Image

This is basically the image acquisition block of the system. Here the faulty fabric image is taken by the different types of camera such as CCD (Charged Coupled Device) camera, CMOS (Complementary Metal Oxide Semiconductor) camera, or any basic Digital camera, etc. The pixel value of these cameras is around 320×420 pixels. The acquired image may or may not contain noise signal, if it consists of the noise signal it is required some pre-processing techniques in the image. Noise must be removed from the image by using noise removal techniques.

1.1.2 Conversion of Color Image to Gray Image

This is basically converting the original image that is being forwarded by the previous block in to the gray scale image. The gray scale image conversion is really very important since the further processing of the system is to be done on the gray image only. Explore noise reduction in images using linear and nonlinear filtering techniques is applied.

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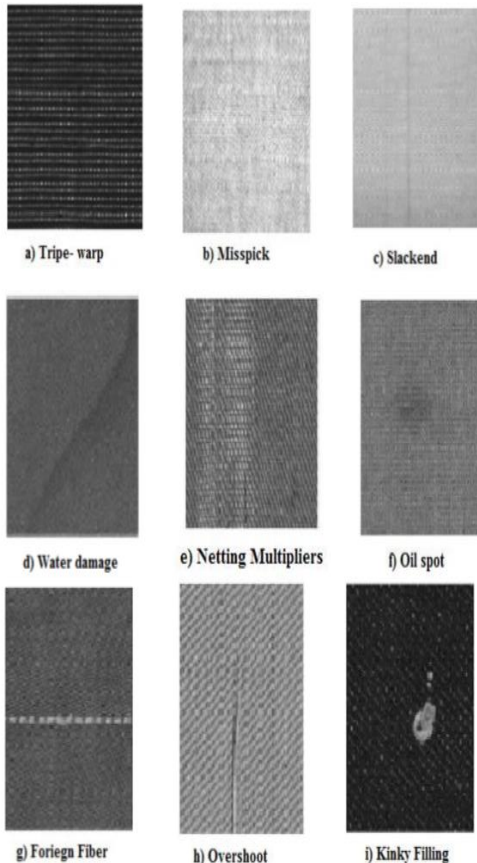


FIGURE 1.1: FABRIC FAULT'S

1.1.4 Noise Removal and Filtering from the Image

The image that is converted to the gray scale image is being given as an input to the noise removal part of the system. In this part of the system the removal of the noise signal is done in order to analyze the image for the defects in the image that is the fabric. The noise removal is one of the crucial part of the system since the noise in the image acts as the impurities in the image that can cause the degraded output of any system. Here in our system the noise can affect the level of the intimation of the faults that the system is going to predict at the end [4].

1.1.5 Conversion to the Binary Image

The noise of the image is being totally removed in the noise removal part of the system. The next step after the noise removal from the fabric image is the conversion of the noise removed image to the binary image of the original image. Here the conversion of the binary image is the important task since the original image is in the image format of the various

formats. This conversion of the image to the binary image is necessary since the image is to be converted in to the machine readable format for the processing and that is done only with the help of the binary image. Various operations on the images is also done only on the binary images.

1.1.6 Histogram

A histogram is basically the graphical representation showing a visual impression of the distribution of data. It is an estimate of the probability distribution of a variable. In this system the collected frame of the image is analyzed for its appearance, the every pixel of the frame which is obtained from the output of the image enhancement process is measured and their appearance value is given between the standards 0 – 256 and their resultant values are marked in the histogram graph. Histogram here basically is used to classify the defects of the fabric. With the use of the output of the histogram the faults are being guessed.

2. Flowchart of the System

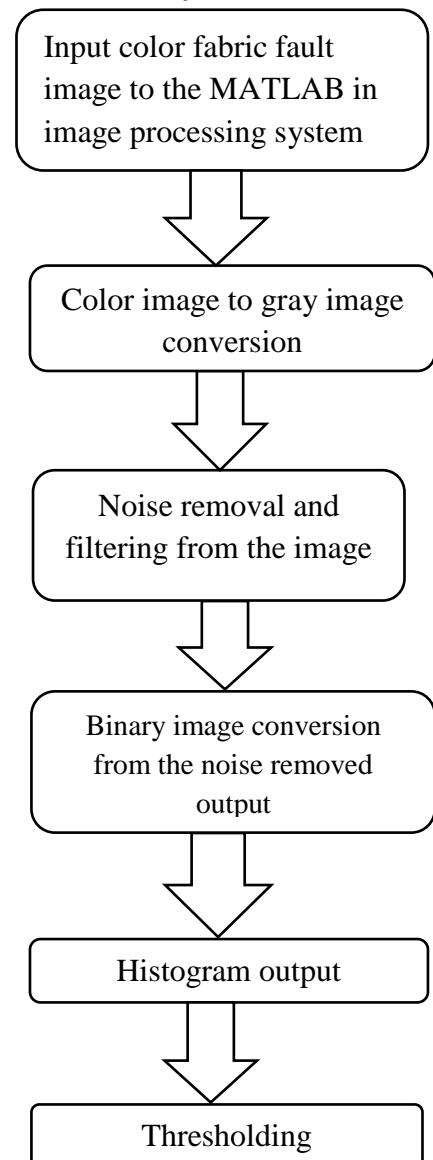


FIGURE: 2.1 FLOW CHART

1.8 Thresholding

It is the simplest method of image segmentation. From a gray scale image, thresholding can be used to create images in thresholding, the color-image or gray-scale image is reduced to a binary image. Thresholding is a process of converting a gray scale input image to a bi-level image by using an optimal threshold. The purpose of thresholding is to extract those pixels from some image which represent an object (either text or other line image data such as graphs, maps). Though the information is binary the pixels represent a range of intensities. For a thresholding algorithm to be really effective, it should preserve logical and semantic content. There are two basic types of thresholding algorithms:

- Global thresholding algorithms
- Local or adaptive thresholding algorithms.

2.1 TOOL TO BE USED

2.1.1 Camera/webcam

A webcam is a video camera that feeds or streams its image in real time to or through a computer to computer network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via systems such as the internet, and email as an attachment. When sent to a remote location, the video stream may be saved, viewed or on sent there. Unlike an IP camera (which connects using Ethernet or Wi-Fi), a webcam is generally connected by a USB cable, or similar cable, or built into computer hardware, such as laptops.

2.1.2 MATLAB

Matlab is a high-level language and interactive environment for numerical computation, visualization, and programming. Using Matlab, you can analyze data, develop algorithms, and create models and applications. The language, tools, and built-in math functions enable you to explore multiple approaches and reach a solution faster than with spreadsheets or traditional programming languages, such as C/C++ or Java. You can use MATLAB for a range of applications, including signal processing and communications, image and video processing, control systems, test and measurement, computational finance, and computational biology. More than a million engineers and scientists in industry and academia use MATLAB, the language of technical computing.

2.1.3 Image processing Toolbox

Features

Image analysis, including segmentation, morphology, statistics, and measurement.

- Image enhancement, filtering, and deblurring.
- Geometric transformations and intensity-based image registration methods

- Image transforms, including FFT, DCT, Radon, and fan-beam projection
- Large image workflows, including block processing, tiling, and multiresolution display
- Visualization apps, including Image Viewer and Video Viewer.
- Multicore- and GPU-enabled functions and C-code generation support.

2.1.4 Graphical User Interface in MATLAB

Graphical User Interface (GUI) is a type of user interface that allows users to interact with electronic devices with images rather than text commands. GUIs can be used in computers, hand-held devices such as MP3 players, portable media players or gaming devices etc. It represents the information and actions available to a user through graphical icons and visual indicators.

It is a combination of technologies and devices to provide a platform that the user can interact with, for the tasks of gathering and producing information. It makes easy for people with few computer skills to work with and use computer software.

MATLAB GUIs are created using a tool called guide, the GUI Development Environment. This tool allows a programmer to layout the GUI, selecting and aligning the GUI component to be placed in it. Once the components are in place, the programmer can edit their properties: name, size, font, text to display, and so forth. When guide saves the GUI, it creates working program including skeleton function that the programmer can modify to implement the behavior of the GUI. When guide is executed, it creates the Layout Editor.

3. ACKNOWLEDGMENTS

It is indeed a matter of great pleasure and privilege to be able to present this paper on fabric fault detection using image processing in Matlab under the valuable guidance of Prof. Madhura Tilak, Professor of department (EXTC ENGINEERING) and the faculty of workshop technology.

I would like to express my deep sense of gratitude to my Guide Mrs. Madhura Tilak, for her valuable guidance, advice and constant aspiration to our work. Also here would like to thank our honorable principal MR. Arun Kumar, who made all the facilities available for us in the college premises. We are obliged...

It has been a great fun to work together with staff and faculty members. And financial support from our parents is gratefully acknowledged.

To improve the general awareness, knowledge many things like advantages, disadvantages and applications and maximum possible diagrams are included in this book. We are also thankful to our parents for their understanding and support during these days, friends and staff members and professors for the consistent encouragement and who extended their co-operation and suggestions at every juncture.

And lastly appreciate the suggestions and criticism of views expressed in this book with a view of its improvement.

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ECO-FRIENDLY TRAIN AUTOMATION

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ABSTRACT

Considering the current state of turmoil in the Indian railways, the controversy surrounding the use or rather the ineffective use of technology in the railways, there is an aggravating need for some improvement in technology and at a low cost. The world is facing energy crisis. There has been an enormous increase in the global demand for energy in recent years. Fuel shortage is due to the excess use of the fuels in Railway electrification systems. In order to overcome this problem and reduce the wastage of fuels unnecessarily, development in the system is required with the use of renewable sources of energy. Hence the 'WIND TRAIN' system is required.

The main aim is to mount a windmill on the train whose energy can be used to drive the Lights and Fans of the coaches. Also by placing Dynamo sensors on the wheel of the train a battery backup will be provided by converting the motion of wheels into electrical energy, in absence of wind energy.

General Terms

Train automation, solar power, Wind power

Keywords

Density of people, Tunnel Automation, Station Automation, Generation of Power using Windmill, Generation Of Power using Solar Energy.

1. INTRODUCTION

For an extensive use of railway network in India where fuel is used for the generation of power and to reduce unnecessary wastage of power in railways this technology can be effectively used. Hence we are going for an ecofriendly approach with no usage of fuels and diesels. It is with the help of acceleration mechanism and stator rotation we can generate electric energy from the windmill, for energy provision of coaches lights and fans. When the wind is sensed, it will rotate the stator of the windmill. This will generate a signal which will be given to microcontroller. From microcontroller, the signal will be given to the compartment's lights, fans etc. By implementing Dynamo sensors on the wheels of the train, a battery backup will be provided. Further with the use of Solar Power and technology, automation can be provided in the railway system, which is further explained in the scope.

1.1 Scope

This paper deals with Conserving Power by allowing Automation in the Railway System with the use of Windmill on Trains and Solar Power on the Platform. The system will be divided into two parts that is:

- Field
- Train

The FIELD side will include automation on the Station and in Tunnel .For this Part, the coding will be done in microcontroller ATC2051 for interfacing different IC's and other components and to control various features involved in this part. The power for the field will be provided by the Solar Panels mounted on the Station.

The TRAIN side of the system will include automation inside the Train .The Electricity for driving the Lights and Fans of the Train will be provided by the Windmill and backup will be provided by the Dynamo.

2. LITERATURE SURVEY

The earlier railway system worked on coal engine which consumed a lot of coal to run the train which carried passengers and goods. With the enhancement in the technology, improvements were made in the system by implementing electric engines. These engines are used only in the local trains in India, while the long distance trains still make the use of fuel for running the train. Out of total consumption of fuel in India, 70% is utilized by these trains. With the increase in the population, the consumption of fuel is also increasing day by day. Also the drawback of the present system is that the switching of lights and fans is done manually. There is an essential need to automate the system with the use of present technology and use of renewable sources of energy to conserve the energy. The study of paper [1] Solar Led Street Light Using Motion Sensor and Single Axis Control led us to the conclusion to use solar power to control the electric system on the station. Paper [2] and [3] paved a way to implement windmill on the train that will provide power to train's light and fans. To conserve power, the wastage of power needs to be reduced in the tunnels by automating the control of electric systems in the tunnel was explained in paper [4].So the proposed system deals with automation in the railway with an ecofriendly approach to conserve energy [5].

3. METHEDODOLOGY

3.1 Field side

The FIELD side of the system will include automation on the Station referred from [6] and in Tunnel referred from paper [7]. For this Part of the project the coding will be done in microcontroller ATC2051 for interfacing different IC's and other components and to control various features involved in this part. The power on the field will be provided by the Solar Panels mounted on the Station.

3.1.1 Working

This Block diagram represents the Field Side of the system. This Includes two IR sensors which will be placed before the Tunnel. These sensors will sense the incoming train which will enable the microcontroller to switch ON/OFF the Lights inside the Tunnel.

3.1.2 Block Diagram of field side

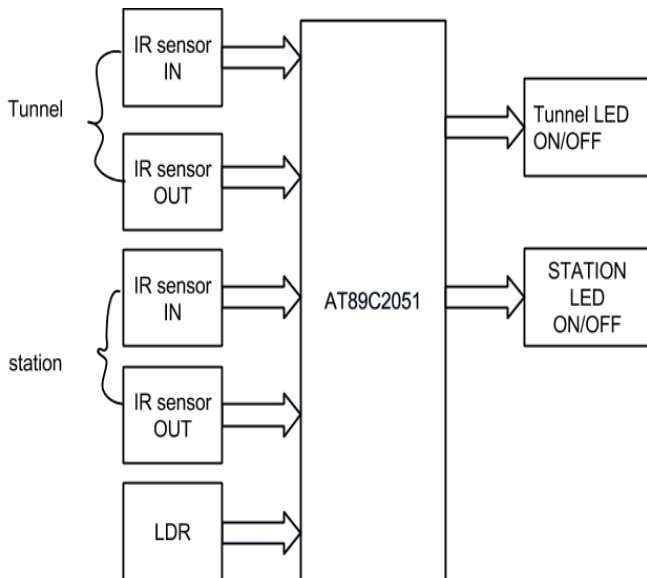


Fig. 1 Block Diagram of field

3.2 Train Side

This part of the system includes automation inside the train using the wind energy provided by windmill. This energy will drive the lights and fans of the coaches in the train using AT89S52 microcontroller. The working is as follows:

3.2.1 Working

There are two IR sensors in the train which will be used for obtaining the crowd density which will count number of people entering and leaving the train and will display the density on LCD. If person enter into the train then first IR sensor sense then second IR sensor will be sense. So count value will be increment and new value will be display on LCD. Also the Motor drivers are used to drive the train and

fans inside the Train. The Windmill will be mounted on the Train's Engine Compartment which will provide electricity to drive the Lights and fans inside the train in its second compartment. The backup will be provided by the Dynamo sensors mounted on wheels of the Train.

3.2.2 Block Diagram inside the Train

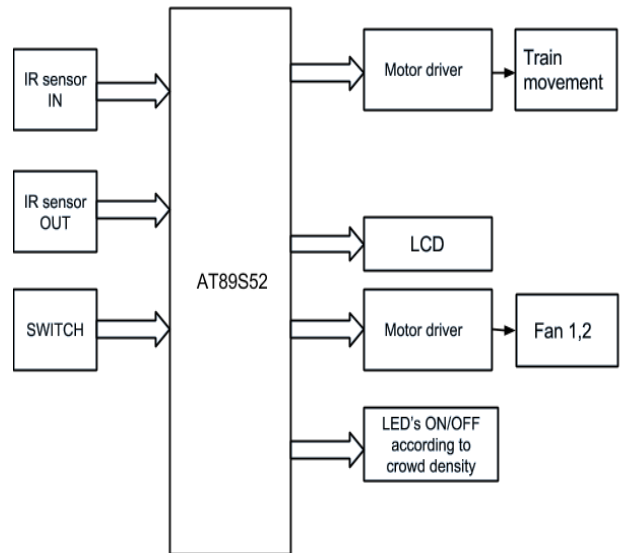


Fig. 2 Block Diagram of train

3.3 Other Features

3.3.1 Density of People Entering In Train

This is the first feature of our project. Here we will be developing a circuit which will count the no. of visitors going inside and no. of visitors coming outside. So if the number of visitors inside and outside is equal so there are number visitors inside thus no need to switch ON the lights and fans and thus our circuit will automatically switch OFF the lights.

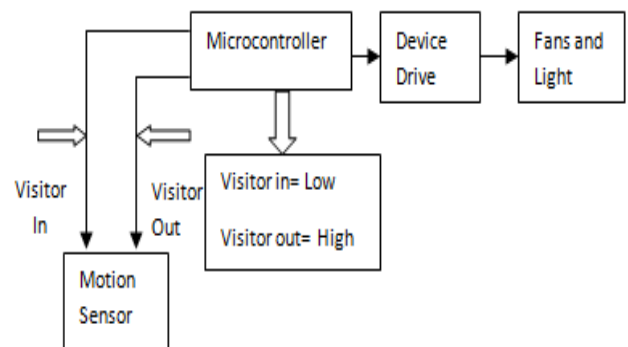


Fig. 3 Flow chart of train automation

3.3.2 Automatic switching of light on station

This feature will lead to save energy when not in use. Lights will be switched OFF during daytime and they will be automatically ON when it is dark by using sensors.

Also when there is no train on platform only few lights will be ON and when train arrives all lights will be switched ON.

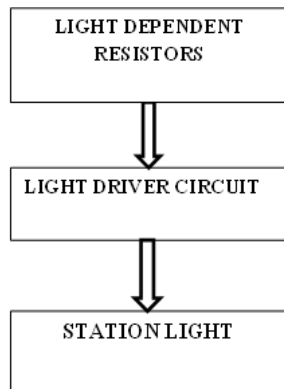


Fig. 4 Flow chart of automatic switching of light on station.

3.3.3 Power saving in tunnel

As the lights of the tunnels are continuously ON the entire day, leading to wastage of power, hence this feature will lead to save the power if the lights of the tunnels are ON only when the train enters the tunnel and they will automatically be switched off as the train passes away.

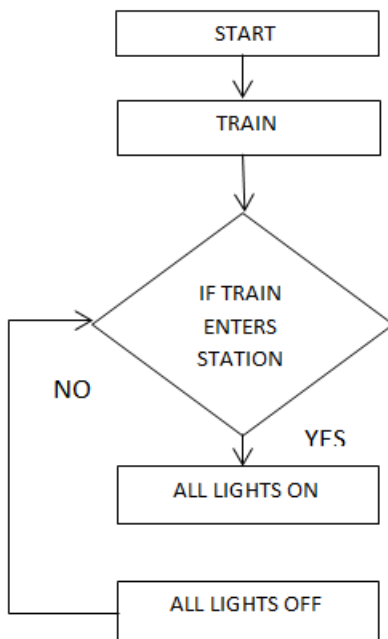


Fig. 5 Flow chart of tunnel automation

4. TOOLS TO BE USED

4.1 Hardware Used

4.1.1 AT89S52

The AT89S52 is a CMOS 8 bit microcontroller having 8k bytes flash memory, 256 bytes of RAM, 32 I/O lines. It is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications manufactured by Atmel. It is a 40pin IC which is used in the Train side of the system. This will be used for interfacing different IC's and the LCD display. This IC will enable automation in the Train as proposed in the system.

4.1.2 ATC2051

The ATC2051 is a high-performance CMOS 8-bit microcomputer with 2K bytes of Flash, 128 bytes of RAM, 15 I/O lines. This IC is designed with logic for operation down to zero frequency and supports software selectable power saving modes. It is a 20 pin IC which is used in the field of the proposed system for interfacing the various sensors and relay circuits to provide automation on station and tunnel.

4.1.2 L293D (motor driver)

This is a motor driver IC which provides 600mA current at voltages ranging from 4.5V to 36V. It is a 16 pin IC and can drive 2 dc motors in both the directions. This IC is used in the train for driving the fans and for running the wheels of the train.

4.1.3 Dynamo

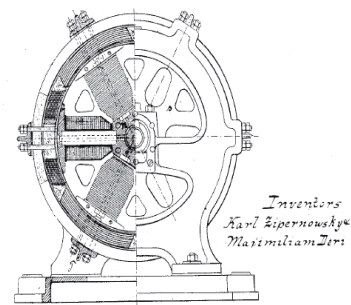


Fig. 6 Dynamo.

Dynamo is an electrical generator that converts the motion into the electric energy with the help of commutator. The dynamo sensors are used in the Train of the proposed system in order to provide battery backup in the absence of wind energy.

4.1.4 Obstacle sensor

This sensor consists of 3 components: IR transmitter, IR receiver and 555 IC. These sensors are available at different carrier frequencies ranging from 32kHz to 42 kHz. In the field

near the station this sensors will be implemented in order to detect the train entering the station. The idea for this was given as per the study of paper [8].

4.5 LDRs (Light Dependent Resistors)

The LDR sensors are used for detecting the dark and light and control the device depending on the application. As per paper [4] this sensors are used in intelligent devices to automate the system. These sensors will be used with the solar panels to control the lights and fans on the station.

4.6 IR sensor

An infrared sensor is an electric device that is used to sense some characteristics of the surrounding by either emitting or detecting the infrared waves. In this system these sensors will be used inside the train to detect the number of people entering and leaving the train as per paper [9].

5. EXPECTED RESULTS

With the implementation of working given above the system is expected to work in this manner. When the train starts the windmill implemented on the train will provide electric power to drive the lights and fans inside the train. As the train reaches the station depending on the density of people the corresponding lights and fans of that side of compartment will be switched ON. On the field side when the train enters the station the lights and fans of the platform will be switched ON with the power provided by the Solar panels. The lights will be switched ON only when it is dark. During day time lights will be kept OFF and this will be controlled using LDR'S. Now when the train leaves the station only few lights will be switched OFF. This train will further move towards the tunnel where the lights of the tunnel will be ON only when the train enters the tunnel and when the last compartment of the train leaves the tunnel the lights will be switched OFF.

6. CONCLUSION

This proposed system will be specifically used in the railway system working on fuel and diesel. This will avoid the wastage of power in the railway system and save the world from facing future Energy Crisis due to railway system. This system is also ecofriendly and hence will not Harm the Environment and allow Automation in the System. This project can be extensively used in Bullet and Maglev trains. This will enable us to implement less man power and proper safety in the system. In future if the world faces some Energy Crisis we can effortlessly run the Railway System. Also the concept of windmill can be applied in various other fields. For the extensive Railway network in India, where fuel is used for generation of power and to reduce unnecessary wastage of power in railways this technology can be used.

7. FUTURE SCOPE

The main aim of system is to implement a windmill on the train which will provide electricity to the Lights and fans inside the Train. This project can be implemented only in the trains which work on fuel and not the local trains that work on electricity. If we see the Future Scope of the project this concept can be implemented in the Monorails and Maglev trains which work due to the magnetic effect and have a very high speed and also in the monorail systems [10]. Further the Automation in the system can also be implemented in the Railway System. This project makes the system ecofriendly. Today's world is facing Energy crisis, if this continues it may happen that the railway system may come to an end in the absence of the electricity. If an ecofriendly concept is applied in the system we can effortlessly run the Railway system without any Harm to the Environment.

8. ADVANTAGES

- Modeling of existing railway techniques and implementing their improvements.
- All features can be projected in a small area.
- Study equipment designed to meet working conditions of railway operations
- Compact apparatus with high degree of operational reliability.
- Immune to climatic conditions most of the time.

ACKNOWLEDGMENTS

It is indeed a matter of great pleasure and privilege to be able to present this paper on eco-friendly train automation under the valuable guidance of Prof. Archana Ingle, Head of department (EXTC ENGINEERING) and the faculty of workshop technology.

I would like to express my deep sense of gratitude to my Guide Mrs. Archana Ingle, and co-guide Ms. Kaustuba Desai, for her valuable guidance, advice and constant aspiration to our work. Also here would like to thank our honorable principal MR. Arun Kumar, who made all the facilities available for us in the college premises. We are obliged.

It has been a great fun to work together with staff and faculty members. And financial support from our parents is gratefully acknowledged.

To improve the general awareness, knowledge many things like advantages, disadvantages and applications and maximum possible diagrams are included in this book. We are also thankful to our parents for their understanding and support during these days, friends and staff members and professors for the consistent encouragement and who extended their co-operation and suggestions at every juncture.

And lastly appreciate the suggestions and criticism of views expressed in this book with a view of its improvement

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Real Time Skeleton Tracking Based Human Recognition System Using Kinect & Arduino

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ABSTRACT

A Microsoft Kinect sensor has high resolution depth and RGB/depth sensing which is becoming available for wide spread use. It consists of object tracking, object detection and reorganization. It also recognizes human activity analysis, hand gesture analysis and 3D mapping. Face expression detection is widely used in computer human interface. By using the Microsoft Kinect we can detect the face expression. Using a Kinect depth camera for detection of common face expressions. Face is tracked using MS Kinect which uses 2.0 SDK. This makes use of depth map to create a 3D frame model of the face. By recognizing the facial expressions from facial images, a number of applications in the field of human computer can be build. This paper describes about the working of Kinect and use of Kinect in Human Skeleton Tracking.

General Terms

Skeleton tracking algorithm & Action Recognition

Keywords

Skeleton Tracking, Kinect, Pose Estimation, Arduino, Actions

1. INTRODUCTION

Mobile robots have thousands of applications, from autonomously mapping out a lawn and cutting grass to urban search and rescue autonomous ground vehicles. One important application in the future would be to fight wars in place of humans. That is humans will fight virtually and whatever move human makes the same move the mobile robot will copy. To achieve this we need to teach robot how to copy human actions. So our project deals with making a robot that will copy human action.

We are going to make use of one of the most amazing capabilities of the Kinect: skeleton tracking. This feature allows us to build a servo driven robot that will copy our actions efficiently. Natural interaction applied to the robot has an important outcome; there is no need for physical connection between the controller and the robot. This project will be extended to implement network connectivity that is the robot could be controlled remotely from anywhere in the world.

It will use the concept of skeleton tracking so that the Kinect can detect the user's joints limbs movements in space. The user data will be mapped to servo angles and send them to the Arduino board controlling the servos of the robotic robot. The skeleton tracking feature is used to map the depth image of human. It will track the position of joints of the human

body which is then provided to the computer which will in turn sends the signal to the Arduino board in the form of pulse for every joints this will make the servo motor rotate in accordance with the pulse.

The eight servos are placed on the shoulders, elbows, hips, and knees of the robot. The servo motor is a DC motor. The rotation of servo motor depends upon the number of signal pulses applied to the servo motor. Suppose if we assume that for one pulse the motor rotates through 1 degree, then for 90 pulses it will rotate through angle of 90 degree, for 180 pulse rotates through 180 degree and so on.

The second important part of paper is angle calculation. The skeleton information from the Kinect is stored in the computer which thus runs a program used by Arduino to calculate the angle inclination of every joints of the human body. This angle calculation is then converted into a pulse train for each servo motor connected to Arduino. According to the received pulse the servo motor rotates through a certain angle which is observed by Kinect sensor. Hence the robot copies the action of the human skeleton.

The third important part of the project is to extend the concept of using the project on internet. So through internet the robot can be operate anywhere around the globe. To do so the user sets the external IP address of the computer in the Arduino program through this the robot will emulate the human action anywhere from the earth through internet.

2. RELATED WORK

Our project deals with making a robot that will copy human action. Recently, Microsoft released the Xbox Kinect, and it proves useful for detecting human actions and gestures. So in this paper we propose to use Kinect camera to capture the human gestures and then relaying these actions to the robot which will be controlled by Kinect and Arduino board.

2.1 Existing Systems

Previously depth images were been recorded with the help of the silhouettes which are nothing but the contour of the body part whose depth images is to be formed [1]. They reject the shadow part of the body or the colour of the clothes the person has worn. It just simply sees the border of the body. But for the digital system it's been very difficult to predict the motion of the body part of unknown person since this type of model was based on the priori knowledge of the contours. Since the human of every part of the world are not same and differ in size, length and many other physical parameters. Hence it

becomes difficult to store all such kind of information. Therefore using the silhouettes just simply reduces the scope of depth images. [1]

The two major steps leading from a captured motion to a reconstructed one are:

- Marker reconstruction from 2-D marker sets to 3-D positions;
- Marker tracking from one frame to the next, in 2-D and/or 3-D.

However, despite the fact that 2-D and 3-D tracking ensure the identification of a large number of markers from one frame to another, ambiguities, sudden acceleration or occlusions will often cause erroneous reconstructions or breaks in the tracking links. For this reason, it has proved to be necessary to increase our procedure's robustness by using the skeleton to drive the reconstruction and tracking process by introducing a third step, i.e. the accurate identification of each 3-D marker and complete marker inventory in each frame. The approaches to solving these issues are addressed in the following paragraphs, starting with the presentation of the human model used and keeping in mind that our entire approach is based on the constant interaction between the model and the above marker processing tasks.

2.1.1 Skeleton model

Our skeleton model is controlled by 32 degrees of freedom grouped in 9 joints in 3-D space. This is a simplified version of the complete skeleton generally used. It does not include detailed hands and feet.



Fig 1: Default Skeletal Joint Locations

2.1.2 Stereo triangulation

3-D markers are reconstructed from the 2-D data using stereo triangulation

2.1.3 Binocular reconstruction

Once we have reconstructed these 3-D markers in the first frame, we need to compare the number of reconstructed markers with the number of markers known to be carried by the subject. As all remaining processing is automatic, it is absolutely essential that all markers be identified in the first frame. Any marker not present in the first frame is lost for the entire sequence. Therefore, if the number of reconstructed markers is insufficient, a second stereo matching is performed, this time also taking into account markers seen in only two views. [2]

There are three techniques from which the image can be tracked without using the marker less approach First, learning-based methods which rely on prior probabilities for human poses, and assume therefore limited motions. Second, model-free methods which do not use any a priori knowledge, and recover articulated structures automatically. However, the articulated structure is likely to change in time, when encountering a new articulation for instance, hence making identification or tracking difficult. Third, model-based approaches which fit and track a known model using image information.

2.2 Proposed Approach

In this paper, we aim at limiting as much as possible the required a priori knowledge, while keeping the robustness of the method reasonable for most interaction applications. Hence, our approach belongs to the third category. [3] Among model-based methods, a large class of approaches use an a priori surface or volume for representation of the human body, which combines both shape and motion information [4]. The corresponding models range from fine mesh models to coarser models based on generalized cylinders, ellipsoid or other geometric shapes. In order to avoid complex estimations of both shapes and motions as in, most approaches in this class assume known body dimension. However, this strongly limits flexibility and becomes intractable with numerous interaction systems where unknown persons are supposed to interact. A more efficient solution is to find a model which reduces shape information. To this purpose, a skeletal model can be used. This model does not include any volumetric information. Hence, it has fewer dependencies on body dimensions. In addition, limbs lengths tend to follow biological natural laws, whereas human shapes vary a lot among population. Recovering motion using skeletal models has not been widely investigated and an approach where a skeletal structure is fitted with the help of hand/feet/head tracking. However, volumetric dimensions are still required for the arms and legs limbs. Hence for all the complication and errors in the technique the use of Kinect in this project has tackled all the difficulties in the approaches for finding the robust technique. [3]

3. KINECT & ITS WORKING

A Microsoft Kinect sensor has high resolution depth and RGB/depth sensing which is becoming available for wide spread use. It consists of object tracking, object detection and reorganization. It also recognizes human activity analysis, hand gesture analysis and 3D mapping. Face expression detection is widely used in computer human interface. It can be used to detect and distinguish between different kinds of objects. The depth information was analysed to identify the different parts of fingers or hands, or entire body in order to interpret gestures from a human standing in front of it. Thus the Kinect was found to be an effective tool for target tracking and action recognition. [5]

Kinect camera consists of an infrared projector, the colour camera, and the IR camera. The depth sensor consists of the IR projector combined with the IR camera, which is a monochrome complementary metal- oxide semiconductor sensor. The IR projector is an IR laser that passes through a diffraction grating and turns into a set of IR dots. [6]

The relative geometry between the IR projector and the IR camera as well as the projected IR dot pattern are known. If

we can match a dot observed in an image with a dot in the projector pattern, we can reconstruct it in 3D using triangulation. Because the dot pattern is relatively random, the matching between the IR image and the projector pattern can be done in a straightforward way by comparing small neighbourhood's using, for example, normalized cross correlation. [6]

In skeletal tracking, a human body is represented by a number of joints representing body parts such as head, neck, shoulders, and arms. Each joint is represented by its 3D coordinates. The goal is to determine all the 3D parameters of these joints in real time to allow fluent interactivity and with limited computation resources allocated on the Xbox 360 so as not to impact gaming performance. Rather than trying to determine directly the body pose in this high-dimensional space, Jamie Shotton and his team met the challenge by proposing per-pixel, body-part recognition as an intermediate step Shotton's team treats the segmentation of a depth image as a per-pixel classification task (no pairwise terms or conditional random field are necessary)[4]. Evaluating each pixel separately avoids a combinatorial search over the different body joints. For training data, we generate realistic synthetic depth images of humans of many shapes and sizes in highly varied poses sampled from a large motion-capture database. We train a deep randomized decision forest classifier, which avoids over fitting by using hundreds of thousands of training images. Simple, discriminative depth comparison image features yield 3D translation invariance while maintaining high computational efficiency. [6]

4. SKELETON TRACKING ALGORITHM

The depth maps captured by the Kinect sensor are processed by a skeleton-tracking algorithm. The depth maps of the utilized dataset were acquired using the OpenNI API2 [7]. The OpenNI high-level skeleton-tracking module is used for detecting the performing subject and tracking a set of joints of his/her body. More specifically, the OpenNI tracker detects the position of the following set of joints in the 3D space which are Torso, Neck, Head, Left shoulder, Left elbow, Left wrist, Right shoulder, Right elbow, Right wrist, Left hip, Left knee, Left foot, Right hip, Right knee, Right foot. The position of joint g_i is implied by vector $\mathbf{p}_i(t) = [x \ y \ z]^T$, where t denotes the frame for which the joint position is located and the origin of the orthogonal XY Z co-ordinate system is placed at the centre of the Kinect sensor.

4.1 Action recognition

Action recognition can be further divided into three subtypes

4.1.1 Pose estimation

In particular, the aim of this step is to estimate a continuously updated orthogonal basis of vectors for every frame t that represents the subject's pose. The calculation of the latter is based on the fundamental consideration that the orientation of the subject's torso is the most characteristic quantity of the subject during the execution of any action and for that reason it could be used as reference. For pose estimation, the position of the following three joints is taken into account: Left shoulder, Right shoulder and Right hip. These comprise joints around the torso area, whose relative position remains almost

unchanged during the execution of any action. The motivation behind the consideration of the three aforementioned joints, instead of directly estimating the position of the torso joint and the respective normal vector, is to reach a more accurate estimation of the subject's pose. It must be noted that the Right hip joint was preferred instead of the obvious Torso joint selection. This was performed so that the orthogonal basis of vectors to be estimated from joints with bigger in between distances that will be more likely to lead to more accurate pose estimation. However, no significant deviation in action recognition performance was observed when the Torso joint was used instead. [8]

4.1.2 Action Representation

For realizing efficient action recognition, an appropriate representation is required that will satisfactorily handle the differences in appearance, human body type and execution of actions among the individuals. For that purpose, the angles of the joints' relative position are used in this work, which showed to be more discriminative than using e.g. directly the joints' normalized coordinates. Additionally, building on the fundamental idea of the previous section, all angles are computed using the Torso joint as reference, i.e. the origin of the spherical coordinate system is placed at the Torso joint position. For computing the proposed action representation, only a subset of the supported joints is used. This is due to the fact that the trajectory of some joints mainly contains redundant or noisy information. To this end, only the joints that correspond to the upper and lower body limbs were considered after experimental evaluation, namely the joints Left shoulder, Left elbow, Left wrist, Right shoulder, Right elbow, Right wrist, Left knee, Left foot, Right knee and Right foot. The velocity vector is approximated by the displacement vector between two successive frames, i.e. $\mathbf{v}_i(t) = \mathbf{i}(t) - \mathbf{i}(t-1)$. The estimated spherical angles and angular velocities for frame t constitute the frame's observation vector. Collecting the computed observation vectors for all frames of a given action segment forms the respective action observation sequence \mathbf{h} that will be used for performing HMM-based recognition, as will be described in the sequel. [8]

4.1.3 HMM based recognition

Markov Models is stochastic model describing the sequence of possible events in which the probability of each event depends only on the state attend in the previous event. This model is too restrictive to be applicable to current problem of interest thus we extend the concept of Markov model to form Hidden Markov Model (HMM). HMM is doubly embedded stochastic process with the underlying stochastic process i.e. not observable (it is Hidden) but can only be observed through set of stochastic process that produce the sequence of observations. [12].

HMMs are employed in this work for performing action recognition, due to their suitability for modelling pattern recognition. In particular, a set of J HMMs is employed, where an individual HMM is introduced for every supported action a_j . Each HMM receives as input the action observation sequence \mathbf{h} (as described above) and at the evaluation stage returns a posterior probability $P(a_j|\mathbf{h})$, which represents the observation sequence's fitness to the particular model. The developed HMMs were implemented using the software libraries of Hidden Markov Model Toolkit (HTK). [8]

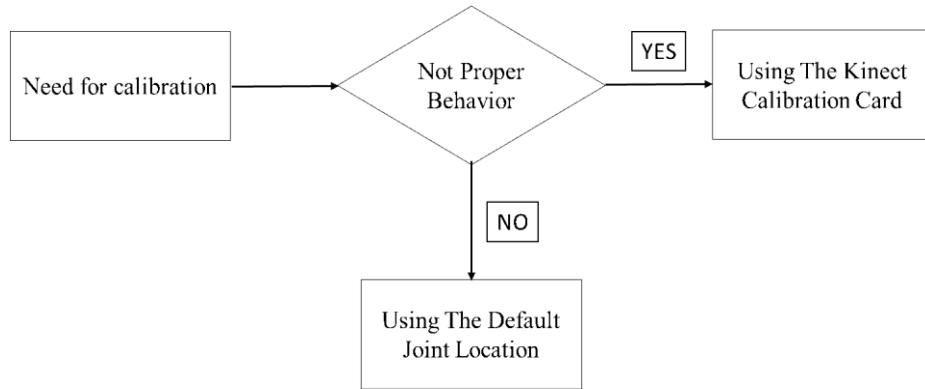


Fig 2: Initialization of Kinect Camera

5. METHODOLOGY

The entire process is divided in two parts i.e. Initialization & working.

5.1 Initialization

For the smooth functioning & Error free working the Kinect is initialized to its default mode. Initialization is done with the help of calibration card been provided by the Microsoft, this card helps to align the Tx and Rx Infrared Sensor of Kinect. Fig 1 indicates the default joint location which is been used, these are treated as the reference joints and with the help of these joints other joints are been calibrated.

detected nor the skeletal joints are detected. This kind of image results into blackening of frame and the white spots on the black frame are due to noises present in the environment. Once the Joints are been recognized/detected Kinect uses HMM algorithm for joint estimation and predicts the future movements. These recognized joint information are been converted into PWM pulses by the programmed PWM pulse generator present on Arduino board. The generated PWM pulses which serve as input to the servo motors, are been made to perform angular tilt as per the movement been captured. Since this is real time the entire process is been continuously repeated for each frame.

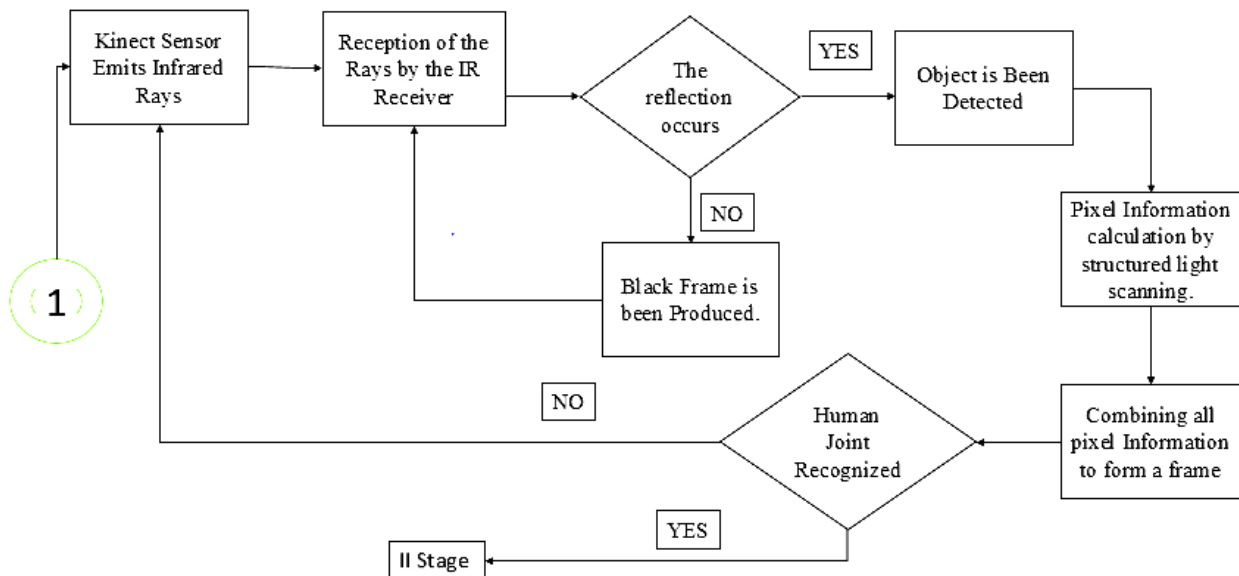


Fig 3: Working of stage 1

5.2 Working

Initially Infrared Rays (IR) are emitted from the IR transmitter of Kinect Camera. Emitted rays are been received by Kinect receiver which is been stored in its database. Since it is monitoring for the human joints, it waits until the human joints are recognized. If any object other than the skeleton joints are recognized it discards the frame and restarts the scanning of the next frame until joints are recognized. Black frame in Fig 2 indicates that neither the object is been

6. RESULT

As can be seen from the fig 6 we have formed the framework required for the robot. Along with the robot we have made the PCB which will help us to interface the servo motors HS 311 and HS 55. We have formed the PCB interfacing for the servo so that connection remains proper and it looks proper and compact which can be seen in fig 5. We have successfully interfaced the kinect camera through OpenNI and the tracked the skeleton.

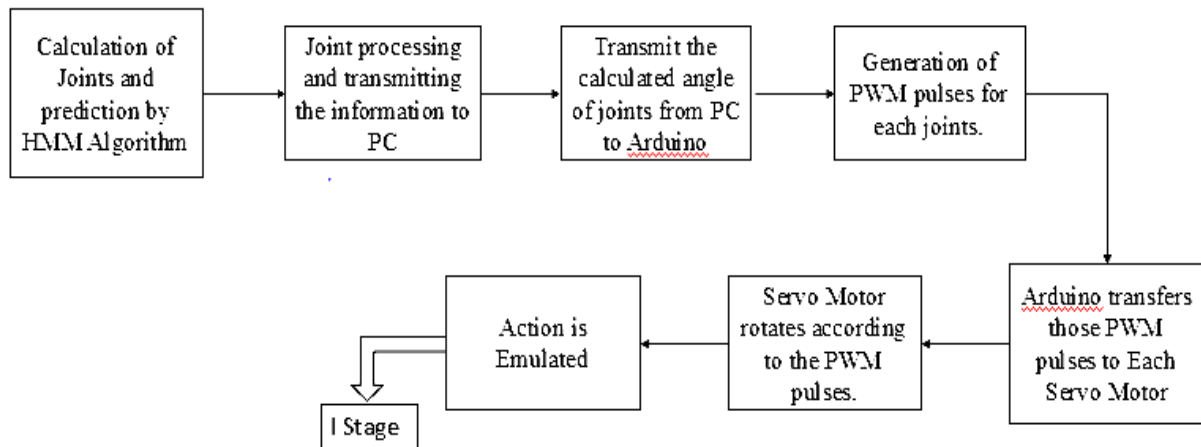


Fig 4: Working of stage II

7. CONCLUSION

After analysing the studies mentioned above, it can be concluded that the Kinect is an incredible piece of technology, which has revolutionized the use of depth sensors in the last few years. Because of its relatively low cost, the Kinect has served as a great incentive for many projects in the most diverse fields, such as robotics and medicine, and some great results have been achieved. Throughout this project, it was possible to verify that although the information obtained by the Kinect may not be as accurate as that obtained by some other devices (e.g., laser sensors), it is accurate enough for many real life applications, which makes the Kinect a powerful and useful device in many research fields. And thus we integrated and tested a real-time motion capture robot using Kinect camera. We proposed a natural gesture based communication with robot. The skeleton tracking algorithm has been well explained for further work. The results are better than the techniques that were used before Kinect camera.

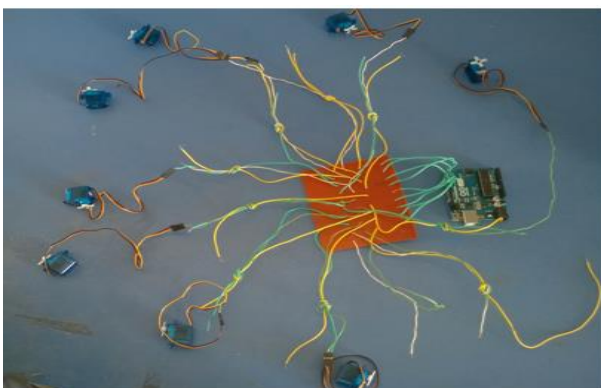


Fig 5: PCB with Servo Interfaced

Learning from demonstration is the scientific field which studies one of the easier ways a human have to deal with a humanoid robot: mimicking the particular task the subject wants to see reproduced by the robot. To achieve this a gesture recognition system is required. In this paper we presented a novel and cheap humanoid robot implementation along with a visual, gesture-based interface, which enable

users to deal with it.. Users are allowed to control the robot just by mimicking the gestures they want to be performed by the robot in front of the depth camera. This should be seen as preliminary work, where we are providing elementary interaction tools, and should be extended in many different fashions, depending on the tasks the robot. [11]

8. FUTURE SCOPE

With the progress in the Kinect technology in the last decade it can be seen as a revolutionary tool in robotics. We have made a human controlled robot using the Kinect camera.

Now further modification may be as follows:

1. We have tracked only few set of joints. So now the tracking algorithm can be expanded to track all the joints in the human body and we can have more reliable and robust copying of human action.

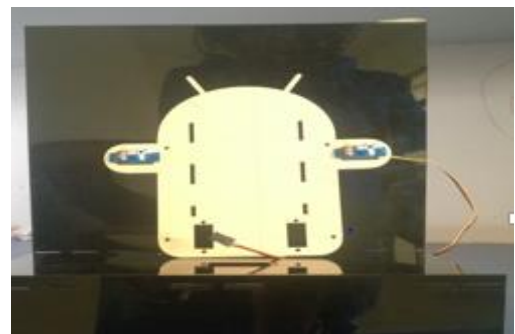


Fig 6: Robot Layout

2. We also would like to create the system portable by making the camera mobile. As now we know our Kinect camera isn't a portable reducing the size of Kinect camera to the size of mobile phone camera can be a good future development.

3. The servo motors used could be further investigated and changed to build the system more robust and natural.

4. The robot we built is fixed. Instead it can be made mobile. Thus not only it will copy human action but even move around like a human.

5. We can try to implement this project over the network. That is the Kinect camera will feed the data in the network and then the robot will get the data from network and thus we can control the robot by sitting in any corner of the world.

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Railway Wheels defect detection using Microstrip Antenna

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ABSTRACT

An antenna which is a part of wireless network that will monitor temperature and vibrations of the wheel bearings on the train wagons will be designed. This will allow for an earlier detection of damaged wheels, which will ease planning of maintenance and reduce wear on the rails considerably. The requirement of the system is that it is to be installed without any cables attached to the sensor nodes. This calls for wireless communication, and that for that antennas are needed. A train is a difficult environment to transmit electromagnetic (EM) waves in. It is full of metal and EM-waves cannot pass through a conducting material. Having much metal in its vicinity also affects the function of the antenna. This needs to be taken into consideration when making the design. The constructed antenna is a small dual-layer patch antenna. Dual layer means that it is constructed out of two sheets known as substrates of isolating material with different characteristics. The lower one of these substrates is made in such a way that integration with a circuit board is possible. Such integration would reduce the production cost considerably. The antenna is designed for direct placement on a conducting surface. This surface could be part of the train. It uses the surrounding metal as a ground plane in order to reduce its size. The result is a small patch antenna with good radiation qualities in metallic surroundings.

Keywords

Microstrip antenna, Gateways, RFID

1. INTRODUCTION

Nowadays many train accident happened not only in India but worldwide also, the major problem behind this accident is cracks in railway tracks. These cracks may occur because of defects in railway wheels. Our aim is to detect these defects in railway wheels. We are design an antenna for the 2.45 GHz ISM-band. This antenna is to be a part of a temperature sensor network placed on trains. The network will monitor temperature and in a later stage vibrations of the wheel bearings on the train wagons. This is done in order to detect faulty and broken wheels. The goal is to enable better planning of wagon maintenance by detecting which wheel will break before it actually does. Today detection is only possible after the wheel gets so badly damaged that it starts to cut into the rails. When this happens the wheel will damage the rail along the whole way from the point it starts to cut until it gets repaired or replaced. Being able to replace the

wheels before this happens would thus reduce the need for rail maintenance. Research on the radio environment of trains has been performed previously [1].

One sensor node is place on wheel bearing of train boogie, and gateway is place on side of railway tracks where using RFID send the information to server computer where all monitoring is done.

The antenna is desired to be small. It should work in metallic surroundings, a condition that puts tough requirements on the antenna design. When currents are flowing on the surface of the antenna there will be a coupling between the antenna and the metal in its surroundings. This will affect the performance of the antenna. It has to be designed in such a fashion that it will work at the desired frequencies in a position very close to a metal wall. The design also has to make sure that the energy is actually radiated and not dissipated into the train.

2. LITERATURE REVIEW

2.1 Substrates

As patch antenna establishes its physical attributes on a dielectric substrate having effective electrical and magnetic properties, so selecting a correct substrate is important as well [2]. Duroid substrate with relative permittivity 2.32 [3]; whereas of Roger 4003 substrate with electric permittivity 3 is to be used in the designing because of its low loss dielectric constant.

2.2 Feeding Technique

There are four types of feeding technique.

- 1] Microstrip feed
- 2] Coaxial feed
- 3] Aperture coupled feed
- 4] Proximity Feed

The feed of microstrip antenna also effecting the radiation characteristics of radiating element, hence while designing antenna a care must taken while deciding the proper feed. As mentioned above the aperture coupled feed is better due to low return loss but its fabrication is difficult of all and hence for ease of fabrication we are using Microstrip feed[4].

2.3 RFID

The cases of accidents due train derailment can be reduced extensively with the help of RFID. This approach is so much cost effective and installation of RFID is so easy. This provides many features over the technology which is running presently in railways. The future aspect of this system is so important in the development of railways. The High speed trains can also run with the help of this technology using RFID[5].

2.4 Power levels

The power levels are measured in dBm. It measures the power level in comparison to 1 mW on a decibel scale. 0 dBm thus equals 1 mW, while -10 dBm equals 0.1 mW[13].

3. Related Theory

3.1 Patch Antennas:

Patch or microstrip antennas are one kind of antennas. A patch antenna design is presented in this report which means that a more detailed explanation of their function is in order. The classic patch antenna consists of a ground plane and a thin layer of conducting material that are separated from each other by a dielectric sheet called substrate. Current is led to the thin layer or patch and will induce an electric field between the patch and ground. This field will directly beneath the patch be straightly directed from the patch to ground or the other way around depending on the phase of the 5 current. But at the edges it will be more spread out since there is more room. This effect is called fringing and it is this that makes patch antennas work.

To describe this a basic half wavelength rectangular patch antenna, which is shown in Fig , will be used as an example. Half wavelength means that at resonance frequency the wavelength will be about double the length of the antenna and the current will thus form half a wave. In this kind of antenna the electric potential will reach its maximum values at the edges but with a sign change. This is the situation shown in Fig . What happens is that near the patch the electric field will be directed towards positive y on both sides of the patch. That means that they will have the same phase and for the radiation normal to the patch surface the fields will add up .This is the direction of the strongest radiation. For waves travelling in the y direction the interference will be negative since there is one half wavelengths distance between the two edges where most of the radiation originates meaning that a wave that has travelled from one side to the other will experience a sign change and the interference will therefore be negative. Theoretically no radiation should be possible to detect in the positive or negative y directions At the edge of a conductor the current needs to be zero. This is because current is transportation of charge and if the conductor ends the charges need to stop. For an antenna with open ends such as the patch antenna described above this means that the longest standing wave will be twice the size of the antenna. If there is a way for the current to continue to flow, it can instead reach its maximum value at the end. This can be accomplished by 6 short- circuiting the conductor or by placing a load at the edge. By doing this the current pattern can be a quarter of a wavelength and so this is an efficient way to reduce the size of the antenna[13].

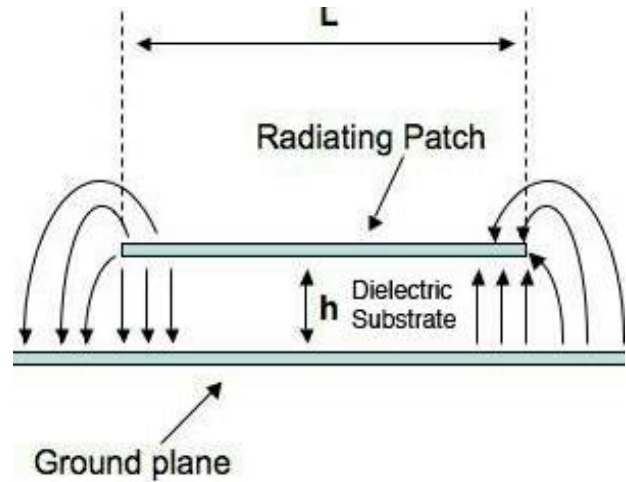


Fig 1: Patch antenna with fields.

3.2 Friis Transmission Equation:

The Friis Transmission Equation is one of the most commonly used equations when testing antennas. It gives the power received as a function of the power transmitted, the geometry, and various loss factors.

$$P_r/P_t = [e_{cdt}e_{cdr}(1 - |\Gamma_t|^2)(1 - |\Gamma_r|^2)(\lambda/4\pi R)^2 * (D_t(\theta_t, \phi_t)D_r(\theta_r, \phi_r) / \rho_r \rho_t)]$$

The subscripts t and r refer to transmitter and receiver respectively. The e- terms are radiation efficiency, the gamma terms are the reflection losses, D is directivity, and the term to the utmost right is polarization losses. $(\lambda/4\pi R)^2$ is called the free space loss factor, which shows the losses that appear due to the waves spreading in a spherical way. This is, as the name hints, only valid for free space. Radiation efficiency takes into account the combined effect of conduction and dielectric losses. These are lumped together since it is most often very hard to separate them.

Radiation efficiency is defined as the ratio of the power radiated to the power that reaches the antenna. Directivity is a measure of how much power is transmitted in a particular direction.

The free space loss factor assumes isotropic radiation, which is never the case in reality. The directivity adjusts for this. It is defined as $4\pi U/\text{Prad}$.

Where U is the radiation intensity in the direction of interest and Prad is the total radiated power. What this does is that it gives a coefficient of how much the intensity in the given direction varies compared to the average value. Sometimes the parameter gain is mentioned. Gain is the radiation efficiency multiplied by the directivity. Total gain is the total efficiency multiplied by the directivity[13].

4. DESIGN METHODOLOGY

Many antennas made today are designed to work in empty space. This is the simplest environment, where only the antenna needs to be taken into consideration. Since the antenna is mounted on a large piece of metal and has an electric circuit close to it. Both of these factors will affect the performance of the antenna. There are antennas designed for

hostile environments. Some are designed to have a large bandwidth in order to make them work even after detuning. Detuning is the unwanted change in operating frequency that takes place due to the surroundings of the antenna. Others are made in such a way that they will be very robust to changes in their surroundings and can work in difficult environments. The goal of those designs is to keep the fields within the structure of the antenna and in that way minimize the sensitivity of the antenna to its surroundings. There is however no general solution to this problem and there are no antennas available to buy that will work well in any hostile environment.

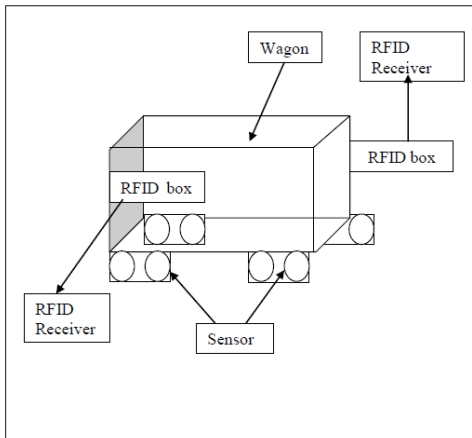


Fig 2: System setup on one wagon.

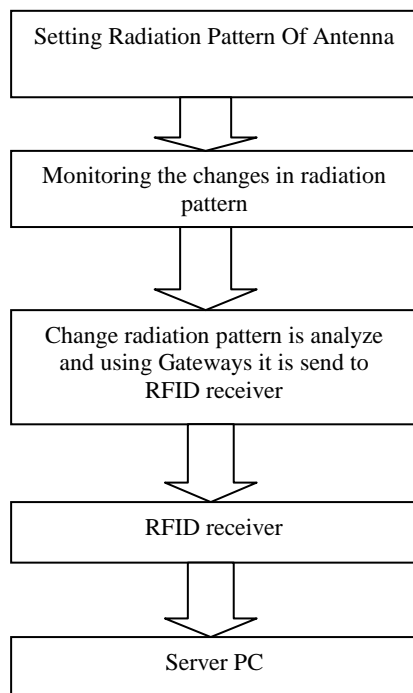


Fig 3: Flow chart for proposed system.

4.1 Setting Radiation Pattern Of Antenna

The proposed antenna can be used for detecting the defect in the wheel. For setting radiation pattern of antenna, metallic surface of the train is considered. Standard radiation pattern is

set using HFSS software. For antenna designing, we are using two substrates FR4 & ROGER 3003. This helps us to set radiation pattern of antenna in metallic field due to their low loss dielectric, proper impedance for matching, which helps us in avoiding problems associated with it. Antenna will be placed at the bottom side of train wagon[2].

4.2 Monitoring the Changes in Radiation Pattern

That the antenna radiation pattern will be compared with the changes radiation pattern. The sensors that are placed at wheels are used for monitoring the changes in temperature and vibration. Due to these changes, standard radiation pattern gets disturbed. These changes may cause due to railway wheels or rail track also; this information will be sent to a server computer from which all monitoring work is done[4].

4.3 Analyzing radiation pattern

Gateway work with RFID receiver to take place communication between antenna and server PC. The gateway needed to include one RFID antenna, one 2.45 GHz antenna, one solar cell, one battery, and one circuit. A box is to be made for fitting the above material for which a proper planning is to be made. The antennas and the solar cell all needed to be on the top, while it did not matter where the battery and circuit was placed[5].

4.4 RFID Receiver

RFID is the wireless use of electromagnetic fields to transfer data from the transmitter end to the receiver side. The RFID receiver then receives this information from the antenna and sends it to server PC[5].

4.5 Server PC

It is a place from where all the monitoring is done. Server PC gets all the information from RFID receiver and takes further decision as changing defected parts to avoid any accident[5].

5.EXPECTED RESULT

The antenna placed at the bottom side of wagon is used to communicate with RFID antenna through which the recorded radiation pattern is sent to RFID receiver located at server station for comparing with set radiation pattern. Only the reflected wave from antenna must be used for analyzing and not the radiation reflected from the side wall of the wagon.

6.CONCLUSION AND FUTURE SCOPE

6.1 CONCLUSION

The goal of the project is to make an efficient, small, and robust antenna that would be possible to produce at low cost. Antennas are being widely used in many applications, by using antenna in train for the maintenance and early detection from any problem will not only save our time but also prevent from any major accident. This antenna will help us for monitoring any defect in train wheels by observing change in radiation pattern, which will be very useful in identifying which wheel is damaged and instead of completely removing the multiple wheels connected to the defected bogie, we can simply replace the defected wheel, which in turn saves our time.

6.2 FUTURE SCOPE

The project may be modified by using network and covering all train bogies. This technology can be used for metro train

also. A wider antenna would give a larger difference in path length for the current and increase the bandwidth. Another improvement that should be made to the system is multi-hopping. It is desirable that the two gateways on each wagon can communicate with each other. The way to solve this is to use the nodes as relays. More improvements need to be made but they are outside the radio field and are thus not related to this report.

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Analysis and Design Techniques of Power converter for Energy Harvesting System

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ABSTRACT

Energy harvesting has become popular and adopted by various industries in many applications such as wireless sensor networks, health monitoring system, defense etc. In today's world it's important to improve battery lifetime and making the system robust and autonomous. The transducers produce very low voltage thus power converters must be capable of boosting this low voltage into desired high voltage, thus a key challenge in designing an energy harvesting system is the power converter circuit. Power converter circuits should be portable and fully integrated in System on Chip (SoC) applications therefore it must be designed such that it has low on-chip power requirement, high power efficiency, less area etc.

This paper presents importance of energy harvesting and how various parameters associated with power converter design can be optimized to create a converter which is feasible and has higher efficiency. The design is aimed to make the most out of the energy that is harvested from the environment/surroundings where the device is deployed.

General Terms

VLSI Design, Renewable Energy

Keywords

Energy Harvesting, Dickson Power converter, On-Resistance, CTS (Charge Transfer Switches)

1. INTRODUCTION

Due to the vast advancement in wireless technology and low power electronics, the deployment of small low power and portable applications has taken a challenging place in the electronics market. Some examples of low power applications are RFID cards, PDA, watches, calculators, cell phones, flash memories, MEMS, LCD drivers etc. [1] [2]. Batteries are the primary requirement for powering these portable devices. But as the technology scales down, it is expected that the battery size decreases and with the decreased size of battery its life also becomes shorter. Therefore there is a need to either replace the battery time to time or to implant a rechargeable battery which can be recharged whenever required. When the area where the application is deployed is hazardous and risky then both solutions become infeasible. Also small size batteries carry low energy density therefore for portable applications the frequency of battery replacement increases, thus the effort and cost is more in replacing batteries [3]. If an example of WSN is considered which consists of several thousand of nodes then the effort and time in re-installing the batteries is extremely high. So, there should be a new solution which will reduce time and efforts.

The most feasible solution for the above stated problems is energy harvesting. Energy Harvesting is the process of converting ambient energy from environment renewable sources like solar, wind, biomass, tidal, fuel cell, vibration etc. into usable electrical energy. This process is done by means of transducers which transform the ambient energy into electrical energy [4].

2. POWER CONVERTER

In Energy Harvesting Systems, energy is received from non-conventional energy sources and if it is in AC form then it needs to be converted into DC form using rectifier circuit. The next stage is DC-DC power converter. As it is said source energy is received from non-conventional energy sources therefore transducers are used. Typically, the output of transducer is very low therefore there is a need to design a device which can boost this low energy obtained from non-conventional energy sources. Power converters are most suitable and feasible option due to its various advantages. The energy received from various non conventional sources varies as per the source and hence for any Energy Harvesting System, designing Power converter is a crucial and challenging task [3].

A power converter is used to generate a voltage that is higher than that of the power supply voltage, without the need of amplifier or transformer [5]. The advantages of Power converters are [6]:

1. Small Power Consumption
2. High Performance
3. Low Current Drivability
4. Small Area
5. Can provide multiple on-chip voltages.

Due to these advantages of Power converter, it is utilized in many portable applications such as Electrically Erasable Programmable Read-Only Memory (EEPROM) or flash memories in Radio Frequency Identification (RFID) tag, System on Chip (SoC), microcontroller unit, FPGA systems etc.

There are many topologies present for power converters which are broadly categorized as Dickson, Cross-Coupled Voltage Doubler and Makowski Power converters, etc. Cross-Coupled Voltage Doubler uses 2^N PMOS and 2^N NMOS therefore its area increases where N is no. of stages. Makowski power converter has large gain whereas, it suffers due to very complex circuit designs as its structure changes for low and high gains and it requires more number of clocks and MOSFETs therefore its area also increases [7] [8].

Dickson power converters have simple control method, it's easy to design and it has all the advantages stated above,

therefore most of the conventional Power converters are based on the topology proposed by Dickson [7].

Thus, in this paper important parameters of Power converter design are discussed in section 3. And Conventional Dickson and Modified Dickson are compared based on different parameters and results are shown in section 5.

3. DESIGN TECHNIQUES OF POWER CONVERTER

The various parameters influence the performance of power converters. In this section important design parameters and performance parameters are analyzed and discussed.

3.1 Performance Parameters

3.1.1 Output Voltage

Charges are transferred to output node using MOSFETs and capacitors. Output Voltage is the most important parameter for designing power converter circuit. For Dickson power converter maximum output voltage is given by [9]

$$V_{out} = (N + 1) * V_{in} \quad (1)$$

Where, N =number of stages, V_{in} = input supply voltage

As number of stages increases output voltage also increases.

3.1.2 Ripple Voltage

For any power converter design, reducing ripple voltage is an essential design aspect. Ripple voltage is defined as [9]

$$Vr = \frac{V_{out}}{f * C_{out} * Rl} = \frac{I_{out}}{f * C_{out}} \quad (2)$$

Where, V_{out} =output voltage, f =clock frequency, C_{out} = output capacitance, Rl = load resistance, I_{out} = output current.

For ripple voltage to be small clock frequency, output capacitance and load resistance should be high. But for a particular application clock frequency, output current and output voltage are fixed therefore ripple voltage is directly affected by output capacitance. As capacitors occupy more area therefore optimization of output capacitor value with respect to area reduction is crucial step in performance optimization of any power converter.

3.1.3 Power Efficiency

Power efficiency is important figure of merit for power converter design.

Power efficiency is defined as [6]

$$\eta = \frac{V_{out} * I_{out}}{V_{in} * I_{in}} \quad (3)$$

And

$$I_{in} = (N + 1) * I_{out} \quad (4)$$

Therefore

$$\eta = \frac{V_{out} * I_{out}}{V_{in} * (N + 1) * I_{out}} \quad (5)$$

$$\eta = \frac{V_{out}}{V_{in} * (N + 1)} \quad (6)$$

Where, V_{out} = output voltage, V_{in} = input voltage and N = number of stages.

It is seen that, power efficiency is only determined by number of stages because for a particular application output voltage (V_{out}) and input supply voltage (V_{in}) will be fixed. And the relationship is inversely proportional i.e. as number of stages (N) increases power efficiency decreases therefore optimization of number of stages with respect to power efficiency is compulsory.

3.1.4 Area

For SoC applications, power converters with minimum area are preferred to achieve smaller chip size. Power converters consists of switches designed using MOSFETs and storing elements as capacitors, therefore the total area is measurably decided by these two components. Area occupied by MOSFETs are determined by multiplying W (width of MOSFET) and L (length of MOSFET) of MOSFET and area occupied by capacitor is determined by $k * N * C$ i.e. multiplication of k (process dependent), number of total capacitors and value of capacitance [10].

The desired values of performance parameters decide the limits for design parameters to achieve output voltage with optimum number of stages and low area. The design parameters are discussed in the next section.

3.2 Design Parameters

The variation in design parameters can drastically affect the performance parameters specifications. Thus, the relation between various design parameters is required to be analyzed deeply for overall performance optimization of Power converters.

3.2.1 On-Resistance

In power converters, the switches are used to transfer charges from one stage to the next stage. For any power converter, voltage drop per switch must be less that means the switches must have low on-resistance. If on-resistance is less then the voltage drop per switch will also be less and the resultant output voltage will be high, therefore designing a switch which has low on-resistance is an important task in designing power converter circuit. On-Resistance is calculated using given formula [7].

$$R_{on} = \frac{L}{\mu * C_{ox} * W * (V_{gs} - V_{th})} \quad (7)$$

Where, μ = Mobility of charge, C_{ox} = gate oxide of MOSFET, W = width of MOSFET, L = length of MOSFET, V_{gs} = gate to source voltage, V_{th} = threshold voltage.

The solution to this problem is given as reducing on-resistance value, gate to source voltage (V_{gs}) and width of MOSFET (W) should be high and length of MOSFET (L) should be low.

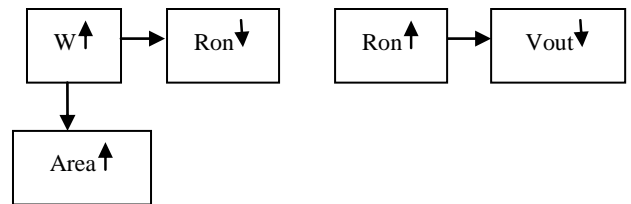


Fig 1: Effect of On-Resistance on other Parameters

Effect of on-resistance on other parameters is shown in figure 1. As W of MOSFET increases R_{on} decreases but it in turn increases the area occupied by the chip. If W is not optimized then increased R_{on} will decrease the output voltage.

3.2.2 Number of Stages

Power converter consists of several number of stages depending upon conversion ratio value. As number of stages increases output voltage also increases. Most power converters are based on Dickson topology. As it has a disadvantage of V_{th} augmentation problem when number of stages increases, it becomes more prominent [6]. The increasing number of stages in turn increases overall chip area. Thus, deciding number of stages for any power converter design is very important step.

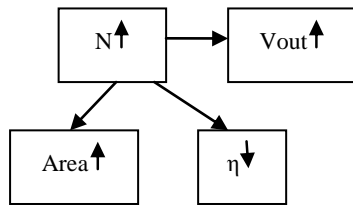


Fig 2: Effect of Number of Stages on other Parameters

Effect of number of stages on other parameters is shown in figure 2. It is seen that as number of stages increases output voltage increases but at the same time area increases and power efficiency decreases.

3.2.3 W/L Ratio

In power converter circuit, switches are used for transferring charges from one stage to the next stage. These switches can be designed using various MOS transistor based topologies such as NMOS based, PMOS based, transmission gate, charge transfer switches etc. For designing these switches, channel width and length i.e. W and L need to be decided. Each stage of Power converter circuit requires at least one switch that means it occupies $W*L$ area. Thus, as number of switches in each stage increases area occupied also increases.

The effect of width of MOS transistor used in switch design on other parameters is shown in figure 3.

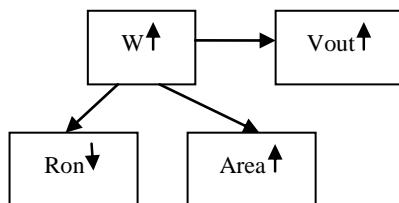


Fig 3: Effect of Width of MOSFET on other Parameters

The increase in W reduces on-resistance of MOSFET and increases area. The switch are designed for carrying charge to next stage thus, W/L optimization of MOS transistor with respect to on-resistance and output voltage is very important [7].

3.2.4 Boosting Capacitance

Boosting capacitances are very important component for any power converter circuit as they store charges for half cycle and in other half cycle they transfer charges to next stage

through MOSFETs switches. Capacitors occupy more area on chip therefore minimization of capacitors value is important for any power converter design.

Total capacitance value can be obtained by using the given formula

$$C_{tot} = \frac{I_{out}}{f} * \frac{N^2}{(N*V_{in} - (V_{in} - V_{out})*(1+\alpha))} \quad (8)$$

Where, I_{out} =output current, f = clock frequency, N = number of stages, V_{in} = input supply voltage, V_{out} = output voltage, α = ratio of boosting and parasitic capacitance value

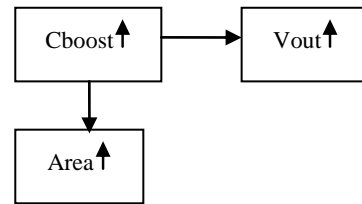


Fig 4: Effect of Boosting Capacitance on other Parameters

Effect of boosting capacitance value on other parameters is shown in figure 4. As boosting capacitance value increases output voltage increases but area occupied also increases. Thus, optimization of boosting capacitance value with respect to area and output voltage is important.

3.2.5 Output Capacitance

Output Capacitance is an important parameter for reducing output ripple voltage. If ripple voltage is to be reduced then output capacitance value has to be increased but capacitor requires more area so this value is selected such that ripple is optimized with respect to area.

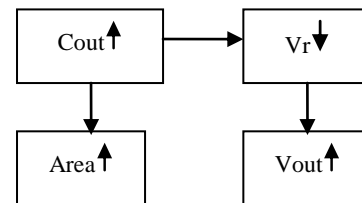


Fig 5: Effect of Output Capacitance on other Parameters

Effect of Output Capacitance on other Parameters is shown in figure 5. The increase in output capacitance value decreases ripple voltage and decreased ripple gives better output voltage but this increases occupied area. So, it is needed that the output capacitance value is optimized with respect to area, ripple voltage and output voltage.

4. ANALYSIS AND DESIGN OF POWER CONVERTERS

4.1 Conventional Dickson Power converter

The first power converter was designed using diodes as charge transfer switches. But diodes cannot be easily integrated into the standard CMOS process therefore in 1976 J.F Dickson proposed a new topology which used MOSFET as CTS [9]. It consists of number of identical stages. Each stage consists of MOS switch to transfer energy from one

stage to other and capacitor to store the energy. Each capacitor is connected to pumping clock. Two pumping clocks are used clk and clk_bar , which are anti-phase and have voltage amplitude equal to supply voltage V_{in} . The number of stages can be adjusted depending upon the required output voltage.

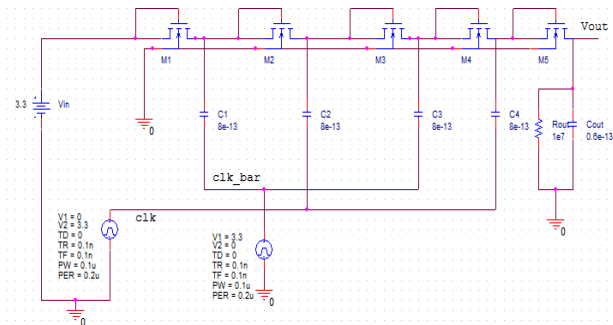


Fig 6: A Four-Stage Conventional Dickson Power converter

4.2 Modified Dickson Power converter

Modified DCP Power converter circuit is reported by Wu and Chang. This circuit uses dynamic CTS (Charge Transfer Switches) for transferring the charges from one stage to the next stage and the CTS switches are controlled by dynamic control circuit which consists of one PMOS and one NMOS. When the signal clk is low and clk_bar is high then the voltage on node 1 is V_{in} . Because during this time interval voltage on node 1 is low therefore MOS MN1 is turned off and MOS MP1 is turned on, therefore the charge transfer switch, MS1, can be completely turned on and thus it can transfer charges from the power supply V_{in} to node 1. Now when signal clk is high and clk_bar is low then the voltage on node 2 will be $2*V_{in}$ because during this clock cycle MOS MN1 will be turned on and MOS MP1 will be turned off therefore the charge transfer switch MS1 can be completely turned off and the charges are prevented from leaking back to power supply V_{in} . The operation of every pumping stage is similar to this. Thus the ideal final output voltage given by this circuit $5*V_{in}$ because the charge transfer switches can be turned on and turned off completely at designated clock cycles [11] [12].

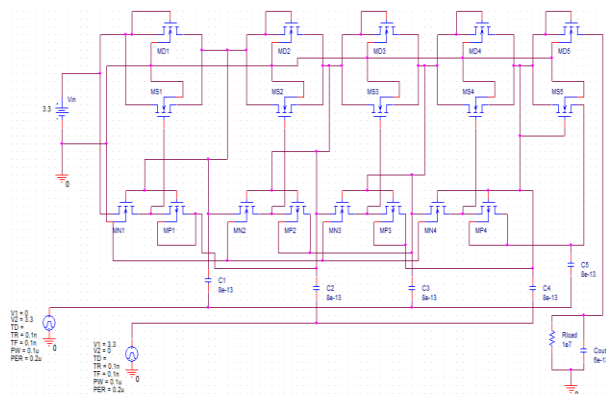


Fig 7: A Four-Stage Modified Dickson Power converter

5. SIMULATION AND RESULT

Two topologies Conventional Dickson and Modified Dickson power converters are designed in Orcad 16.5 software and results are compared. Circuit simulations are performed using 0.18 μ m CMOS Level 3 process parameters. All the simulations are carried out at 10MHz frequency and clock voltage is equal to $V_{in}=3.3V$. The values of boosting capacitors for each stage and each topology are same and are equal to 0.8pF and output capacitor is 0.6pF respectively. The number of pumping stages is $N=4$.

The output voltage waveforms for Conventional and Modified Dickson designs are shown in figures 8 and 9. Non-overlapping clocks are the same for both the circuits with amplitude 3.3 V as seen in figure and output voltage for Conventional DCP is 12V whereas Modified DCP has output voltage of 13.763V.

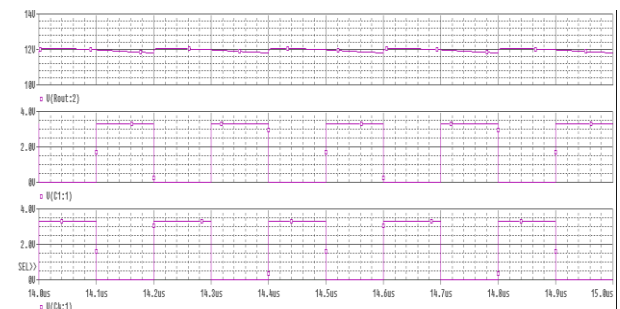


Fig 8: Output Voltage Waveform of Four-Stage Conventional Dickson Power converter

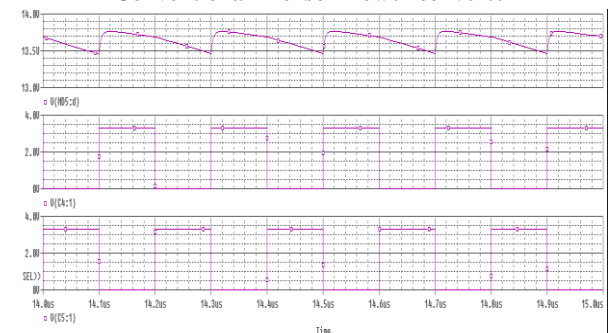


Fig 9: Output Voltage Waveform of Four-Stage Modified Dickson Power converter

The graph between switches and its on-resistances is shown in figure 10. It is seen that Conventional Dickson Power converter has more on-resistance value compared to Modified Dickson Power converter because of its low V_{gs} value and therefore Conventional Dickson Power converter has more voltage loss and its output voltage is less. Comparison of maximum output voltages for Conventional and Modified Dickson Power converter topologies is shown in figure 11. It is seen that Modified Dickson Power converter gives higher output voltage for the same number of stages because of the modified switches and there reduced on-resistance values. The graph between output capacitor and ripple voltage is shown in figure 12. It is seen that as value of output capacitor increase ripple voltage decreases. But for designing the circuit $C_{out}=0.6e-13$ value is selected so that ripple reduces to 0.2V and area also doesn't increase. The graph between number of

stages and power efficiency is shown in figure 13. It is seen that as number of stages is increased power efficiency for Modified Dickson Power converter increases whereas power efficiency decreases for Conventional Dickson power converter. The comparison of maximum output voltages versus boosting capacitors for Conventional and Modified Dickson Power converter topologies is shown in figure 14. It is seen that both the topologies Conventional and Modified Dickson Power converters output voltage have steady increases in output as the values of boosting capacitances increase. But the selection of boosting capacitance is important because it leads to increase in area.

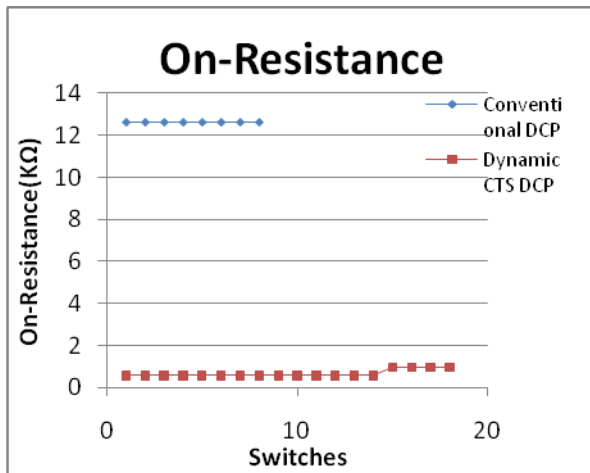


Fig 10: On-Resistance of Conventional and Modified Dickson Power converter

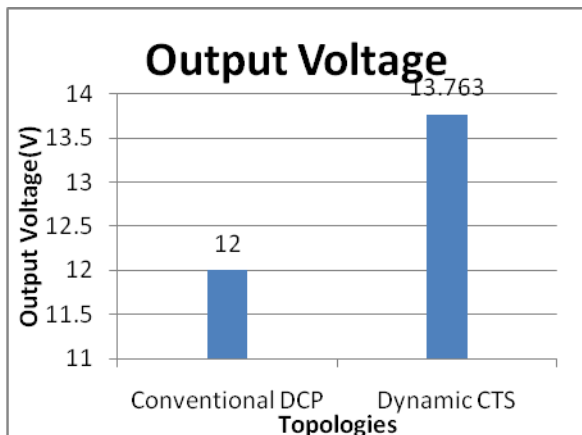


Fig 11: Output Voltage of Conventional and Modified Dickson Power converter

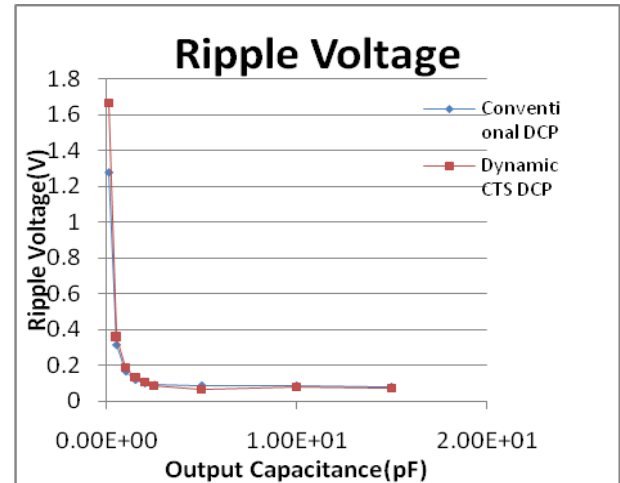


Fig 12: Ripple Voltage versus Output Capacitance for Conventional and Modified Dickson Power converter

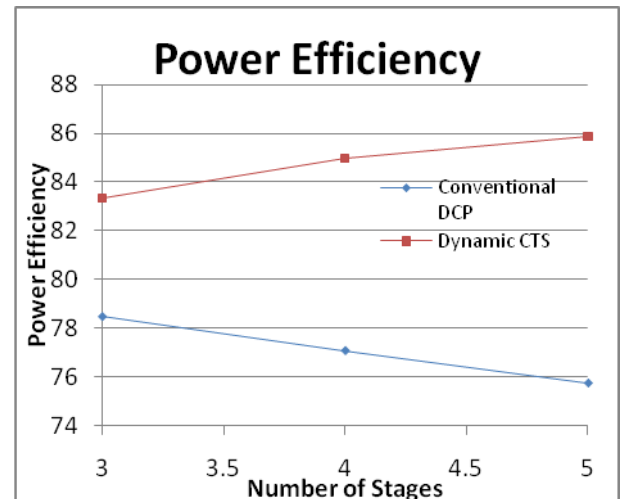


Fig 13: Power Efficiency versus Number of stages for Conventional and modified Dickson Power converter

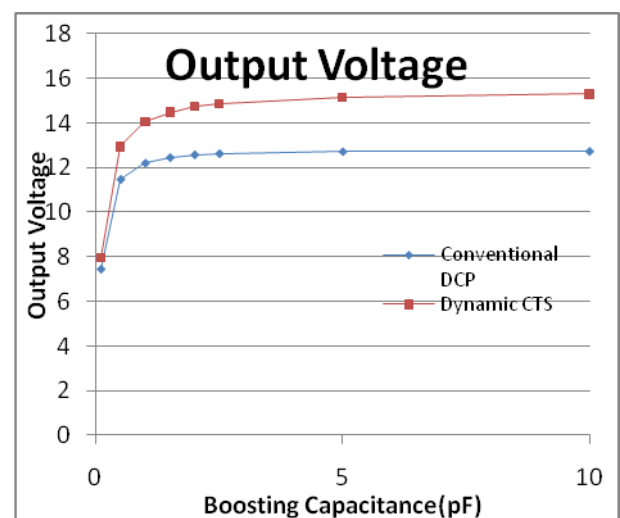


Fig 14: Power Efficiency versus Number of Stages for Conventional and Modified Dickson Power converter

6. CONCLUSION

Energy harvesting from non-conventional energy sources is increasing day by day in applications like embedded systems, RFID tags, wireless sensor nodes, health monitoring systems etc. and the most important circuit in energy harvesting system is power converter thus proper designing of power converter circuit is very crucial.

For designing power converter circuit several design parameters have to be considered. This paper presented crucial design parameters which impact the performance parameters highly. The parameters optimization gives better performance with lesser area. Conventional and Modified Dickson Power converters are designed considering the discussed design parameters and its effect on performance parameters are analyzed. The result shows that Conventional Dickson Power converter gives output voltage 12V with power efficiency of 72.73%, ripple voltage less than 0.2V and area $7.6\mu\text{m}^2$ whereas Modified Dickson power converter gives output voltage 13.763 with power efficiency 83.41%, ripple voltage less than 0.2V and area $5.38\mu\text{m}^2$.

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MATLAB – ARDUINO BASED INDUSTRIAL CONVEYOR BELT

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ABSTRACT

The main objective of this project is to elaborate and simplify how different products manufactured in a factory can be put on a single conveyor for its proper distribution and data logging in a random sequence.

To upgrade this process, images captured by the webcam can be processed using MATLAB with image processing techniques. This image processing technique, color detection and tracking techniques are applied for the taken image and the output is obtained in this project.

The goal is to develop a conveyor belt which will play a vital role in small scale as well as large scale industries for distributing and logging the data, consequently reducing the cost of labour and multiple conveyors. The system leverages a conveyor belt with 2 motors, a mechanism to sort the products and a Webcam in proximity of the apparatus. The webcam is mounted in parallel to the assembly line focused on the products on the conveyors in order to have known the product and its sequence. The apparatus sends image processed readings and measurements over wires to a microcontroller for further processing. Code running on the microcontroller in conjunction with a code in MATLAB generates an output on the appropriate pins configured by user by a program, which controls the speed and direction of the conveyor belt. This quality in MATLAB image processing toolbox and Arduino has made it possible.

This research thus implements an industrial assembly line with methodology in image processing.

ALGORITHM

Color detection using thresholding techniques

KEYWORDS

Arduino Board, Image Acquisition, Image processing, MATLAB, Conveyor belt.

1. INTRODUCTION

Primitive conveyor belts were used since the 19th century. Thomas Robins began a series of inventions in 1892, which led to the development of a conveyor belt used for carrying coal, ores and other products[1]. Now a day's Belt conveyor system not only used in mining industries but also applied in cement industries, power plant, food industries, production industries etc. So it is essential equipment for in house material transportation today[2].

A conveyor Belt is ultimate and widely used option in most of the manufacturing applications where ever there is complete assembly line automation like chemical industries, bottling plant, food processing and packaging factories. The entire process from start to end is carried on a single conveyor belt and the processes are done in between, while they are moving. So here, one such conveyor belt application is explained.

Determining real time and highly accurate characteristics of small objects in a fast flowing stream would open new directions for industrial sorting processes[3]. This is

the project to build a single conveyor belt for multiple objects in a random sequence, for its proper distribution and data logging.

In this project efforts have been made to use a single assembly line for the classifying and sorting purpose of different objects using electronic systems, advanced sensors and image processing technique in MATLAB on the basis of physical and color characterization of each object. The project involves colour identification of an object which is done by a webcam acting as colour sensor which identifies the object's colour and sends the signal to the microcontroller. The microcontroller in response to the received signal; generates an appropriate control signal which is send to the circuit which drives the various motors and it also synchronizes the movement of the belt with the sorting mechanism. Based upon the color detected, the linear actuator pushes the object to the specified location. It aims in classifying and sorting the colored objects which are coming on conveyor belt by placing them in their respective pre-programmed place. The GUI based system helps to control and monitor the whole conveyor belt. With this it is possible to calculate the number of items with their respective colors and predefined weights which will make packaging much easier and controllable. Due to this only one conveyor is sufficient instead of many, Thereby achieving high accuracy and speed in the work; while eliminating the monotonous work done by human.

There are many different methods to detect object through image processing like surf, histogram, and matrix method and color detection using MATLAB image processing toolbox.

2. RELATED WORK

Now a day's Conveyor belt system not only used in mining industries but also applied in cement industries, power plant, food industries, production industries etc. So it is essential equipment for in house material transportation today. The modification and latest technologies or methodologies used in different applications to reduce failures, maintenance cost and equipment related a fatal accident occurs during operation.

By classifying the colored objects by color, size, which are coming on the conveyor by picking and placing the objects in its respective pre-programmed place which drastically reduces the monotonous work done by human, increasing accuracy and speed in the work. In that the microcontroller sends signal to circuit which drives the various motors of the robotic arm to grip the object and place it in the specified location. Based upon the detected object, the robotic arm moves to the

specified location, releases the object and returns to the original position.

MATLAB is widely used software environment for research and teaching applications on robotics and automation mainly because it is a powerful linear algebra tool with a very good collection of toolboxes that extend MATLAB basic functionality and because it is an interactive environment and also provides image processing toolbox which helps in the detection of colors for sorting mechanism.

Arduino IDE (Integrated Development Environment) is free open source prototype and environment for interfacing interactive analog and digital devices (electronic). Basically it is used for programming the microcontrollers. In this project we have made use of the Arduino library to interface the Atmega 328 microcontroller deployed on our board.

2.1. CONVEYOR BELT

Conveyor belt is a continuous moving band made from fabric, metal or rubber used for transporting objects from one place to another. A belt conveyor system is one of many types of conveyor systems. It consists of two or more pulleys, with an endless loop of the conveyor belt - that rotates about them. One or both of the pulleys are powered which causes the belt and the material on the belt forward. The drive pulley is the powered pulley while the idler pulley is unpowered pulley.

2.2. ARDUINO

A couple of years ago the Arduino team designed a microcontroller board and released it under an open source license. Arduino is a registered trademark—only the official boards are named “Arduino”. So clones usually have names ending with “duino”[4]. The Arduino developers have created a simple but useful integrated development environment (IDE). This project is intended to design a microcontroller circuit board of its own similar to that developed by Arduino team and make use of the open-source Arduino environment (IDE) and its libraries to make it easy to write code and upload it to the I/O board. The Boot loading package of Arduino IDE is used to burn programs into the Atmega IC.

2.3. MATLAB

The name MATLAB stands for MATrix LABoratory. MATLAB is a software package for various high performance computation and visualization. It has advantage of interactive environment which includes hundreds of built-in functions for technical computation, animation, and graphics. Best of all, it also provides flexibility with its own high-level programming language[5][6]. The proposed project uses MATLAB in conjunction with the Arduino for digital image processing to classify each object on the basis of physical and color characterization.

2.4. PROJECT KEY FEATURES

- A single conveyor belt for the entire process.
- Conveyor belt can be configured to fit almost any application.
- PC to microcontroller communication.
- Object color and shape identification using MATLAB.
- Reduce production cost and labour hours.
- Conveyor system improves reliability, efficiency & production.

2.5. APPLICATIONS

- In small and large scale industries to sort the products based on the various parameters.
- Medicine and wine industry use this technique to sort the bottles of various sizes.
- Food industries make use this system to identify the rotten or damaged fruits.
- It can be used to sort the different agricultural products like almonds, grains, lemons, grapes, and many more in agriculture Industries.
- In Robotics application like artificial robotic intelligence.

2.6. OBJECTIVES

- The general objective of this project is to elaborate and simplify how different products manufactured in a factory can be put on a single conveyor for its proper distribution and data logging in a random sequence.
- To develop a conveyor belt which will play a vital role in small scale as well as large scale industries in lower cost.
- To implement an industrial assembly line with methodology in image processing.
- Reduces production cost and labour hours.
- To improve reliability, efficiency & production.

3. METHODOLOGY

3.1. DESIGN FLOWCHART

The figure 1. Shows flowchart of a system. The basic theme of this project is that the object moving on conveyor are first sensed, and then sorted depending on their colour and size. For this, webcam is used as input sensor, which is mounted on PC, and will be connected to PC via USB. The webcam will take a snapshot and it will send it to PC for colour processing [7]. In PC; MATLAB is used for processing on colour, depending on the detected colour an appropriate signal will be given to microcontroller Atmega 328. In turn, The microcontroller will control the linear actuator and servomotors by PWM signals. These servomotors and linear actuator will place the object in its respective place depending on its colour and size. This is full automatic process no manual support is needed. The MATLAB-Arduino platform supports the microcontroller for its optimum use [8].

Fully functional multi-object sorter mechanism can be implemented on a single conveyor belt in order to increase the overall throughput which results with a forecasted performance. The project can work successfully. The system can successfully perform station handling task, namely pick and place mechanism with help of sensors. Hence a cost effective Mechatronics system can be designed using the simplest concepts and efficient result can be observed.

So this project presents a mechatronics colour sorting system solution with the application of image processing. The proposed system works in following three steps:

- Image Acquisition
- Image Processing
- Sorting Mechanism

3.2. IMAGE ACQUISITION

To start with when the object on the conveyor is detected by the IR sensors, image is captured by the camera and is sent to the MATLAB workspace. The input image obtained from the webcam cannot be directly given for processing. Pre-processing is done on the image such as thresholding. Then only object image is converted in binary format. This final threshold image of object is now ready for processing [7][6].

3.3. IMAGE PROCESSING

The objects are sorted on the basis of color and predetermined shape. To identify the color, firstly the image is converted into gray format and then thresholding is done. After thresholding color components are extracted and the image is converted into black and white format which is called as binary format. Find region properties & bounding box and the color are identified [6].

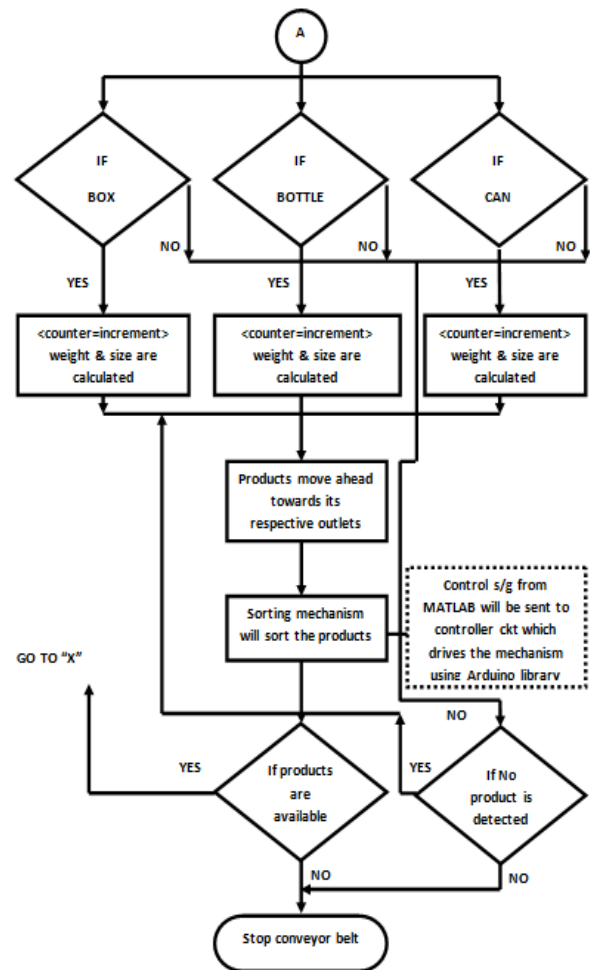
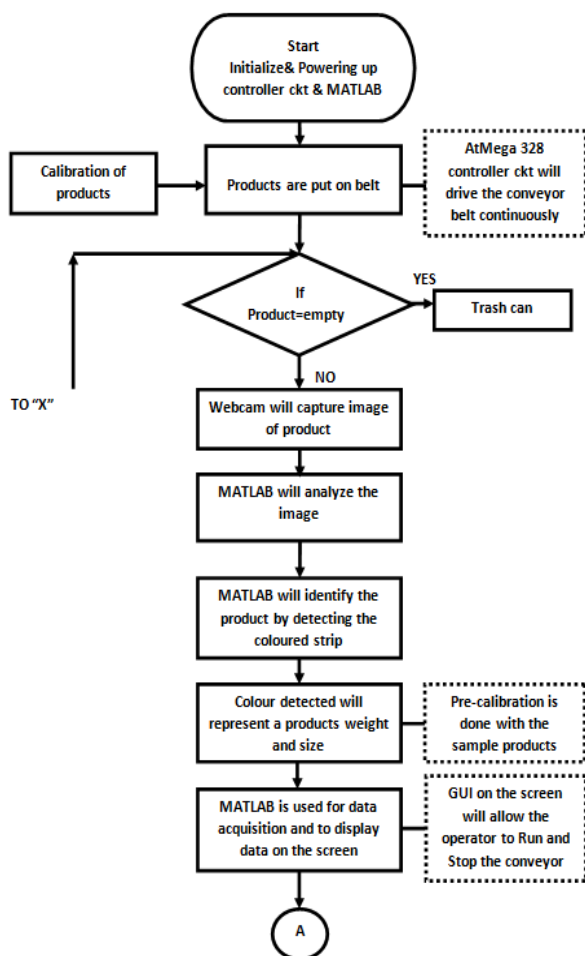


Figure 1

3.4. SORTING MECHANISM

The sorting mechanism consists of a linear actuator, servo motors and a conveyor assembly. After identifying the color with predetermined size, command will be sent to direct the linear actuator through COM port of the computer via the development board. Conveyor assembly is in OFF state for this period. According to the size and color the servo motors with help of linear actuator places the objects in their specified place.

4. TOOLS TO BE USED

4.1.1 Atmega 328: It is a single chip microcontroller used instead of Arduino board. The ATmega328 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. It has 32KB ISP flash memory with read-while-write capabilities & compatible with Arduino IDE [12].

4.1.2 Motor Driver IC: L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal which is used to drive the motors [14].

4.1.2. FTDI Chip with UART: The UART (Universal Asynchronous Receiver Transmitter) converts parallel out to serial out and sends it with proper added bits for timing.

4.1.3. USB Connection: To form a connection between PCB and computer. Universal Serial Bus (USB) defines the various hardware cables and communication protocols used in a bus which are responsible for communication-connection function and power supply between computers and electronic devices.

4.1.4. Crystal 12MHz: Standard frequency crystals - use these crystals to provide a clock input to microprocessor. Rated at 20pF capacitance and +/- 50ppm stability. 12MHz is good for use with devices that need USB.

4.1.5. Power Supply: To fulfill the power requirement of the components a power supply is used which is an electronic device that supplies electric energy to an electrical load. The role of power supply is to convert one form of electrical signal to another, therefore power supplies are mostly referred to as electric power converters.

4.1.6. Servo Motors: Servos are DC motors with built in gearing and feedback loop control circuitry. A servomotor is a rotary actuator that does not require any motor driver for precise control of angular position.

4.1.7. Conveyor Belt: It is mechanically movable belt which is used for passing the object. Polyester is used as a belt material. A conveyor belt can have two or more pulleys, with a continuous loop of material - the conveyor belt - that rotates about them. One or both of the pulleys are powered for moving the belt and the material forward.

4.1.8. MATLAB: It provides a comprehensive set of functions, reference-standard algorithms, and apps for the task of image processing, visualization, analysis, and algorithm development; and also used for object detection using webcam.

4.1.9. Arduino Software: Arduino software is used for the interfacing between board and MATLAB.

4.1.10. Webcam: It is a video camera that feeds or streams its image in real time to or through a computer to computer network.

5. EXPECTED RESULT

The conveyor system designed will only be efficient when it achieves higher degree of accuracy and its output is very close to the expected result. The initialization delay of the microcontroller in the beginning is expected and can be tolerated up to 4 seconds.

The Conveyor system is designed in an efficient way and expecting to work normally with provided power supply. The Matlab code has the option to modify the industrial and product parameters and can be recalibrated.

There is still a lot of work being done on this project to achieve 'Expected Results'...

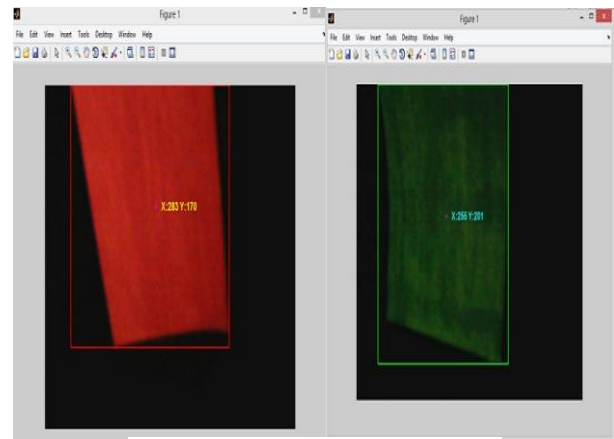


Figure 2. Red & Green colour detected

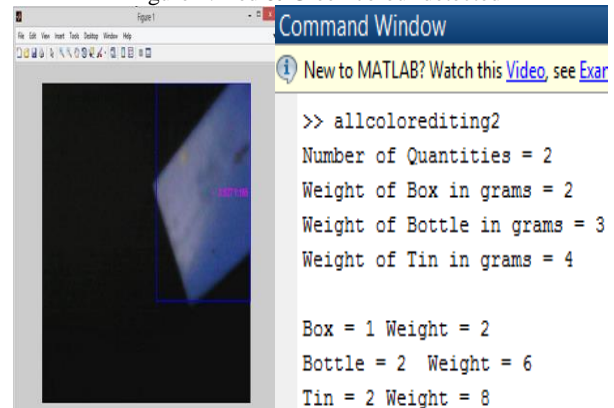


Figure 3. Blue colour detected & Output on command window

6. CONCLUSION

The Code is generated using MATLAB image processing in conjunction with Arduino.

The whole process is documented in the theory sections.

There are no more limits but your imagination. One can begin to explore the more advanced functionality that the MATLAB-Arduino platform offers to understand as one progress further and further.

It was a valuable experience in making the project design, implementation, and testing of a system that involved digital components. More time was available for the circuit design and implementation, which was able to go through several designs before an acceptable one was reached. Ultimately the system accomplished its primary goal of motor speed control in a clear way.

7. FUTURE SCOPE OF THE PROJECT

Conveyor belts are designed for a sequential organization of workers, tools or machines, and products. Mass production & distribution via conveyor belts is widely considered to be the catalyst which initiated the modern consumer culture by making possible low unit cost for manufactured goods.

The conveyor belt designed today can be upgraded to automatically sort more number of products on a single conveyor belt and delivered at convenient distances with faster speeds. More precisely coded algorithm will be developed using image processing techniques and optimally planned logistics to create a finished product much faster than with present methods.

The constant research & development has abled to improve other aspects of industry, so that the motion of the workers will be minimized to the extent possible in the future.

Instead of manual trucking all parts or assemblies will be handled either by conveyors or motorized vehicles such as fork lifts. Heavy lifting will be done by machines such as overhead cranes or lifts. Each worker typically performs one simple operation.

The future of conveyor belt will be large-scale development, expand the scope of use, automatic sorting, reduce energy consumption, and reduce pollution.

8. ACKNOWLEDGMENTS

We wish to express our sincere gratitude to Viva Institute of technology and management for providing us an opportunity to do our project work on “**MATLAB – ARDUINO BASED INDUSTRIAL CONVEYOR BELT**”. We owe a debt of gratitude to our most cherished head of department **Prof. Archana Ingle** and to our project guide **Prof. Karishma Raut** without whose help our project would have neither begun nicely nor would have reached the fine ending. We would like to take this opportunity to express our sincere gratitude to everyone who has helped us to make our imagination into reality.

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VOICE CONTROLLED WHEELCHAIR

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ABSTRACT

Voice controlled wheelchair will play an important role in the future welfare society. The use of intelligent wheelchair encourages the view of the machine as a partner rather than as a tool. The population of people with disabilities has risen markedly during the past century.

A voice controlled wheelchair can provide easy access for physical disabled person who cannot control their movements. The powered wheelchair depends on the motor control and drive system which consists of Microcontroller AT89S52 and DC Motor. Once the voice recognition system recognizes the voice commands in comparison to the pre-stored memory, the respective coded digital signals would be sent to Microcontroller which then controls the wheelchair accordingly. Buzzer and multipurpose IR sensor are used for obstacle detection and keypad is provided with four keys so that wheelchair will move according to command given for each key.

KEYWORDS

Voice recognition module(HM 2007), Microcontroller, IR Sensor, Drive circuit, Microphone.

1.INTRODUCTION

The project titled "VOICE CONTROLLED WHEELCHAIR" describes the design of a simple, low-cost microcontroller based robot for helping disabled persons. Robot is an intelligent agent that can perform tasks automatically or with guidance, typically by remote control. A robot is usually an electro-mechanical machine that is guided by computer and electronic programming.

Software deals with the language C, Diptrace software for PCB layout and Hardware deals with Processors, Peripherals, and Memory. Voice controlled wheel chair is controlled by human voice which is helpful to human beings who are having several disabilities. It also uses sensor for obstacle detection. It uses buzzer for creating sound when an obstacle is detected. By using keypad, we can also move the wheelchair for those people who are having voice problem.

An embedded system is a system which is going to do a predefined specified task and is even defined as combination of both software and hardware. A general-purpose definition of embedded systems is that they are devices used to control, monitor or assist the operation of equipment, machinery or plant. "Embedded" reflects the fact that they are an integral part of the system. It is a general-purpose computer may be used to control the operation of a large complex processing plant, and its presence will be obvious.

The very simplest embedded systems are capable of performing only a single function or set of functions to meet a single predetermined purpose. In more complex systems an application

program that enables the embedded system to be used for a particular purpose in a specific application determines the functioning of the embedded system. The ability to have programs means that the same embedded system can be used for a variety of different purposes.

The simplest devices consist of a single microprocessor (often called a "chip"), which may itself be packaged with other chips in a hybrid system or Application Specific Integrated Circuit (ASIC). Its input comes from a detector or sensor and its output goes to a switch or activator which (for example) may start or stop the operation of a machine or, by operating a valve, may control the flow of fuel to an engine.

The improvements in the field of prosthetics have opened new doors for the handicap people. But these gadgets and devices come very expensive and every one cannot afford these devices and hence are deprived from their benefits. So with the help of new technology and some noble thoughts to help these people, the idea of Voice controlled wheelchair was tossed.

2. METHODOLOGY

The project aims at controlling a wheelchair by means of human voice. It enables a disabled person to move around independently, using a voice recognition application which is interfaced with motors. The prototype of the wheelchair is built using a micro-controller.

A user-dependent recognition voice system and multipurpose IR sensor systems has been integrated in this wheelchair[2]. In this way we have obtained a wheelchair which can be driven with using voice commands and with the possibility of avoiding obstacles and hole detection. A voice recognition system built using the HM2007 voice analysis.

Here we use a voice recognition module to control performance of the micro controller a microphone & Voice recognition module is trained by giving the 5 commands[1]. The five commands are converted into hex file. These hex file points 5 address locations of AT89S52 microcontroller[4]. When command is given the program in the corresponding and thereby controls the movement or rotation of the motor. This is the basic working principle of the 'voice controlled wheel chair'. Voice is given to the voice recognition module through address location is executed and chair moves accordingly. The battery and battery charger unit is there for power supply.

3.OBJECTIVE AND SPECIFICATION

3.1. Objective of the system

The objective of our project is to integrate existing motorized wheelchair control system with voice recognition system. With the help of this feature we can help disabled people especially those

who cannot move their hands and other body parts. By simplifying the operation of our Voice controlled Wheelchair, disabled people will be able to operate it with ease. We have interfaced wheelchair control module with speech recognition circuit as well as with wired microphone unit to produce Voice controlled wheelchair.

3.2. Specification of the system

The development board is prepared using glass epoxy Printed Circuit Board (PCB). There are two 9v, 1.3Ah batteries which are interfaced with the wheelchair. One is for electronics circuit and other is for motors. In our project we have used HM2007 voice recognition board for the voice training. The voice command (input) is given to the MIC. The voice command is in the analog form. This analog input is given to voice recognition board. The voice recognition board processes/recognizes the voice and gives the output in digital form. The digital output is given to the port of 89S52 microcontroller and the remaining pins of the port is given to the LCD.

4.DESIGN OF THE SYSTEM

4.1 Description Of Block Diagram:

4.1.1 Voice Recognition Module:

The voice recognition unit consists of the HM2007 IC. It is a Large Scale Integration (LSI) circuit with analog front end, voice analyzer, voice recognition processor and functional control system embedded in a single chip Complementary Metal Oxide Semiconductor (CMOS). It also consists of HM6264B IC which is a 64k external static RAM used by the HM2007 IC to store the trained words that are used at the recognition phase, a 4*3 keyboard, external microphone and some other components assembled together to build a 40 or 20 isolated sound word recognition system. The voice recognition IC HM2007 is operated in speaker dependent recognition mode. In this mode, the unit responds only to the current user.[3]

Training Process:

Press "1" (display will show "01" and the LED will turn off) on the keypad, then press the TRAIN key (the LED will turn on) to place circuit in training mode, for word one. Say the target word into the onboard microphone (near LED) clearly. The circuit signals acceptance of the voice input by blinking the LED off then on. The word is now identified as the "01" word. If the LED did not flash, start over by pressing "1" and then "TRAIN" key. You may continue training new words in the circuit. Press "2" then TRN to train the second word and so on. The circuit will accept and recognize up to 20 words (numbers 1 through 20). It is not necessary to train all word spaces. If you only require 10 target words that's all you need to train.[4]

Testing Recognition:

Repeat a trained word into the microphone. The number of the word should be displayed on the digital display. For instance, if the word "directory" was trained as word number 20, saying the word "directory" into the microphone will cause the number 20 to be displayed.[4]

The HM2007 IC is trained to recognize five words

- Forward: Both the motors in forward direction.
- Reverse: Both the motors in reverse direction
- Left: Left motor stopped/Right motor in forward direction.
- Right: Right motor stopped/Left motor in forward direction.
- Stop: Both motors stop rotation.

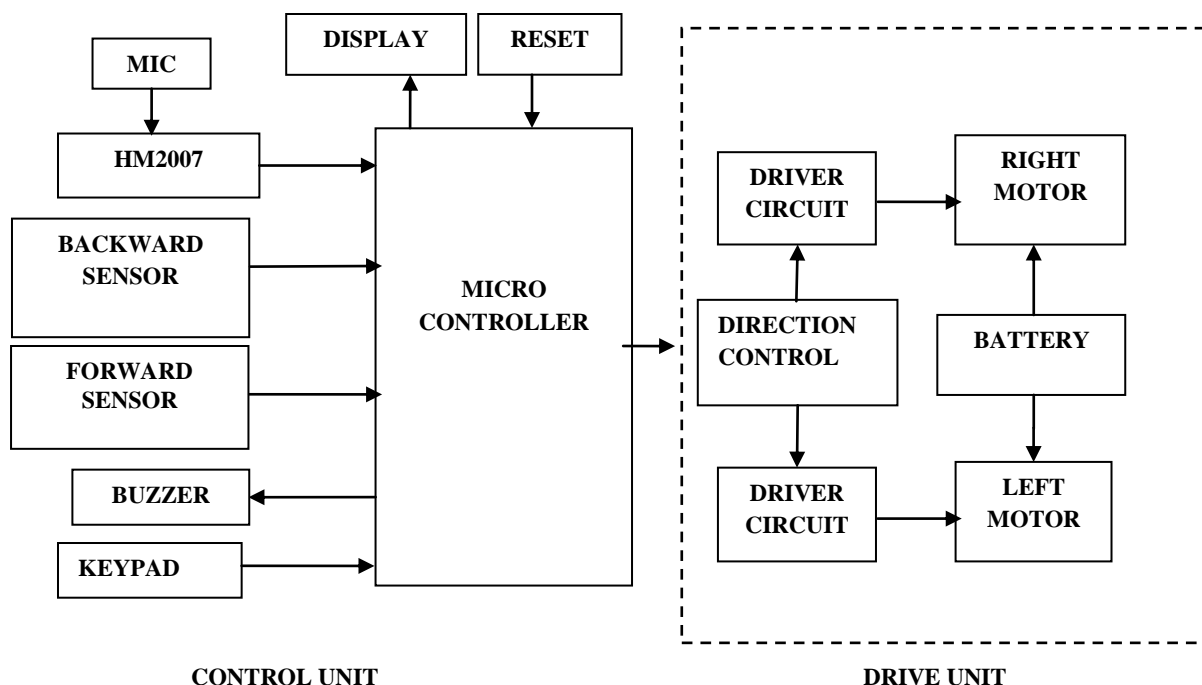


Fig1:Block Diagram

4.1.4 Obstacle Detection Unit:

This is a multipurpose infrared sensor which can be used for obstacle sensing, color detection, fire detection, line sensing etc. also as encoder sensor.[7]

- 5V powered, low current consumption, less than 10mA.
- 3 pin interface which are signal, GND and 5V.
- Small LED as indicator for detection status.
- Obstacle detection up to 8 cm

4.1.5 Buzzer:

It can inform the user with various sound frequencies that correspond to different distances detected from the backup sensor.

4.1.6 Keypad:

By using keypad, we can also move the wheelchair for those person who had voice[6].

4.1.7 Driving unit:

This unit consist of DC motor and motor driver circuit. DC motor is a device that converts direct current(electrical energy) into mechanical energy.Two motors are used to control wheelchair.motor driver circuit consist of IC L293D.This is used for producing higher current to drive motors[11].

4.1.8 Battery:

A 9V battery is used for the motors to provide a sufficient power to the motor.

4.1.9 Keil C:

A compiler is a computer program (or set of programs) that transforms source code written in a programming language (the source language) into another computer language that is the target language, often having a binary form known as object code)[10]. The name compiler is primarily used for programs that translate source code from a high-level programming language to a lower level language (e.g., assembly language or machine code).

It is used to program 89S51, 89S52, 89S53. It reads, programs hex files into microcontroller.

4.2 Working:

As shown in figure 1, first switch on the power supply of voice module to provide sufficient voltage for proper working. Voice input will be given by microphone to HM2007 IC. Voice module generate hex code corresponding to input speech that code will be applied to input port of the microcontroller. Microcontroller will generate corresponding code hex02h (0010) which will be given to both motor driver to drive the motor in forward direction. These steps will be repeated for all commands[2]. If obstacle is detected by IR sensor in forward and backward direction while wheelchair is moving then buzzer will create sound then wheelchair will stop[8]. Also we are providing one keypad with four keys which will be interfaced with microcontroller from that also we can control wheelchair in four direction[12]. Two DC motor will drive the wheelchair with the help of driver circuit[11]. Display is used to specify the direction in which wheelchair is moving. To understand the flow of our project refer figure 2.

4.2 Flow Chart:

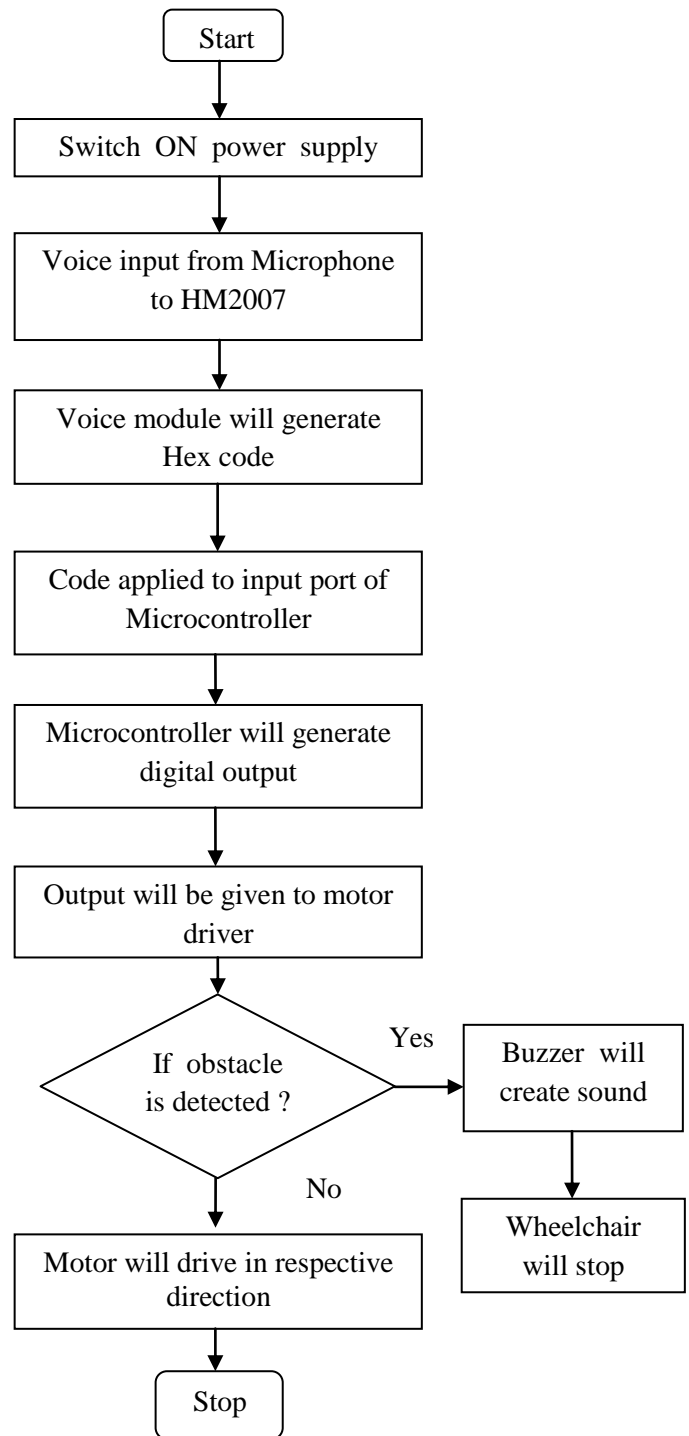


Fig.2: Flow chart

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GSM BASED WIRELESS SMART NOTICE BOARD

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ABSTRACT

In today's world people are constantly searching for smarter ways to do a task on board without moving an inch. Hence herein, a wireless system that is the use of "Embedded Systems in Communication" has proved to be a boon for humans. Notice Board is a primary thing in any institution or organization. But sticking various notices day to day is a tedious task. In this project, SMS based notice board is designed incorporating widely used GSM to facilitate the display of the message on the notice board using authorized mobile phone as an input. The microcontroller receives the SMS, validates the sending Mobile Identification Number (MIN) and the desired information is displayed on Liquid Crystal Display (LCD). The display board programs itself with the help of the incoming SMS with proper validation. Such a system proves to be helpful for immediate information transfer.

Keywords

GSM Modem, Microcontroller, LCD display

1. INTRODUCTION

The project mainly focuses on transmission of textual data through air interface by the use of GSM through asynchronous serial communication. The data will be displayed on LCD only after entering unique pass key. In addition to that address matching is done and data can be received only by the dedicated receiver. Sending SMS through phone has become very popular and if we can use this SMS to control devices and in displaying data. The system required for the purpose is nothing but a Microcontroller based SMS box. The main components of the kit include microcontroller, GSM modem. These components are integrated with the display board and thus incorporate the wireless features. The GSM modem receives the SMS. The AT commands are serially transferred to the modem through Rx-Tx connection. In return the modem transmits the stored message through the COM port. The microcontroller validates the SMS and then displays the message in the LCD display board. Various time division multiplexing techniques have been suggested to make the display boards functionally efficient.

It is possible to receive or decode the SMS globally by using GSM, and display data on LCD board. In this project we not only send the data but send the data with pass code also. Which enables us to prevent the unauthorized use of LCD display board and only the person who have pass code can have access to LCD board.

2. RELATED THEORY

The project deals with sending of message via mobile phone which is received by the GSM modem and is displayed on the LCD.

Gsm modem is capable of receiving messages and also for sending messages. A software GM-MAL was developed for interaction between teachers and students.[1]. Biometric, RFID (Radio frequency identification) along with GSM modem can be used to maintain the attendance of students and also the guardian is intimated by a SMS that the student has reached the university or not on a daily basis.[3]. They serve as useful applications in the field of education. Our project also aims in serving the educational institutions so that manual work is reduced manifold. The SMS to be send to and from mobile telephones on a GSM network and GSM modem uses the RS-232 as transport protocol and uses microcontroller. The MAX232 is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals.[6]. Our project uses USB TO TTL instead of RS-232. Transmitting and receiving the SMS can use two forms: Text pattern and PDU (Protocol Description Unit) pattern. By transmitting AT instruction, the MCU can control gsm in completing the corresponding operation. The operation flow is: Transmit "AT +IPR=9600 Enter" through the serial port, and establish the gsm's baud as 9600, enabling the MCU to communicate. Transmit "AT+CMGF=0 Enter" to establish the gsm working pattern as the PDU pattern; Transmit "AT+CMGS= YYY Enter", and YYY is the TPDU's decimal base length; Transmit "0011000D9 1+ PDU of the goal mobile phone's number+000800+ PDU of the SMS content to be transmitted", and the content of the SMS to be transmitted is the family condition; Transmit "ctrl- PDU of Z" [8]

The LCD module is programmed to display text message when message (SMS) is received and it is displayed on the LCD Display. The Read/Write (R/W) determines if we read from or write to the LCD. The Register Select (RS) is for selects register whether '0' (instruction register) or '1' (Data Register). Enable (E) pin or disable the LCD module. When the Enable (E) is low the LCD is disabled and the status of RS, R/W and the data bus will be ignored. When the Enable is high, the LCD is enabled and the LCD will process the status of the other control pins and data bus. [9]. There are two sections: Transmitting and Receiving. Transmitting section consists of just a mobile

Any type of user (sim number) can be used, as users are assigned password for accessing the system. Authorized users send the message that they want to display on the notice board to the receiving section's mobile number and the message will be displayed only if the users have the authentication password. Receiving section consists of a GSM modem to receive message. Received SMS is then extracted by PC with the help of a VB program using AT commands. SMS are then sent to microcontroller using MAX232 IC and PC's serial port. The modem will receive the SMS; the microcontroller will read the message and verify the password, if password is correct the message will get displayed. [12]

3. METHODOLOGY

3.1 BLOCK DIAGRAM

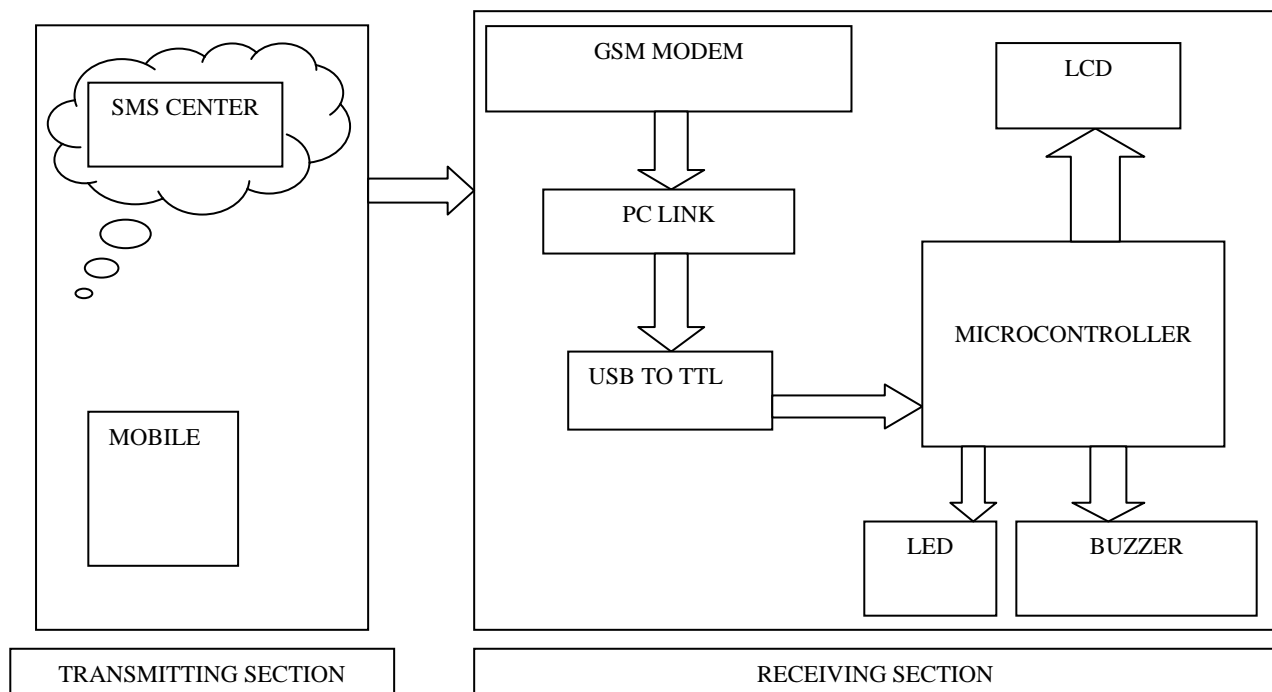


Fig 1: Electronic notice board

As shown in figure, the whole system is basically divided into two sections: Transmitting and Receiving. Transmitting section consists of just a mobile. Any type of user (sim number) can be used, as users are assigned password for accessing the system. Authorized users send the message that they want to display on the notice board to the receiving section's mobile number and the message will be displayed only if the users have the authentication password.

Receiving section on the other hand consists of a GSM modem to receive message. After receiving a new message the buzzer rings. Received SMS is then extracted by PC with the help of a VB program using AT commands. SMS are then sent to microcontroller using MAX232 IC and PC's serial port. Microcontroller finally displays it on LCD display.

4. EXPECTED RESULT

Message is getting sent from the mobile device and it is received by the gsm modem and is displayed on the LCD display. Authentication of user is done by the microcontroller.

5. FLOWCHART

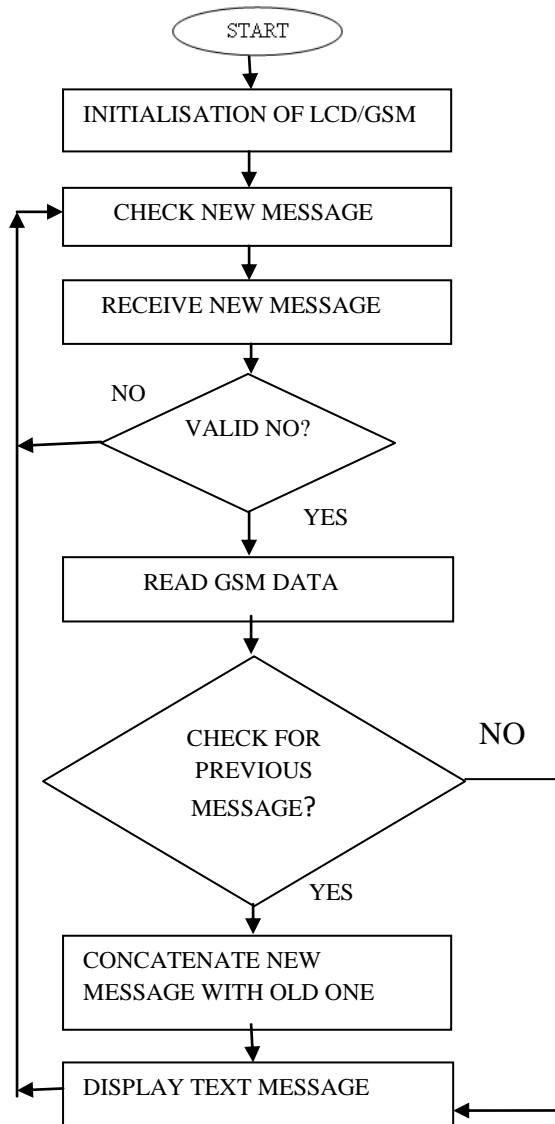


Fig.4.1 Flow chart

6. EXPERIMENTAL SETUP

6.1 HARDWARE

1. 89S52 Microcontroller
2. USB TO TTL.
3. Voltage regulator 7805.
4. Diode IN4007
5. GSM Modem.
6. Some other components to produce interrupt.

6.2 SOFTWARE

1. Keil u-Vision 3.0
2. Eagle for PCB schematic
3. Visual Basic
4. Diptrace for layout

7. CONCLUSION

The prototype of the GSM based electronic notice board was efficiently designed, integrated with a display board making it truly mobile. The toolkit accepts the SMS, stores it, validates it and then displays it on the LCD module. When a new message is received the buzzer rings. Multiple users can access this system who are authorized. As there is no manual intervention required and the entire design is paperless it is cost efficient and time saving thus it can be used in public transport places, like railways, bus station, and airport and also at roadside for traffic control, educational institutes.

8. FUTURE SCOPE

When the message is received it can be displayed for a predefined amount of time and after that the message can be automatically discarded.

In multiple user system, the messages can be categorized and corresponding LED shall glow when a particular message is received, this will clarify which user has sent the message.

Temperature display during periods wherein no message buffers are empty is an improvement that is possible.

Multilingual display can be another added variation of the project. This feature can be added by programming the microcontroller to use different encoding decoding schemes in different areas as per the local language. This will ensure the increase in the number of informed users.

Graphical display can also be considered as a long term but achievable output. MMS technology along with relatively high end microcontrollers can be used to carry on the tasks.

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Sensor based wearable Physiological Parameters Monitoring and Prognosis system

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ABSTRACT

This paper is related to wireless monitoring of physical parameters with the help of wireless module. The design and development of a smart noninvasive wearable physiological parameters monitoring device will be developed and reported. The system can be used to monitor physiological parameters, such as temperature, heart rate and blood pressure etc. of a human subject.

The system consists of an electronic device which is worn on the person using several sensors to measure different vital signs, the person is wirelessly monitored within his own home or hospital. The device detects physiological parameters of a person and sends those to a receiver unit that is connected to a computer. The device is battery powered so that it can be used outdoors. The wireless monitoring devices will help to lower the medical expenditures by continuous monitoring of patients recovering from illness.

General Terms

Health monitoring, Wireless transmission.

Keywords

Sensors, microprocessor, Wireless Module.

1. INTRODUCTION

Nowadays, medical care is expensive for long-term monitoring and long waiting lists for consultations with health professionals. The cost of hospitalization is ever increasing, so is the cost of rehabilitation after a major illness or surgery. Hospitals are looking at sending people back as soon as possible to recoup at home. Several physiological parameters need to be continuously measured. Telemedicine and remote monitoring of Patients at home are gaining added importance and urgency.

Patients are being monitored using a network of wireless sensors. Elderly people need to be monitored continuously and provided with immediate medical help and attention when required. For monitoring purpose the system consists of a various bio sensor, a microcontroller, and a wireless module. The host computer stores the data, which can be used to analyze the resident's overall health condition. When the resident is in an emergency situation the host computer automatically alerts the care staff.

These facts show an increasing demand for long-term health monitoring which is affordable. Wearable systems for continuous health monitoring are a key technology in affordable healthcare. It allows monitoring physiological changes in patient and provides feedback to maintain health status.

2. LITERATURE REVIEW

This paper reviewed by Karandeep Malhi, Subhas Chandra Mukhopadhyay, Fellow, IEEE, Julia Schnepfer, Mathias Haefke, and Hartmut Ewald, offer more comprehensive survey of the field A Zigbee-Based Wearable Physiological Parameters Monitoring System. The system can be used to monitor physiological parameters, such as temperature and heart rate, of a human subject. The system consists of an electronic device which is worn on the wrist and finger, by an at-risk person reference paper [1]. This literature survey can be divided into two main sections as follows:

2.1 Physiological Parameters Measurement

M. Manojprabu, V.R.Sarma Dhulipala analyzes noninvasive wearable physiological parameters monitoring device system. The system can be used to monitor physiological parameters, such as temperature and heart rate, of a human subject. The system consists of an electronic device which is worn on the wrist and finger, by an at-risk person. Using several sensors to measure different vital signs, the person is wirelessly monitored within his own home. An impact sensor has been used to detect falls. The device detects if a person is medically distressed and sends an alarm to a receiver unit that is connected to a computer. This sets off an alarm, allowing help to be provided to the user [2].

Carlo Alberto Boano, Matteo Lasagni, Kay Romer, and Tanja Lange provided body sensor network for unobtrusive and highly accurate profiling of body parameters over weeks in realistic environments. One example application is monitoring the impact of sleep deprivation on periodic processes in the human body known as circadian rhythms, which requires highly accurate profiling of skin temperature across the human body over weeks with real-time feedback to a remote medic. They analyze the requirements on a body sensor network for such applications and highlight the need for self-organizing behavior such as adaptive sampling to ensure energy efficiency and thus longevity, adaptive communication strategies temperature measurements need to have an accuracy of at least 0.05°C over a typical skin temperature range of 16-

42°C. The sampling frequency should be configurable. Temperature measurements need to have an accuracy of at least 0.05°C over a typical skin temperature range of 16-42°C. As different applications require different sampling rates in the range from 0.01 Hz (circadian rhythms) to 10 Hz (emotions), the sampling frequency should be configurable [4].

Carlo Alberto Boano, Matteo Lasagni describe the design and implementation of the system and show that it can be used to identify the circadian rhythms of core body temperature, as well as to detect the variation in core body temperature due to prolonged physical exertion. Core Body Temperature (CBT) is a well-known indicator of the human body's effectiveness in maintaining its operating temperature within a constant range; and its precise and continuous measurement is a prerequisite for studies on human thermoregulation. Long-term measurements of CBT in ambulatory patients allow chronobiologists to derive an accurate profile of the circadian-system [5].

There can be different methods to estimate the exact body temperature from skin temperature:-

1. Body temperature measured at the ear.
2. Body temperature measured at the wrist.

But with a rough estimation usually the body temperature is 5.1 c higher than skin temperature when the body temperature is measured at the ear by the certain thermometer used by a general practitioner compared to the skin temperature measured at the wrist. The sensor has been used for measurement of body temperature at wrist, upper arm and neck for many males and females [1].

Carlos Casillas, Rta Americas, Guadalajara, Mexico demonstrates fundamental implementations of the cost effective heart rate monitor (HRM) and electrocardiograph (ECG or EKG) devices using Freescale products. The heart rate monitor is implemented on a low cost MC9RS08KA2 ultra low-end 8-bit microcontroller using an analog comparator module (ACMP) and standard IO pins. Electrical heart activity is based on depolarization and re-polarization of myocardial cells. The electrical impulse starts in the

sinuatrial node (natural pacemaker) flowing through the atriums to reach the atrioventricular node and generating the atrium contraction. The current then flows through the His Bundle reaches the ventricles and flows through them generating the ventricular contractions. Finally, the current reaches the Purkinje fibers and re-polarization of the heart tissue occurs [7].

Sanjay Singh, Rajesh Singh provided system in which heart beat sensor is used to measure Heart beat. This system is totally depends on WSN (wireless sensor network). In this network we are displaying the transmitted data in the central computing. The sensor nodes can also be deployed to monitor patients and assist disabled. Some other commercial applications Include managing inventory, monitoring the product quality, and monitoring disaster areas. The Wireless sensor network is a new research field. It can be used in some special situation for signal collection, processing and transmitting [8].

Zhang Feng demonstrates a non-invasive device used to measure blood pressure. This paper demonstrates the implementation of a digital blood pressure meter using Microchip's PIC24FJ128GC010 microcontroller and MCP6N11 instrumentation amplifier. A digital blood pressure meter measures systolic and diastolic pressures by oscillometric detection. Microchip's digital blood pressure meter demo can measure blood pressure and pulse rate during inflation. The Measurement While Inflating (MWI) principle reduces overall measuring time, which in turn reduces discomfort caused by the pressure in the cuff. After the motor pumps the pressure up to 30 mmHg in fast mode, the motor changes to slow mode gradually and linearly inflating the cuff. When the pressure in the cuff gets high enough to just begin constricting the flow of blood, the arterial pulse becomes detectable by the pressure sensor [9].

Namrata Dalvi describes the basic glucose meter design using Microchip's PIC® 8-bit PIC16LF178X XLP device. A glucose meter is a medical device used to determine the concentration of glucose in the solution. The glucose concentration is measured in units of milligram per deciliter (mg/dl) or mill mole per litre (mmol/L), depending on the different regions. The glucose meter determines the concentration of glucose in the solution. This application note focuses on the design of a glucose meter, including the necessary hardware design and software development. Most glucose meters are based on electrochemical technology. They use electrochemical test strips to perform the measurement. A small drop of the solution to be tested is placed on a disposable test strip that the glucose meter uses for the glucose measurement. The two most common methods used in electrochemical measurement of glucose are the Colorimetric method and the Amperometric method [10].

2.2 Wireless Network

Sanjay Singh, Rajesh Singh describes Wireless which is a new Wireless sensor network technology characteristic of less distance and low speed. It is a new wireless network protocol stack of IEEE 802.15.4. Zig Bee-style networks began to be conceived about 1998, when many installers realized that both Wi-Fi and Bluetooth were going to be unsuitable for many applications. In particular, many engineers saw a need for self-organizing ad-hoc digital radio networks [8].

Lalit Saraswat, Pankaj Singh Yadav And Rekha Rani describes The IEEE 802.15.4/Zigbee protocol stack. It has been considered as a promising technology for Wireless Sensor Networks (WSN). IEEE 802.15.4 Low-Rate Wireless Personal Area Network (WPAN) standard specifies the lower protocol layers—the physical layer (PHY), and the media access control (MAC) portion of the data link layer (DLL) and Network layer (NWK). Wireless sensor network provide the low rate, wireless interconnection of ultra low cost sensor/actuator devices to enable the cyber world to sense and affect the real physical environment. The main functions of IEEE802.15.4/wireless network layer are forming network, allocating address for node joined the network, routing discover, routing contain.

There are three types of nodes:

1. The coordinator, which manages the network.

2. The routers, which are capable of participating in the AODV routing procedure.

The end devices, which transmit and receive frames through their parent node, end devices have no capability of AODV routing [12].

3. RELATED THEORY

The system has been designed to take several inputs to measure physiological parameters of human such as temperature, heart rate, blood glucose and blood pressure. The inputs from the sensors are integrated and processed. The results are sent through the wireless Module to a host computer, which stores the data into an Access Database.

3.1 SENSORS:

Sensor is a device that senses changes in the required quantity and produces output accordingly.

3.1.1 TEMPERATURE

The skin temperature measurement is done using an integrated Circuit. The Sensor gives an analog output depending on the measured temperature. This voltage has to be measured by the microcontroller using a 12 bit Analog-to-Digital converter (ADC). There can be different methods to estimate the exact body temperature from skin temperature but with a rough estimation usually the body temperature is 5.1 c higher than skin temperature when the body temperature is measured at the ear by the certain thermometer used by a general practitioner compared to the skin temperature measured at the wrist. The sensor has been used for measurement of body temperature at wrist, upper arm and neck for many males and females.

3.1.2 HEART RATE

A custom heart rate sensor was designed to read the patient's beats per minute (bpm). The technique used to measure the heart rate is based on near-infrared spectroscopy (NIR). NIR involves using light in the wavelength of 700–900 nm to measure blood volume. At these wavelengths most tissues do not absorb light— other than hemoglobin (which is what we are interested in). A silicon phototransistor, molded into a flat side-facing package, and a GaAs Infrared Emitting Diode were used in the sensor. The amount of light that was detected by the phototransistor varied with the patient's heart pulse, as the amount of absorbed light changed with the flow of blood, which is directly linked to the heart rate. This signal was then amplified, filtered, and sent to the microcontroller to be analyzed.

3.1.3 MICROCONTROLLER

Storing data of sensor in digital form. It will process data, whether the readings that we got from sensors are in reference range or not and accordingly microcontroller will send necessary text that will be shown at the output.

3.1.4 WIRELESS MODULE

This module will establish network and send data. They are powered by 2.7–3.3 V and can be connected without additional power-supply circuit. Send data to pc with the help of wireless module which will have reference range according to the required area.

3.1.5 LAPTOP

It will be helpful to monitor and keep track of physiological parameters at one place. Laptop will help to monitor many patients at one time at one place.

3.1.6 BLOCK DIAGRAM

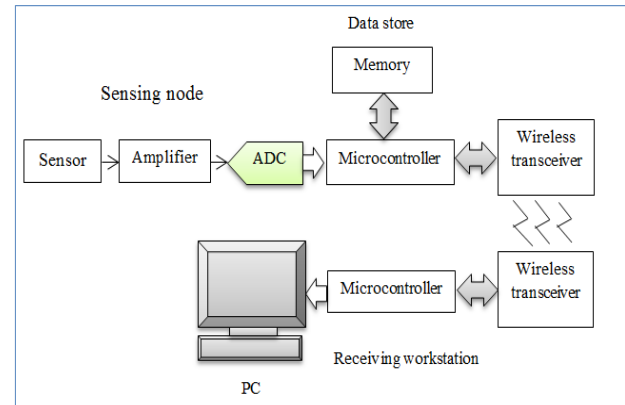


Fig 1: Sensor based physiological parameters monitoring and prognosis system.

4. EXPECTED RESULT

System monitors body temperature, heart rate etc. any changes in these parameters will be conveyed to output's display with the help of wireless module. At the output station all these changes will be monitored and necessary action will be taken.

Future improvements will focus on the use of flexible PCBs to replace the stiff cards, so that it could be molded around the wrist unit, making it more comfortable for the wearer. The receiver unit would ideally be enhanced so that it can connect to either the local or cellular phone network, and in the case of an emergency would contact an ambulance.

5. ACKNOWLEDGMENTS

We have great pleasure in presenting paper on Sensor based wearable Physiological Parameters Monitoring and Prognosis system. We take this opportunity to express our sincere thanks towards our guide Assistant Professor Ashwini Kothavale, Department of Electronics and Telecommunication Engineering, V.I.T., Thane for providing the technical guidelines and suggestions regarding line of work. We would like to express our gratitude towards her constant encouragement, support and guidance through the development of project.

We also thank the entire staff of V.I.T., Thane for their invaluable help rendered during the course of this work. We wish to express our deep gratitude towards all our colleagues of V.I.T., Thane for their encouragement.

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On Computer Science And Engineering Vol. 02,
 No. 03, 554-559.

High Bandwidth Microstrip Antenna using Electromagnetic Band Gap (EBG) Structures: A Review

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ABSTRACT

This article summarizes different techniques to achieve wide bandwidth of microstrip antenna using Electromagnetic Band gap (EBG) structures. As wireless communications need more bandwidth with times, there has been an increasing worldwide interest for ultra-wideband microstrip antennas. To satisfy the demands of bandwidth requirement, several techniques have been developed in last few years, whereas the recent research concentrates on EBG structure(s). The EBG structure(s) can provide high bandwidth, with the solutions to the problems of switching noise, surface and leaky waves. This review paper describes bandwidth enhancement technique using different EBG structures and parametric study.

Keywords

Microstrip patch antenna, Electromagnetic Band Gap (EBG) structure(s), bandwidth

1. INTRODUCTION

Recently, wideband antennas for wireless communication system are used in various applications. Microstrip patch antennas [1], [2] are used in satellite communication, military purposes, mobile, GPS, missile systems etc. as they are less complex and easy to implement, due to its compact shape and light weight. However along with these advantages it also suffers from some limitations like low impedance bandwidth, low gain, excitation of surface waves etc. Several techniques are being introduced to improve the performance of such an antenna. One of the techniques to get broad band (up to 65% fractional bandwidth) for a planar inverted-F antenna (PIFA) is by selecting the right values for the feed and shorting plates [3]. Another technique to enhance the bandwidth are by using printed monopole antenna along with L-Shaped Slot [4], with circular slot [4] or with a fork shaped slot [5]. Printed monopole antenna with a pair of L-shaped slot increases the bandwidth up to 130%, using fork shaped slot, the bandwidth achieved is 165%, whereas the bandwidth as high as 162%, can be achieved by comprising a circle-like slot, a trident - shaped feed line, and two nested C-shaped stubs [6]. Electromagnetic Band-Gap (EBG) structures are also used to increase the bandwidth of the microstrip patch antenna.

2. ELECTROMAGNETIC BAND GAP (EBG) STRUCTURE(S)

In recent years, there has been a growing interest in utilizing Electromagnetic Band-Gap (EBG) structures in the electromagnetics and antenna because of its specific characteristics like high bandwidth, surface and leaky wave suppression [6]. The generation of surface wave decreases the antenna efficiency and degrades the antenna pattern. So improving antenna's performance such as increasing the antenna gain and reduce power consumption, EBG structures can be used.

EBG structures are periodic arrangement of dielectric materials and metallic conductors. The structures have very high impedance and are very compact in nature. The main advantage of EBG structures are exhibiting band gap to suppress the surface wave current.

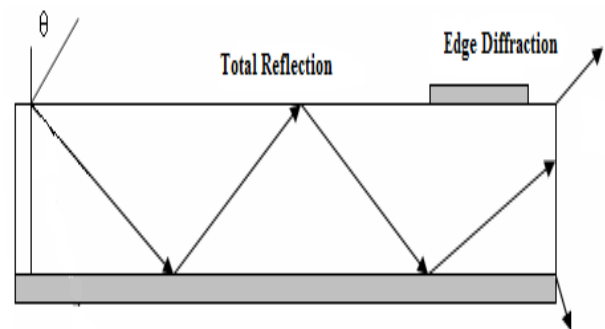


Figure 1. Propagation of surface wave in substrate of microstrip patch antenna [1]

As shown in Figure 1, the microstrip antenna excite the surface waves in it, when the dielectric constant of the substrate, $\epsilon_r > 1$. These waves are incident on the ground plane and get reflected from the plane, then reach to the dielectric-air interface, which also reflect the waves. Finally they reach the boundaries of the microstrip structure following this zig-zag path, where they are diffracted by the edges causing reduction of antenna efficiency and gain, increase cross-polarization levels increase end-fire radiation, limit bandwidth, and limit the applicable frequency range of microstrip antennas. But because of the periodic arrangement of the substrate in EBG structure, the propagation of the surface wave along the substrate cannot be occurred, causing rise of radiating power to be coupled to the space waves. Figure 2 illustrates the surface wave propagation with and without EBG structure along with the microstrip patch antenna.

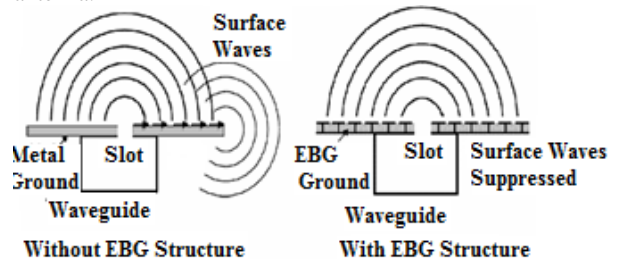


Figure 2. The blocking of propagation surface wave by EBG structure [17]

The EBG structures are equivalent to the LC circuit acting as a two-dimensional electric filter in the range of frequency to block the flow of the surface waves. In a mushroom type EBG, as shown in Figure 3, the inductor L results from the current flowing through the vias and the capacitor C is due to the gap effect between the adjacent patches. The EBG structures can be of with via or without via. At low frequency, the impedance is inductive in nature and supports TM surface wave, whereas, the impedance is capacitive in nature at high frequency, which supports TE surface wave. As inductance is related to via, so EBG without via suppresses only TE mode of the incident wave, whereas TM and TE mode both are suppressed by the EBG with via.

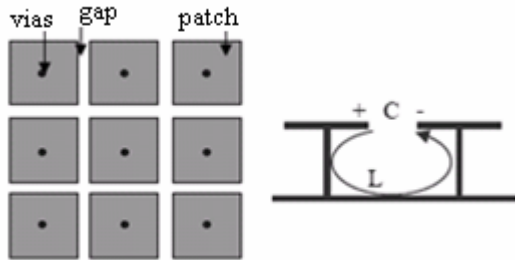


Figure 3. Mushroom type EBG structure [17]

EBG structures can take different shapes, like Fork, Fractal, Spiral, F etc. If the number of EBG structures increase in an array, the band gap increases and it shifts to the lower frequency region [7]. The unit cells of different types of EBG structure are shown below in Figure 4.

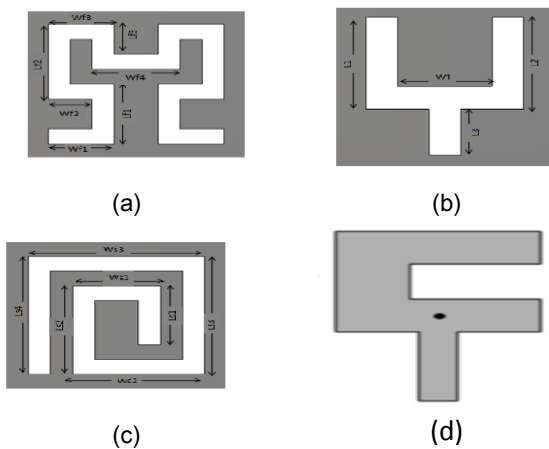


Figure 4. Different types EBG structures (a) Fractal, (b) Fork, (c) Spiral, (d) F-shaped [7], [8]

3. BANDWIDTH ENHANCEMENT TECHNIQUES USING EBG STRUCTURES

Microstrip antenna has been popularly used in the field of high performance antenna system. Besides light-weight, low profile, low fabrication cost, it also has advantages like planar configuration, and small size [1]. Considering the limitations, the microstrip antenna suffers from problems, like low efficiency, low power handling ability, high Q, spurious feed radiation and very narrow bandwidth. The bandwidth of this antenna can be enhanced either by using larger substrate thickness or lower permittivity of the dielectric to obtain low Q or by optimization of the patch geometry [2]. But the

substrate thickness and lower permittivity increases surface wave resulting in low gain, low efficiency of the antenna and distorts the radiated field pattern. So to increase the bandwidth along with reduced surface wave, EBG structures along with microstrip antenna can be used.

A comparative analysis of three types of planar EBG structures, i.e. fractal, fork and spiral are discussed by Shiva Chauhan, and L. Yang et al [7], [8]. The band gap properties of array of EBG structures have been analysed. On comparing the band gap properties of all three EBG structures it has been concluded that the fork type EBG structure gives better performance in terms of compactness, simplicity and band gap.

To enhance the bandwidth of microstrip antenna with EBG structures, different techniques can be used, which are presented below [9] - [17]. One method is to use an inverted F-L microstrip patch antenna with slotted structures arrangement on the ground plane side and tuning stub on the inverted L-patch [9]. This proposed compact ultra wideband (UWB) antenna offers excellent performance in terms of lower S_{11} i.e. up to -31.4 dB with bandwidth 22.34 %. D. N. Elsheakh et al have demonstrated a semi-circular microstrip monopole antenna with circular modified ground plane, and analysed the performance of antenna in terms of bandwidth, range of frequency, compactness, efficiency, gain [10]. The proposed antenna provides a range of frequency from 7 to 10 GHz and from 12.5 to 17.5 GHz, an impedance bandwidth of more than 33 GHz, averaged radiation efficiency of 73%–74%, antenna gain of 6.5 dBi, omnidirectional radiation pattern, with antenna size reduction of more than 60% compared to conventional patch. A novel shape of half circular planar monopole radiator and ground plane along with metamaterial structures such as metallo-electromagnetic band gap structure (MEBG) and spiral artificial magnetic conductors (SAMC), can also be used to increase the bandwidth [11]. The use of metamaterial with the microstrip antenna, increases bandwidth performance from 1 GHz to more than 30 GHz with radiation efficiency of $\eta = 0.92$, increases antenna gain of 7dBi and approximately omnidirectional radiation patterns (E-plane and H-plane). Another method to increase the bandwidth is by using a ultra-wideband (UWB) antenna with double-deck meshed-planar fan electromagnetic bandgap (MP-FEBG), where the bandwidth range achieved was from 3.20 to 15.78 GHz, size reduced by 79.1% with return loss less than -10 dB [12]. Sarawuth Chaimool et al have compared two different antenna prototypes, namely two conventional 2×2 arrays without EBG superstrate and 2×2 array with EBG superstrate [13]. EBG substrate gives better impedance bandwidth which covers the bandwidth of the WLAN (2.4–2.484 GHz) and WiMAX (2.3–2.5 GHz) with moderate gain of over 8.5 dBi. Zheng Guo et al have designed three antennas, first with spoon type microstrip patch antenna, second with spoon type patch along with EBG structure [14]. According to the comparative study of these three antennas, the slot with EBG structure give better performance results, in terms of impedance bandwidth (151%), range of frequency (1.53 –11 GHz) and resonant frequency (5.6 GHz). Gaurav K. Pandey et al have proposed a L-slot loaded modified mushroom type Electromagnetic Band Gap (EBG), which achieve impedance bandwidth ($VSWR < 2$) from 2.3 GHz to 11.4 GHz with band notched characteristics ($VSWR > 2$) from 4.9 GHz to 6 GHz [15]. Dalia Nashaat et al have done a comparative study of five different types of antenna, namely conventional 2×2 microstrip patch array, antenna with spiral artificial magnetic

conductor (SAMC) ground plane, antenna embedded with a large spiral artificial magnetic conductor (LSAMC), antenna embedded with small spiral patch cells (SSAMC), and antenna embedded with small spiral mushroom-type electromagnetic band-gap patches (ESEBG) [16], [17]. Based on the comparative study, it is concluded that the antenna with embedded SEBG gives better performance, with bandwidth (extended from 0.5 to 3.5 GHz and from 4 to 19.5 GHz), and higher antenna gain (10.5 dBi).

Another technique to enhance the bandwidth is to use a one dimensional multilayer EBG structure with large capacitance and proper arrangement of ground vias [18]. The 10 layered EBG structure provides a wide bandwidth of 1.27 GHz to 10 GHz, along with reduction in size and power/ground noise suppression.

A cylindrical hybrid reflector, constructed with EBG material and artificial magnetic conductor (AMC), can be used to increase the directivity and to control the radiation pattern [19].

The EBG structures can also be used to enhance the gain and to reduce the mutual coupling between the elements of the array. Seungbae Park et al described a novel circular microstrip patch antenna using an EBG structure and an air layer, which gives a gain of 11.9 dB, an improvement of 6.5dB over that of the conventional circular patch antenna [20]. To reduce mutual coupling two different methods are investigated. One can use a new uni-planar type EBG structure with a double folded bend connecting bridge, where 17 dB reduction of mutual coupling is obtained [21]. Another method is to use a mushroom-like EBG structure along with microstrip antenna which was analysed using the finite-difference time-domain (FDTD) method [22]. An 8 dB reduction of mutual coupling is obtained at the resonant frequency.

Minimization of Electromagnetic Interference (EMI) can also be achieved by using EBG structures [23], [24]. It will also provide the reduction of the surface waves which would be an advantage in terms of battery life enhancement of mobile handset [25].

4. CONCLUSION

In wireless applications, the requirement of high performance antenna is critically important in any transceiver system, which will provide high bandwidth and gain, along with low profile and low cost. In mobile terminal applications, multiple antennas are used for different frequency band, for e.g. GPS (1.2 – 1.6 GHz), DVB-H (1.67 – 1.675 GHz), DCS1800 (1.71 – 1.88 GHz), PCS 1900 (1.85 – 1.99 GHz), UMTS2000 (1.92 – 2.17 GHz), Bluetooth (2.4 – 2.484 GHz), WiMAX (2.3 – 2.7 GHz, 3.4 – 3.6 GHz), UWB bands (3.1 – 10.6 GHz) etc. A single antenna, can be used as a replacement of such antennas so that cost and space requirement will minimize. The solution to the requirement of high bandwidth and increased gain as compared to the conventional microstrip antenna is by considering the microstrip antenna with the periodic structure, i.e. EBG. Along with these improved characteristics, it also provides solutions to switching noise, surface and leaky waves. The reduction of surface waves would be an advantage in order to battery life enhancement of mobile handset.

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A Review on Band Reject Microstrip Patch Antenna

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ABSTRACT

Nowadays, different antennas are preferred/devised for different wireless applications, which increase the complexity, bandwidth utilization, power and size of the device. The antenna can be used for various combinations of wireless applications such as Wi-Fi, WiMAX, and Bluetooth etc. within microwave S and C bands in the electromagnetic spectrum. Particular band rejection is very important from the security point of view and to avoid interference, as interference can modify or disturb the signal propagating from source to destination through the channel. This review paper summarizes different band rejection techniques, using split-ring resonator or Multiple Input Multiple Output (MIMO) antenna etc.

Keywords

Multiple Input Multiple Output (MIMO), Interference, Band Rejection, Microstrip Patch Antenna.

1. INTRODUCTION

Currently, there is an increased interest in different antenna applications for use in several fields like satellite communication, space application, and wireless communication as present and future applications. The micro strip antennas are the present day antenna designer's choice. The microstrip antenna gives Low dielectric constant substrates that are generally preferred for maximum radiation. In the micro strip antenna rectangular and circular configurations are the most commonly used configuration but the conducting patch can take any shape. Other configurations are complex to analyse and require heavy numerical computations.

In most of the application, interference is a major issue. Most of the bands interfere with other bands due to which degradation of the signal, less accuracy, distorted output, cross talks etc. occur. Different band rejection techniques are available to minimize the interference, using split-ring resonator, Multiple Input Multiple Output (MIMO) antenna or using any other microstrip patch antenna etc. In recent years, there has been a growing interest in utilizing MIMO antenna because of its specific characteristics. Multiple-input-multiple-output (MIMO) antenna can be used to enhance isolation and increase impedance bandwidth [1]. MIMO technology, which involves the use of multiple antennas at both the transmitter and receiver, is used to enhance channel capacity and data transmission performance [2]. To avoid the interference between frequency bands, the band reject MIMO antenna is available. Antennas are used in satellite communication, military purposes, mobile communication, missile systems etc. For e.g. in military application if a particular band is being used for communication and the information has to be confidential, then that band can be rejected for other users so that they cannot interfere in the band where confidential information is

shared. Another new technique to reject the band planar monopole antenna are used that covers 3G, Bluetooth, WiMAX, and the UWB bands by using one quasi-complementary split-ring resonator (CSRR) in the feed [3].

Isolation is an important parameter in antenna. Isolation between two antennas is a measure of how tightly coupled antennas are. To improve the isolation, decoupling element is introduced. One of the important factor is mutual coupling. Reduction in mutual coupling is desired because energy that should be radiated away is absorbed by a nearby antenna, thereby reducing efficiency and performance of antennas. Microstrip antenna has proven to be excellent radiator for many applications because they are lightweight, have a small volume and have a low profile planar configuration. MSA has ease of mass production using printed-circuit band technology which leads to a low fabrication cost. MSAs are easier to integrate with other MICs on the same substrate and they also allow for dual- and triple-frequency operations [4]. By varying the different parameters of the antenna or using a suitable structure, a particular band of the spectrum can be rejected [2].

First Section provides introduction of MIMO antenna as well as other important parameter of the antenna and also discuss about interference. The remainder of the paper provides depth study of various band reject techniques to avoid the interference. Throughout the discussion, band reject techniques are highlighted.

2. BAND REJECTION TECHNIQUES

Multiple Input Multiple Output (MIMO) communication systems use multiple antennas that are equipped at receiver and transmitter ends to enhance the available data rate in multipath environments [5]. The basic concept of MIMO is to use multiple antenna elements to transmit or receive signals with different fading characteristics [1]. The MIMO antenna offers good isolation ($S_{21} < -15\text{dB}$) and dual band rejection at WiMAX (3.4–3.7 GHz) and WLAN (5.15–5.35 and 5.725–5.825 GHz) over the UWB system operation (3.1–10.6 GHz). Varying the different parameters of the antenna, the impedance of the band of interest can be controlled [4]. As shown in Figure 1, when length of branch 1 (L_1) is reduced, the notched band around 5.5 GHz is shifted toward higher frequencies, and it only slightly affects the antenna performance of the other band. Isolation improvement and dual band-rejection operation were achieved by using only a single structure. Isolation improvement and band-rejection operation were achieved by using only a single structure [4].

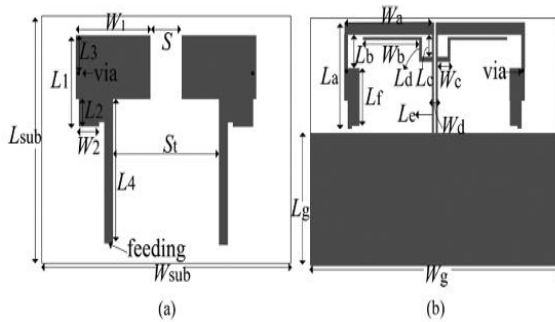


Figure 1. Band reject MIMO antenna (a) top view (b) bottom view [4]

The another author has proposed the antenna that consists of a printed folded monopole antenna coupled with a parasitic inverted-L element, with an open stub inserted in the antenna to reject the WLAN (5.15–5.85 GHz) band that interferes with the UWB band. This antenna was modified to enhance the bandwidth and reject the WLAN (5.15–5.85 GHz) band [2]. Good isolation can be achieved by the antenna which consists of two planar-monopole (PM) antenna elements with microstrip-fed printed on one side of the substrate and placed perpendicular to each other. Along with isolation enhancement, impedance bandwidth can also be increased by two long protruding ground stubs that are added to the ground plane on the other side. A short ground strip is also used to connect the ground planes of the two PMs together to form a common ground [1].

Yong Qiang Hei proposed another technique to avoid interference by introducing a new planar monopole antenna that covers 3G, Bluetooth, WiMAX, and the UWB bands but exhibits dual band-notched characteristic. By using one quasi-complementary split-ring resonator (CSRR) in the feed line, dual notched frequency bands centered at 5.3 and 7.4 GHz are obtained as shown in figure 2 below [5].

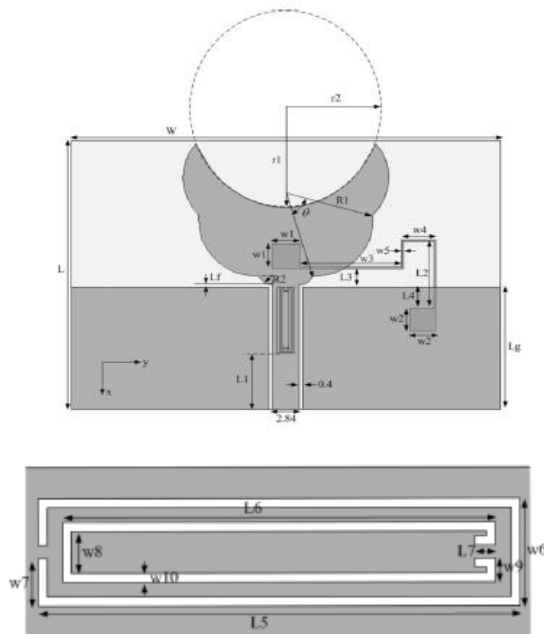


Figure 2. Planar monopole antenna using Geometry of quasi-CSRR [5]

To achieve high isolation a compact dual band-notched UWB MIMO antenna is presented which gives high data rate for wireless communication system. The author has achieved a good isolation for frequencies ≥ 4.0 GHz, where two protruded ground parts are used to increase electrical length of the radiator [6]. MIMO-UWB antenna presents the WLAN band rejection based on Electromagnetic Bandgap (EBG) structure [7]. A mushroom-like EBG structure is used to reject the WLAN frequency at 5.5 GHz and to reduce the mutual coupling of the antenna. A stub structure acting as a multi-mode microstrip resonator (MMR) is inserted to suppress the effect of surface current to the elements of the antenna [7]. By implementing V-inverted shape slot in the patch plane, band rejection is obtained for WLAN. MIMO configuration also achieves high isolation between two antennas [8].

To enhance the isolation between two closely packed antennas which operates at the same frequency band, a coupling element is introduced. Inserting a coupling element artificially creates an additional coupling path between the antenna elements. The idea is to use field cancellation and hence the isolation can be improved. This antenna can operate in WLAN with maximum 30 dB isolation, 2 dBi peak gain and 60% peak efficiency [9]. To achieve excellent broadband isolation performance MIMO antenna is design. The broadband insulators can efficiently reduce the coupling of MIMO antennas. Here the Metamaterial (MTM)-inspired resonators can function as insulators and are placed periodically into a compact MIMO antenna system. T-shaped branch added behind the insulators improves the isolation bandwidth markedly. An isolation bandwidth under 20 dB can achieve 19.3% relative to the center frequency [10]. For the Long Term Evolution (LTE)/Worldwide Interoperability a compact dual-band multiple-input-multiple-output (MIMO) antenna array with eight elements is proposed. The dual-band MIMO array consists of four U-slit etched planar inverse-F antennas (PIFAs) and four L-slit etched PIFAs. To reduce mutual coupling, the two types of PIFA are placed orthogonally between them. The presented decoupling methods give the excellent element isolation (above 20 dB) and good return loss (above 10 dB) across the operating bands (2.6–2.8 and 3.4–3.6 GHz) for all the PIFA elements [11].

To enhance the port isolation a compact decoupling network between two closely spaced antennas is proposed [12]. Here two transmission lines (TLs) are individually connected to the input ports of two strongly coupled antennas. To change the trans-admittance between ports at the antenna inputs from a complex one to a pure imaginary one, suitable length of transmission lines (TLs) can be designed and to cancel the resultant imaginary trans-admittance a shunt reactive component is attached in between the TL ends. At the end a simple lumped-element circuit is added to each port for input impedance matching. High antenna isolation and good input return loss is achieved [12].

Here the antenna structure simulated by using IE3D or HFSS. Then it is fabricated on the FR4 substrate which has a dielectric constant (ϵ_r) of 4.2 - 4.4 and loss tangent ($\tan \delta$) of 0.02. The substrate thickness is available in the range of 1.6 mm - 2.4 mm. The FR4 substrate is abundantly available, relatively cheaper and provides ease in fabrication. The performance of the fabricated antenna is measured by using the Vector Network Analyser (VNA).

3. CONCLUSION

This paper reviews the study of Band Reject Microstrip Patch Antenna as the particular band rejection is important from the security point of view and to avoid interference. It has also offered a review of recent research techniques to reject particular band. By parametric study good isolation and dual band rejection at WiMAX (3.4–3.7 GHz) and WLAN (5.15–5.35 GHz and 5.725–5.825 GHz) can be achieved. Another technique to reject the WLAN (5.15–5.85 GHz) band is to use an open stub. This paper has provided a survey of different antenna like MIMO antenna, planar-monopole (PM) antenna that can be utilized to reject the band. By varying the different parameters of the antenna or using a suitable technique, band-notched function can be achieved. This review has shown that issues related to the interference of different frequency bands in antennas and also band reject techniques to play a significant role in it.

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EYE MOVEMENT BASED ROBOTIC VEHICLE

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ABSTRACT

Communications between robot and a normal person have always been a challenging task. The aim of our project is to develop a new method that allows the user to move around freely while the robot navigates automatically to the desired goal point. The robot will also sense the obstacles in front of it and gives a beep sound.

General Terms

Infrared detection sensor.

Keywords

Wireless operation using infrared sensor, Dual DC motor controller & driver IR obstacle detection sensor, Buzzer for alarm and sensor detection

1. INTRODUCTION

In today's world we are constantly searching for smarter ways to do a task on without moving an inch. Hence a wireless system that is the use of "Embedded Systems in Communication" has proved to be a boon for us humans.

The aim is to develop a new method that allows the user to move around freely while the robot navigates automatically to the desired goal point.

This Wireless intelligent robot is designed to help the paralyzed person who moves a robot, instead of the handicapped person moves the robot by his hand, the robot will automatically move to a particular direction as the patient moves his eyes towards a direction, with the help of Eye ball movement detection sensor. The robot will also sense the obstacles in front of it and gives a beep sound. The details regarding the construction of this chair includes the following

A prototype model which symbolizes the robot is constructed using the ms sheet (wheelchair battery operated- using dc motor 12v/60 rpm-1amps current ratings)

Even though, the eye control offers a more natural mode to guide the robot. Users are normally not allowed to look around during the process.

2. RELATED THEORY

Author have also implemented a new method to guide and control the wheelchair for eyeball movement. In this method we use sensor based eyeball tracking system to control

powered wheelchair. Eyeball sensor will generate distinct range of values for each position of eyeball (i.e. left, right, straight). This concept can be used for multiple applications, but this paper focuses the application to mobile and communication aid for paralytic people. The proposed system involves two stages; first eyeball tracking and second sending of control signals to the controlled wheelchair.[2]

3. BLOCK DIAGRAM

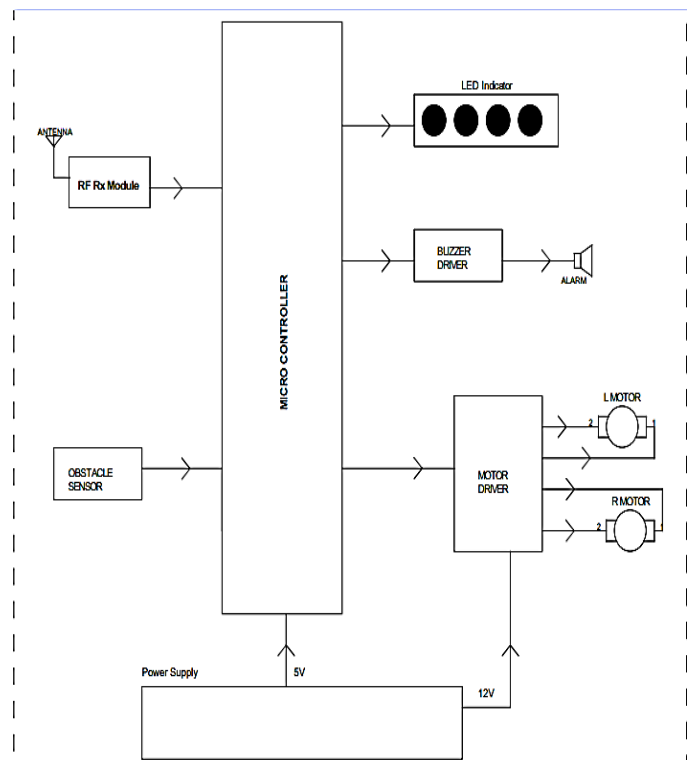


Fig 1: Block Diagram of Receiver section.

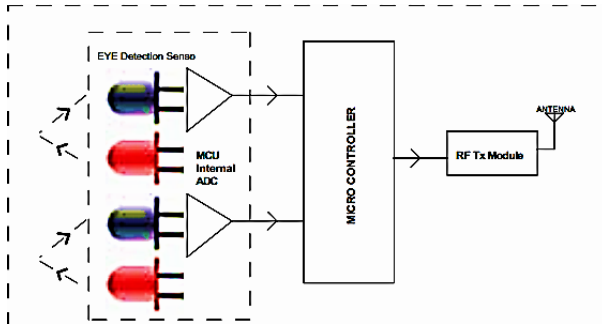


Fig 2: Block Diagram of Transmitter section.

Infrared sensor will first sense the movement of eye ball. Now the signal will be sent to the microcontroller which will convert analog signal into digital form with the help of RF modulator and antenna the signal will be transmitted to the receiver.

At the receiver side microcontroller will analyse the received signal and depending upon the input microcontroller will make the movement of robot with the help of motor driver.

4. DESIGN METHODOLOGY

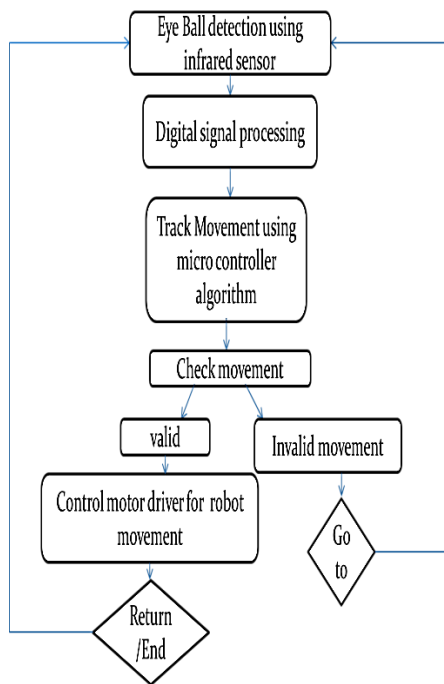


Fig 3: Flow Chart of Eye Movement based robotic vehicle.

4.1 Eye Ball detection using infrared sensor

The flow of our proposed system starts with the detection of the eyeball position. In order to detect the position of the eyeball we use the eyeball IR sensor. The values generated by the sensor depending on the position of the eyeball are routed

to the kit. The eyeball sensor is based on the concept that “white colour region of the eye will scatter the light and black colour region of the eye will absorb the light”. The sensor consists of IR transmitter and receiver circuitry (LDR). The IR transmitter will transmit the light. The iris of the eye which is in black colour will absorb all the light and it won’t reflect whereas the white part will reflect the light.

4.2 Digital signal processing [ADC]

The Infrared sensor senses the eye movement and converts it into an electrical signal, which is applied to the micro controller. The analogue signal is converted into digital format (8 or 10 bit number) by the inbuilt analogue-to digital converter (ADC) of the micro controller. The sensed values of the eye movement used to Control robot.

4.3 Track Movement using micro controller algorithm

The signals from the eyeball sensor are sent to the micro-controller. Based on the signals received by the micro-controller, it sends the control signal to enable the motor circuitry. The motor circuitry supplies power to the motor, thus the motor start to rotate and the robot is locomoted.

4.4 Check movement

Depending on input of micro controller it check the movement, whether the movement is valid movement or invalid movement.

4.5 Valid movement

If the movement is valid then the robot will move left, right or straight.

4.5.1 Left movement

If the values generated by the sensor matches with the values of left in the coding, then the micro controller will automate the motor circuitry to left. Depending on H-Bridge table wheels will turn in left direction. As a result the robot will turn left.

4.5.2 Right movement

If the values generated by the sensor matches with the values of right in the coding, then the Micro controller will automate the motor circuitry to the right. Depending on H-Bridge table wheels will turn in right direction. As a result the robot will turn right.

4.5.3 Straight movement

If the values generated by the sensor matches with the values of straight in the coding, then the Micro controller will automate the motor circuitry to the straight. Depending on H-

Bridge table wheels will move in free direction. As a result the robot will go straight.

4.6 Invalid movement

Invalid movement include such as blinking of eyes.

5. EXPECTED RESULTS

It is expected that robot will make a movement as per movement of eye ball. It has on board Power LED indicator. It is has operating range of 300 meters (in open air). It detects Obstacles using Infrared Sensor and takes a U-turn when object has been detected. It should alarm buzzer when it detects any object or obstacle.

Table 1. Robotic movements corresponding to eye ball movements.

Eye ball movements	Robotic movements
Straight	Forward
Left	Left
Right	Right
Eye close	Stop

It is expected that robot will take a movement as per the table no 1 and also robot will take a U turn when object or obstacle is detected using infrared sensor.

6. CONCLUSION

The proposed eye controlled robot system is easy to operate by the user. The user has to only look left, straight or right to move the robot towards the desired direction. It is cost efficient system that is very easy to handle, a single person can handle all the work with movement of eyes and hence eye controlled robot.

7. FUTURE SCOPE

Eye detection can be used in video games replacing joy stick. To make a sophisticated product that can be implemented in fighter jets. In this pilot just has to point he target with eyes and press the trigger when target comes under the range. In medical field, doctors can study the patients eye movement by using this technique. Disabled person can make use of computer without any help of mouse.

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Automated Allotment Acquisition with Security in Parking

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ABSTRACT

This paper proposes the implementation of parking using Ultrasonic Sound Wave sensor for Automatic Vehicle's Dimension measuring application. The dimension is hereby to make effective use of the ample parking area for different dimensioned vehicles by allotting them slot according to their dimensions. The security implementation include the use of RFID tags & readers interfaced with the micro controller to lock the car inside the parking-slot with the help of Leveler (parking-slot guard) controlled by a motor interfaced with the micro controller. The tag can only access/empty the parking slot and the chances of theft at parking will be reduced. The same tag issued between open and close of the Leveler there by gives the time for which vehicle was present at the parking-slot accordingly parking charge is made using software application. So the project gives the complete utility of space, safety, efficiency, without human interface with high security as well.

General Terms

Automatic car parking system, Embedded system.

Keywords

Slot locking system, programmable interface controller, passive reader active tag, Radio frequency Identification (RFID), ultrasonic distance sensor.

1. INTRODUCTION

At present the space utilization is the major problem to be concerned. The use of private vehicles has been increased drastically; thus by increasing the parking in less available space with maximum security may increase the efficiency of on road traffic. Use of available space in an intelligent manner with proper and adequate security will increase the use of space for parking. Since the population is growing day by day and also the available space for the parking is diminishing, so to park the cars in less space is a major concern. People have craze of car by having it according to the budget. But the point comes here, we all require parking, and the slots are same sized at generalized parking place. Say the slots where made assuming Duster but all type of cars will get parked there. If we consider 4.5m as the length of average car length, the difference in the car length result in a waste in generalized parking slot due to equally divided space. By using Ultrasonic distance sound sensor which measures the length of the cars at the entrance of the parking lot and displaying the result of typically Car length and slot number where the car is to be

parked gives the systematic approach to utilize the available space.

The biggest problem comes to news now-a-days is the problem of the cars and bikes being theft from parking place. The slots at parking are just painted on earth; anyone can easily break the lock of the vehicle, self-start it and take it over. Thus we don't have security type of thing in our parking. In the project we include Slot Locking System using RFID reader and tag adding to the existing car locking system. Thus having the double safety and the chances of theft reduces considerably.

The charges paid by the rental holders are not quite effective in the present scenario. The problem is of parking owner, of charge as per the time. If the parking owner chargers Rs50 per hour, and if 5 minutes goes on, then we try to makes efforts to make owner not to charge for that 5 minutes, which makes owner to go loss. So there should be some electronic calculator which directly says charges on car for time being parked. The Java program makes the application of parking charge calculator. The program will first accept the RFID tag shown by the driver/owner of the car.

2. PRESENT SYSTEM

In 2003, Toyota began to sell their Japanese Prius hybrid vehicle with an automatic parallel parking capability offered as an option named Intelligent Parking Assist. In 2006, Lexus added a self-parking system to the redesigned Lexus LS sedan. It parallel parks as well as angle parks. In 2009, Ford introduced their Active Park Assist beginning with their Lincoln models. It does parallel parking. In 2010, BMW introduced a system called "parking assistant" on the redesigned 5-series. It does parallel parking. Up to 2012, automatic parking systems were being developed by several automobile manufacturers. Ford and Lincoln offered active park assist on Ford Focus, Fusion, Escape, Explorer and Flex and Lincoln MKS and MKT. Toyota and Lexus had advanced parking assistant on Toyota Prius V Five and Lexus LS460 and LS460 L. BMW all-new sixth-generation 3 Series used a system called parking assistant. Audi A6, Mercedes-Benz also offered parktronic on their C-Class, CLS-Class Coupe, M-Class SUV, E-Class, S-Class, GL350, GL450 SUV (standard on GL550) and R-Class in different prices.

3. IMPLEMENTATION

The Figure 1 shown below is the simple block diagram of the project. It is a simple illustration of how we have

implemented the project and various parts involved in it. The system consists of a Pic-controller(PIC18F4550), LCD, RFID Reader module, DC motor, Ultrasonic Sound sensor, Passive RFID tag and a Real Time Clock(DS 1307). From the above representation, firstly when the car makes entry to the parking place, a passive RFID tag is provided to the consumer. Now, ultrasonic distance sensor gets activated and gives the reading

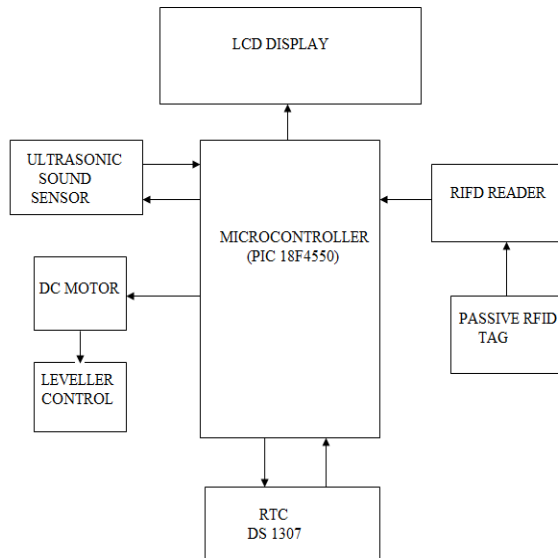


Fig 1: Automated Parking System

of distance in inches which is read by the Pic-controller and Pic-controller displays the dimension of the car and the parking slot allotted to it on the LCD display. The allotted place is generated according to the program written Pic-controller. In the mean while the time is read by the RTC for

calculation of bill. A leveler is placed at the parking slot to lock or unlock the car. The leveler is controlled by a DC motor interfaced with the Pic-controller. The leveler opens or closes on the command of Pic-controller when car driver scans the RFID tag on RFID reader module. The tag number generated by the RFID tag is stored in the Pic-controller and used for bill calculation. Thus it provides the security by assigning a tag to a particular person to lock or unlock the car.

3.1 Circuit Implementation

As shown below in Figure 2, circuit diagram consists of a PIC microcontroller (18F4550), LCD display, power supply and RTC (Real Time Clock) DS 1307. The pins of the microcontroller are connected to the peripherals in following way.

PORT A--Port A of microcontroller is used as I/O (input/output) port only.

PORT B--The port B of the microcontroller is connected to the LCD display. The rs, r/w and en pins of the LCD are connected to the RB4, GND and RB5 respectively. The r/w pin of the LCD is connected to GND to make it writable. Data pins D4, D5, D6 and D7 of LCD are connected to the PB0, PB1, PB2, PB3 pins of port B respectively. VSS and VDD pins of LCD are connected to GND and VCC respectively. The VEE pin of LCD is connected to VCC through 10K pot to control the brightness of LCD.

PORT C--TX and RX pin of port C is used for serial communication purpose. It is connected to the TX and RX pin of the ultrasonic distance sensor to take the reading of the distance. TX and RX pins are also connected with the RFID module to read the tag identification number.

PORT D--The port D of the microcontroller is interfaced with the motor to control the leveler.

PORT E--Port E is used for I/O (input/output) purposes only

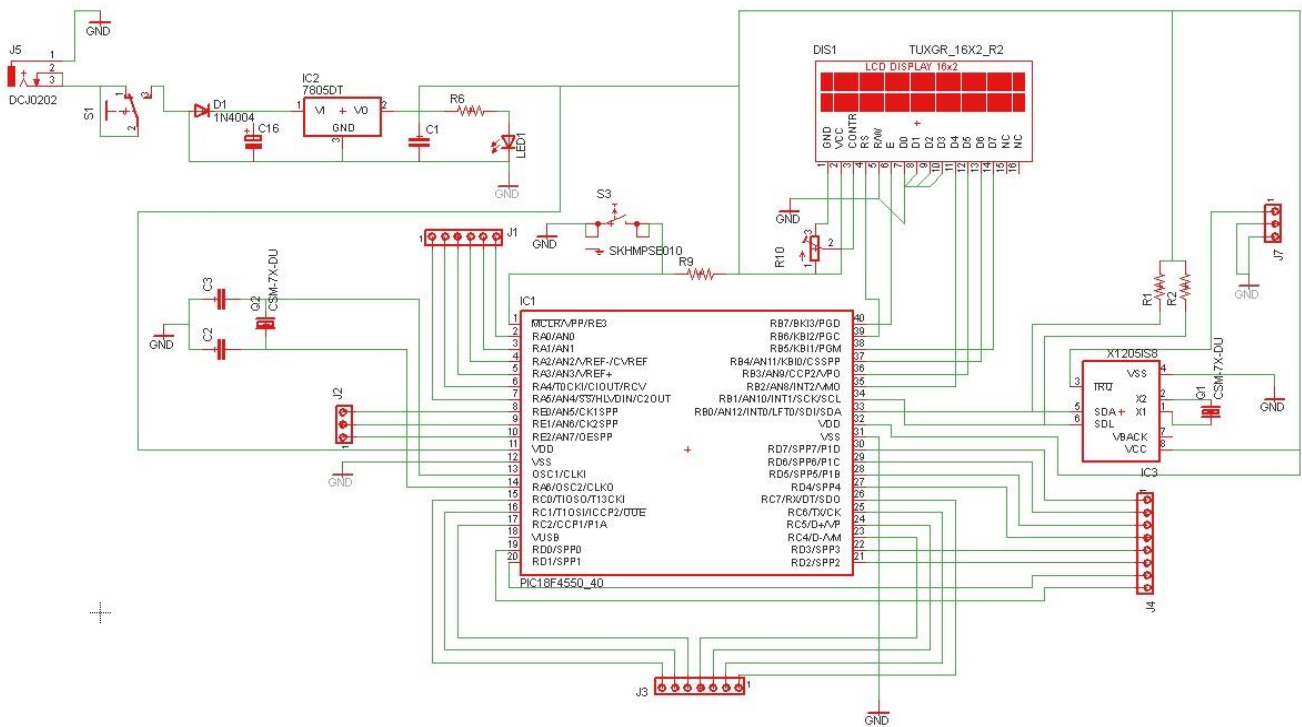


Fig 2: Circuit Diagram

3.2 Flow of Project

At entrance we use three ultrasound sensors to determine whether it is a car or a bike. By determination of that we can have direct bike park. As we are using three sensors at the entrance, if all the three sensors are not giving output i.e. not used together, then we can say that it is a bike not a car. And thus we allot bike parking directly by sensors at use. If all the three sensors are at work, so we can say that the vehicle entered is a car. Now distributing the cars according to its length.

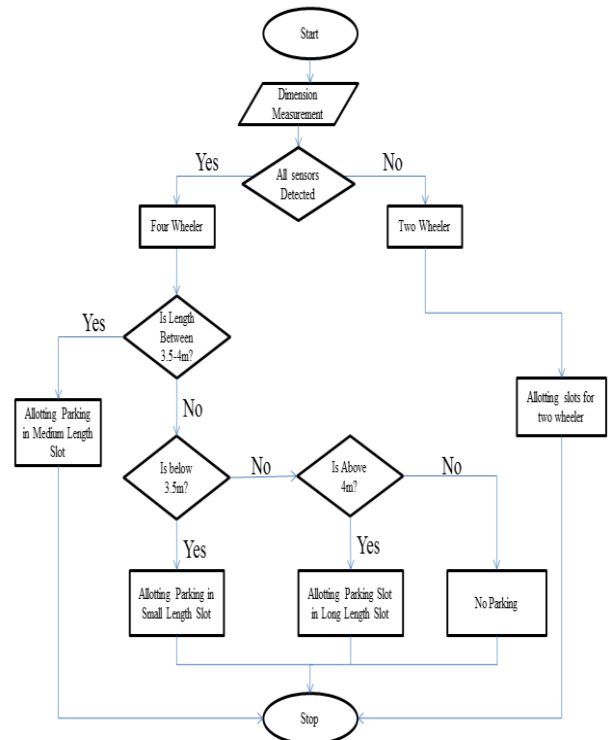


Fig 3: Flow Of System

First it will check the length measure obtained by subtracting the total length with the distance obtained by sound sensor is between 3.5-4m. If they lie between these lengths so it is

under medium length car. And thus the slot is provided accordingly.

Secondly, if the length obtained after subtracting is below 3.5m, then we can count it under small length cars and thus provide slot accordingly.

Thirdly, if the length is above 4m, then we can count it under big length cars and provide slot accordingly and this makes our car entered to segregate according to their length.

3.3 Length Measurement

The following Figure 4 shows the idea generated by us to calculate the length of the car. It works on the principle of ultrasonic. As shown in the diagram a fixed space will be provided at the entrance and ultrasonic sensor will be placed at the end to measure the distance.

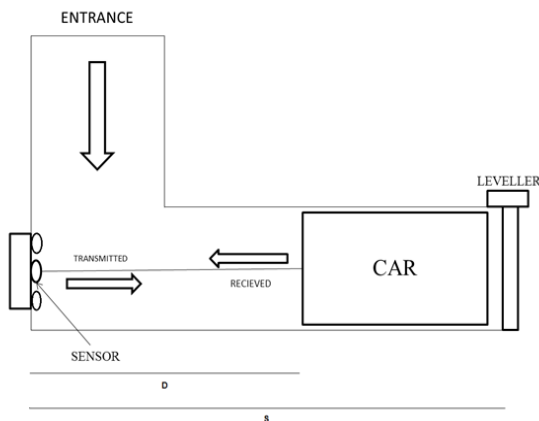


Fig 4: Length Measurement At Entrance

The Figure 4 shows the idea generated by us to calculate the length of the car. It works on the principle of ultrasonic. As shown in the diagram a fixed space will be provided at the entrance and ultrasonic sensor will be placed at the end to measure the distance. As the distance to an object is determined by measuring the time of flight and not by the intensity of the sound, ultrasonic sensors are excellent at suppressing background interference. We are using HC-SR04 ultrasonic sensor since it gives output in ASCII form and its maximum range is also 4m which is recommended for the project. The ultrasound waves generated by the sensor gets reflected back by the rear of the car and the gives value of distance from sensor end to the rear end of the car i.e. D.

$$L = S - D$$

Where L is length of the car, S is fixed known distance and D is measured distance by sensor. Hence the specific slot can be allotted to the car according to its length.

3.3.1 Distribution of Parking Slots

The current car parking system (method) occupies too much area but fewer cars we can park based on that. For example, as shown in above Figure 5 area distribution of car parking, there are area equally divided based on those method we cannot park more car. But with our concept of car parking we can park more cars.

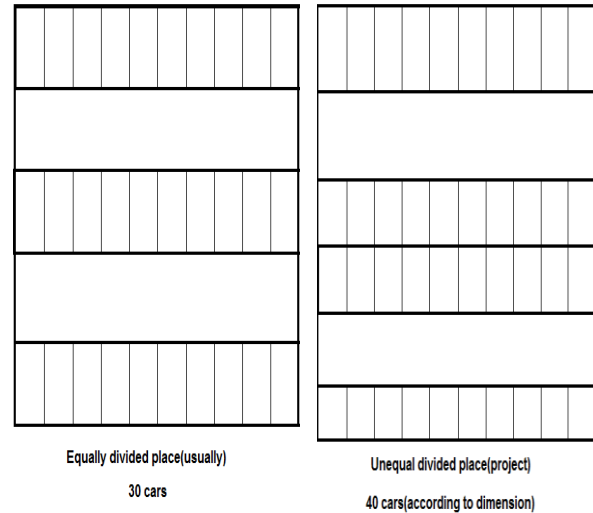


Fig 5: Parking Slot Distribution

From the old method of car parking as shown in above parking slot, if we can park 30 car based on equal area distribution that is the wastage of area even if can park more car.

The parking of car based on the equal area distribution gives us less parking slot. If we can park the car not on the basis of slot size but on the basis of car size, with these we can park maximum cars. For example, our concept of parking slot we can park 40 cars over the place of 30 car.

3.4 Security

3.4.1 Threads to Parking

Some methods used by criminals to steal motor vehicles include: Theft of an unattended vehicle without key(s), Theft with access to keys, Opportunistic theft, Carjacking, Fraudulent theft.

Solution by this project:

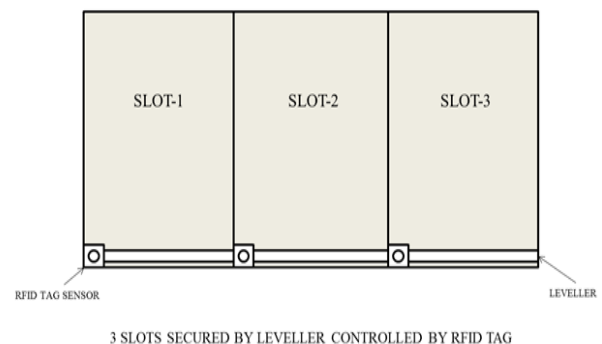


Fig 6: Slots with Leveler Controlled by Tags

Instead of all such security prevention the new project includes the parking Slot Locking System. The following Figure 6 shows the mapping of Slot Locking System. The Slot Locking System consist of parking slot of individual car, RFID tag reader which will read the tag scanned by the

driver/owner of the car, Stepper motor controlling the leveler which is use to lock the slot.

The system will run as when the specific length of car passed by the entrance carrying the passive tag and slot number displayed at the entrance LCD display it enters into the specific length of slot. The passive tag will be specifically identical for every slot in the parking area. At very first the leveler remains open to get the entry. The car enters the slot, driver makes the car shut down, lock his car according to the various car standards locking system then he just have to view the passive tag which was given at the entrance of the parking area over the passive RFID tag reader. The reader will process the command introduced by the tag to the Pic-controller. The Pic-controller in respond give its locking command to the stepper motor to Lock down the leveler from where the tag data is being processed at the respective parking slot. Thus here included two types of locking one is Car internal locking and the Slot External Locking introduced in this project. Thus the security strength increases by twice. If the thief want to theft the car he have to unlock the car locking system and the Slot Locking System which is automatically handled by the autonomous system, giving the total security for the Car.

3.5 Cost calculation

Cost calculation process is simple according to the introduction of the application of passive RFID tag reader with passive tag.

The role of RFID tag and reader is very much important throughout the process in the parking from the entry to the exit. For the billing system the RFID tag plays a crucial role as when the driver/owner of the car takes the car to the billing area he has to scan the tag over the tag reader for the billing process. The billing process is that when the car enters into the specified parking slot the leveler close down and when it empty the slot the leveler opens up. The time between the close and open of the leveler from the respective slot gives the timing for how much the car has been parked. Thus calculating the interval time between open and close of the leveler with the cost per hour gives the expected charge for the parking.

Bill Charge = time interval between open and
close of the leveler

* charge per hour

3.6 At The Entrance

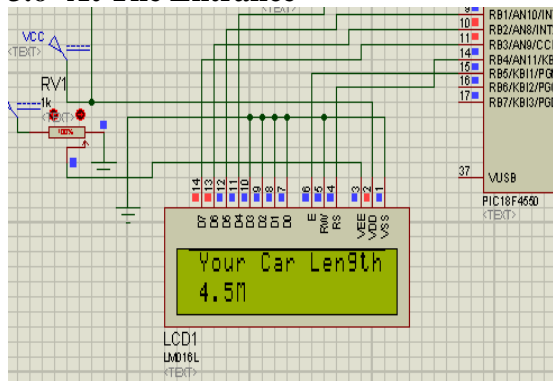


Fig 7(a): LCD Display at the Entrance

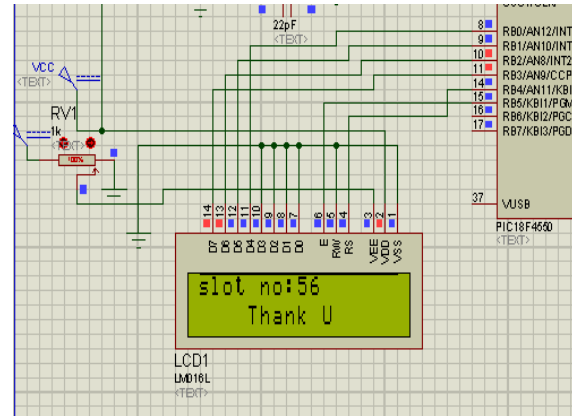


Fig 7(b): LCD Display at the Entrance

4. CONCLUSION

This project presents well categorized and distributed space available for parking by allotting the space according to the dimension of the cars with no space wastage in a utilized manner. The parking is made automated by using Ultrasonic sound sensor to detect length automatically located at entrance. The RFID tags that are assigned to the users provide the security in parking, making the parking system more secure and robust then the present system. The tags are identical to individual users. These tags are not only used for security purpose but also for providing the time interval for parking. The RTC interfaced with the controlling system gives the clock interval from occupying the parking slot to the state of empty.

5. ACKNOWLEDGMENTS

Our thanks to the expert Mr. Aditya Desai, who guided the project. We would also thanks for the references from the people giving the reference paper, and the website links for related information, the book authors for their books.

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INTELLIGENT RAILWAY CROSSING GATE CONTROL WITH HIGH SPEED ANTI-COLLISION ALERTING SYSTEM

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ABSTRACT

In India, railways have a dense network and the trains run at high speed. Hence, there is a very high possibility of accidents due to collisions, derailment and accidents due to weather conditions. Thus the paper aims at reducing the number of accidents. It considers the vulnerable areas of accident. It includes features like anti-collision and automatic gate control, accident detection and power saving in tunnel. These features are mainly modeled using Microcontroller AT89s52. Different types of sensors included in the model play a vital role.

General Terms

Avoid railway accident and save energy

Keywords:

Microcontroller, Motor driver Obstacle sensor, Mechanical sensor, IR sensor, LED.

1. INTRODUCTION

The Indian Railways has the world's fourth largest railway network in the world after United States, Russia and China.

Railway Safety is a crucial aspect of rail operation. Railways being the cheapest mode of transportation are preferred over all the other means.

To avoid such accidents the paper proposed will analyze few vulnerable areas of accidents and help to find out the possible way to reduce the number of accidents. The accidents occurring are mainly due to the carelessness in manual operations or lack of workers. It will be describing few major features namely anti-collision, automatic gate control and track misalignment. Anti-collision will avoid the collision between two trains or the train hitting a heavy mechanical object. Automatic gate control will help the accidents reduce occurring at the railway crossing. Track misalignment will avoid the accidents occurring due to two trains running on the same track in opposite direction. There are few minor features included like tunnel power saving and accident detection. The feature accident detection will enable the immediate help needed after the accident taking place without human interference. Tunnel power saving will help efficient use of power in tunnel.

2. PROPOSED SYSTEM

The proposed system is divided into two sides namely; the train side and the field side as shown in Fig 1 and Fig 2. The train side circuit is fitted on the train.

Train Side

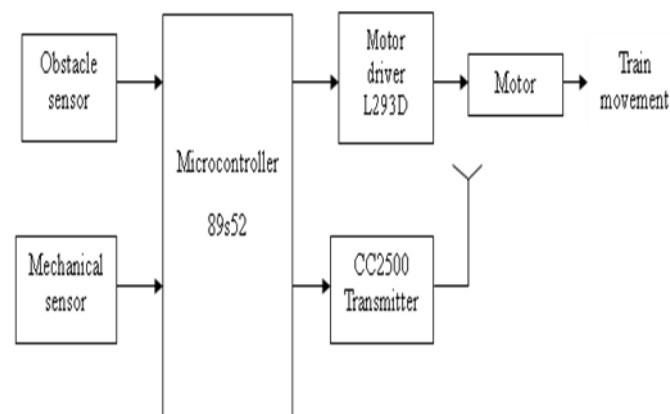


Fig: 1 Block diagram of train side

Field Side

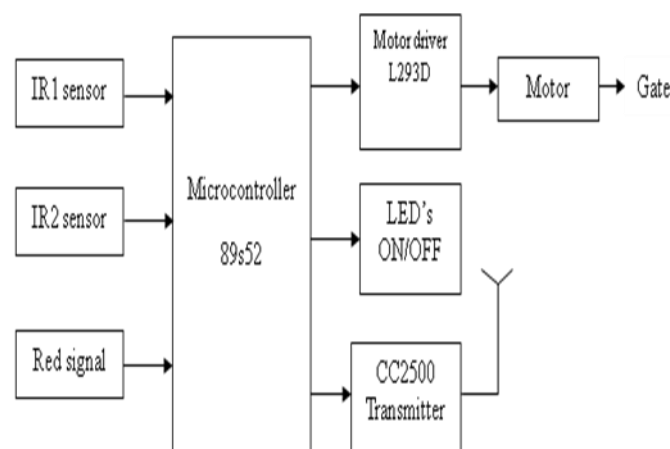


Fig: 2. Block diagram of field side

PC Side

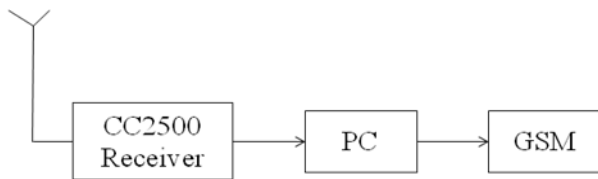


Fig: 3 Block diagram of PC side

2.1. Microcontroller:

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8Kbytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density non-volatile 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 conservative non-volatile memory programmer. 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.

2.2 IR (Infrared) sensor:

It is high power infrared emitting diode (950nm) GaAlAs/GaAs. TSAL6100 is a high efficiency diode. It is pair of transmitter and receiver. It works on the principle of line of sight. These sensors will be used for implementing automatic gate control and tunnel power saving.

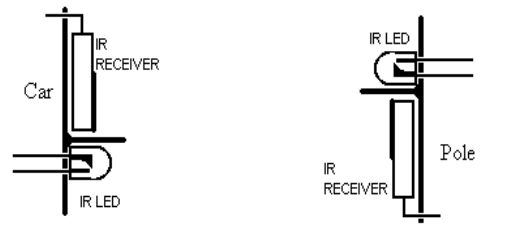


Fig: 4 Schematic diagram of IR sensor

IR receiver consists of Photo Diode. A photodiode is a type of photo detector capable of converting light into either current or voltage, depending upon the mode of operation.

2.3. Obstacle sensor:

It is transceiver. It consists of IR LED and IR receiver (TSOP) and IC555. A constant stream of square wave is generated by IC555 at particular frequency which drives IR LED.

When this signal is hit by an obstacle the signal is sent to the microcontroller. This sensor is used to implement anti-collision.

2.4. Motor driver (L293D):

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 you can control two DC motors with a single L293D IC. It works on the concept of

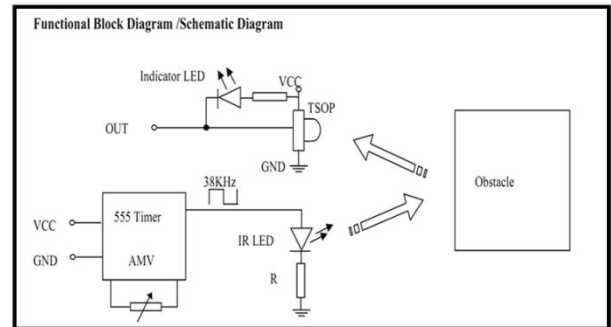


Fig: 5 Functional block diagram of Obstacle sensor

H-Bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. The change in the direction of the voltage enables the motor to rotate in clockwise or anticlockwise direction. In a single L293D chip there are two H-BRIDGE circuits inside the IC which can rotate two DC motors independently. Due to its size it is very much used in robotic applications for controlling DC motors.

2.5. CC2500 transceiver module:

MO-CC2500 is a FSK /MSK transceiver module. It provides extensive hardware support for packet handling, data buffering, bus transmissions, link quality indications and wake on radio. It has a high performance and is easy to design. It can be used in 2400-2483.5 MHz ISM/SRD band system. The module's frequency output power, sensitivity can be programmed.

3. FEATURES

3.1. Automatic gate control system:

Main feature of our project is automatic gate control. This feature is implemented using two pairs of IR sensors. One pair is placed before the gate at a certain distance; another pair is placed after the gate at a distance. When the train crosses the line of sight path of the first pair of IR sensor the sensor will send the signal to the microcontroller. This signal will be sent to the microcontroller at the field side near the gate. This signal sent will further open the gate. Same process will repeat when the train will cross the second pair of IR sensors.

3.2. Anti-collision system:

Anti-collision will be implemented using the obstacle sensors fitted on the train side. The obstacle sensors sense the obstacle using infrared LED and infrared detectors. The signal will be fed to the microcontroller. As soon as the signal is received the microcontroller will take the necessary actions to stop the train. The obstacle sensor is essential is a transceiver which helps to transmit the signal to the microcontroller.

3.3. Accident detection:

This is another feature with the sensor network and communication network for disaster management, in which the concerned authorities dealing in disaster management get the message on their mobile phones about disaster information. The proposed model will be using the GSM technology and on-board mechanical sensors to detect an accident or crash. The mechanical sensors will sense the accident and will send the signal to the GSM module.

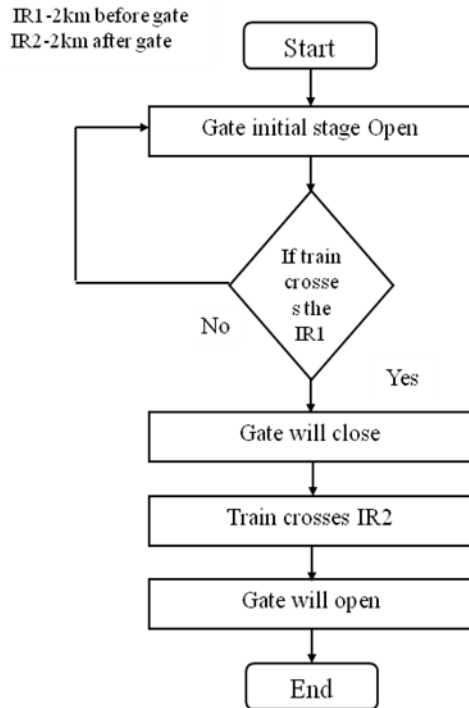


Fig: 6 Flowchart of automatic gate control system

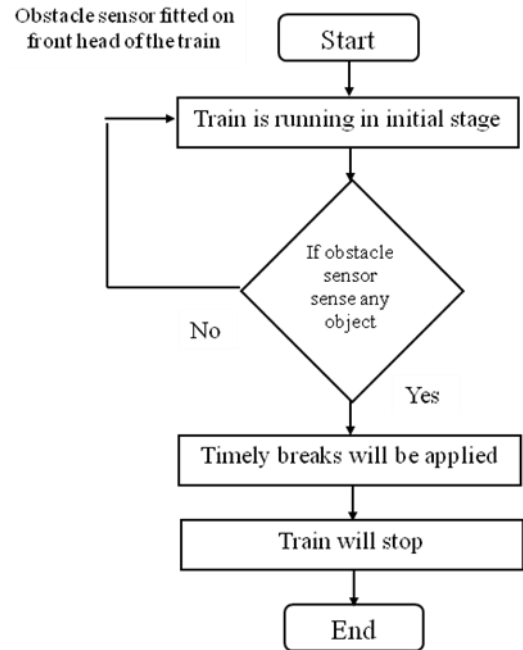


Fig: 8 Flowchart of anti-collision system

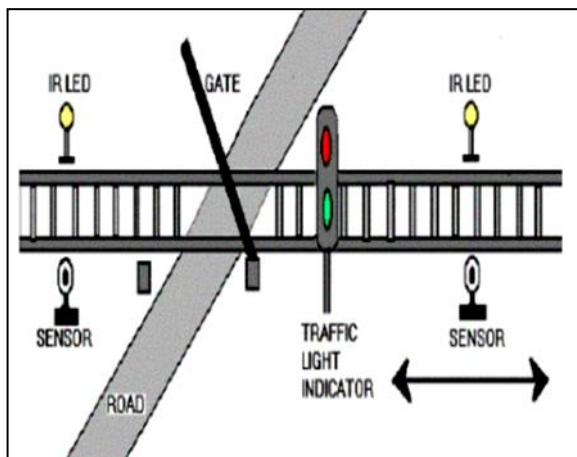


Fig: 7 Illustration of gate control

The GSM module will then send an emergency message to the nearest hospital and police station.

3.4. Tunnel power saving system:

Tunnel power saving is implemented using two pairs of IR sensors. One pair will be fitted at the entrance of the tunnel and other pair at the end of the tunnel.

The lights are initially OFF, when the train crosses the line of sight of the IR sensor at the entrance the signal is giving to the microcontroller at the field and the microcontroller will take the necessary action to switch ON the light in the tunnel. Similarly, the train crosses the line of sight of the IR sensor pair at the exits of the tunnel. Then signal is given to the microcontroller and the light will switch OFF again.

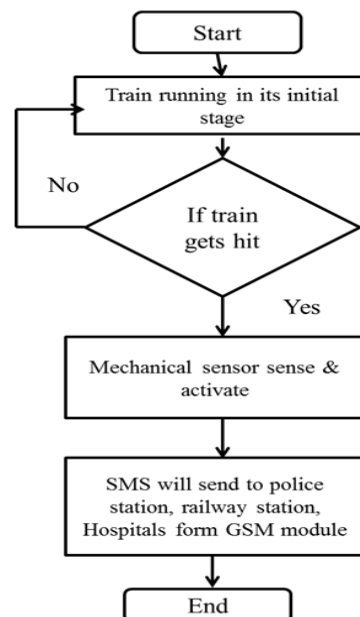


Fig: 9 Flowchart of accident detection

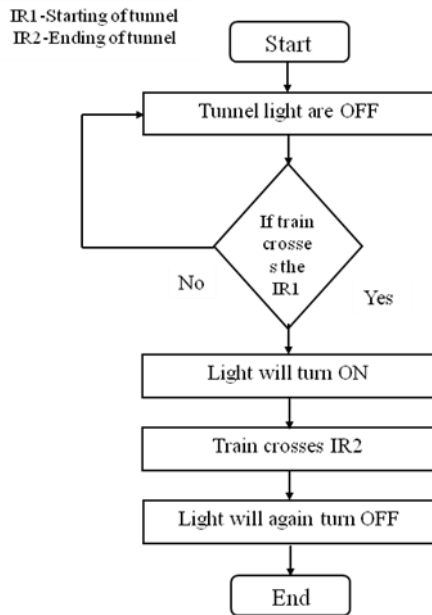


Fig: 10 Flowchart of tunnel power saving system

4. RESULT

The result expected by implementing the above mentioned features can be described feature wise.

In automatic gate control the IR sensors placed on the either sides of the gate will sense the presence of the train and will control the movement of the gate according to avoid accidents.

In anti-collision the obstacle sensor placed on the train will sense the obstacle or another train on the same track and will cause the train to stop.

In power saving the IR sensors will sense the train entering the tunnel and will keep the lights ON only as long as the train is there in the tunnel.

In accident detection the sensors will sense the accident that took place and will send an SMS using GSM to the nearest police station, railway station and hospital for immediate help.

5. CONCLUSION

The paper proposed above deals with the safety of railways. The various features mentioned and described in the paper intend to provide secure and safe commutation. The features include anti-collision and automatic gate control lessen the manual interference and hence increase the accuracy and precision to avoid accidents occurring due to more negligence. Accident detection provides emergency assistance needed if an accident occurs.

It demonstrates that it is possible to improve the overall safety of the railway system in India. The success depends on both the railway industry and the regulator working together to

achieve that common goal. The proposed system provide the means for real time inspection, review and data collection for the purpose of maintenance on the movable and fixed facilities for the guarantee of operation safety and maintenance efficiency as well as the safety appraisal decision-making system based on the share of safety data.

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AUTOMATED WHEELCHAIR USING EYE DETECTING SPECTACLES

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ABSTRACT

Traditional electric-powered wheelchairs are normally based on joystick control, head control, hand gesture control etcetera. Many people with disabilities do not have the ability to control powered wheelchair using the above mentioned interfaces. The above mentioned controls provide a more natural mode of interaction between a human and a wheelchair, but also require the user to be concentrated during motion due to safety reasons and can make the user uncomfortable. It can also lead to false triggering by the unintentional face movements made by the user. The eye-control powered wheelchair offers them a possible alternative. This wireless intelligent chair will automatically move in a particular direction as the person moves his eyes towards a direction, with the help of eye ball movement detection sensor. The aim of our project is to develop a new method that allows the user to look around freely while the wheelchair navigates automatically to the desired goal point.

General Terms

Sensor based movement detection using I.R. Sensors and microcontroller.

Keywords

Automated wheelchair, Sensor based wheelchair movement.

1. INTRODUCTION

1.1. Importance of the project:

The powered wheelchair is a mobility aided device. It gives the user independence to movement. This wheelchair is designed taking in consideration the needs of the handicapped people.

Transportation is a very important role in this advanced world. The world is moving towards automation. The aim of this project is to introduce automation in transportation for the physically challenged people. This project proposes advanced model of existing system. This existing system can operate using joysticks in hand or using head movement detection sensor. But this proposed system operates in eyeball movement detection.

Inside house physically challenged people reaching a desired destination is difficult. So, physically challenged people can't move freely inside their house they depend on others for their motion. Here with the help of eyeball movement sensor system, the new idea of providing a low cost, less hardware complex embedded system that helps the physically challenged people to move freely inside their rooms.

1.2. Motivation:

The main reason behind the implementation of this project is to give a helping hand for the sufferings of the challenged people. They have no way to get rid of from the bed due to their lack of movements. Degeneration of nerve cells and muscle fibers can lead to the challenges. To defeat the challenges is the main objective of this project. By designing the wheelchair for the challenged people can reduce the sufferings of the patients to an extent. Powered wheelchairs play a vital role in bringing independence to the severely mobility-impaired and allow people to get on with their activities of daily living. Many people who suffer from mobility-impairments rely on powered wheelchairs to get out and about. However, a substantial number of users find it difficult to operate their chairs effectively; this can be due to a variety of physical, perceptive or cognitive impairments. It needs for the development of smart wheelchairs that would empower people with mobility impairments to get on safely with their activities of daily living. The disabled people can direct the wheelchair to the designation without any difficulty.

1.3. Scope of the project:

The project deals with the people who are completely paralyzed below the neck who can at least make movement of their eyes. But the people who cannot make eye movement either cannot use this system. The further scope of the project can be like use of brain waves for the movement of wheelchair. But this requires a lot of research and development.

The G.P.S. tracking can be improved by connect it with the satellite and sending the exact coordinates of the user to the close personals so as to track their exact location on some application like Google maps or any other G.P.S. navigation software.

2. LITERATURE SURVEY

The automated wheelchair movement is an application for people suffering from diseases such as paralysis, loss of legs or any other body part, people who are overweight who cannot even walk etc. But in the above mentioned cases if the user has lost his hands or who is paralyzed below neck cannot operate the wheelchair with techniques that include joystick. Such user is dependent on the caretaker for all the time. In order to overcome these problems, there are various methods we came across while doing the literature study of various types of process used to overcome this problem. The entire literature survey is divided into various sections mentioned below:

- I. Sensor based wheelchair movement.
- II. Image processing based wheelchair movement.
- III. Other methods of wheelchair movement control

2.1. Sensor based wheelchair movement:

The Electro-Oculogram method obtains the gaze direction by sensing the electrooculographic potential. This is done by measuring the potential using electrodes placed on face where human eye is an electric dipole with a negative pole at the fundus and positive pole at the cornea. [2][9]

A simple, but very effective control algorithm was developed to control the wheelchair. At the beginning of a dialog a user inputs some control command (either by swiping a finger through a touch plate, by uttering a voice command or by moving an eye). Depending on the configuration and his abilities a user might be able to use more than one input modality.[4]

Master Controller: A PIC Microcontroller will act as a master controller for the movement of the automated wheelchair. It is responsible for all the decisions taken by the automated wheelchair.

Eye ball Movement Sensor: This is used to sense the movement of the eye ball's direction and converts it into digital data and transfers it to the Master controller. (Straight Command, Left/Right Command, Stop Command). [7]

Touch Screen - A touch screen is an electronic visual display that the user can control through simple or multi-touch gestures by touching the screen with additional fingers. The touch screen permits the user to interact directly with what is displayed, instead of employing a mouse or any other intermediate device. **Accelerometer Technology** -The accelerometer sees the acceleration related to the development of weight experienced by any mass at rest within the frame of reference of the accelerometer device. Accelerometers can be used to measure vehicle acceleration.[8]

2.2. Image processing based wheelchair movement:

Image Capturing is to capture a sequence of iris images from the subject using a specially designed camera. In iris recognition image capturing is a very important step. The image is then changed from RGB to gray level for further processing. It is to capture a sequence of iris images from the subject using a specifically arranged camera. With an average diameter of 12 mm, a camera must have enough resolution to capture the details of the iris pattern. [1]

Infrared camera system consists of single infrared camera, net-book, micro-controller, and, modified wheelchair. Camera is mounted on user glass in order to allow user movement. Infrared LED will adjust illumination when illumination of environment is changes. Also, this camera position will allow user movement because camera always follows head movement. After user's image acquired by camera, image processing analysis methods estimates user gaze from this image. Viola-Jones eye detection, adaptive threshold, and Kalman filter are used to estimate the gaze. Single ultrasonic sensor, which used to avoid collision, puts on front of wheelchair. In order to control wheelchair, invisible layout is used. Turn left, right, and go forward will be selected by user by looking at the key during 2 seconds. Invisible keys mean that user know the keys position without any real mark. When user changes the gaze direction, wheelchair will automatically stop. Also when system fails to analyze user gaze, wheelchair will stop..[3]

The coherence algorithm works for detecting the motion of eye. This algorithm operates on the frames extracted from the video of the eye. From the frame, the algorithm extracts the pixels which lie on the vertical edges of the rectangular area selected by the user. These pixels are then processed to

determine the RGB values. When the user is looking straight in front, the pixels on both the vertical lines are black. This is interpreted as the "center" direction of the user's eye. When user looks towards left, the pixels on the left vertical line are black, but the pixels on the right vertical line are white. The closed eye condition is also recognized by the software. This condition is then used to determine the blinking of the eye. The user has to blink his eye for a second if he wants to start moving or stop moving the wheelchair. Also, an obstacle detection module is added to the system for safety of the user. [6]

2.3. Other methods of wheelchair movement control:

In lens tracking method a non slipping contact lens fits over corneal bulge. The tracking of the pupil is recorded by affixing a magnetic coil or mirror to the lens. The integrated mirror in the contact lens allows measuring reflected light; alternatively, the integrated coil in the contact lens allows detecting the coil's orientation in magnetic field. The big advantage of this method is high accuracy and nearly unlimited resolution in time.[2]

HM2007 is a single chip CMOS voice recognition circuit which has 8 bit data out which when combined with any microcontroller an intelligent recognition system can be built. GSM based Alert mechanism (SIM300) Advantage of using this modem will be that we can use its RS232 port to communicate and develop embedded applications. Applications like SMS control, data transfer, remote control and logging can be developed easily. [5]

In each and every methods discussed above there are some advantages and disadvantages. Like in EOG method the chances of sensor not detecting the movement is very high or the sensor need to be very sensitive. Also for people who cannot make head movement there the system can fail [9].

In image tracking methods, there is a common problem faced is that the camera placed in front of the eye for movement detection can block the view of the user. Also it makes the device for a bit heavy which can make the user a bit uncomfortable [1]. We have tried to combine the advantages of both. IR Sensors will be placed on a spectacle in place of a camera as it weighs less than camera. Also the sensors are more sensitive than the EOG method electrodes and cheaper in cost.

3. METHODOLOGY

3.1. Block Diagram:

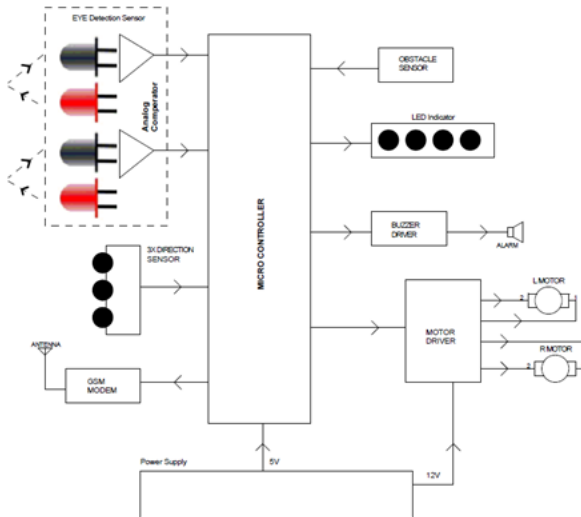


Figure 1: Block Diagram

3.2. Infrared Detection:

3.2.1. Features:

- I. Microcontroller based design for greater flexibility and ease of control
- II. Modulated IR transmitter
- III. Ambient light protected IR receiver
- IV. No need of calibration and adjustment
- V. 3 pin easy interface connectors
- VI. Bus powered module
- VII. Indicator LED
- VIII. Active low digital output on detecting obstacle
- IX. Up to 20cm range for white object
- X. 5 VDC supply sourced through the interfacing Relimate connector

3.2.2. Applications

- I. Proximity Sensor
- II. Obstacle Detector Sensor

3.3. Microcontroller:

A microcontroller is a computer on a single chip; it contains a CPU (usually called the core) and a variety of peripherals which assists our application. In simple circuits the microcontroller may be the only IC. Many microcontrollers can operate with no external components except an oscillator (a crystal resonator).

3.4. PIC:

Microchip's RISC family has been around a few years now. It has become very popular through aggressive OTP pricing, a simple instruction set, robust hardware (e.g. brown-out detectors) and excellent support.

3.5. DC MOTOR CONTROLLING:

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.

Let's start by looking at a simple 2-pole DC electric motor (here red represents a magnet or winding with a "North" polarization, while green represents a magnet or winding with a "South" polarization).

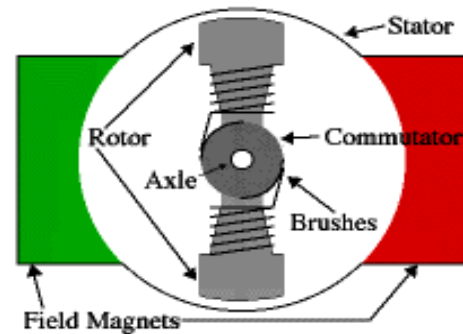


Figure 2: Two Pole DC Electric Motor.

Every DC motor has six basic parts -- axle, rotor (a.k.a., armature), stator, commutator, field magnet(s), and brushes. In most common DC motors, the external magnetic field is produced by high-strength permanent magnet. The stator is the stationary part of the motor -- this includes the motor casing, as well as two or more permanent magnet pole pieces. The rotor (together with the axle and attached commutator) rotates with respect to the stator. The rotor consists of windings (generally on a core), the windings being electrically connected to the commutator. The above diagram shows a common motor layout -- with the rotor inside the stator (field) magnets.

The geometry of the brushes, commutator contacts, and rotor windings are such that when power is applied, the polarities of the energized winding and the stator magnet(s) are misaligned, and the rotor will rotate until it is almost aligned with the stator's field magnets. As the rotor reaches alignment, the brushes move to the next commutator contacts, and energize the next winding. Given our example two-pole motor, the rotation reverses the direction of current through the rotor winding, leading to a "flip" of the rotor's magnetic field, driving it to continue rotating.

3.6. EYE TRACKING MODE:

This mode basically works on the basis of IR transmitter, receiver and analog comparator. We will place four IR detection sensors in the four directions on one side of the goggle. The transmitter will continuously transmit IR light to keep a check on the position of the pupil. The basic principle can be explained from the figure below.

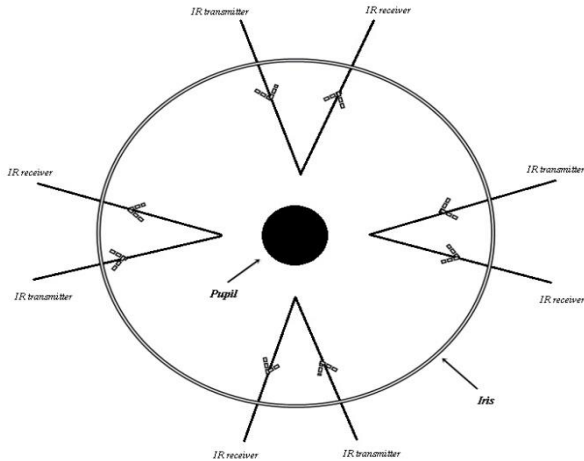


Figure 3: Working of IR Detection Sensors

In the reflection mode, when the IR receiver receives the IR light it produces minimum voltage when reflected from a black surface and comparatively higher voltages from surfaces lighter than black. The pupil of the eye is darker black compared to the iris. So the pupil is tracked using the sensors. So when the user looks towards a particular direction the voltage drop is measured in every sensor and sent to the analog comparator. The analog comparator compares the outputs of the four sensors. We write an algorithm such that the wheelchair moves in the direction in which the sensor recorded the lowest drop. The controls using this system can be illustrated from the figure 4.

When the user looks in the left direction the wheelchair turns left and similarly for the right direction. For moving in the forward direction the user has to look down. If the user is not looking in any direction the system will go in the hold mode. We cannot keep the system in the on state always as it can lead to false triggering of the system. So we design it in such a way that when the user looks upwards the system will deactivate or activate as per the need of the user. We are not designing the system to move backwards as the user will not be able to see behind.

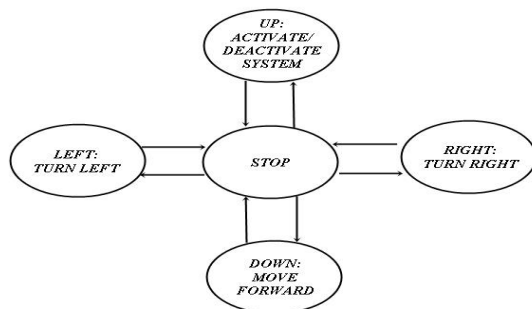


Figure 4: System Control

Thus the eye tracking mode will give the user independence to movement as they will not have to stay dependent on someone for moving about. The use of obstacle detection sensor also makes it less risky for the user as, when an obstacle is detected the system will automatically stop to

avoid any possible collision. So if the user does not see the obstacle they don't have to worry as there is no risk of colliding with it. Also if the user faces some problem and needs help they can use the GSM module and send a message to their relative or care taker. Thus this system will give complete independence to the user.

3.8 IR DETECTION MODE

This mode is used as the caretaker follower mode. In this mode we use IR light detectors and IR light emitter to guide the wheelchair. This gives independence to the care taker as they don't have to push the wheelchair and the wheelchair will follow them by IR detection sensing. The working of this mode can be illustrated by the diagram below.

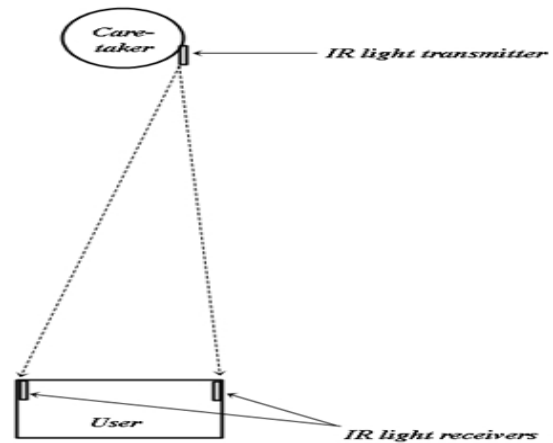


Figure 5: Working of IR Detection Mode.

The IR light receivers receive the IR light which is emitted from the transmitter with the care taker. We use two detectors for receiving the light. The received intensities of the lights will be compared by a comparator and thus the direction to move in will be decided by the system. The sensors will work as long as the proximity is maintained. This will give complete independence to the care taker and the user as the wheelchair will follow the IR light.

4. TOOLS TO BE USED:

4.1 HARDWARE REQUIREMENTS

- 1) Microcontroller: PIC 16F72 (28 pin microcontroller).
- 2) Motor driver: L293D motor driver/ controller (dual channel) used to control both the motors.
- 3) Analog comparator: LM358 dual operation amplifier/ controller.
- 4) Infrared sensors:
 - a) Transmitter: 5mm or 3mm IR LED
 - b) Receiver: 5mm or 3mm photodiode or photo transistor (black color)
- 5) Obstacle sensor: 5V digital output active low infrared proximity sensor.
- 6) Microcontroller oscillator: 4MHz Crystal oscillator
- 7) Buzzer driver: BC547 n-p-n switching transistor
- 8) Buzzer: 12V piezoelectric buzzer
- 9) Battery: 12V/1.2Ah lead acid rechargeable battery
- 10) Filter capacitor: 1000µF/16V electrolytic capacitor
- 11) Voltage regulator: LM7805 5V v/g regulator IC

12) DC motor: 12V 100rpm DC geared motor

4.2 SOFTWARE REQUIREMENT

We are using Embedded C for microcontroller programming.

4.3. SOFTWARE FLOWCHART:

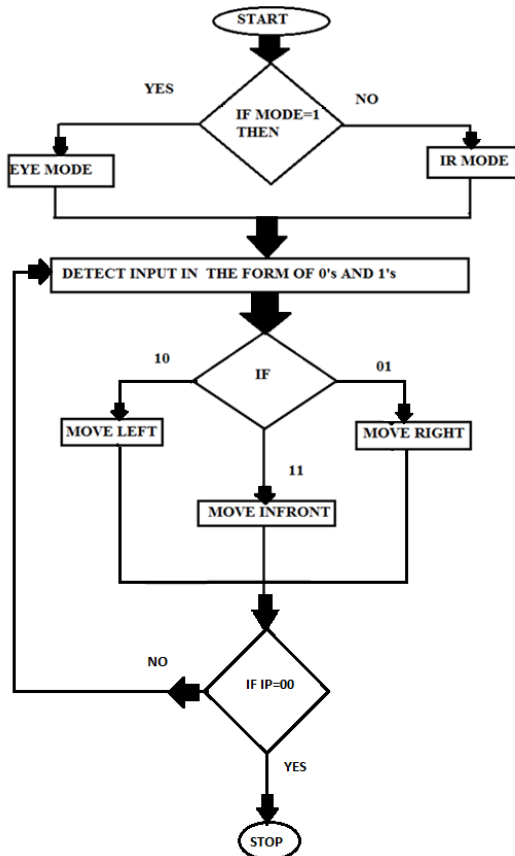


Figure 5: Software Flowchart

5. APPLICATIONS

The main application and advantage of using our technology is that the people who are unable to use the current technology can use our technology. Also, the care taker has to take less effort to handle the wheelchair. There are also a few safety measures included to protect the disabled.

6. FUTURE SCOPE:

- I. The project deals with the people who are completely paralyzed below the neck who can at least make movement of their eyes. But the people who cannot make eye movement either cannot use this system. Use of brain waves for the movement of wheelchair can be an alternative.
- II. Further the I.R. navigation can be made remote controlled.
- III. The obstacle detection could be made by using image processing techniques such as edge detection to detect the obstacle. Thus making obstacle detection more precise.

7. CONCLUSION

Thus we can create an easier interface for the interaction between a human and a machine. This technology will help a number of patients and elderly people having different needs. The use of eyes in this system is easy as the patient just has to look in a particular direction. The inclusion of IR detection mode will help people to carry the patient without pushing them. This will help caretakers who cannot manage to push the wheelchair along with the patient. It will allow the people with eye sight problems to use this wheelchair too. The use of GSM module and obstacle detection both make it less risky and highly efficient.

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- [11] A State-of-Art Survey AMER AL-RAHAYFEH AND MIAD FAEZIPOUR (Member, IEEE) University of Bridgeport, Bridgeport, CT 06604, USA Corresponding author: M. FAEZIPOUR “Eye Tracking and Head Movement Detection”, Received 21 May 2013; revised 27 July 2013 and 30 August 2013; accepted 15 October 2013. Date of publication 6 November 2013; date of current version 14 November 2013 (mfaezipo@bridgeport.edu)

SOLAR OXYGEN TREE

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ABSTRACT

Solar oxygen tree is a power generating method from solar energy. It is simple and is generated from natural resource. This project helps to generate energy by setting the equipment to get maximum sunlight automatically. It tracks maximum intensity of light. If there is decrease in intensity, it adjusts its direction automatically towards the maximum intensity.

An electrical power source is connected to two electrodes which are placed in the water. Hydrogen(H) molecule will appear at the cathode i.e. negatively charged electrode, and Oxygen molecule(O) will appear at the anode i.e. the positively charged electrode. The amount of hydrogen generated is double the number of molecules of Oxygen, and both are proportional to the total electrical charge conducted by the solution.

1. INTRODUCTION

Water is a very limited natural resource and in many cases there is not enough supply of water of appropriate quality for domestic and industrial use. Many pollutants are harmful and toxic to the environment and human health. As the rivers, lakes and other water bodies are being continuously polluted and the potable water supply is insufficient in many places, there is an urgent need to techniques for the treatment of waste water. Electrolytic treatment of wastewater presents an innovative technology in which a sacrificial metal anode and cathode produce electrically active coagulants and tiny bubbles of hydrogen and oxygen in water. Trees naturally convert the CO₂ into O₂. But today because of Greed Selfish Humans are cutting trees and forests and on that place we humans are building white cement forest. Thus we humans are not getting pure air. Population is increasing and number of trees are decreasing. This will lead to various problems and many more. We are using three sensors in two directions to sense the direction of maximum intensity of light. The difference in the outputs of the sensors is given to the micro-controller. Here we are using the micro-controller for tracking and generating power from sunlight.

2. LITERATURE SURVEY

A solar tracker is a device that orients a payload toward the sun. Payloads can be photovoltaic panels, reflectors, lenses or other optical devices. In flat-panel photovoltaic (PV) applications, trackers are used to minimize the angle of

incidence between the incoming sunlight and a photovoltaic panel.

Recent works done by Ciobotaru (2007), Pandiarajan (2012) and Jamri (2010), respectively [1], [6] and [7], revealed some basic aspects of photovoltaic cell modelling. They have adopted similar model of solar cell and carried out some simulation works on their output characteristics including power vs voltage and current vs voltage using MATLAB/Simulink. The output characteristics are similar showing a power that increases proportionally to the voltage from an initial stage up to a certain threshold after which it decreases rapidly down to zero.

In March/June 2011, Ahmed Hamza H. Alia, Y. Matsushita, S. Ookawara introduced the paper "Photovoltaic Module Thermal Regulation: Effect of the Cells Arrangement Configurations on the Performance"[5]. This study is carried out to clarify experimentally the effect of higher PV module temperature on the module output power when the module works with and without thermal regulation system. Moreover theoretical study results are used to clarify which of the three configurations, in-line, oblique and offset of the cell location inside the channel, provide higher heat transfer rate at minimum friction factor. From the outdoor experimental measurements on PV module results indicate that, the cell temperature is the prevailing parameter affecting the module output power more than the solar irradiance. Using PV modules in hot arid areas without thermal regulation leads to an increase in the total module areas ranging from 2.12 to 1.8 times that of module using thermal regulation system producing the same power[5].

In 2013, Lalia Miloudi, Dalila Acheli, Ahmed Chaib published the paper "Solar Tracking with PV panel"[2]. In this paper we studied the effect of the slope and the orientation on the maximum power extracted from a photovoltaic module. We present the simulation of the sun trajectory tracking with a PV panel, keeping continuously the panel surface oriented face the sun[2].

In December 2013, Amevi Acakpovi and Essel Ben Hagan introduced "Novel Photovoltaic Module Modeling using Matlab/Simulink"[3]. This paper deals with the modelling of solar energy conversion through photovoltaic effect. An analytical model presented in first instance was later constructed under Matlab/Simulink and simulated for two effects: varying irradiance and varying temperature. The developed model was firstly not simulating successfully because of the presence of two algebraic loops. However, the

model has been later improved with a comprehensive solution to the two algebraic loops. One was solve by insertion of delay block while the other was solve by a re-working of necessary formula. Finally, simulation results show that more irradiance greatly increase the generation of energy while big variation of temperature reduces the current and power produced. This results obtained in form of two fundamental graphs namely power characteristic (power over voltage) and current characteristic (current over voltage) are very similar to empirical results known for solar system and this further confirms the effectiveness of the proposed model[3].

Electrolysis is a process in which the elements of waste water i.e. hydrogen and oxygen are separated out this electrolysis process was introduced in “1800 by William Nicholson and Anthony Carlisle (view also Johann Ritter), to decomposed water into hydrogen and oxygen and still its continuing various technologies, method of electrolysis are invented after 1800 and still new techniques are coming. The idea of creating sustainable energy systems has lead over the past decade to several hydrogen energy demonstration projects around the world. The method that has plenty of potential to improve the production of hydrogen is electrolysis. The principle of electrolysis has been well known since the early 19th Century and today’s state of the art electrolyzers are systems of high security and easy use. Water Electrolysis is a very simple process that takes water and passes a supply of electricity through it using immersed electrodes to split into positive hydrogen (H⁺) and negative oxygen (O⁻) ions. These hydrogen and oxygen ions migrate through the water towards the cathode and anodes respectively, where electron transfers allow for the diatomic H₂ and O₂ molecules to form at high purity[13]. This Hydrogen can be used for production of electricity that can be produced from many different sources, including fossil fuels, renewable resources, and nuclear energy; a thorough review of the available literature on issues relevant to hydrogen production, it also reveals that water electrolysis would be the easiest option.

Hydrogen can be produced from water electrolysis, high temperature electrolysis [17] and various alkaline methods [18], PEM technologies are also used [19] which can operate at atmospheric pressure or high pressure. In high temperature electrolysis part of the energy is used for the production of steam (700° C) [17]. In alkaline technology various chemicals are used like tetra-alkyl ammonium sulfonic acid [18]. Thereafter various techniques were used such as tube type receiver for high temperature electrolysis in this HTE very high temperature is required and its efficiency is also high than alkaline electrolysis [17].

The most common methane reforming processes for hydrogen production are known as: “steam reforming (SR)”, “partial oxidation reforming (POR)”, “auto thermal reforming (ATR)”, “dry reforming (DR)” and “dry oxidation reforming (DOR)” With respect to fuel cells, both the degree of purification of H₂ as the nature of the electrode catalysts and

the electrolyte used, can interfere with the functioning and efficiency in generating electricity. Cells with higher temperatures besides presenting higher electrical efficiency, they also have a higher tolerance to CO₂ (50 ppm). To these cells, there are several studies that show that the bimetallic catalysts reduce the tendency to coke formation. They should be chemically and thermally stable, preventing carbon deposition on its surface (coke) which consequently slows down the inactivation process.

3. PROPOSED METHODOLOGY

Here we are using three sensors in three directions to sense the direction of maximum intensity of Sunlight. The outputs difference of the sensors is given to the microcontroller unit. The microcontroller is being used for solar tracking and generating power from sun. It will process the input voltage from the comparator circuit and control the direction in which the motor has to be rotated so that it will receive maximum intensity of light from the sun.

3.1 Block diagram of Solar Oxygen Tree

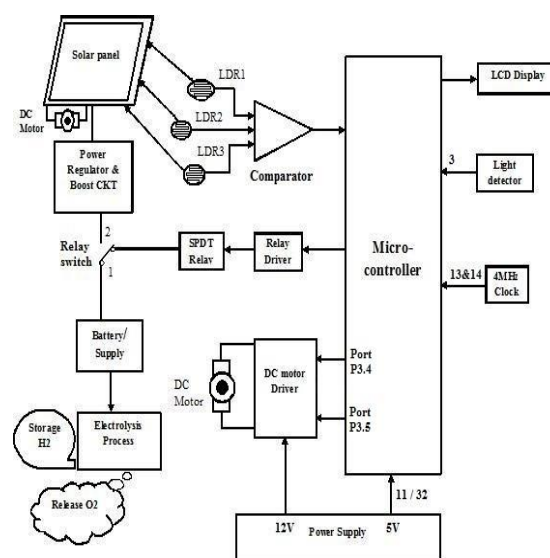


Fig.1 Block diagram of Solar Oxygen Tree

The solar output is used for electrolysis from which hydrogen and oxygen is obtained.

4. EXPECTED RESULT

No.	Parameters	Expected o/p
1.	Supply voltage	12 V
2.	LM7805 Voltage Regulator	5V

We are expecting to obtain hydrogen and oxygen from acidic water or industrial waste water. The hydrogen thus obtained can be used for various purposes.

5. FUTURE SCOPE

The hydrogen obtained from “Solar Oxygen Tree” can be used for generation of ‘electricity’ using ‘hydrogen fuel cell’. And can also be used as fuel for vehicles.

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SENSOR TRIGGERED AUTOMATIC ROBOT TO PICK AND PLACE

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ABSTRACT

The pick and place robot is one of the technologies in manufacturing industry and designed to perform pick and place operation. The system is very important for eliminating human errors and to get more precise work. It can be used in high temperature, narrow area and very heavy load thing. The robot can be further modified with the gripper for lifting heavier objects. The microcontroller is programmed to make the robot move forward, turn right or turn left based on the input coming from the comparator. The outputs of the microcontroller are fed to the motor driver. On receiving the signals from the microcontroller the gripper gets activated if the object is detected. The gripper will first hold the object and then it will place the object to the specified position. However the destination is specified through the programming. Color sensors are used to distinguish between obstacle and object. However the obstacle is removed from its path by using gripper motion. The advantages of this robot are its movement is automatic, cost effective and is simple to build.

Keywords:

Pick and place; IR based line follower; object differentiation using color sensor.

1. INTRODUCTION

A robot can be defined as a programmable, self-controlled device consisting of electronic, electrical, or mechanical units. More generally, it is a machine that functions in place of a living agent. Robots are especially desirable for certain work functions because, unlike humans, they never get tired; they can work in physical conditions that are uncomfortable or even dangerous; they can operate in airless conditions; they do not get bored by repetition; and they cannot be distracted from the task at hand[4].

The pick-and-place processes are the primary requisite for many of the industrial and household application. For such applications, there is a need to automate the pick-and-place process basically comprising of picking the intended objects, possibly performing certain tasks and placing them to desired location. The automated pick-and-place systems mainly consist of robotic arms and sensors. The machine vision is used as sensor and the primary function of them is to drive the robotic arms to the right location of desired object for picking and placing according to the robot's degrees of freedom. The placing location is prefixed in most applications hence the

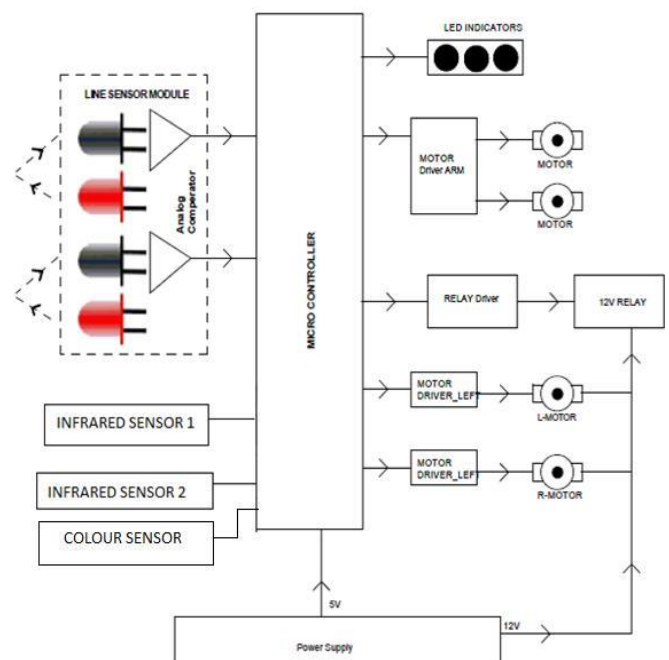
sensors are rarely used here and the placing phase found to be comparatively easier. In contrast, the picking phase becomes very complex process in the applications where the scene is occluded and constrained. In this phase the sensors plays most important role as it is responsible for correct movements of the robotic system [6].

A line-following robot is a self-operating robot that detects and follows a line drawn on the floor. The path to be taken is indicated by a black line on a white surface. The control system used must sense the line / Path and man oeuvre the robot to stay on course while constantly correcting the wrong moves using feedback mechanism, thus forming a simple yet effective closed-loop system.

The arm control by robotics is very popular in the world of robotics. Our primary objective is to make the Robotic arm, having servo motors or a dc motor to interface with the microcontroller based Robotic arm. This microcontroller also provides interfacing to other devices for performing various operations. However we have interfaced pic microcontroller to the drivers used for driving the motors for base movement and gripper motion.

2. DESIGN METHODOLOGY:

BLOCK DIAGRAM:



2.1 Line/Path Detection

A Line follower robot is an electronic system that can detect and follow the line drawn on the floor. Generally, the line is specified a predefined path that can be either visible like a black line on a white surface with a high contrasted color. Light dependent resistor sensor has been attached with the robot whose resistance varies with light intensity. When the LDR receives maximum amount of light then its resistance goes to its minimum value, ideally zero and when no light falling on the LDR then its resistance goes to its maximum value, ideally infinity[1].

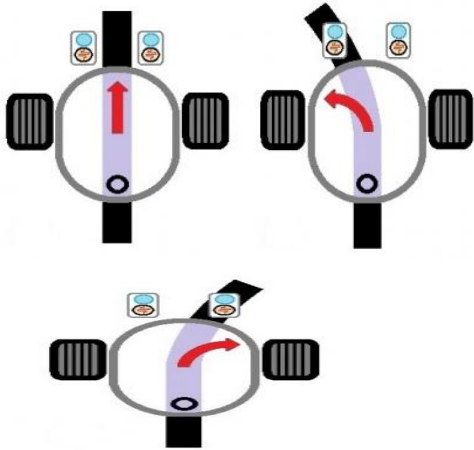


Fig 2: Line Detection Sensor Module

There is also the robot's movement using mobile phones. It is manually operating robot for selecting a desired path. Also it has a feature that it can choose a particular path from multicolored paths according to the command given by the user. The robot movement is controlled by android software using an application where a command is given by the phone to the robot and robot functions accordingly [2]. Author explained about using the infrared sensors for detection of path for robots. Infrared sensors are accurate and available easily and have low cost as compared to other sensors [3].

2.2 Object Detection

Object detection is primary requirement for any autonomous robot. The robot acquires information from its surrounding through infrared sensors mounted on the robot. Bump sensor, infrared sensor, ultrasonic sensor, laser range finder; charge-coupled device (CCD) camera web cam and so on can be used for obstacle avoiding. Methods of obstacle avoiding are

distinct according to the use of sensor. Some robots use single sensing device to detect the object. But some other robots use multiple sensing devices. Author used charge-coupled device (CCD) camera as the detection device [5].

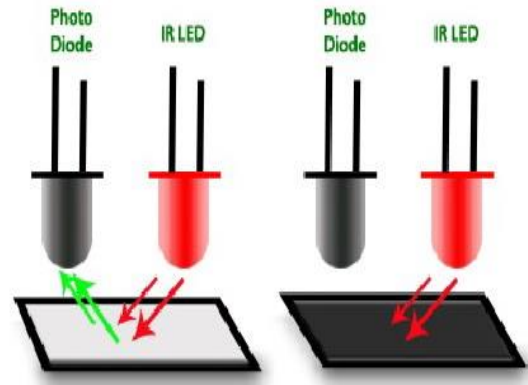


Fig 3: IR Reflective Sensors

Also infrared sensors can be used for object detection. However the Robot was only able to detect the obstacle but could not replace it. It only avoids the collision. The reason for choosing IR sensors is because of its low cost, reliability and its ability to cover larger distance [6]. The robot uses the IR sensors for performing operation of identifying the object or an obstacle but with the advantage that the ROBOT has two arms for picking up the object [7].

2.3 Gripper Motion

Robot uses magnetic gripper for holding metal objects. The gripper consists of induction coils which energizes the gripper on the basis of electromagnetic effect. On the application of voltage to the induction coils, these coils produces magnetic field in the vicinity of it. Since the magnetic field is changing it produces another voltage that is called induced voltage on the same coils. This is due to the principle called self-inductance. This self-induced voltage energizes the gripper to hold the object and perform pick and place operation [8].

Gripper designed is an adjustable one. The advantage of adjustable gripper is that it can lift objects of varying dimensions. The Gripper is controlled with the help of the actuator. There are two basic grasp configurations - cylindrical and spherical. In cylindrical grasp configuration, two finger are placed so as to oppose the third finger where it useful for grasping prismatic objects. Meanwhile for spherical grasp configuration, the three fingers are positioned approximately 120° apart where they are suitable to grasping round object [9].

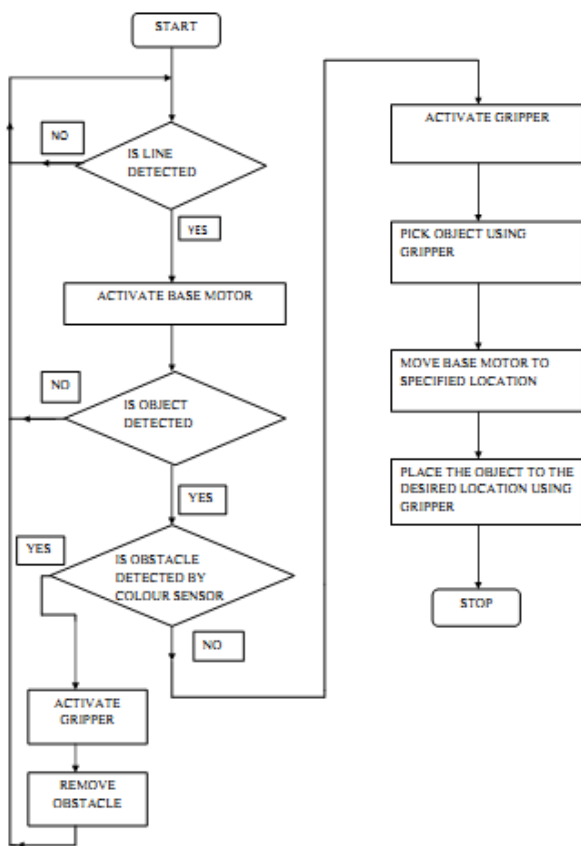
Gripper activated by using sensors, it is an adjustable gripper that can pick up the objects of any shapes. This adjustable gripper works when the sensors gave signal to microcontroller [10].

Author has explained about the automatic robotic arm which

is a gripper. An electric motor is used in this robot which is an electromechanical device that converts electrical energy into mechanical energy. The microcontroller used is ATmega8 which is a 28 pin microcontroller that provides high flexibility to the gripper [11].

Another technique used in the gripper is point to point trajectory motion. In this technique the robot gripper is controlled by the point to point motions. Another technique used in the gripper is that one arm of the gripper is fixed and the other arm has a dc motor in it so when the object is detected the robot extends its arm and the movable arm rotates and the object is picked [12].

2.4 Flow chart



3. EXPECTED RESULT

3.1 Working of motor drivers

IN1	IN2	MOTOR 1
1	1	OFF
0	0	OFF

0	1	ON(FORWARD)
0	1	ON(REVERSE)

IN3	IN4	MOTOR 2
1	1	OFF
0	0	OFF
1	0	ON(FORWARD)
0	1	ON(REVERSE)

3.2 Working of gripper

IN1	IN2	MOTOR 1
1	1	OFF
0	0	OFF
1	0	ON(FORWARD)
0	1	ON(REVERSE)

IN3	IN4	MOTOR 2
1	1	OFF
0	0	OFF
1	0	ON(FORWARD)
0	1	ON(REVERSE)

4. CONCLUSION

This project is based on an idea to reach to the extent where humans cannot. The project exists in reality and even used in many industries to move objects, but the cost of the robots is high. So our major goal is to satisfy all the basic needs of an object transporting robot by using fewer components, so as to reduce the cost of the robots.

We will build a robot that can move objects from one place to

other without human effort and can also detect obstacles in its path. This robot will pick and place objects automatically by path following operation, without the help of humans. It uses different infrared sensors to detect the object and to be placed.

5. FUTURE SCOPE

We have done our best efforts to make the project feasible, simple and reliable for the local industrial usage. There can be modification in this robotic system that can be more efficient and effective like :

- The robot can perform multi colored line/path operation.
- The gripper of the robot can be made adjustable for different size objects.
- Making gripper more powerful can increase the payload property of the robot.
- The gripper can be modified for different operations in different industries.

ACKNOWLEDGEMENT

First it is our pleasure to Dr. ARUN KUMAR, *Principal* and Prof. ARCHANA INGLE, *H.O.D. of EXTC* for granting us the opportunity to represent our project “SENSOR TRIGGERED AUTOMATIC ROBOT TO PICK AND PLACE”.

We express our sincere thanks to our project guide Prof. NUTAN MALEKAR, *Assistant Professor* who offers us all the possible assistance during our developing period and for the interest she took in sorting our difficulties and offering us guidance with constant encouragement and help.

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DESIGN AND IMPLEMENTATION OF AN 1-BIT ALU ON FPGA USING VHDL

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ABSTRACT

The paper deals with designing and implementation of 1-bit ALU. It accepts two 1-bit numbers and code corresponding to different operations. The ALU performs desired operations and generates result accordingly. The different operations are arithmetic, logical and data transfer group. To implement ALU, coding is done in VHDL and then converted into binary format. User constraints file is generated and also bit file to load design in FPGA.

1. INTRODUCTION

For newly implemented digital designs, VHDL is one of the most popular design application used by designer. Microprocessors are very important part of Electronics Engineering. Processors are not as flexible as programmable logic devices. The ability to emulate a microprocessor on a programmable chip can lead to cheaper more efficient and more flexible performance.

It involves use of many examples including counters, registers, arithmetic logic units, and memory. The use of hardware descriptive languages (HDLs) allows FPGAs to be more processor with limited resources. The FPGA once programmed, behaves in much the same way as an actual microprocessor. This includes Arithmetic Logic Unit (ALU), working registers, and memory. FPGAs are usually slower than ASICs but have the advantage of shorter time for production, ability to be re-programmed in the field for errors correction and upgrades, flexibility, and cheap. Therefore, they combine many advantages of ASICs and DSPs.

Individual instructions are initially tested and then they will be combined to test functionality. The FPGA once programmed, behaves in much the same way as an actual microprocessor. This includes an Arithmetic Logic Unit (ALU), working registers, and memory. Each part of the ALU will be designed separately and tested for functionality. After testing that all parts are working they will be combined together forming a simple ALU of the microprocessor. The design is implemented by programming it into a SPARTAN-3E.

2. RELATED THEORY

Arithmetic Logic Unit(ALU) was designed to perform arithmetic operations such as addition and subtraction using 1-bit adder, logical operations such as AND, OR, XOR and NOT operations. ALU also compares two 1-bit input using comparator. ALU also consist of two input 1-bit registers to hold that data during operation and output register to hold result of operation. It contains idea about how the data and instructions are handled by ALU subsystem. In which accumulator accepts the data that is to be manipulated. The

ALU of the microprocessor takes additional data that will be operated on the instructions for that data from system bus.

The results placed back in the accumulator. The ALU only reads the additional data and instructions from the bus and cannot send any information to the bus.

VHDL (VHSIC Hardware Description Language) is a hardware description language used in electronic design automation to describe digital and mixed-signal systems such as field-programmable gate arrays and integrated circuits.

The VHDL software reduces the complexity and also provides a graphic presentation of the system. The main advantage of VHDL when used for systems design is that it allows the behaviour of the required system to be described (modelled) and verified (simulated) before synthesis tools translate the design into real hardware (gates and wires). This software compiles the given VHDL code and also produces waveform results.

It [8], describes various tools for implementation of microprocessor. The Application Specific Integrated Circuits (ASICs) are very costly, even though they provide the highest performance. Digital Signal Processors (DSPs) are cost efficient and low in power consumption. However, they only provide limited speed for data processing. FPGAs because of their advantage of real-time in-circuit reconfigurability make the FPGA based microprocessor flexible, programmable, and reliable. It [6] helps us to understand description of steps to implement an 1-bit microprocessor based design on a FPGA, creating a Xilinx bit file, setting up the processor and compiler options and then configuring and programming the design to an FPGA device. to create an FPGA project containing VHDL source file. Finally obtained bits will be displayed on the SPARTAN kit LEDs. The scope of FPGA usability, steps to implement a digital system, FPGA architecture, The unit of Structure of FPGA, Various hardware description languages, Synthesis path and route, Spartan-3E Configuration Modes, steps to give FPGA clock inputs, steps to assign pins, UCF constraints for discrete LEDs. Timming area and power analysis and future of FPGA technology [14].

3. PROPOSED SYSTEM

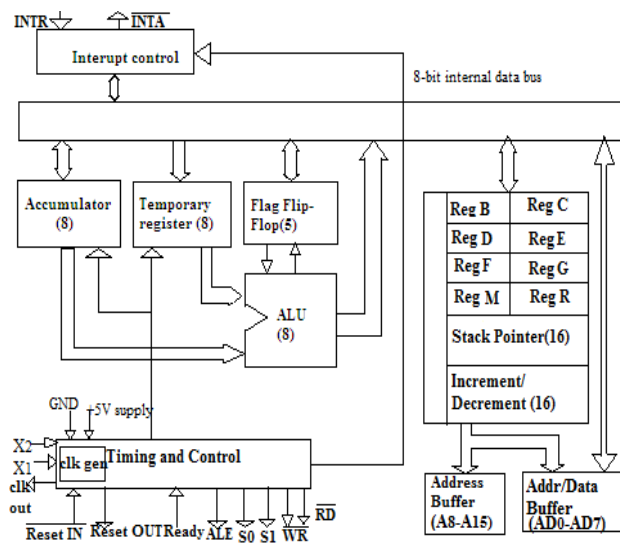


Fig1. Block Diagram of ALU

The processor has eight 1-bit registers accessible to the programmer, named A, B, C, D, E, F, G, M and R, where A is the 8-bit accumulator and the other seven are general purpose registers. It also has a 16-bit stack pointer to memory. The microprocessor has extensions to support interrupts one externally serviced interrupt (INTR). The processor can accommodate slower memories through externally generated wait states (pin 35, READY), and has provisions for Direct Memory Access (DMA) using HOLD and HLDA signals.

4. Simulation results

UCF file:

```
NET "X" LOC = "L13" | IOSTANDARD = LVTTTL |
PULLUP;
NET "Y" LOC = "L14" | IOSTANDARD = LVTTTL |
PULLUP;
NET "F" LOC = "F9" | IOSTANDARD = LVTTTL | SLEW =
SLOW | DRIVE = 8;
```

AND Gate

```
entity and1 is
Port ( X : in STD_LOGIC;
Y : in STD_LOGIC;
F : out STD_LOGIC);
end and1;
architecture Behavioral of and1 is
begin
process(X,Y)
begin
if((X='1') and (Y='1')) then
F<='1';
else
F<='0';
end if;
end process;
end Behavioral;
```



Fig2. Output of AND gate

ADD

```
entity adder is
Port ( X : in STD_LOGIC;
Y : in STD_LOGIC;
F : out STD_LOGIC);
end adder;
architecture Behavioral of adder is
signal S1 : std_logic;
begin
F <= X xor Y;
S1 <= X and Y;
end Behavioral;
```

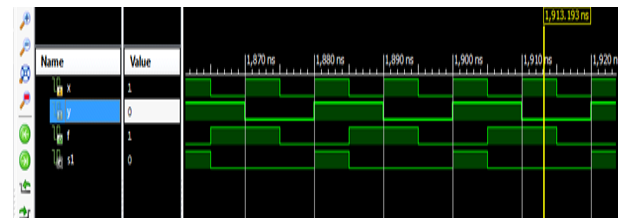


Fig3. Output of ADD

The simulation results of AND gate and ADD operation are shown above. Similarly, various operations under Arithmetic, Logical and Data transfer group were also simulated. After simulation is done bit file is generated for the design of ALU using Xilinx-impact tool. Then the bit file is loaded into the FPGA kit. The design of Arithmetic Logic Unit (ALU) is done on XILINX Spartan 3 FPGA kit. The entire synthesized design will run on an FPGA prototyping circuit board.

5. Conclusion

Thus we simulate various microprocessor operations like arithmetic, logical and data transfer in VHDL and implement it on FPGA. Independent are simulated and tested initially and will be combined later. The FPGA behaves in the similar manner as an ALU.

Future Scope of the Project

An Arithmetic Logic Unit (ALU) is a digital circuit that performs arithmetic operation, logical operation and data transfer operations. The ALU is building block of the Central Processing Unit (CPU) of a computer. The ALU can be inside high speed computer and also super computers. The processor found inside modern CPU's and GPU's accommodate very powerful and very complex ALU's. A single component may contain a number of ALU's. It can be extended to 4bit, 8bit, 16bit, and so on. ALU interfaced with various devices will find its application in almost every electronic device.

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AUTOMATIC COLOUR DETECTION FOR CAR REPAINTING

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ABSTRACT

Repainting a small damaged area on a car panel may lead to repainting the whole panel if there was inaccurate colour match. This would be time-consuming and expensive. Therefore it is very important to achieve an accurate colour matching which will lead to a neat repainting job as well as cost-effective. Although the initial colour code of the car is usually provided by the car manufacturing company, it actually changes with time due to weather conditions and successive car washing with various detergents. The paper describes colour detection of car for repainting. In Image processing the colour space separation convert the actual colour to its basic colour percentages (%R, %G, %B) and then with subtractive colour system method RGB is further converted into CMYK. The proposed approach will give the appropriate percentage of CMYK. It may also be used in other industries such as in printing industry.

General Terms

Image normalization, Subtractive Colour, Colour Space Separation.

Keywords

Colour Detection, Colour Formation,

1. INTRODUCTION

Paintwork is a restoration task that is often, like the engine builds, left to professionals. Professional car painters have more and better equipment at their disposal, along with a large amount of experience and training. However, unless you pay top prices, you cannot guarantee that they are going to take more care of your car than they do of the usual insurance repairs and to-a-price re-sprays that make up most of their work. However, if untrained person paints a car himself, then those rusty patches are adequately repaired but this may result in uneven painting, time delay in painting and physical tiredness. Previously colours were detected manually for car repainting which caused errors. So, for appropriate perfection the circuit has been designed which will automatically form appropriate proportion of colours as per image detected by camera. These are the things that motivated us to do this project. This eliminates the monotonous work done by existing system. It achieves high accuracy and speed.

1.1 Related Work

Vehicle colour recognition is important for recognizing the colour feature of the vehicle. To recognize the image,

automatic analysis of colour is important. Ku-Jin Kim, Sun-Mi Park, Yoo-Hoo Choi used colour histogram for extracting the features of the objects contained in an image. Prior, many researchers have been used colour histograms for content-based image retrieval, image classification, and measuring the similarity between images [2].

Colour constancy is an algorithm used for subjective constancy and a feature of the human color perception system which ensures that the perceived color of objects remains relatively constant under varying illumination conditions. Kobus Barnard, Graham Finlayson and Brian Funt used retinex algorithm which uses the information from both surface reflectance and illumination variation to solve for colour constancy[3].

Graham D. Finlayson, Bernt Schiele and James L. Crowley used Comprehensive image normalization which removes image dependency on lighting geometry and illumination colour. Comprehensive normalization improves recognition rate. [5].

Yimeng Zhang, Shiaw-Shian Yu, Tsuhan Chen used PLSA Model which decides the colour of the object automatically. One type of previous works on colour categorization is the chip based methods, this type of methods can be used to assign colour names to each pixel of an image however it may not be suitable for assigning colour category to the whole image. So we used another methods which has the advantage over chip based method i.e. PLSA model. It is used to learn the distribution of RGB values for each colour categorization. But, it cannot handle multiple object categories simultaneously [7].

Xingzhi Chang and Liqun Gao used geometric features for detection of car. The approach is to provide fast car detection from rear or head images of the car running on road. Algorithm is divided into three steps: Segmentation, geometric features extraction, rear/head shape restoration. Some defective images and small cars are difficult to locate [10].

The proposed paper used additive and subtractive colour system for the detection of colour. RGB colour scheme is an additive colour system. Once we get the value R, G, B, then the value of CMYK can easily be found. This method is not time consuming and less expensive. This method gives an accurate colour matching which will lead to a neat repainting job [1].

1.2 Scope of the Project

The figure 1. shows the simplified block diagram of automatic colour detection. The camera will capture the image. The

image can be in any of the format. The captured image is then passed to the program for coding. The coding is done in the matlab. After that we will get the appropriate percentage of RGB and then this RGB is converted into CMYK format.

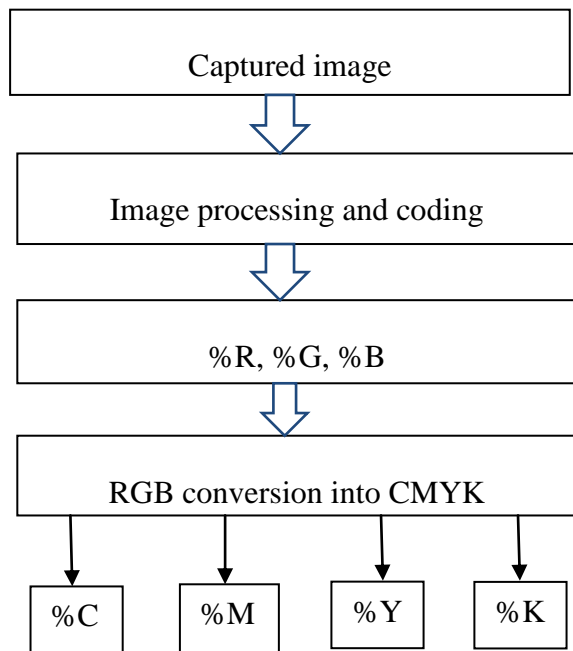


Figure1: Simplified diagram for automatic colour detector [1]

The three colours, Red (R), Green (G), and Blue (B) are combined to form colour monitors for TV and computer and called RGB format. RGB are the three primary colours of light. On the other hand, if you magnify 'colour print' with a magnifying glass, you will see Cyan(C), Magenta (M), Yellow (Y), and Black (K). The combination of these four colours forms 'colour print' and called CMYK format. CMY is subtractive mixture; in other words, CMY are the primary colours of paints. The black is a supplemental colour, because for printing (or painting) purposes, CMY colours are unable to produce 'Black'. Figure 1.2 below, shows the difference of the three colours.

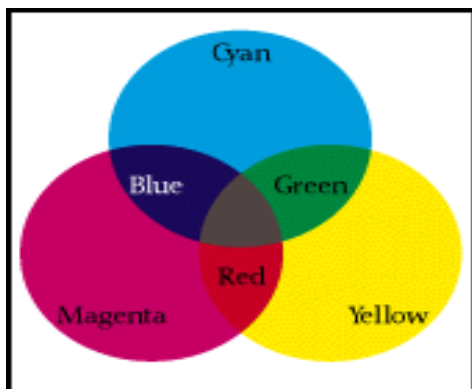


Figure 2: CMY colours

2. METHODOLOGY

The automatic colour detection for car repainting which will detect the colour of the car and it will give the accurate colour matching. The block diagram for the project is as shown in figure 3. It consists of camera, PC for image processing, micro-controller and relays. Firstly, the small undamaged part of the car panel will be captured by camera. The image processing method is used which processes the images and give the actual colour percentages which is done on MATLAB software. Using colour space conversion image will be sent to a program for analysing and coding the actual colour to its basic colour percentages (%R, %G, %B). This is simple method to get the percentages of basic colours (RGB). Then, this RGB is converted into CMYK by subtractive colour system. We used subtractive colour system which gives the percentages of CMYK (%C, %M, %Y, %K). Thus, the proposed method will give us the appropriate percentage of CMYK. The normalization method is used so that the quality of the image would not be affected even if it is captured from any intensity and also found the dimension of damaged part so that the colour should not get wasted.

The values of CMYK is sent to microcontroller (AT 89s52) through USB to TTL. Then output of the microcontroller is fed to the relay. There are four relays used. For Each colour there is a separate relay for %C, %M, %Y, %K. Respective relay will turn on and off depending upon the proportion of C,M,Y,K required, Supposing if we set 1 sec timer for 1% of cyan, then for 20% of cyan(C), it is 20sec. So the relay (%C) will turn on for the duration of 20sec. So at the end, by proper colour mixing accurate colour will be formed which will be used for car repainting. The colour reservoirs are used for respective four colours i.e. CMYK and valve is connected to each to release and stop the flow of colours. Then the colours are collected in container which contains the stirrer for the mixing of colour. The colour mixture is then sprayed manually.

2.1 BLOCK DIAGRAM:

The camera used in block diagram will capture the image of small damaged part of the car panel; the colour of image is then detected by image processing using matlab in pc. The pc and microcontroller (89S52) is connected using USB to TTL, where USB is connected to pc and TXD and RXD pin of TTL is connected to port 3 of microcontroller. The four relays are used for respective CMYK colour as shown in fig 1. This four relays are connected to port 3 of microcontroller. The relay is set for particular time with respective proportion of colours.

2.2 MECHANISM:

The colour reservoirs are used for respective four colours. i.e. CMYK and valve is connected to each to release and stop the flow of colours as shown in fig 2.1. Then the colours are collected in container which contains the stirrer for the mixing of colour. The colour mixture is then sprayed manually.

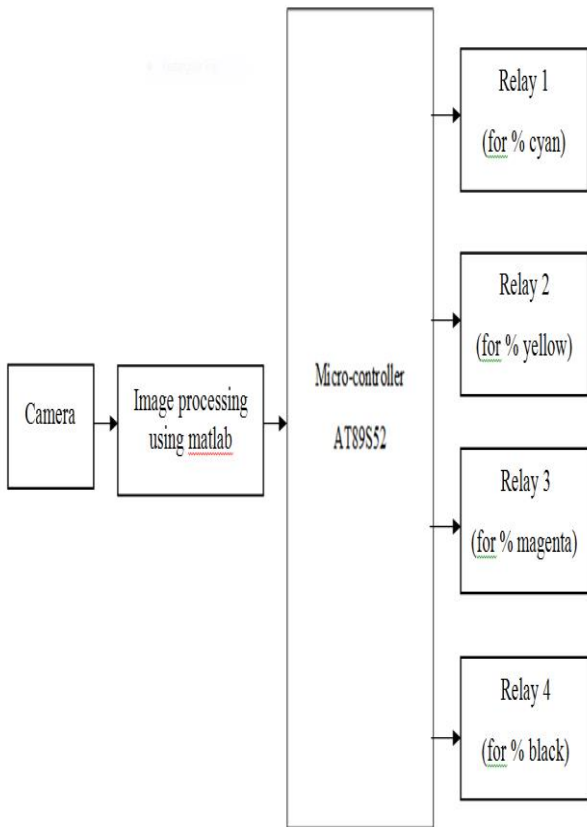


Figure 3: Block Diagram

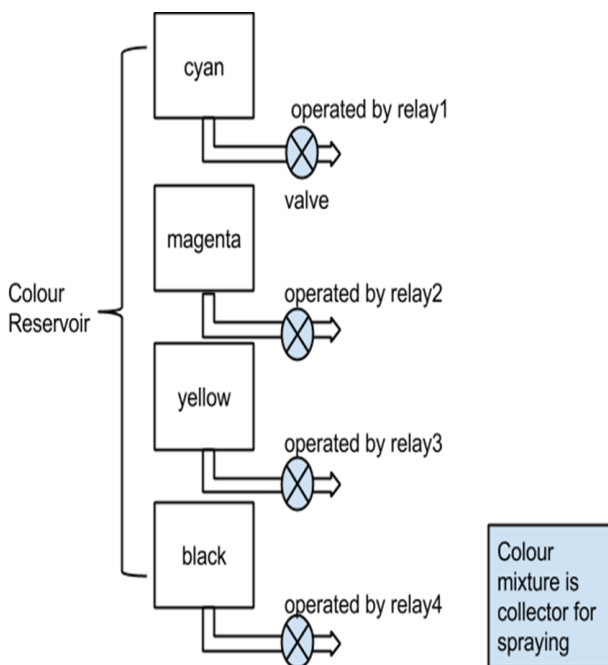


Figure 4: Mechanism

2.3 HARDWARE:

2.3.1 Camera:

The camera captures the image. camera of 12 Megapixel is used. Camera with a minimum of 1Megapixel resolution can also be used so that image processing is not affected. The image format obtained will be of JPEG.

2.3.2 USB to TTL:

For interfacing PC and microcontroller, this hardware module is used . Here logic conversion takes place and data from PC is transmitted to microcontroller's RXD pin.

2.3.3 Microcontroller:

AT89S52 microcontroller is used. The data received from USB to TTL is received at RXD pin i.e. P3.0. The relays are connected at P0.0 to P0.3 of the microcontroller. The relay will be ON for specific time.

2.3.4 Relay1, 2, 3&4:

Relays are used to open and close the valve for specific duration, which is proportional again to the %C, %M, %Y and %K.

2.3.5 Power supply:

A power supply is a device that supplies an electrical load. A regulated power supply is one that controls the output voltage or current to a specific value; the controlled value is held nearly constant despite variations in either load current or the voltage supplied by the power supply's energy source.

2.4 SOFTWARE:

- For Microcontroller : keil µvision software and flash magic for burning IC
- For Image Processing : Matlab 7.10 software with image processing toolbox.

2.5 FLOWCHART:

The flowchart in Figure 3.1 is showing the stages involved in the colour detection system. Firstly, Image is captured by Camera. If image exists, then only it will pass for the further processes. If there is some error in captured image, then the process begins from the start. The detection of colour is done by image processing and coding using subtractive colour system. At the output, we will get the basic colour percentages (%R, %G, %B) by colour space separation. Then, this RGB is converted into CMYK by subtractive colour system.

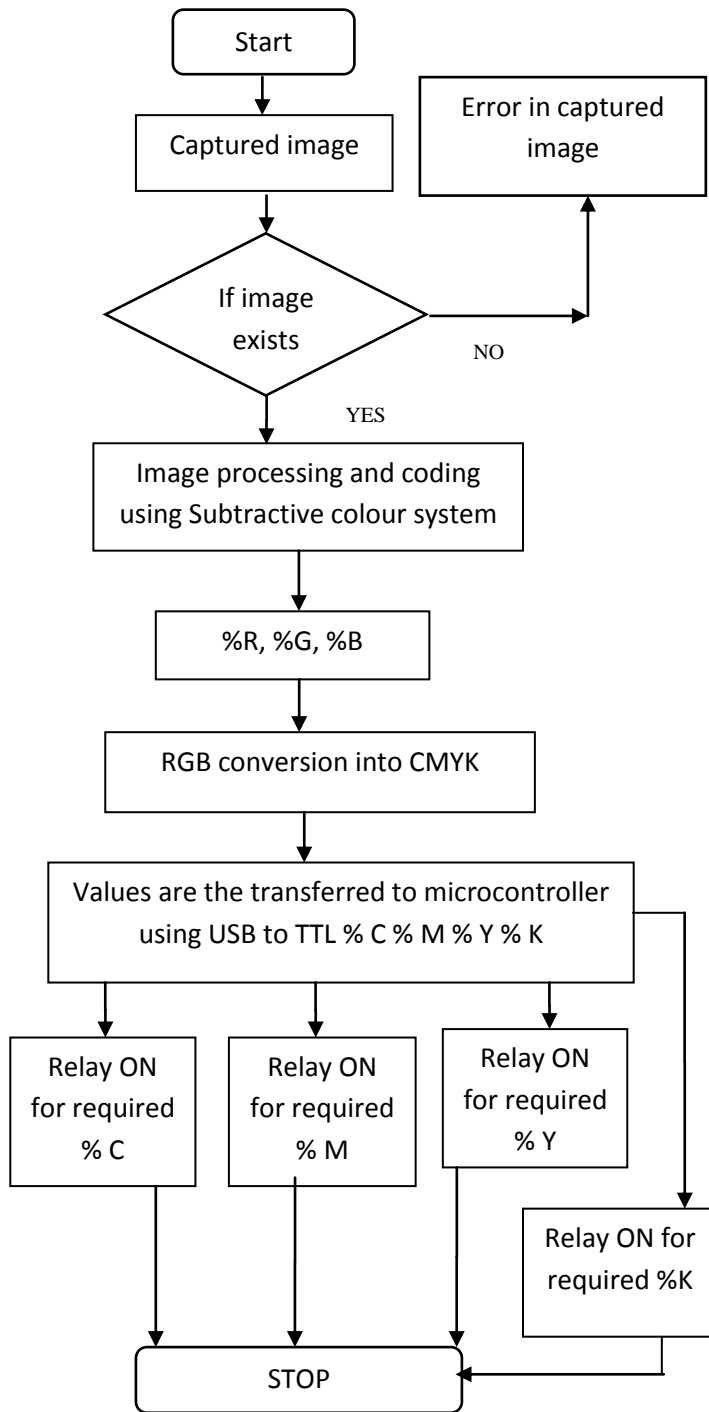


Figure 5: flowchart

3. EXPECTED RESULTS :

Several shots of different angle and at varying distance has to be taken of the car panel. It must be noted that there are some factors like lighting condition, temperature, and cleanness of the panel surface would influence the results. So, optimum conditions for image capturing could be established for better accuracy.

4. CONCLUSION:

The paper described the design and development of an automatic colour detection system for car repainting. The system captures a picture of a small undamaged part of the car panel. This picture is then passed for coding the actual colour to its basic colour percentages. Although the paper focused on car repainting application, it may also be used in other industries such as in printing industry. Subtractive colour method will give the percentages of the primary colours for formats RGB and CMYK and according to the value of CMYK, the relay circuit will turn on and off and it will form an accurate colour which is used for car repainting. Achieving accurate colour matching is vital, which will lead to a neat repainting job as well as cost-effective. This method gives an accurate colour matching. However some factors like light intensity, dimensions and quantity of colours need to be taken into account for optimum results.

5. FUTURE SCOPE:

- Extends a car paint database.
- We can also make a robot which can be used for tall building painting, wall painting etc.
- We can also detect the dent in the car bodies by vacuum pipe, dent remover kit. But, it would be so expensive.
-

ACKNOWLEDGMENTS

It is our pleasure to thanks Dr. ARUN KUMAR, Principal, Prof. ARCHANA INGLE, H.O.D. of EXTC AND project guide MISS. NUTAN MALEKAR, Assistant Professor to represent our project "AUTOMATIC COLOUR DETECTION FOR CAR REPAINTING" who offered us all the possible assistance during our developing period and for the interest she took in sorting our difficulties and offering us guidance with constant encouragement.

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Face Detection Using Matlab

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ABSTRACT

Face detection is a biometric technology with a wide range of potential applications such as access control, banking, information security, human computer interaction, virtual reality, database retrieval etc. However, it is difficult to develop a complete robust face detector due to various light conditions, face sizes, face orientations, background and skin colors. This projects the building of face detection system by using MATLAB Tool Box. MATLAB Tool Box is a statistical approach used for reducing the number of variables in face detection. While extracting the most relevant information (feature) contained in the images (face). Human face detection has become a major field of interest in current research because there is no deterministic algorithm to find face(s) in a given image. Further the algorithms that exist are very much specific to the kind of images they would take as input and detect faces. To detect faces we can put a number of simple rejection blocks in series, until we get the faces. Deeper the rejection block, more specifically it can be trained to detect-faces. Various methods like neural networks, template matching, maximal rejection, fisher linear discriminants and eigenfaces have been tried.

General Terms

Face Detection algorithm, Matlab programming, Matlab toolbox.

Keywords

Face Detection, Expressions, Interface, Matlab.

1. INTRODUCTION

Face is one of the most important visual objects in our life which playing a major role in conveying identity and emotion and includes rich information. Face recognition is a huge research area in computer vision, pattern recognition and plays a vital role in the applications of image analysis and understanding. Face recognition commonly includes feature extraction, feature reduction and recognition or classification. Feature extraction is to find the most representative description of the faces, making them can be most easily distinguished from others. Face reduction is to not only decompose and compress the original features but also not destroy the most important information. Recognition or classification is to choose the available measure method such as Euclidean distance, which is used to classify the feature of images present in the database and test image. Because the face image is often with a high dimension, it is difficult to use the original data directly, so it is critical to choose the effectively distinguished features for extraction and reduction. In all kinds of the algorithms of face recognition, Principle Component Analysis is effective feature extraction method

based on face as a global feature. It reduces the dimension of image effectively and holds the primary information at the same time [1]. In our project, we are going to implement a pretty simple but very effective face detection algorithm which takes human skin color into account [2].

2. RELATED WORK

Our project deals with making a robust and reliable face detection system which requires minimum time and space for storage. Our project will detect face and store the face with date and time and the remaining temporary files will be deleted thereby saving memory.

3. FACE DETECTION

Face detection is concerned with finding whether or not there are any faces in a given image (usually in gray scale) and, if present, return the image location and content of each face in the initial stage. Several systems have been developed that are able to detect faces fairly accurately with in-plane or out-of-plane rotations in real time. Although, a face detection module is designed to deal with single images, its performance can be further improved if video stream is available.

Detection of face in the images is the first stage of an “Face detection system”, since a face has to be located in the input image before it is detected. A definition of face detection could be given as an image, detect all faces in it and locate their exact positions and size. Usually, face detection is a two-step procedure: first the whole image is examined to find regions that are identified as —Face. After the rough position and size of a face are estimated, a localization procedure follows which provides a more accurate estimation of the exact position and scale of the face. So while face detection is most concerned with roughly finding all the faces in large, images, which include many faces and much clutter, localization emphasizes spatial accuracy, usually achieved by accurate detection of facial features. Eventually, more precise detection for processing of various facial expressions and regions of face is carried out by implementing various algorithms accordingly.

4. FACE DETECTION ALGORITHM COMPARISON

4.1 Algorithm comparison on the basis of lighting variations and facial expressions

Different lighting and facial expressions curtail the accuracy of the face detection techniques. Comparing various algorithms like correlation, eigenfaces, linear subspaces and fisherface it is inferred that the fisherface algorithm is the most effective algorithm. Various drawbacks such as requirement of large storage space, lack of face detection under different facial and lighting conditions are overcome in fisherface algorithm.

Fisherface algorithm is more accurate, fast, and also uses less memory space. Also providing low error rate and being almost insensitive to lighting as well as various facial expressions [4].

4.2 Feature based and Image based algorithm

Feature-based methods are applicable for real-time systems where color and motion is available. Since an exhaustive multi resolution window scanning is not always preferable, feature-based methods can provide visual cues to focus attention. The most widely used technique is skin color detection based on color models.

Image-based approaches are the most robust techniques for processing gray-scale static images. Algorithms are based on multi resolution window scanning to detect faces at all scales, making them computationally expensive. Multi resolution window scanning can be avoided by combining the image-based approach with a feature-based method as a pre-processor with the purpose of guiding the search based on visual clues such as skin color [3].

4.3 Fast Face detection algorithm using edges

A faster face detection system is proposed with minimal features based on edges. It consists of three steps: initially the images are enhanced by applying median filter for noise removal and histogram equalization for contrast adjustment. In the second step the edge image is constructed from the enhanced image by applying sobel operator. Then a novel edge tracking algorithm is applied to extract the sub windows from the enhanced image based on edges. The rectangle features are calculated for the sub windows, and these feature values are fed into a trained Back propagation Neural Network (BPN) to classify the sub-window as either face or non-face. The performance of the proposed method is compared with adaboost classifier. The result is as shown in fig [2] it shows that the proposed method outperforms the existing algorithms in terms of processing time in training and testing [5].

4.4 Landmark detection using comparison of MLL and Viola Algorithms

Landmark detection in face detection basically deals with a detection of landmarks and location of the facial features (eyes, nose, and mouth) as landmarks. It comprises of two landmarking methods viz:-

1. Viola Jones Algorithm.
2. MLL (Most Likely Landmark Locator).

Viola Jones Algorithm generally has developed for locating 5 landmarks. On measurement of mean localization errors and effect of verification performance it was found that on nose and mouth MLL algorithm was 0.5% more accurate than Viola Jones.

The MLL (Most Likely Landmark Locator) has been trained for locating 17 landmarks. It is observed that by using more landmarks, more accurate land marking method will give the best detection performance by reducing the errors.

Precise landmarks are essential elements for good face detection performance. For the better performance both the algorithms are compared to each other to ground truth data. Their performance will be quantified by RMS value of error with respect to ground truth data[1] as shown in fig [4].

4.5 Face detection on ridge images

Face detection has become one of the most important applications of image analysis and computer vision in recent years. This trend has caught the attention of many academic and research groups. There are three main contenders for improving face detection algorithms : high resolution images ,three-dimensional(3D) face recognition, and new preprocessing techniques. In current two-dimensional (2D) face recognitions systems, changes in lighting (illumination), and pose of the face always have been challenging problems. The 3Dface detection algorithms identify faces from the 3D shape of a person's face .Because the 3D shape of a face is not affected by changes in lighting or pose, 3D face detection has the potential to improve performance under these conditions.

This paper presents a method for 3D face detection using range data based on 3D binary images, created using principal maximum curvature. Hence we can get 3D binary image showing the locations of the ridge lines in the range facial image (i.e., lines around the eyes, the nose, and the mouth) [8].

4.6 Face detection using skin colour

Detecting and recognizing human faces automatically in digital images strongly enhance content-based video indexing systems. This algorithm, a novel scheme for human faces detection in color images in presence of complex background and uncontrolled illumination, is presented. Color clustering and filtering using approximations of the YCbCr and HSV skin color subspaces are applied on the original image, providing quantized skin color regions. A merging stage is then iteratively performed on the set of homogeneous skin color regions in the color quantized image, in order to provide a set of potential face areas [2] as shown in fig [1].

4.7 Rapid face detection

This algorithm is designed to detect visual object which is capable of processing images very fast and achieving high detection rates. It is made of three parts:

1. Introduction of a new image representation called the "Integral Image" which allows the features used by our detector to be computed very quickly.
2. Selecting a small number of critical visual features from a larger set and yields extremely efficient classifiers.
3. The method for combining increasingly more complex classifiers in a "cascade" which allows background regions of the image to be quickly

discarded while spending more computation on object in focus.

This face detection system detects faces extremely rapidly. This system achieves high frame rates working at 15 fps on 384 by 288 pixel images. It works only with the information present in a single grey scale image[9].



Fig 1: Face Detection achieved using skin colour detection.

5. METHODOLOGY

5.1 Block diagram

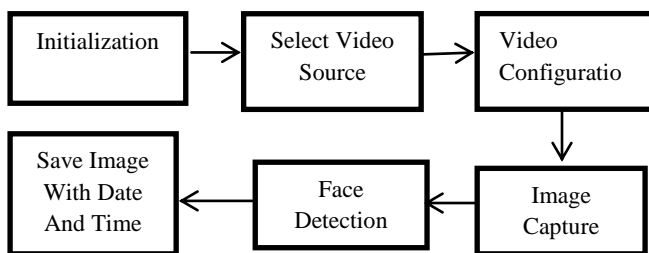


Fig 5: Block Diagram of project

5.2 Working and Explanation

5.2.1 Initialization:

Connect the camera with computer and install the required drivers of the camera.

5.2.2 Configure Video Source Input:

Configure camera in MATLAB using Image processing toolbox.

5.2.3 Set Video Frame Rate:

Frame rate determines how many frames are captured per second of video. The video frame rate 30fps is supported by most cameras.

5.2.4 Set Video Resolution :

Video resolution will determine how clear the video input should be, higher the resolution higher will be the processing time and will require large processing power. The video resolution of 640*360 is found to be ideal.

5.2.5 Start Video Input Source :

Start real time video streaming in MATLAB using commands of image processing toolbox.

5.2.6 Get Snapshot:

The video input is stream of images captured by camera. Convert the video input into a stream of temporary images and save the images for further processing.



Fig 2: Face Detection achieved using edge detection.



Fig 3: Face Detection achieved using quantized colour region.

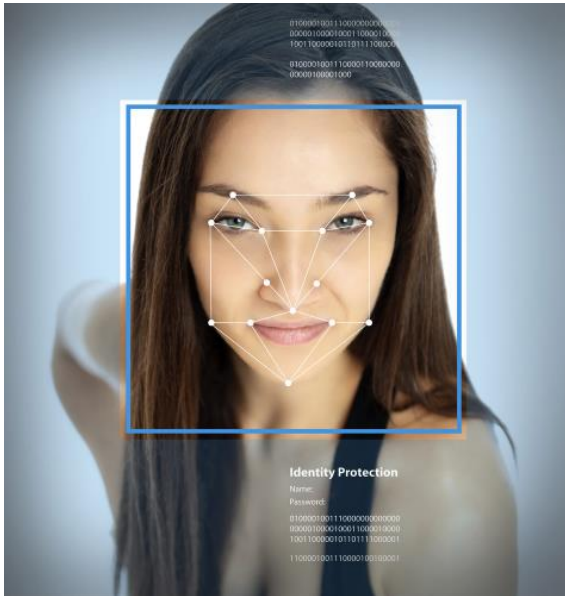


Fig 4 : Face detection using landmark.

5.2.7 Save Image in RGB format:

Convert the temporary images into RGB format and store the temporary images in a folder.

5.2.8 Detect Change in Motion By Comparing Images:

Compare the RGB images for detecting any motion in the video.

5.2.9 Implement face detection algorithm:

Implement face detection algorithm on the images in which motion is detected.

5.2.10 Save Image:

Save the image of the detected face in a log along with date and time.

5.2.11 Clear All Process:

If motion is detected the repeat the process again from step 5 or else clear the temporary folder and stop.

6. EXPECTED RESULTS

After analyzing the studies mentioned above, It can be concluded that an initial video source is initialized by a camera interface and video is streamed accordingly. Furthermore, snapshot of images associated with the video streamed are captured and suitable algorithms are implemented for further processing. Eventually, the image can be saved in a data log with date and time.

7. CONCLUSION

The accuracy of the algorithm depends on the amount of light present in room. The accuracy also depends upon the position of the camera and the pose of the person. Efficiency of the program can be improved by using lower frame rate and resolution but by compromising quality.

8. FUTURE SCOPE

Face detection systems used today work very well under constrained conditions, although all systems work much better with frontal mug-shot images and constant lighting. All current face detection algorithms fail under the vastly varying conditions under which humans need to and are able to identify other people. Next generation person detection systems will need to recognize people in real-time and in much less constrained situations.

We believe that identification systems that are robust in natural environments, in the presence of noise and illumination changes, cannot rely on a single modality, so that fusion with other modalities is essential. Technology used in smart environments has to be unobtrusive and allow users to act freely. Wearable systems in particular require their sensing technology to be small, low powered and easily integrable with the user's clothing. Considering all the requirements, identification systems that use face detection and speaker identification seem to us to have the most potential for widespread application.

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PAPER CURRENCY TO COIN EXCHANGER USING IMAGE PROCESSING

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ABSTRACT

These days the use of coins has been increased at many places like bus stop, railway stations, malls, parks or even in rural areas where PCO system is still in use. So getting coins for this purpose is becoming headache for people. People have to suffer a lot to get required coins for their use. Therefore we are designing a coin exchanger machine. In our proposed plan there would be a machine that will take note as an input and display number of coins in exchange to them as an output; this machine can be further upgraded by adding a coin container which will provide coins rather than displaying it.

The authentication of a note can be achieved by various methods such as texture recognizing, UV light authentication, image processing etc.

Note detection using image processing is done by Edge detection, Image acquisition; Image resizing, Image rotation, Image enhancement, Histogram equalization. For detecting the type of note MATLAB Algorithm runs and the result is given to the controller. The users simply press the keypad for type of change he wants for example one rupee coins, two rupee coins or five rupee and hence in the output coins are displayed as per user requirement.

Keywords

Microcontroller (89C2051), Webcam (normal), Serial communication, Image processing, Edge detection, Image segmentation, colour detection, MATLAB

1: INTRODUCTION

Now a day's coins are a need in public places, shops, transport etc. So for the betterment of people paper currency to coin exchanger machines are needed. The specialty of Indian currency is that it absorbs the UV light and the fake note reflects the UV light. Fake note detection unit consists of UV LED, Photodiode, Amplifier and Comparator. Microcontroller is used for performing requested task. The machine will accept the note and check whether note is real or fake. If the note is real it will be further processed with the help of computer having MATLAB program to determine the note.

We are going to develop an interactive system that generates currency recognition system using localization and color recognition with the help of MATLAB. The proposed system

will be useful in day to day life of every common man where people have to suffer for change at many public places. As mentioned in the applications this project is a real time application for all real time places. In the future this system can also be applied in the buses itself. This will be a relief for the conductors and passengers.

The major technique of this system is image analysis and image processing, are the part of cognitive and computer science. The Image processing is a signal processing after pre-processing. The output can be an image or a set of characteristics or parameters related to the image. Actually the image is treated as 2-dimensional signal and applies some standard signal processing techniques with image-processing techniques involved. Image analysis means the meaningful information from an image is extracted mainly from digital images by means of digital image processing techniques. Image analysis tasks can be simple as reading bar coded tags or as sophisticated as identifying a person from their face. now a day's coins are a need in public places, shops, transport etc. So for the betterment of people paper currency to coin exchanger machines are needed. The specialty of Indian currency is that it absorbs the UV light and the fake note reflects the UV light. Fake note detection unit consists of UV LED, Photodiode, Amplifier and Comparator. Microcontroller is used for performing requested task. The machine will accept the note and check whether note is real or fake. If the note is real it will be further processed with the help of computer having MATLAB program to determine the note.

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science. The Image processing is a signal processing after pre-processing. The output can be an image or a set of characteristics or parameters related to the image. Actually the image is treated as 2-dimensional signal and applies some standard signal processing techniques with image-processing techniques involved. Image analysis means the meaningful information from an image is extracted mainly from digital images by means of digital image processing techniques. Image analysis tasks can be simple as reading bar coded tags or as sophisticated as identifying a person from their face.

2: SCOPE OF PROJECT

The main aim of this project is to convert the currency notes into coins by designing an efficient and simple machine which will fulfill the need of coins for transactions so that people will not face the problem of coins. This project will provide coins for note, for this purpose we have to develop mechanical coin dispensing model which takes the note inside and checks whether note is fake or real, if note is real camera takes picture of it and with the help of computer having MATLAB find out its value using image processing technique and then according to the value equivalent number of coins are dispensed.

The paper currency is placed on the note placing unit and it will be scanned, the scanned image is then passed to the PC and is judged whether the currency is real or fake. This detection is carried out by authentication process using various algorithms such as Edge detection, Image acquisition; Image resizing, Image rotation, Image enhancement, Histogram equalization. If the currency is real then the process is continued further else the process is terminated and the currency is rejected. Then the user will enter the number of coins required through keypad. Now according to the input currency and number of coins required the output will be displayed on the LCD display.

3: LITERATURE SURVEY

A video camera is designed to capture an image – either a single “frame,” or a series of frames, over a period of time. Prior to solid-state cameras, video cameras used photosensitive “tubes,” similar to television or cathode ray tubes (CRT), to convert incoming light into an electronic signal that could be sent to a monitor or transmitter, or to video recorders which used magnetic “heads” to capture images on coated (magnetic) tape. Modern solid-state cameras can capture images in a broad range of light conditions. It is possible to produce an image using a shutter speed of less than 1/800,000 second, or to leave a shutter open for many seconds to accumulate necessary light. Cameras are designed to work in both of these extremes. Examples would be a time exposure to photograph a dim star, or an extremely quick shutter speed to capture a bright explosion. The sensitivity of its cameras using the lux unit of measure, which is based on the amount of light falling on a given area (1 lux = 1 lumen per square meter). This rating provides an indication of the minimum illumination level at which the camera can produce a reasonable image, and is determined by JAI without a lens attached to the camera. A lens with an aperture of f/1.4 reduces the specified sensitivity number roughly a factor of 10.

These features can be implemented using image processing

In this project will be using next generation features i.e. Detection of the note image using the defined information for getting the actual coins from outlets, Capture of image, etc. without actual touch to the screen or device.

4: METHODOLOGY



Fig 1: FEATURES OF INDIAN NOTE

Commonly Used Methods to Detect Fake Currency

See through Register

The small floral design printed both on the front (hollow) and back (filled up) of the note in the middle of the vertical band next to the Watermark has an accurate back to back registration. The design will appear as floral design when seen against the light.

Water marking

The Mahatma Gandhi Series of banknotes contain the Mahatma Gandhi watermark with a light and shade effect and multi-directional lines in the watermark window.

Security Thread

The Rs.500 and Rs.100 notes have a security thread with similar visible features and inscription “Bharat” (in Hindi), and “RBI”. When held against the light, the security thread on Rs.1000, Rs.500 and Rs.100 can be seen as one continuous line. The Rs.5, Rs.10, Rs.20 and Rs.50 notes contain a readable, fully embedded windowed security thread with the inscription “Bharat” (in Hindi), and “RBI”. The security thread appears to the left of the Mahatma's portrait.

Intaglio Printing

The portrait of Mahatma Gandhi, the Reserve Bank seal, guarantee and promise clause, Ashoka Pillar Emblem on the left, RBI Governor's signature are printed in intaglio i.e. in raised prints, which can be felt by touch, in Rs.20, Rs.50, Rs.100, Rs.500 and Rs.1000 notes.

Latent image

On the front side of Rs.1000, Rs.500, Rs.100, Rs.50 and Rs.20 notes, a vertical band on the right side of the Mahatma Gandhi's portrait contains a latent image showing the respective denominational value in numeral. The latent image is visible only when the note is held horizontally at eye level.

Micro lettering

This feature appears between the vertical band and Mahatma Gandhi portrait. It always contains the word “RBI” in Rs.5 and Rs.10. The notes of Rs.20 and above also contain the denominational value of the notes in micro letters. This feature can be seen well under a magnifying glass.

Identification Mark

Each note has a unique mark of it. A special feature in intaglio has been introduced on the left of the watermark window on all notes except Rs.10/- note. This feature is in different shapes for various denominations (Rs. 20-Vertical Rectangle, Rs.50- Square, Rs.100-Triangle, Rs.500-Circle, and Rs.1000-Diamond) and helps the visually impaired to identify the denomination.

Optically Variable Ink

This is a new feature included in the Rs.1000 and Rs.500 notes with revised color scheme introduced in November 2000. The numeral 1000 and 500 on the obverse of Rs.1000 and Rs.500 notes respectively is printed in optically variable ink viz., a color-shifting ink. The colour of the numeral 1000/500 appears green when the note is held flat but would change to blue when the note is held at an angle.

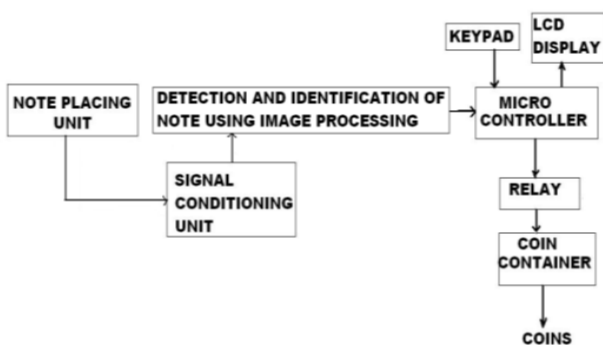
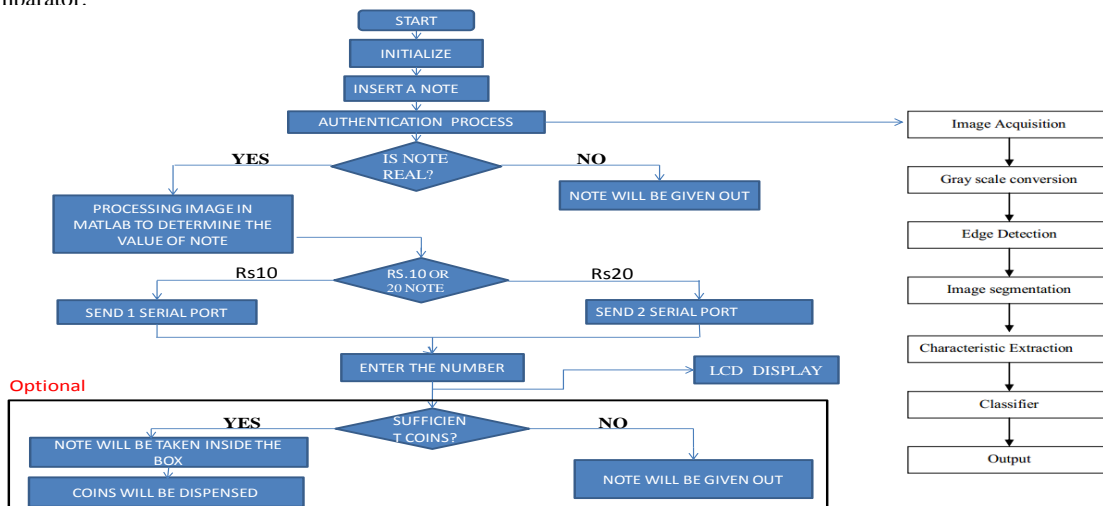


Fig 2: Block Diagram of Paper Currency to Coin Exchanger

The main aim of these projects is to convert the paper currency into coins by designing an efficient and simple machine which will fulfill the need of coins for transactions so that people will not face the problem of coins.

The using of microcontroller performing requested task. If the machine will accept note whether check note is real or fake. If the note is real, camera takes picture of note with the help of computer having MATLAB program.

The specialty of Indian currency note is that it absorbs the UV light and the fake note reflects the UV light. Fake note Detection unit consists of UV LED, Photodiode, Amplifier and Comparator.



Initially when the note is placed on the note placing unit the scanner will scan the note and the scanned image is send to PC where the MATLAB program will authenticate whether the note is real or fake. If the note is fake it will be given out and if it is real the signal is send to the PC for determining the value of note. The user will now enter the desired number of coins through keypad which will be shown on the LCD.

5: CONCLUSION:

This system is a user-friendly and it is beneficial for the people. Through this system we can exchange notes to coins. It also recognizes whether the note is real or fake. If it is real the process of exchanging paper currency to coin continues. As this is a real time application in real time places and can be used in various public places in future

We are going to develop an interactive system that generates currency recognition system using localization and color recognition with the help of MATLAB. The proposed system will be useful in day to day life of every common man where people have to suffer for change at many public places.

In the future this system can also be applied in the buses itself. This will be a relief for the conductors and passengers.

6: FUTURE DEVELOPMENTS: SCOPE

In the future we can extend note and coin capacity up to 100 rupee note. The Provision for coin container is also possible. The same machine can be upgraded to currency to currency exchange.

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IMAGE PROCESSING BASED OBJECT MOTION CONTROLLED ROBOT

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ABSTRACT

This Paper introduces a vision based object motion controlled robot which is driven by wheels and controlled by a computer along with some specialized softwares for image processing and for controlling the motion of the robot. The objective of this Paper is to design a robot which is controlled by computer autonomously to identify the predefined desired object and interact with it in a predefined manner [1]. Emphasis is given on vision based robotic applications, processing of the appropriate images of the desired object which are captured and the autonomous nature of the robot which does not require human intervention during its operation. Image acquisition by the robot is achieved by using a PC-based webcam and then it is sent to image processing software for further processing. The computer sends image processed readings and measurements over wires to a microcontroller for further processing [3]. Code running on the microcontroller in conjunction with a code in MATLAB generates an output on the appropriate pins configured by user by a program, which controls the direction of the motors which run the wheels of the proposed robot. The quality in MATLAB image processing toolbox and Arduino has made it possible. The serial communication between the software used for image processing, which is MATLAB and the software used for controlling the motion of the motors according to movements of the desired object, which is Arduino is also achieved through coding in which we need to consider the appropriate baud rates[4]. The desired object in our Paper is a coloured ball, but it can be any other entity like a single person, a combat unit or a vehicle if the Paper is to be implemented on a larger scale and the predefined motions for interaction with the desired object are left, right, forward and backward[1].

General Terms

Object recognition, motion controlled robot

Keywords

Matlab, Image processing, Arduino, Robot

1.INTRODUCTION

The use of manual remote controlled cars to traverse through an environment for following a moving object is tedious and need humans' assistant. Yet, the design of a robot with vision system to follow an object of interest autonomously in a desired environment overcomes the human attention for object location[12]. Vision enables a robot to have a sophisticated sensing mechanism that allows it to respond to

its environment in an intelligent manner. So the proposed object motion controlled robot based on image processing will navigate autonomously without any human assistance. The robot will possess an on-board webcam to transmit video signal which is later on to be processed using image processing techniques[3]. The proposed robot will identify an object based on its colour, size and position and interact with the object in a predefined manner. The conditions under which the robot will work successfully and perform its operations more accurately are that the desired object must have a unique colour as compared to the colour appearing in the background of the object. The desired object must be less lustrous. The accuracy will be greater if object is less lustrous as in that case larger amount of light will be reflected. Best results will be obtained in a dark environment as the robot will be able to see object more clearly through lights on webcam as compared to other environment, where its vision can be disturbed by other objects in vicinity[7].

2.DESIGN METHODOLOGY

2.1 Block Diagram:

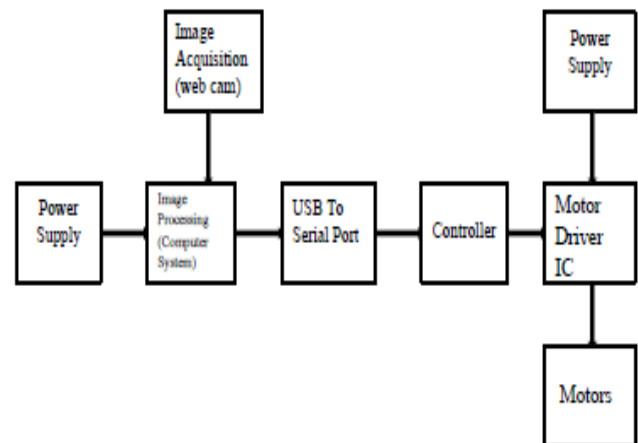


Figure 1.Complete Block Diagram

2.1.1 Working:

The first step is interfacing camera and com port to MATLAB after that camera is triggered and image of path is taken. The taken image is re-sized to a smaller and convenient size for fast processing [3]. After that the taken image is converted to a gray scale image from the RGB image which is taken by camera, after that we set the proper threshold value and

convert it to black and white image i.e. binary image. Next process is to reduce noise from the picture[1].

A simple approach for developing object recognition and following system is shown below:

1. Decide the ideal position of the object with respect to the camera
2. The distinguishing feature of the object to be picked is to be figured out, which is colour and size in our case.
3. Deciding the robots movement as planned the ideal position of the ball will be when the center of the frame coincides with the center of the ball[2].

2.2 Flowchart:

2.2.1 Image processing techniques flowchart:

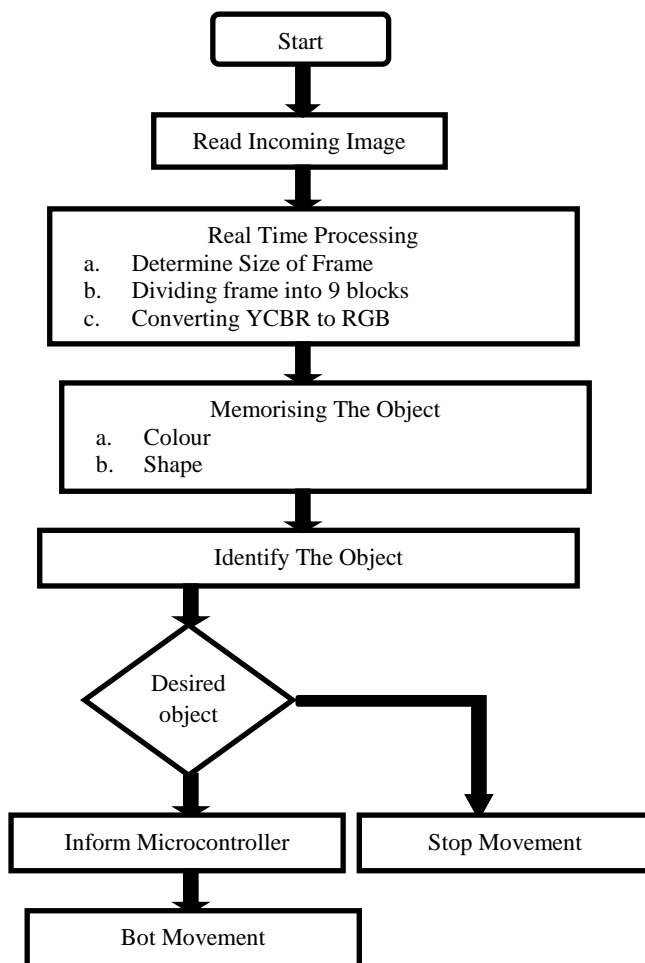


Figure 2. Image Processing Flowchart

2.2.1.1 Explanation:

1. Start:

The settings include starting the MATLAB, starting image acquisition tool box, setting up the settings for trigger and frames per second in image acquisition tool box, starting the video[2].

2. Read incoming image:

- After starting the video, place the desired object at the centre position of the lens in such a way that a complete and clear image can be obtained. In order to capture the

image, use the functions available in matlab for that particular purpose.

- Capture the image using the function `getsnapshot()` and view it using `imshow()`. This image is in ycbcr format[2].

3. Real time processing:

- Determine the size (resolution) of the image captured using function `size()`
- Divide the frames into blocks: This is done by setting some boundary conditions for the frame captured. This division of frame into blocks quadrants helps to define position of desired object
- Convert the stored image from ycbcr format to rgb format using `ycbr2rgb()`. [4]

4. Memorising the image:

The colour and shape of the object is noted and stored using `image()` function.[3]

5. Identifying the object and thresholding:

- Thresholding is done by converting rgb image into binary image using certain logical conditions.
- The object is detected by using various functions for finding the structural element `strel()` and setting 5 markers along the border of the image of the object using `plot()` and `impixel()` function.
- The binary values of the pixels obtained are then converted into decimal values using some logical conditions[7].

6. Decision making :

The movement of the bot is decided by using some conditions put under switch case.

a. If the desired object is present:

Whenever the object comes in the range of the camera vision, the signals are sent to the microcontroller depending upon the position of the object. The microcontroller further processes these signals and sends commands to the motor-driver IC for clockwise/anti-clockwise movement of the motors, which in turn are responsible for the bot movement.

b. If the desired object is absent:

If the desired object is not within the range of the camera vision or is not present at all, then the robot will stop its movement[9].

7. Bot movement:

As and when a valid byte is recieved by the microcontroller then according to the conditions specified in the arduino program, the movement of the bot i.e movement of the motors is controlled. This is done by putting some pins in the high and low state with the help of some functions such as `digitalWrite(pin number, state)` in arduino environment[1].

2.2.2 Control Decision Programming Flowchart:

2.2.2.1 Explanation

The flowchart shown below is for micro-controller which is used to control the direction and orientations of motors. Serial communication which takes place between the pc and the arduino board (microcontroller) which is initiated using the `Serial.begin` function of arduino. Appropriate baud rate is set for the communication. First the input and output port of UART are defined and initialized. First it will wait for a while to check if the data is ready in UART buffer. If so the UART port receives the data and a selection 'if -else' ladder is initiated to execute appropriate command according to received data. There are six possible data to be received which are shown in the flowchart with their corresponding actions. The UART is read repeatedly as long as signal is ready in UART buffer[1].

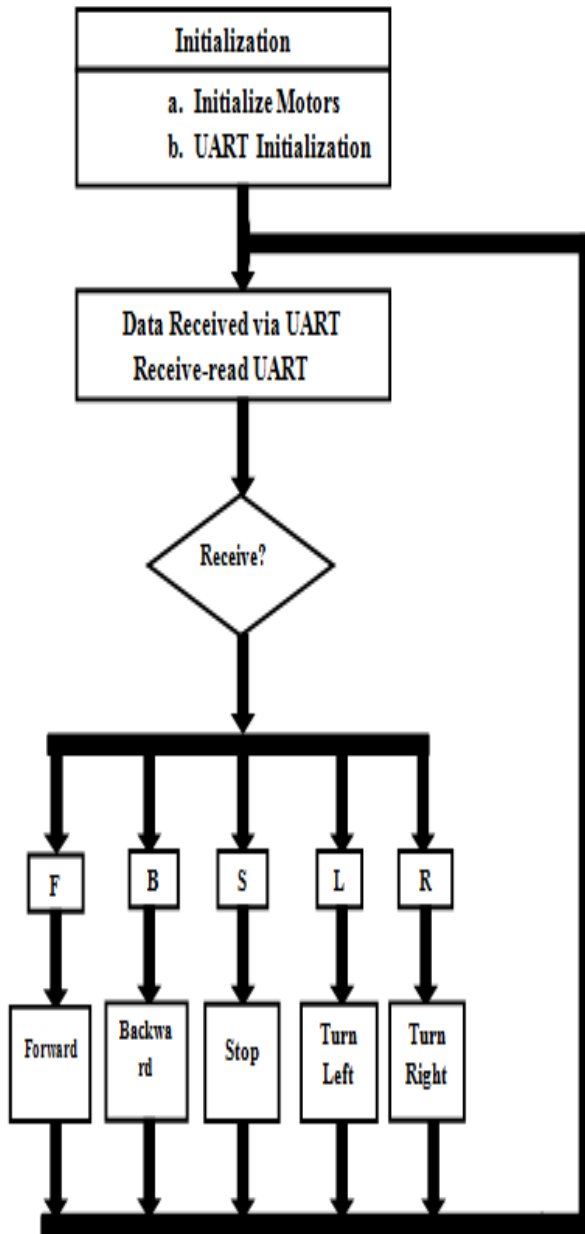







Figure 3: Flowchart for Controlling Micro-controller

3.RESULT:

Table 1.Motion of robot according to the position of ball

SrNo	Position Of Ball In Frame	Motion Of Robot
1		No Motion
2		

		Move Left
3		Move Right
4		Move Withward
5		Move Backward

When the object is stationary then it appears at the center of the frame and the robot is stationary. When we move the object closer to the webcam the size of object on the frame increases and the robot moves backwards. If the object is moved towards right then it is shown at the right side of frame and the robot moves towards right and similarly when object is moved toward left then the robot moves towards left [5].

4.CONCLUSION AND FUTURE SCOPE:

4.1 Conclusion:

Vision system is the most desirable and is the main cornerstone for developing complicated robots. By integrating a Vision System using a normal webcam sensor, in real time, the robot will be able to maneuver through desired environment and detect an object of interest because of its ability of providing considerable amount of information of the real world for better detection and to perform pre-defined interactions.

4.2Future Scope:

4.2.1 Hardware Improvement:

The current location of the robot is not known so in future work it can be proposed to use Global Positioning System, GPS for the localization of the robot. In order to protect robot Implementing Obstacle Avoidance Mechanism can be implemented. This can be done by sensing the back ground images and processing it properly. The robot can be made wireless by making the communication between robot and computer completely wireless. Due to this, the flexibility of the robot can be improved[12].

4.2.2 Software Improvement:

Simultaneous localization and mapping (SLAM) is a technique used by robots and autonomous vehicles to build up a map within an unknown environment (without a priori

knowledge), or to update a map within a known environment while at the same time keeping track of their current location. By using this technique, exact location of the robot can be mapped which improves the performance and increases the accuracy[12].

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IMAGE AND VIDEO TRANSMISSION USING LED

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ABSTRACT

The main objective of this project is to transmit the data using LED (Light Emitting Diode). With the increasing popularity of solid state lighting devices, Visible Light Communication (VLC) is globally recognized as an advanced and promising technology to realize short-range, high speed as well as large capacity wireless data transmission. In this report, a prototype of real-time audio and video broadcast system using inexpensive commercially available light emitting diode (LED) lamps is proposed. Experimental results show that real-time audio and video with the maximum distance of 2ft can be achieved through proper layout of LED sources and improvement of concentration effects. The design and construction of the LI-FI (Light Fidelity) light source enable efficiency, long stable life, and full spectrum intensity that is digitally controlled and easy to use.

General Terms

Visible Light Communication, Image and Video Transmission.

Keywords

VLC, LED, OOK, OFDM, MIMO, Phototransistor.

1. INTRODUCTION

In the 21st century, high speed data transmission is playing an important role in our daily life. Multimedia information is envisaged to be available at any place and at anytime [1]. Wireless access networks constitute a key element to achieving these goals. However, radio frequency bandwidth at frequency ranges which allow reasonable spatial coverage is a limiting factor. Therefore, alternative wireless transmission means have to be explored [2].

Short range communication systems characterize a wide range of scenarios, technology and requirements [4]. White LEDs are currently penetrating many areas of our everyday life. They are envisaged to replace high energy consuming light bulbs in private and business homes and even in street lamps. Moreover, they can be used in headlights of planes and trains, front and back lights in cars and trains, and for object illumination in museums, *etc.*

The next sections include literature survey about all the papers then methodology describing the experimental setup and finally conclusion based on literature review.

2. LITERATURE REVIEW

The data transmission using LED is a bidirectional, high speed and fully networked wireless communications, like Wi-

Fi, using visible light. The following sections talk about the literature that was used and reviewed for realizing the research work.

2.1 Basics of Visible Light Communication

The visible light communication is an emerging domain where visible light is used as a medium of data transmission. The basic and background information of visible light communication is introduced by Shinichiro Haruyama in [1]. This article talks about application of VLC along with its properties. VLC is new way of wireless communication. Visible-light LEDs are used as transmitter and photodiodes as receiver. Properties of VLC communication are as follows: distance using VLC is between 1-100m, the distance is small as compared to radio wave communication and it is basically line-of-sight communication. Major concentration is been given on applications like: location based services using photodiode as receiver and location based services using image sensor as receiver. It also mentions properties of VLC, major discussion on location based application which can be included in future scope for our project and advantages and disadvantages of VLC. Dinesh Khandalet *et al.* explains the advantages of visible light communication where the article [2] talks about features of Light Fidelity. It also mentions that every light bulb can be converted into Li-Fi signal receptor to transfer data and we could proceed toward the cleaner, safer, greener and brighter future. As we know that the airways are getting clogged day by day, Li-Fi can offer a genuine and very efficient alternative. Li-Fi is enabled by advanced digital transmission technologies. Optical cell networks based on Li-Fi are the link between future energy efficient illumination and cellular communications. They can also harness unregulated, unused and vast amount of electromagnetic spectrum and can even enable ever smaller cells without the need for new infrastructure. The visible light communication basic block diagram is explained by Ying jie He *et al.* in [3]. It mentions VLC prototype design with large increase in transmission distance and improvement in channel capacity. The MATLAB program is used to simulate the illuminance distribution for two practical light source deployments. VLC system descriptions are explained with general block diagram for data transmission using LED. Experimental result is presented and analyzed. Transmission on high quality video/audio images with the distance of 3 m can be achieved and improvements can be made by adding focusing lens between transmitter and receiver.

2.2 Orthogonal Frequency Division Multiplexing (OFDM)

There are various modulation techniques available. H. Elgala *et al.* mentions in article [5] that OFDM is a multiplexing technique. Therefore, in this article OFDM is considered in combination with modulation schemes.

2.3 Multiple Input Multiple Output (MIMO)

Thomas Q. Wang *et al.* in article [9] talks about imaging MIMO optical wireless system which uses a hemispherical lens in the receiver setup. The channel gain and the power density of the new system are derived. It shows that the system provides a wide FOV and significant spatial diversity at the same time. Results are also presented for a number of typical indoor optical wireless scenarios. Consequently, significant diversity order and wide FOV can be provided by the imaging receiver which can be used for high data rate communications. Yang Hong *et al.* have described in article [10] about the investigated BER and SNR performances of proposed pre-coding MIMO indoor VLC system for decentralized multi-user. The multi-user interference is eliminated in transmitter by BD pre-coding algorithm. Under this scheme, the power consumption and complexity of user terminals are reduced. A method to improve the system performance by utilizing different FOV is analyzed.

2.4 Modulation techniques

Table 1: Comparison of modulation technique [5][6][7].

Modulation	QPSK	OOK	OOK
BER	10^{-3}	2×10^{-5}	10^{-6}
Distance	1m	90cm	1.75m
Luminous	5600mcd	11000mcd	-
Intensity			
Photodiode	9.8mm^2	9.8mm^2	9.8mm^2

It is shown that for OOK modulation a BER of 2×10^{-3} was achieved at a distance of about 90cm with only a single LED. Harald Haas *et al.* in article [6] mention an overview about the technology and describe the physical layer implementation of a VLC system based on a modified version of the classical OFDM modulation technique.

Preliminary measurements showed promising results with 9 LEDs producing illuminance of about 5 times below that required for work spaces.

Mostafa Z. Afgani *et al.* in article [7] talks about wireless communication using white, high brightness LEDs. In particular, the use of OFDM for intensity modulation is investigated. The prototype system has managed a distance close to one meter with an impressive bit error rate of 10^{-3} under the moderate ambient light conditions found indoors.

3. METHODOLOGY AND EXPERIMENTAL SETUP

Methodology section explains the flow of the project. In this section the experimental setup and methodology is described with the help of flow chart. The proposed system will have description of transmission of data using LED. The data will be in the form of image and video.

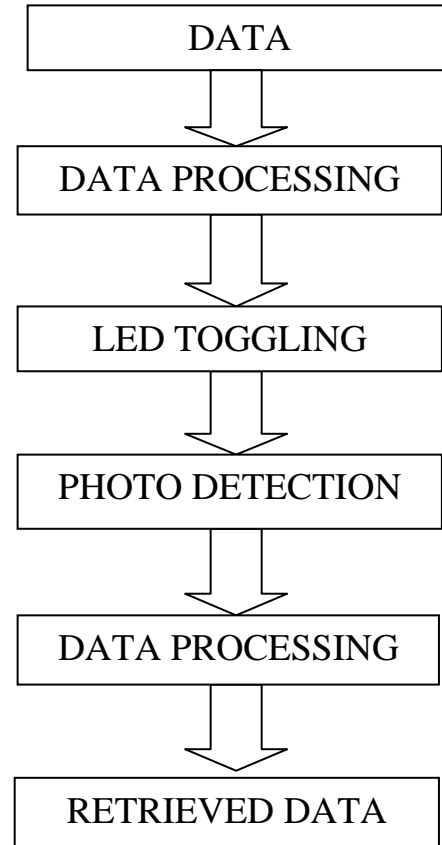


Figure1: Flowchart

The data i.e. Image/text or video is given as an input to the sender PC consisting of MATLAB (software) reserved for image processing of the input image. Image processing is done in the sender PC, the output of which is processed by the microcontroller connected to PC via a serial port using USB to TTL.

Depending upon the output of microcontroller the led's connected to one of its port gets toggled. At the receiver side photo-detection takes place using photo-diode placed at the receiver end. Then the microcontroller at the receiver side conducts the binary conversion of the input data taken from photo-diode output. This data is received by the receiver PC connected to microcontroller via serial port processed the data in order to reconstruct the send image at the receiver side by using the MATLAB (software).

4. CONCLUSION

It has been shown that even though most existing efforts are still in a very early stage, VLC is a promising technology with a wide held of prospective applications. An ever growing

interest in VLC throughout the world can be expected to lead to real-world applications in the future. In some fields of application it poses a favorable alternative to conventional solutions (infrared, WLAN). The transmission is based on the assumptions of direct LOS (line-of-sight) channels and simplex channel conditions. The encoding and decoding could be used in the transmitter part and receiver part to reduce the error in transmission. In addition, the data transmission rate could be enhanced by using fast switching LED. The driving speed of the circuit could also be enhanced if fast switching transistors were used. The tests were carried out under moderate indoor ambient light conditions. It is envisaged larger coverage can be obtained by using LED arrays. Finally, the wireless communication technology could be embedded into the visible light source which is the ultimate goal of the project.

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A study of Parallels between Modern Physics and Concept of *Spanda Shastra*

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ABSTRACT

Spanda-Karikas is one of the important works of Kashmir Saivism. Modern scientists have discovered that the world was created from the vibration of the first explosion and that the universe is still expanding. This paper points out the parallels between modern physics and *spanda* principles. We will particularly look at the parallels between *spanda* principles to particle physics, quantum mechanics, theory of relativity and string theory. It is our opinion that present-day science and engineering students should be able to work quantitatively with the concepts of modern physics and *Spanda Shastra*.

Keywords

Spanda-Karika, modern physics, particle physics, quantum mechanics, string theory Shiv *shakti*, *shakti-cakra* mantras.

1. INTRODUCTION

Spanda-Karikas is one of the important works of Kashmir Saivism. The doctrine of *spanda* is scientific. Modern scientists have discovered that the world was created from the vibration of the first explosion and the universe is still expanding. *Spanda* is a Sanskrit term derived from the root '*spadi*', which means to move a little for the creative pulse of the universe as it manifests into dynamism. The term is a key concept of Kashmir Saivism according to which the entire universe is nothing but conscious energy where everything in the universe is that I consciousness expressed in different forms. *Spanda* as the supreme reflects different meanings including vibration, an explosion, an arising of a throb source of spontaneous expression or a reflection oriented through thought and intention to organize into authentic action. It is dynamic consciousness. *Spanda* also connotes *svatantrya* (absolute freedom) of the divine. *Spanda* means both tension, excitement, and, in scientific terms, voltage or potential difference. *Spanda* may be described as a desire to lie according to the innermost urging of soul and rhythm of the nature of the body as they harmonize within the great scale of natural life. *Spanda* is not only sound but unity of sound and light, not only tone but a unity of tone and colour, a unity implied by the term 'colour tones'. The authorship of *Spanda-Karikas* is

divided. Amongst Bhaskara Utpala Vaisnava and Bhatta Utpala, both of whom flourished in the 10th century CE.

The author of this *Karikas* was Kallata who was the chief disciple of Vasugupta. Vasugupta divided the *Karikas* into three sections: totalling 53 verses as follows:

1. Svarupaspanda or Spanda as essential Nature of Siva [25 verses]
2. Sahajavidyodaya [7 verses],
3. Vibhutipanda [19 verses].
4. two verses.

2. MODERN PHYSICS

In the 18th century Newtonian universe is Euclidian Geometry. Newton's equations and fundamental laws of motion are the basis of Classical Mechanics. French mathematician Laplace explained irregularities in the motion of the planets. So Laplace succeeded in explaining the planetary motions, tides and other phenomenon related to gravity. In 19th century discovery of electric and magnetic field along with the works of Faraday and Maxwell replaced the concept of force by the force field. Maxwell tried to explain in mechanical terms, interpreting the fields as states of mechanical stress in space filling medium called 'ether' and the electromagnetic waves as elastic waves of this ether. Einstein pronounced that no ether existed and that the electromagnetic fields were physical entities which could travel through empty space and could not be explained mechanically.

In 1905 Einstein initiated the revolutionary trends of thought 1) special theory of relativity and 2) theory of atomic phenomenon. According to relativity theory space is not three dimensional and time is not a separate entity. Both are intimately connected and form a four dimension space-time. In relativity we can never talk about space without talking about time and vice versa. Einstein invented the equation $E = mc^2$ where 'c' is the speed of light. Einstein's general theory of relativity abolishes the concepts of absolute space and time. The whole structure of space and time depends on the distribution of matter in the universe and the concept of empty space loses its meaning. The discovery of X-rays led to the

conception that the atom had some structure. Ernest Rutherford realized that α -particles emanating from radioactive substances were high speed. This was by supplemented by discoveries of Niel Bohr, de Broglie, Schrödinger, Pauli, Heisenberg and Dirac. Every time they asked nature a question in an atomic experiment, nature answered with a paradox. After a long time they accepted the fact that these paradoxes belong to the intrinsic structure of atomic physics. In the words of Heisenberg they got into spirit of quantum theory and finally they formed the concept of quanta.

Depending on how we look at them they appear sometimes as particles or sometimes as waves. After these developments Max Planck discovered that energy is in the form of energy packets. Einstein called these packets 'quanta'. Quantum theory reveals a basic oneness of the universe. Quantum theory has shown that all these properties of atoms arise from the wave nature of their electrons. In 1930, after quantum theory had emerged, the main task was to understand the structure of nuclei and forces which hold them together. In the 1930s scientists discovered the basic building blocks of matter which were three basic elementary particles. Understanding the nuclear world is essential to both quantum theory and relativity theory. The new view of particles was put forth by Dirac. Dirac predicted the symmetry between matter and antimatter. After Dirac the dynamic realistic view was adopted. Did the paradox disappear? The particles were now seen as dynamic patterns, which may involve additional particles. High energy collision particles are used by physicists to study the properties of these particles and particle physics is therefore also called 'high energy physics'. Both force and matter are now to have their common origin in the dynamic pattern, which we call 'particles'. The particle world cannot be decomposed into elementary components. In modern physics the universe is as a dynamic inseparable whole which always includes the observer in an essential way. The similarity of quantum physics to relativistic theory becomes apparent and even stronger in 'quantum-relativistic' models of physics. After this the concept of string theory started gaining ground.

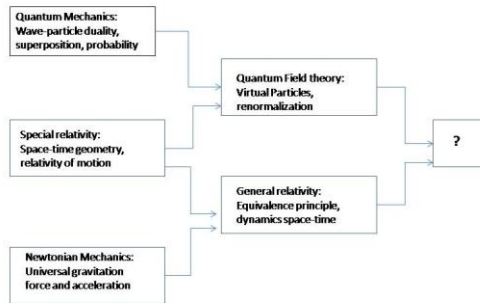
Relativistic quantum field theory was effective in describing the observed behaviours and properties of elementary particles. But the theory itself only works well when gravity is so weak that it can be neglected. Particle theory only works when we pretend that gravity does not exist. General relativity has a wealthy look into the universe, the orbits of planets, the evolution of stars and galaxies, the big bang and recently observed black holes and gravitational lenses. However, the theory itself only works when we consider the universe as purely classical and quantum mechanics as not needed in our description of nature. String theory is believed to bridge this gap.

Originally string theory was proposed as an explanation for the observed relationship between mass and spin for the certain particles called 'hadrons' including

protons and neutrons. It has also been known for a long time that there is a particle with zero mass and two units of spin. This has been known by the theoretical physicist for a long time. This particle is called 'graviton'. This led to the belief that string theory be applied not as a theory of hadronic particles but as a theory of quantum gravity for zero distance between the interacting particles for the gravitons' mathematics behaves so badly at zero distance that the answers just do not makes sense. In string theory the strings collide over a small but finite distance and the answers do make sense. But the zero distance behavior is such that we can combine quantum mechanics with gravity and we can talk sensibly about a string excitation that carries the gravitational force. This was a great hurdle that was overcome in the late 20th century physics, which is why young people are willing to learn the grueling complex abstract mechanics that is necessary to study quantum theory of an interacting string. What is string theory? Think of a guitar string that has been tuned by stretching the string under tension across the guitar. Depending on how the string is plucked and how much tension is in the string, different musical notes will be created by the string. These musical notes could be said to be excitation modes of that guitar string under tension. In similar manner, in string theory the elementary particles we observe and particle accelerators could be thought of as the 'musical notes' or excitation modes of the elementary strings. If string theory is to be a theory of quantum gravity then the average size of a string should be somewhere near the length scale of quantum gravity called the 'Planck length' which is about 10^{-33} centimeters. String theories are classical according to whether or not the strings are required to be closed loops, and whether or not particles spectrum includes fermions. In order to include fermions in string theory, there must be a special kind of symmetry called 'super symmetry', which means for every boson (particle that transmits a force) there is a corresponding fermion (particle that makes up matter), so super symmetry relates the particles that transmit forces to the particles that makes up matter. In the next decade evidence for super symmetry at high energy would be compelling evidence that string theory was a good mathematical model of nature at the smallest distance scale.

3. HISTROY OF STRING THEORY:

Figure 1: Components of Strings



In 1970 string theory emerged to describe the particle spectrum and it also described the quantum mechanics of oscillating strings. In 1991–1995 the duality revolution's interesting work on string black holes in higher dimensions leads to a revolution in understanding how different versions of string theory are related through duality transformations. Then what is string theory—what is the world made up of? Ordinary matter is composed of atoms, which are in turn made up of three basic components: (1) The electron whirling round the nucleus. The electron is a truly fundamental particle and one of a family of particles known as leptons. (2) The nucleus composed of neutrons and protons. Neutrons and protons are made of smaller particles known as quarks. Quarks as far as we know as elementary. Our knowledge of subatomic composition of the universe is summarized by the Standard Model of particle physics. It describes (1) the fundamental building blocks out of which the world is made, and (2) the forces through which the blocks interact.

There are 12 building blocks:

Table 1: Building Blocks of particles

Six Quarks	Six Leptons
UP,	Electrons and heavier siblings
DOWN	Neon
CHARM,	Tauon
STRANGE,	Three neutrinos
BOTTOM, TOP	

For example, proton is made up of two up quarks and one down quark. There are four fundamental forces in the universe:

1. Gravity
2. Electromagnetism
3. Weak nuclear force
4. Strong nuclear force.

Each of these forces is produced by fundamental particles that act as carriers of the force. The most familiar is photon, a particle of light, which is the mediator of electromagnetic forces [e.g. a magnet attracts a nail because both the objects exchange photons]. Graviton is a particle associated with gravity. Strong force is carried by eight particles known as 'gluons'. Weak force is transmitted by three particles, the ω^+ , ω^- and z . The behaviour of all these particles and forces is described precisely by the Standard Model. The essential idea behind string theory is that all of the different 'fundamental' particles of the standard model are really just different manifestations of one basic object, a string. How can that be? Electron is ordinarily pictured as a point with no internal structure. A point cannot do anything but move. But if string theory is correct then under extremely powerful microscope electron is not really a point but a tiny loop of string. A string can do something aside from moving—it can oscillate in different ways. If it oscillates a certain way, then from a distance we are unable to tell whether it is really a string, and what we see is an electron. But if it oscillates in some other way than gravity then we call it a 'photon' or a quark or a you get the idea. So if string theory is correct then the entire world is made of strings.

Figure 2: Force Carriers

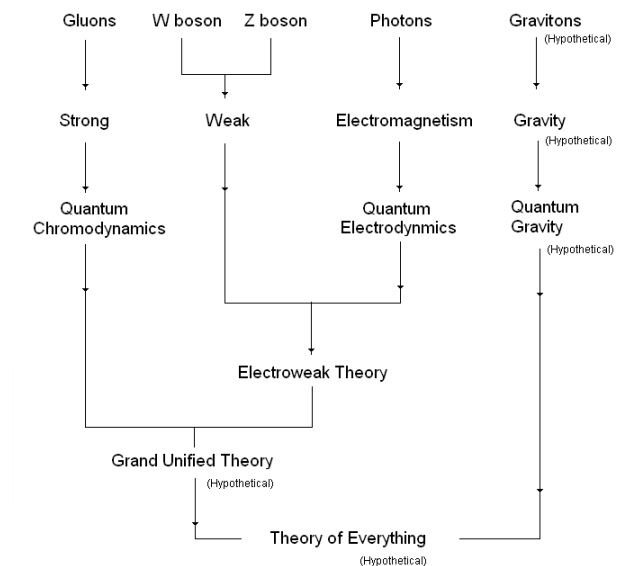
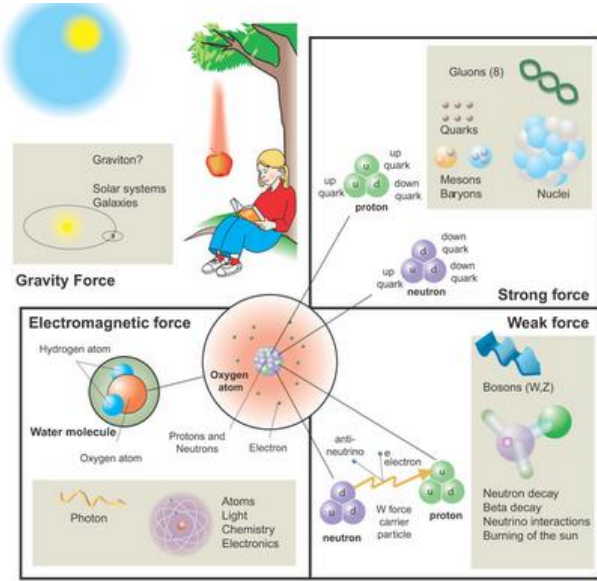


Figure 3: Newton's Concept of Force



Source: The Daily Blaa Blog Spott
<http://www.thedailyblaa.com>

4. Parallels between Spanda Principles and Modern Physics.

In what follows, we provide the verses from the *Spanda Shastra* and attempt to draw out a parallel of it to modern physics. The numbers correspond to the numbers of verses.

1. In *Spands Sastra: Svatantryasakti* (The power of absolute freedom) of lord is called *Spanda*.

Parallels in physics: Energy is parallel to *svatantryasakti*. Is energy fundamental?

2. In *Spanda Shastra*: This power though non-distinct from the lord goes on presenting the cycles of manifestation and withdrawal on its own background like the reflection of a city in mirror.

Parallels in physics: This *fundamental* property of nature (matter and non-matter) which occur in different forms with respect to time and is unique and also it cannot be differentiated from its origin $(x_i y_i z_i t_i) - (x_n y_n z_n t_n)$

3. In *Spanda Shastra*: The great teacher has written this *sastra* in order to explain the fact that our nature is identical with that of Sankara who is full of *spandasakti* the essence of which consists in quivering light, thus this *shastra* has been appropriately named *Spanda*.

Parallels in physics: The universe is made up of different particles. The existence of these particles is realized due to their vibrating property in nature

4. In *Spanda Shastra*: The root meaning of the word *Spanda* is 'having slight movement' the lord is *acala*, means non-moving. Therefore, movement cannot be ascribed to him. The word '*Spanda*' in case of the lord, i.e. Shiva, has to be taken in a figurative sense of creative pulsation, divine activity throbbing with life dynamism.

Parallels in physics: Macroscopically atom is the smallest part of an element. Each element is composed of different elements. Therefore we can say that the atom is the representation of the universe which is basically a stable state. However, when this universe is studied through its particle structure microscopically, it is observed that the notion of the universe being stationery is negated. In fact the universe is constantly in a moving state (vibration state) which is attributed to the elementary components of atoms of the universe which are by nature always in motion in this aspect. We can claim that the universe is dynamic and not static. This phenomena assigns the dynamic to the universe which defines life.

5. In *Spanda Shastra: Spanda shakti* consists of the compact bliss of consciousness which holds in its bosom (chest) endless cycles of creation and dissolution which is of the nature of the entire world of the pure and the impure; which, in turn, is of the nature exhibiting limitation and expansion of subjects and object

Parallels in physics: The world is made up of building blocks which are fundamental elements. These blocks constantly interact with each other due to forces existing between them. That means core of building blocks possesses certain quantum of energy which is intrinsic of the blocks and forms the source of energy for interactive forces mentioned above. This quantum of energy is variable in nature for every block and hence the amount of energy inhaled or exhaled during the interaction occur intermittently and is responsible for the expansion and contraction behaviour of the matter—pure or impure—of which the universe is made up of. The details of the quantum energy, interactive forces and related blocks is elaborated in the Standard Model.

Figure 4: Standard Model of Elementary Particles

(Name)	Electric Charge	Model of Elementary Particles			
(Symbol)	Number of Color Charges	Three Generations of Matter(Fermions)			Force Carriers (Gauge Bosons)
	Mass in MeV	I	II	III	
Quarks		Up +2/3 u 3 ~ 5	Charm +2/3 c 3 ~1350	Top/Truth +2/3 t 3 > 131000	Photon 0 γ 0 Electro-magnetism
		Down -1/3 d 3 ~ 9	Strange -1/3 s 3 ~175	Bottom/Beauty -1/3 b 3 ~ 4500	Gluon 0 g 8 0 Strong Interactions
		Electron Neutrino 0 ν _e 0.0000070	Muon Neutrino 0 ν _μ 0.27	Tau Neutrino 0 ν _τ 0.31	Z zero 0 Z ⁰ 91187 Weak Interactions
		Electron -1 e .511	Muon -1 μ 105.66	Tau -1 τ 1777.1	W plus minus ±1 W [±] 80220
Leptons					

September 1994

(Source:

<https://www.withfriendship.com/images/g/30710/Elementary-particle-pic.png>)

6. In *Spanda Shastra*: The goddess (i.e. creative power) is always engaged in exercising her energy in manifestation and yet always appears as replete she is the wave of ocean of consciousness, the volitional power of LORD.

Parallels in physics: The atomic power is constantly used up in the creation of the new universe and this power is exhibited in different forms and capacity. The quantum of energy which is intrinsic of every individual component forms a part of the vast energy existing in the universe. This represents the vibration behaviour of the matter.

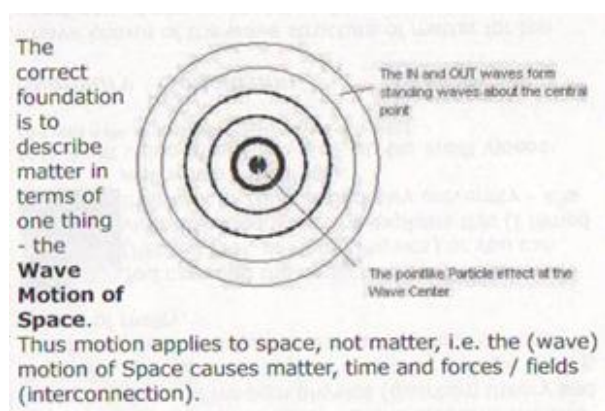
7. In *Spanda Shastra*: Whose *sakti* (divine power) predominant in displaying creations instinct with the concealment (*nimesa*) of his (*sivas*) essential nature is the cause of the manifestation of the universe, i.e. manifestation form Siva, down to earth consisting of diversity.

Parallels in physics: This energy is prominent in the phenomena of the process of variation in the form of universe thereby hiding the fact that energy is the root cause for the change in the universe.

8. In *Spanda Shastra*: In reality however nothing arises and nothing subsides we shall show that it is only the divine *Spanda sakti* (the divine creative *pulsatia*) which though free of succession appears in different aspects as if flashing in view and if subsiding *sthiti* (maintenance of the world process *vilaya* (concealment of the essential nature) and *anugraha* (grace) are not anything other than particular forms of absorption and manifestation.

Parallels in physics: A quantity of liquid when cooled changes with absorption of energy as the same. When heated it changes again, and, with the form of energy exhaled, the quantum of energy in both the cases is the same. This shows that energy is neither created nor destroyed but what changes is the form (state) only. The law of conservation of energy is verified.

Figure 5: Wave Motion of Space



(Source: <http://www.spaceandmotion.com/Most-Simple-Scientific-Theory-Reality.htm>)

9. In *Spanda Shastra*: By *sakti-cakra* is meant the aggregate of twelve divinities such as *sristi rakta*, etc. By its *vaibhava* is meant the play of that aggregate in the form of creative activity (*udyoga*), maintenance (*avabhasana*), and absorption (*carvana*). So the whole phrase *sakti-cakra vaibhava- prabhavam* means the cause of creative creativity, etc., of the twelve divinities.

Parallels in physics: Energy spectrum of the atomic structure is an aggregate of 12 different elementary particles structure spread over three generations of matter in the form of quarks (q_1, q_2, q_3) and leptons (L_1, L_2, L_3). The beauty of the resultant of these three generations of material particles is responsible for the creation, maintenance and absorption activities of the universe.

10. In *Spanda Shastra*: *Sakti-cakra* is described of the aggregate of powers because it exists as identical with the internal digit of the supreme.

Parallels in physics: The atomic structure (*shakti chakra*) is the sum of the powers responsible for the three basic activities, that is creation, maintenance and destruction. This happens due to the behavior of the originator atom. So we say that the two powers (structure and originator) are identical.

11. In *Spanda Shastra*: *Sakti* means 'the eternal mantras'.

The empirical individuals experiment their psychic apparatus, their organs of sense and action and the objective world are the expressions of these saktis. Eternal mantra is the mantra of *purnahanta* the ever-Present perfect I-Consciousness of the divine.

Parallels in physics: The fundamental vibrations of the elementary particles are the frequencies of the ever existing atom of this universe and they are the intrinsic properties of the atom.

12. In *Spanda Shastra*: According to of the group of powers arising from the multitudes of the words '*sakti*' stands for the nature of the deities like Bramhi, etc. The presiding deities of the multitudes of the words are the following:

- I. *Yogisvari* or *mahalakshmi* of a-
vergai-e of the class of vowels.
- II. *Bramhi* of ka-verga.
- III. *Mahesvari* of ca-verga.
- IV. *Kaumari* of ta-verga.
- V. *Vaisnavi* of ta-verga.
- VI. *Varahi* of pa-verga.
- VII. *Andri* or *indrani* of ya-verga.
- VIII. *Camunda* of sa-verga.

Figure 6: Consonents and Vowels

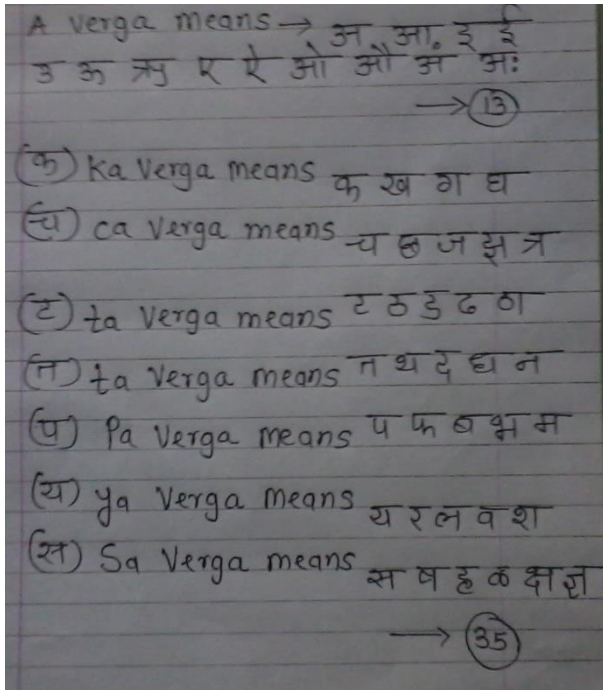


Table 2: Elementary Particles

Elementary Particles					
	Types	Generations	Antiparticle	Colors	Total
Quarks	2	3	Pair	3	36
Leptons	2	3	Pair	None	12
Gluons	1	1	Own	8	8
W	1	1	Pair	None	2
Z	1	1	Own	None	1
Photon	1	1	Own	None	1
Higgs	1	1	Own	None	1
Total					61

(Source://en.wikipedia.org/wiki/Standard_Model)

Parallels in physics: Every element is recognized by its atomic structure which is made up of two basic components —1)the core and 2)its derivative. 1)The core is broadly derived into 12 different energy levels 2)The derivative may be considered as their siblings and are broadly 36 in nature based on their quantum energy. Hence we can say that the entire phenomena in the universe is because of the kinetic energy of the core which has 12 quantum levels and their derivative 36 quantum levels resulting in a total of 12+36=48 quantum energy levels in general depending on energy spectrum of these 48 levels. These 48 are graded as *brahmi*,-----etc (8 *verga*)

13. In *Spanda Shastra*: In *Spanda Shastra* the particle 'ca' should be interpreted in the sense of 'eva' and should be

put in different order so now the line would stand as 'yatrasthitameva' (yad) idam sarvankaryam yasmad nirgatam meaning only as existing in him is all this world come forth.

Parallels in physics: This collection of 48 energy levels are responsible for the universe which is existing in a given state.

5. Conclusion

In this paper we have tried to unfold the mystery of *Spanda Shastra*. In an attempt to do so, we found and observed that in modern physics the technology and the laboratory are dominant in arriving at the results, whereas in *Spanda Shastra* the human body was the technology and instruments both for arriving/understanding of the principles of nature. Hence we are prompted to conclude that the better understanding of nature and its laws/behaviour will be more fruitful if both the sciences work hand in hand.

ACKNOWLEDGMENTS

Our thanks to the experts who have contributed towards development of the paper 'Parallels between Modern Physics and concept of Spanda'

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Encryption Based Intermediary System

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ABSTRACT

With the revolution in Mobile Phone Industry and cheap Internet access almost everyone today has a good data connection in their mobiles. And with internet the world has become a small place and communication has become easy and there are lots of apps to facilitate this social networking need among people.

But with the availability of other social networking applications has put large impact on today's world market but none of the applications provide adequate security and business oriented features since they are informal.

Intermediary is an instant messaging service for smartphones and selected feature phones that uses the internet for communication.

So we propose a new app for Formal, Secure and Organized Communication between group of people. It will also include:

1. Message Encryption
2. Forums

Keywords

Cryptography, Encryption, Decryption.

1. INTRODUCTION

Our system is an application for the Android platform for mobiles. It is the most used mobile OS in the world. The high growth in internet usage and networking technology has lead to a common culture for interchanging of the data very drastically. Hence it is more vulnerable to duplication of data and re-distribution by hackers. Therefore the information has to be protected while transmitting it. For this many encryption techniques exist which are used to avoid the information theft.

Cryptography is the practice and study of techniques to make communication between two parties secure and safe from a third party hacker or enemy.

Plain Text: The original message that the person wishes to communicate with another person is defined as Plain Text. It is in normal text and language and can be understood by anyone. In cryptography the actual message that has to be send to the other end is given a special name as Plain Text. [1]

Cipher Text: The message that cannot be understood by anyone or meaningless message is called as Cipher Text. This is the text we get after applying the encryption algorithm to

plain text and it is meaningless to be understood as it has been encrypted. In Cryptography the original message is transformed into non readable message before the transmission of actual message. [1]

Encryption: A process of converting Plain Text into Cipher Text is called as Encryption. Cryptography uses the encryption technique to send confidential messages through an insecure channel. The process of encryption requires two things- an encryption algorithm and a key. An encryption algorithm means the technique that has been used in encryption. Encryption takes place at the sender side. The encryption key is used to encrypt the message.

Decryption: A reverse process of encryption is called as Decryption. It is a process of converting Cipher Text into Plain Text. In cryptography [1]

Symmetric Key Cryptography: In this type of cryptographic technique, the sender and receiver share the same key for encryption as well as decryption. These can be stream ciphers or block ciphers. The Data Encryption Standard (DES) and the Advanced Encryption Standard (AES) are some examples of cryptography techniques which use symmetric key.

Public Key Cryptography: In this type of cryptography technique there are 2 keys one is public key and other is the private key. The public key is known to anyone and declared publically and the private key is kept secret. The RSA algorithm is an example of public key cryptography.

2. RELATED WORK

Social application requires privacy to be maintained hence almost every application uses security algorithms to maintained privacy of user conversation which encrypts the user data so that it may not be visible to others. They use some encryption algorithm like DES, Triple-DES, AES, Blowfish etc. But still the privacy is not maintained as hackers hack the system and break the security.

DES (Data Encryption Standard) is symmetric key algorithm used for encryption. It was developed at IBM in 1970 and published by the National Institute of standards and Technology (NIST). The key length of DES is 56 bits as it takes 64 bit Plaintext and creates 64 bit cipher text. DES is an encryption technique but as it is demonstrated as weak technique it is insecure. In January 1999, DES key was

publically break and hence it is considered as insecure technique.

Triple-DES (3-DES) is a symmetric key block cipher which applies the Data Encryption standard at each block three times. Triple DES can be done with two keys or with three keys. DES algorithm was enough for encryption purpose until it was broke publically i.e. brute-force attack. Triple DES is more secure than DES as it increases the key size of DES to protect the system against attacks. Rather to design a new block cipher algorithm. But is three times slower than DES and it requires $64 \times 3 = 192$ bits of key size.

AES (Advanced Encryption Standard) was published in 2001 by National Institute of standards. It is more advanced than DES. The key length of AES can be 16, 24 or 32 bytes and it takes a plaintext block size of 128 bits or 16 bytes. It is a symmetric block cipher that is intended to replace DES as it is the approved standard for wide range application. This algorithm is also referred as AES-128, AES-192 or AES-256. The cipher consists of N rounds where it depends on key length. 10 rounds for 16 bytes key, 12 rounds for 24 bytes key, 14 rounds for 32 bytes key.

Using symmetric key algorithm both the parties share same key i.e. only one key is used for encryption and decryption hence this key should always kept secret even while sharing, if the key is revealed to the attacker than he can decipher any messages.

While using symmetric key algorithm as there is only one key for encryption and decryption at sender's side and receiver's side. The key must always be kept secret to maintain privacy. Hence we have to another algorithm for key sharing.

Symmetric key is much easier to crack as compared to asymmetric key.

3. PROPOSED METHOD

Most of messenger uses symmetric key cryptography which is breakable as attacker get that private key. Thus we use RSA algorithm which is an asymmetric key cryptography. Asymmetric algorithms seem to be ideally suited for real-world use: As the secret key does not have to be shared, the risk of getting known is much smaller. Every user only needs to keep one secret key in secrecy and a collection of public keys.

The RSA algorithm was developed in 1977 by Ron Rivest, Adi Shamir, and Leonard Adleman at MIT; the letters RSA are the initials of their surnames.

Basic steps of this algorithm are key generation, encryption, and decryption.

In key generation we generate public key. We select two large prime numbers of similar bit-length. Calculation of 'n' is done by multiplying those numbers. Euler's totient function is calculated as $(p-1) \times (q-1)$.

Consider an example of user 1 and user 2,

In encryption step user 1 transmit public key to user 2 and keeps private key secret. User 2 computes cipher text.

In decryption step user 1 can recover message using that cipher text. [2]

Equations used in encryption and decryption are

$$c = m^e \pmod{n}$$

$$m = c^d \pmod{n}$$

4. ANALYSIS AND RESULTS

Asymmetric key algorithm uses two keys for encryption and decryption i.e. public key for encryption and private key for decryption. Private Key is never visible.

In asymmetric key algorithm the public key is available to anyone and used just for encryption and for decryption private key is used and hence there is no need of using key exchange algorithm. Asymmetric key is difficult to crack as compared to symmetric key. Therefore confidentiality is maintained as asymmetric key algorithm is more secure.

A Quick messaging application provides communication between two or more persons over a network in real time. There are many social applications like viber, hike etc.

In the existing system one can add friends to a broadcast list or make friends group from their contact by using their mobile numbers for group communication. And on individual basis one can communicate with each other and if a person is available than a mark of online can be seen side by that persons contact.

We have added forums for organized discussions. It is used for centralized communications in which group of people interact on a particular topic and post their comments on that topic itself. It is like a Collaborative system working as a team. It can be used for school projects, sharing information, working on business project etc.

5. CONCLUSION

This Intermediary system is used for sending and receiving messages while maintaining confidentiality. The RSA Algorithm has been used for Encryption of messages. It is easy to implement and as it is an Asymmetric Key Encryption algorithm it is more secure. The main problem with symmetrical encryption is that if the key is lost, or stolen, the entire transmission can be compromised since the interceptors can immediately decrypt the message with the one key. Hence we are using RSA Algorithm to overcome this drawback.

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Properties of High Performance Concrete using rice hush ash

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ABSTRACT

This paper presents a study on properties of HPC and comparing the properties with different codes and literatures. The study focus mainly on the mechanical properties, compressive strength, split tensile strength, modulus of rupture, modulus of elasticity of High performance Rice Husk Ash Concrete by 5%, 10% and 15% of rice husk ash (RHA) replacement of OPC to achieve strength of M60, M80 and M100 and compared with concrete without RHA. The stress-strain behaviors under uniaxial compression as well as cracking characteristics of HPC were also observed in this study. Statistical analysis was conducted to develop the relations for the various mechanical properties. According to the test results of HPC, Split tensile strength, modulus of rupture strength and modulus of elasticity are related to the compressive strength of concrete and are good agreement with some of the equation proposed in literature.

Keywords

High performance concrete, Mechanical properties, Rice hush ash

1. INTRODUCTION

Increasing the demand for good quality concrete with better durability properties has focused interest on high strength concrete. In the early 1940s, strength of 30MPa at 28 days was considered to be the representative of high strength concrete (HSC). This level jumped to 50 MPa in the late 1950s and early 1960s. Concrete strength of 100-130 MPa is now being viewed as the criteria for high strength concrete. Recently, concretes with compressive strength over 100 MPa have been used commercially in construction of many applications such as high rise building, long span bridges, undersea and underground structures.

The quality of concrete is usually characterized by its mechanical properties. These properties have an impact on how the members of higher strength reinforced concrete behave. The important behavioral difference in mechanical properties of normal strength concrete (NSC) and HPC is the stress-strain relationship. As the strength of concrete increases the curve becomes more linear, increasing its modulus of elasticity and reducing the area below the curve and hence affecting the stress-block

parameters. Due to this the design parameters derived for NSC cannot be used for HPC.

Strengths of concrete such as tensile, flexural, shearing and bond strength are all related to the compressive strength. For this reason, it means that concrete with high compressive strength will also enhance other properties. Concrete cubes Mechanical properties of hardened concrete are the most important property which civil engineers or everyone who work with concretes should pay attention. These properties are compressive strength, modulus of elasticity, tensile strength, creep and shrinkage. In this research, the first three properties of HPC were investigated. Background knowledge of these properties is described below.

There are many factors contributing to the compressive strength of concrete. These are concrete mixtures, water cement ratio, curing method, shape and size of specimen. From the point of zero stress up to 40-50% of the ultimate compressive strength, which is the service range of concrete, the stress strain relationship is almost linear since concrete is an inelastic material. However, in practice, when concrete is subjected to service, short time loading, the stress strain relationship is usually assumed to be linear.

Beyond the service range, the stress strain relationship of concrete shows a parabolic behavior. Generally, when concrete reach their maximum compressive strengths, the corresponding strains are usually around 0.002. After the peak strength, concretes are still able to resist the compressive load while the strains keep increasing. However, concrete stresses continue to decrease until they fail at the strain of about 0.003-0.004 (mm/mm) depending on their ultimate compressive strengths. Note that, for higher strength concretes, the compressive stresses drop faster than those of lower strength concretes after passing the peak strengths. Accordingly, it can be concluded that lower strength concretes have more ductility than higher strength concretes.

There are three methods to determine the tensile strength experimentally: uni-axial tension (direct tensile test), split cylinder test and modulus of rupture. Direct tension is hard to achieve in practice, due to inevitable interaction between specimen and machine that tend to disturb the stress distribution. Splitting tensile strength is used in Europe, but according to Legeron and Paultre (2000), even if a good correlation with direct tensile results was observed, the aggregates are usually fractured

along the splitting plane, phenomenon unlikely to happen in direct tension, where they are pulled out. Modulus of rupture is regarded as the best to describe the flexural behavior of the members. Raphael (1984) observed that the results are in a higher range than the last two by about 50%. The same author attributes this fact to the nonlinear nature of stress-strain diagram of concrete in tension, and to the inappropriate use of the elastic theory to derive the modulus of rupture. A co-efficient of 0.744 that has to affect the modulus of rupture in order to give the actual tensile stress was proposed after approximating the non-linear curve of concrete in tension with a rectangular stress block.

When, considering higher compressive strength, one expects that the tensile strength will increase as well. This assumption is true, though the increase is not proportional to that of compressive strength. Marzouk and Chen [5] reported that the tensile strength of high strength concrete in direct tension was 5% of compressive strength compared to 8% of f_c' for NSC. The author concluded that overall, high strength concrete has more brittle and stiffer behavior than NSC.

Various authors tried to establish a relationship between tensile and compressive strength in splitting tension and flexure and the equations are as shown in Tables 1.1 and 1.2

Table 1.1 Equations for splitting tensile strength as given in codes and research papers

ACI 318-95 [2]	$f_t = 0.62\sqrt{f_c'}$
ACI 363 [3]	$f_t = 0.94\sqrt{f_c'}$
Ahmad and Shah [4]	$f_t = 0.44(f_c')^{0.7}$
Setunge [6]	$f_t = 0.44(f_c')^{0.65} \pm 2.5\%$
J.Xie and A.E.Elwi [25]	$f_{ct} = \frac{2p}{\pi 2LD}$
S.Bhanja and B.Senguptha [7]	$f_{sp} = 0.248(f_c')^{0.717}$
Mary Beth D.Hueste [8]	$f_t = 0.55\sqrt{f_c'}$ 40MPa < f_c' < 90MPa
Burg and Ost [9]	$f_t = 7.3\sqrt{f_c'}$

Table 1.2 Equations for flexural tensile strength as given in codes and research papers

Ping-Kon chang [24]	$f_r = 0.62[f_c']^{0.5}$
S.Bhanja and B.Senguptha [7]	$f_r = 0.275(f_c')^{0.81}$

Burg and Ost [12]	$f_r = 12.4\sqrt{f_c'}$
ACI 318 [2]	$f_r = 7.5\sqrt{f_c'}$
ACI 363 [3]	$f_r = 11.7\sqrt{f_c'}$

Modulus of elasticity or Young's Modulus is a property that characterizes the elastic response of concrete. For the design of flexural members the modulus is important because it determines the contribution of the concrete to the flexural rigidity of the member. Apart from other materials that have linear elastic curve, the concrete maintains a fairly non-linear behavior in the pre peak zone.

Apparently the main controversies related to the percentage of the strength at which the modulus of elasticity must be calculated. ACI-318 [2] considers the elastic modulus of concrete could be defined has the gradient of the chord drawn between the origin and the point on the curve corresponding to 45 % of the average compressive strength of cylinders. The author Shah and Ahmad [4] have used this value in his paper. A similar definition but with reference point a 40% of the strength is accepted by some standards (ASTM C469-87 [10], Erocide-2 [11], Australian Standard AS 1012.17-1997 [12]) and by other authors in High-strength concrete research (Carrasquillo et al., [13]). For Thoman and Raeder [14], some of the first, to study the elastic modulus of high-strength concrete, the definition was related with the slope of the tangent to the stress-strain curve at 25% of maximum stress. Different authors (Carreirra and Chu [15], Collins et al., [16], Wee et., [17]) were more concerned with modeling of the stress-strain curve in compression and used slope at origin as the elastic constant. CEB-FIB [18] uses two slopes, one at origin and other at peak to describe the elastic properties of concrete. In addition Thorenfeldt [19] proposed the slope of the chord at 60% of the peak as another elastic constant.

2. RESULTS AND DISCUSSION

The present study is based on trial mixes and achieving target strength. Mix proportions have been obtained for M60, M80 and M100 grade Control concrete. Then RHA is replaced by 5%, 10% and 15% of cement mass to study the compressive strength split tensile strength, modulus of rupture and modulus of elasticity.

2.1 Cube compressive strength

Mix with 5% RHA replaced concrete is giving more strength than other percentage replaced concrete and reference concrete at all ages of curing. All mixes of M80 are reached target strength except 15% RHA replaced mix at 28 days. For M100, 5% RHA replaced mixes are reached target strength while 10% and 15% RHA replaced mixes are near target strength at 28 days.

ACI 363R-84[3] gave equation;

$$f_{sp} = 0.59\sqrt{f_{cy}} \quad 21\text{MPa} < f_{cy} < 83\text{MPa} \quad 2.2$$

Said Irvani and Burg et al., [26] gave equations for split tensile strength as in equation 2.3

$$f_{sp} = 0.57\sqrt{f_{cy}} \quad 50\text{MPa} < f_{cy} < 100 \text{ MPa} \quad 2.3$$

The equation for the split tensile strength, by S. Bhanja et al.[10] is as follows

$$f_t = 0.248f_{cy}^{0.717} \quad 2.4$$

Ahmad and Shah [4] gave equations for split tensile strength as in equation 2.5

$$f_t = 0.44(fc')^{0.7} \quad 2.5$$

The comparison of equation 5.1 may be made with the analytical equation given in codes and research papers as shown above. The proposed equation of present study has good match with that of ACI 363R-84, Said Irvani[26] and Burg et al. and also very near to S.Bhanja and B.Senguptha[7]. However, the equation Ahmad and Shah overestimate the split tensile strength.

2.4 Modulus of Rupture Strength

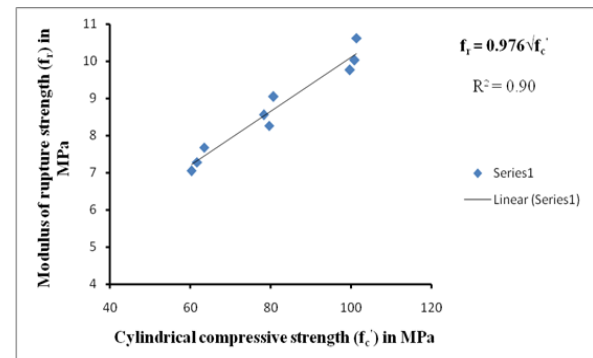


Fig. 2.3 Relation between compressive strength of concrete and modulus of rupture strength

Another indirect tension test for assessing tensile strength of concrete is modulus of rupture strength. The empirical equations developed to relate cylinder compressive strength with modulus of rupture strength is as given in Fig. 2.3 and equation 4.6.

The relation of square root of cylinder compressive strength versus modulus of rupture strength is as shown

2.2 Cylindrical compressive strength

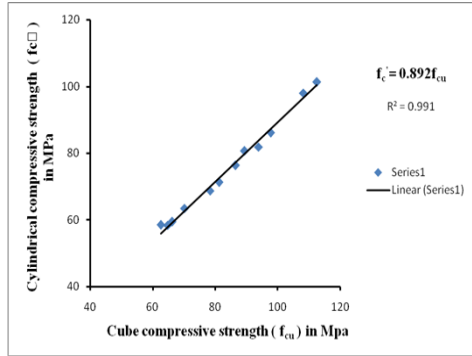


Fig. 2.1 Relation between cube compressive strength and cylindrical compressive strength
the relation obtained is;
 $f_c = 0.892f_{cu}$

2.3 Split Tensile Strength

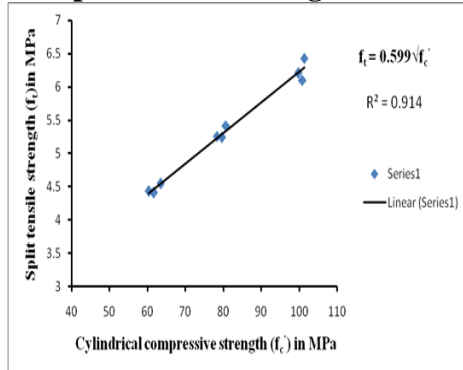


Fig. 2.2 Relation between compressive strength of concrete and split tensile strength

Split tension test was done to assess tensile strength of concrete. The empirical equation developed to relate cylinder compressive strength with split tensile strength is given in Fig. 2.2, and in equation 2.1

The relation of square root of cylinder compressive strength versus split tensile strength is as shown in equation 5.1. This graph is plotted to compare the results of HPC with existing relations for NSC. The relationship for split tension observed in this study is:

$$f_t = 0.599\sqrt{f_{cy}} \quad 2.1$$

in equation 4.6. $f_r = 0.976\sqrt{f'_c}$
2.6

As per, IS: 456-2000[21] the equation is
 $f_r = 0.70\sqrt{f_{ck}} \quad 20\text{MPa} \leq f_{ck} \leq 40\text{MPa}$
2.7

Where f_{ck} , is characteristic strength of concrete

As per ACI 363R-84[3]

$$f_r = 0.94\sqrt{f_{cy}} \quad 21\text{MPa} < f_{cy} < 83 \text{ MPa} \quad 2.8$$

Also, Said Irvani[20], gave equation for split tensile strength as in equation 2.9.

$$f_r = 0.97\sqrt{f_{cy}} \quad 50\text{MPa} < f_{cy} < 100 \text{ MPa} \quad 2.9$$

As per S.Bhanja & B.Senguptha[7] the equation is
 $f_r = 0.275(f_{ck})^{0.81}$
2.10

The comparison of equation 2.6 may be made with the analytical equation given in codes and research papers as shown above. The proposed equation of present study has good match with that of Said Irvani [26] and Burg et al. and also very near to S.Bhanja and B.Senguptha[10]. However, the equation, of code IS: 456-2000 [21] is under estimates the modulus of rupture strength.

4.6 Modulus of Elasticity of HPC using RHA

From the stress strain curves generated in the study, for various grades of concrete secant modulus is evaluated at 40% stress level. The secant modulus E_c , for each specimen is plotted as a function of concrete strength f'_c . Since concrete strength strongly influences the modulus of elasticity.

Based on the stress-strain diagrams Static modulus of elasticity of concrete in the range of 60-100MPa were evaluated and the relation for E_c is as given in equation 2.11.

The relation of square root of cylinder compressive strength versus E_c is as shown in equation

$$2.11. E_c = 5055\sqrt{f'_c} \quad 2.11$$

Table 2.10 Equations for modulus of elasticity by codes and researchers

S.No	Researchers Name/ Code	Equation suggested

1	Euro Code [11]	$E_c = 21500 \left[\frac{f'_c}{10} \right]^{\frac{1}{3}}$
2	ACI 363 [3]	$E_c = 6900 + 3300\sqrt{f'_c}$ MPa < f'_c < 83MPa
3	CSAA23.2-94 [22]	$E_c = 5050\sqrt{f'_c}$
4	Mary Beth et al. [8]	$E_c = 5230\sqrt{f'_c}$ 40MPa < f'_c < 90MPa
5	IS 456-2000 [21]	$E_c = 5000\sqrt{f_{ck}}$ f_{ck} is characteristic strength of concrete

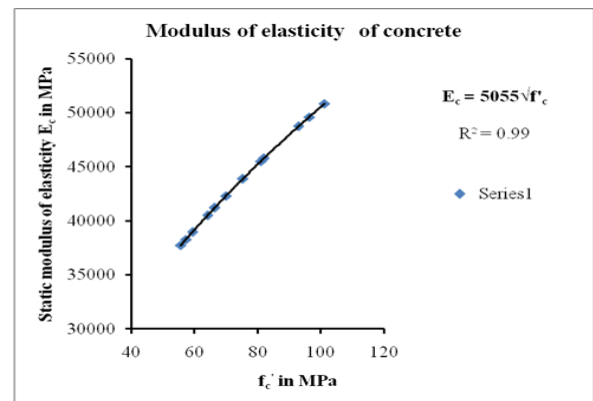


Fig. 5.1 Modulus of elasticity of concrete

The values of E_c obtained in the present research are in the range of 36 to 51 GPa. Some of the equations proposed for E_c by codes and researchers are as shown in Table 2.10.

The equation proposed by CSAA23.2-94 [22] is close to present study equation the equation suggested by Mary Beth et al. [8] overestimate the modulus of elasticity and the equation present in IS 456-2000 [21] is underestimate the modulus of elasticity.

5. CONCLUSION

- The compressive strength of RHA concrete increases as compared to reference concrete. It is higher at 5% replacement among all replacement of M60, M80 and M100.
- The split tensile strength and modulus of rupture strength of RHA are increasing as compared to reference concrete. It is higher at 5% replacement among all replacement of M60, M80 and M100..
- The strain at peak stress increases with increase in concrete strength in this study the strain at peak stress level for 5% RHA

replacement among all replacement of M60, M80 and M100.

- The modulus of elasticity of RHA concrete is increasing as compared to reference concrete.
- Split tensile strength, modulus of rupture strength and modulus of elasticity are related to the compressive strength of concrete and are in good agreement with some of the equation proposed in literature
- The proposed modifications may be considered for future revision of existing codes.
- IS 456-2000, is more conservative and need to be modified to suit the properties of HPC.

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Shear strengthening of RCC structures using NSM technique and estimation of flexural stresses using GFRP

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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

1. 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		Not less than 300

	Specific Surface (m^2/kg)	329	
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)

Characteristics

Fiber density	0.0000091 N/mm ³
Specific area	200 m^2/kg
Melting point	160 $^{\circ}\text{C}$
Water absorption	Less than 0.1%

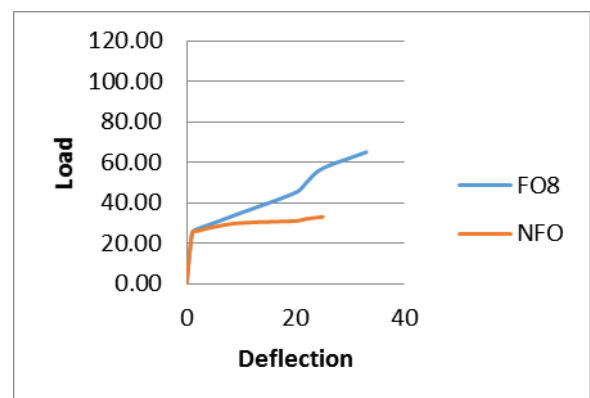
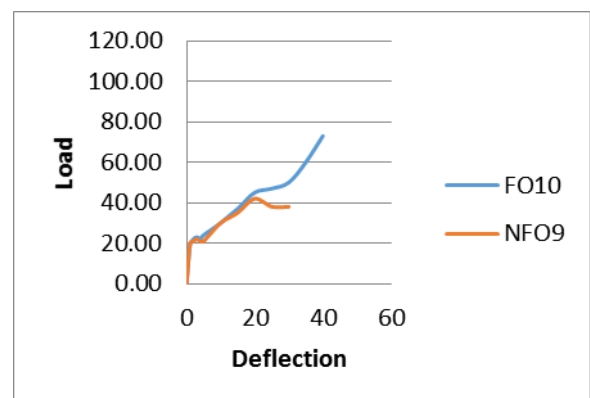
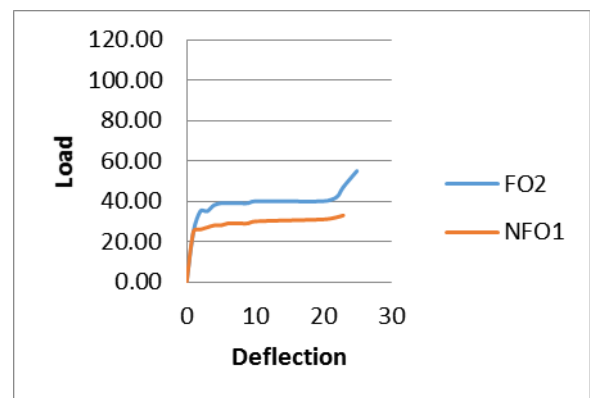
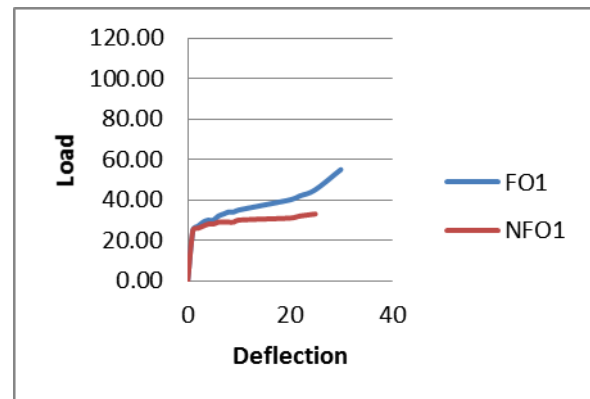
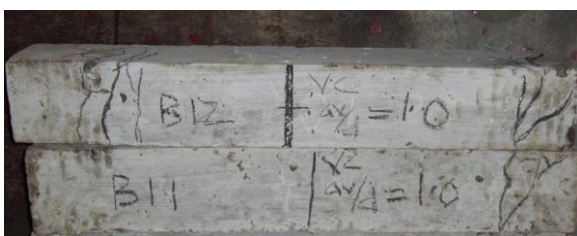
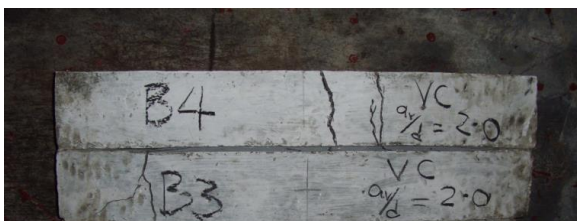
5. TEST RESULTS

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	WRAPPING LAYERS	DISTANCE FROM NEUTRAL AXIS IN TENSION ZONE (mm)
NFO1 230X450	20.4	32	25	NONE	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 has 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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Risk Identification and Analysis in the Construction Project

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ABSTRACT

Risk is present in every construction project and each construction project is unique. The risk factors influencing the projects are also different. If these risk factors are not addressed properly at planning stage, it can adversely affect the project performance. In this study, various risk factors were identified and classified according to their nature. Data related to risk measurement was collected through the questionnaire survey and by meeting personnel working in the construction industry. The risk factors were rated for the likelihood of their occurrence and impact was recorded for the projects under case study. These ratings were analyzed using SPSS software and possible correlations were developed for the critical factors. Findings of this study will help the parties associated with the project management to determine the risk correlations at start of the project to minimize risk through effective planning for the successful completion of the project.

Keywords

Cost overrun; Construction Management; Project Planning;
Risk factors; SPSS software

1. INTRODUCTION

Risk is defined as the chance of something happening that will have an impact on objectives; may have a positive or negative impact [1]. In construction industry greatest risks are of completing the project on time and within budgeted cost and with prescribed quality. If these parameters are not met then it will be negative risk and if everything is better than expected it will be positive risk. Every construction project is of unique nature and hence risk associated with each project also varies from one another. Therefore, for successful completion of project in terms of cost, time, quality, environment and safety, analysis of different risks plays vital role.

Risk management is a technique or process which is used to study and prepare the management to reduce, eliminate or transfer the risk [2]. Many industries have become proactive about using these risk management techniques. However, with

regard to the construction industry, risk management is not commonly used. Many construction companies are starting to become aware of the Risk Management Process, but are still not using models and techniques aimed for managing risks. This contradicts the fact that the industry is trying to be more cost and time efficient as well as have more control over projects [3]. No project is completely free from risks. [4] If risks are not properly analyzed and strategies are not formulated to deal with them, project is likely to lead to failures.

The construction industry operates in a very uncertain environment where conditions can change due to the complexity of each project. The aim of every organization is to be successful and Risk Management can facilitate it. However, it should be understood that risk management is not a tool which ensures success but rather a tool which helps to minimize risk and increase the probability of achieving success. Risk management is therefore a proactive rather than a reactive concept [5].

Identification and evaluation of various risks and qualitative mitigation framework was prepared and techniques were proposed for developing countries which were considered very beneficial [6]. A risk assessment model was proposed for the user in calculating potential risks involved in the international markets by analyzing the various risks [7]. It has been reported that, influence diagramming technique and Monte Carlo simulation were found to be useful tools for the avoidance, transfer, retention and prevention of risk [8]. Risk management model was proposed for measuring effect of risk management on site and at individual level [9].

Till now, many researchers have presented various risk management models and techniques to minimize risk. But the correlation among various risks and their interdependency is not yet reported. Therefore, the main objective of this study was to identify and analyze the critical risk factors that affect project completion. Moreover, this study has devised relations between various critical risks which will help to estimate the interdependencies that will assist construction parties to mitigate risk at different stages.

2. Materials and methods:

2.1 Data collection

A well designed questionnaire form was prepared by meeting with field personnel to record their opinions and suggestions for addition of new factors. It consists of around thirty questions to record different risk parameters. Primary data associated with risk analysis was collected through questionnaire survey circulated among eight different experts working in construction sector. The respondents rated these risks on basis of likelihood of the occurrence and impact of these risks on the project objectives. Further this qualitative information was converted to secondary data for simplicity of risk analysis.

2.2 Risk factors(RF)

Researchers have identified various *RF* influencing the project performance and their significance towards project success. In the present study, in addition to different *RF* considered on the basis of literature review, some of the *RF* were added after discussion with industry experts. These *RF* were categorized based on their nature and were mainly divided into six categories such as design risks, external risks, organizational risks, construction risks, project management risks and force majeure risks as shown in Table 1.

Further each of these main *RF* discussed above were divided into sub-categories. Design risks include risks related to design which include the alterations identifies as (D_1), longer time taken for design as (D_2) and late changes in designs requested by the stakeholders as (D_3). Similarly other sub-factors were coded according to their nature as shown in Table1. External risks include political events, public objections, changes in standards and laws and government approval risks. Then there are organizational risks stating risks such as the workforce problems and lack of protection on site. Next is construction risk, which is actually related to the construction process. Such as the time and cost overruns, labour problems and materials and machines related risks. The next category is related to the project management risks which are scheduling risks, project team and quality of the work. The last category is of force majeure risks which are natural risks of extreme rains and heat conditions.

Table 1. Categorization of Risks and codes

Code	Design Risks	Code	Construction Risks
D_1	Design Alteration	C_1	Construction time overruns
D_2	Design process takes longer	C_2	Construction cost overruns
D_3	Stakeholder requests late changes	C_3	Labour problems
Code	External Risks	C_4	Mechanical machines overstay
Ex_1	Public objections, political events	C_5	Changes in materials
Ex_2	Surrounding structure affected	Code	Project Management

	by initial design		Risks
Ex_3	Law, local standard changes	PM_1	Failure to comply with contractual quality
Ex_4	Tax changes	PM_2	Scheduling errors
Ex_5	Government approvals	PM_3	Project team conflicts
Code	Organizational Risks	PM_4	Tight project schedules
O_1	Inexperienced workforce, staff turnover	Code	Force Majeure Risks
O_2	Delayed deliveries	F_1	Heavy rains and water logging
O_3	Lack of protection on site	F_2	Extreme heat conditions

2.3 Data Analysis

Data Analysis was carried out using SPSS software (statistical package for social sciences). All the 22 factors' likelihood and impact were multiplied and entered in the SPSS spreadsheet. The output results were generated from SPSS demonstrates correlation between various risk factors (Table 2). All these relations were established between -1 to +1. Extreme negative as well as positive value indicates stronger correlations among risks.

Negative sign indicates that if one risk increases then other risk decreases. As the value changes from -1 to 0 the correlation becomes weaker. At 0, the correlation becomes null and it symbolizes no correlation between the two risks. From 0 to 1 the correlation increases it implies that as one risk will increase corresponding risk will also increase. +1 show that the correlation is the most strong.

By the use of software, correlation between all the risks was obtained. But only 4 cases were considered. The table below shows the correlation between these risks.

Table 2. Correlation between Risks obtained from SPSS

	Risk	Risk	Correlation
1.	Design Alteration (D_1)	Stakeholder requests late changes (D_3)	+0.806
2.	Design Alteration (D_1)	Surrounding structure affected by initial design (Ex_2)	+0.864
3.	Lack of protection on site (O_3)	Delayed deliveries (O_2)	-0.063
4.	Failure to comply with contractual quality (PM_1)	Lack of protection on site (O_3)	+0.053

From the table it is clear that, the first two cases have strong correlation and next two have very weak or near null correlation. Firstly, It is known that if stakeholders requests late changes in designs, there will be alterations in the design and hence a very strong positive correlation.

Secondly, a strong correlation is observed between design alterations and the risk of surrounding structure getting affected. Hence it could be said if the chances of design alteration increases the risk of surrounding structure getting affected also increases.

Lastly, in the next two cases a very correlation is observed between the risks. The correlation suggests that there is no relation between the risks. It is true that if a mechanical machine overstates then it is not going to affect the quality.

3. CONCLUSIONS

Results of this study indicate that there exists certain relation between the various risks. However, these relations were varying from positive to negative side between two risks. Negative correlation between two risks state that if one risk decrease other increases and vice versa. Positive correlation shows that both risk increase and decrease simultaneously. Weak correlation between risks was observed when value reach to zero. If the management is able to identify these risks and their correlation they will be able to make proper decisions which could save cost, time. This will be possible as one risk decreases another risk will also decrease and they can study and look after the risk which influences other risks as well.

The results obtained are for a small sample and to obtain more precise results more sites and more respondents will be required which will be done shortly.

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Planning and Designing of Economical Water Distribution Network for R/Northward Mumbai City: A Case Study

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ABSTRACT

Industrialization, population increase and also increase in the standard of living, boosted the water demand in urban areas particularly in metro cities. Water shortages will cause inconvenience to people's life as well as commercial and industrial activities. Hence to overcome this problems, design and analysis of water distribution system is necessary. Therefore, the objective of this study was to propose efficient water network for the area under case study (R/Northward suburban area) Mumbai city. Population was forecasted using S-curve method while Google Earth was used for measuring the pipe length and elevation of proposed distribution network. Hydraulic parameters such as flow, velocity and head loss were calculated using EPANET software. Optimization was carried out to achieve the least cost of Distribution Network. Findings of the study will help water supply authority in designing new water distribution network in the most economical and efficient manner.

Keywords

EPANET; Head loss; Network Design, Optimization; Water demand

1. INTRODUCTION

1.1 General

The global water supply/demand imbalance is increasing. This is due to population growth, particularly in arid, water-short regions, contamination of water sources and inefficient utilization of available supplies. Increasingly, futurists are predicting a world where water shortages, exacerbated by global warming, could cause increased food imports, population shifts, domestic political unrest and geopolitical conflict. As the potential for future crisis rises each year, calls to address water supply issues are becoming more urgent, though political action to change these trends has so far been muted.

1.2 Literature Review

Alperovits and Shamir (1977) first presented a linear programming gradient (LPG) method in the optimal design of water distribution network. To apply LPG, they linearized the mathematical formulation. Segmental lengths of the pipe with different diameters were used as decision making variables. The objective function was to minimize the cost of the total pipe lengths. However, it is not desirable to have pipes that constantly change size along the network. Such pipe arrangement causes bottleneck in the system when the flow direction changes (Walski et al., 1990). The LPG method is later improved by a number of researchers (Quindry et al., 1981; Morgan and Glulter, 1985; Fujiwara et al., 1987; Kessler and Shamir, 1989; Fujiwara and Khang, 1990; and Eiger et al., 1994). The improved approaches used iterative processes. Flow rates or pressure heads are fixed and the pipe sizes are optimized for the specified flow and pressure requirement.

Morgan and Glulter (1985) considered multiple demand patterns in their work. They adapted a linear programming model with a Hardy-Cross network solver to design water supply systems. Kessler and Shamir (1989) presented a two-stage linear programming gradient (LPG) method. Waheed Adil (2008) described that the main considerations in water distribution network are head losses and volumetric flow rates required. He stated that piping accounts for one third of total plant cost and therefore its layout, design and analysis have to be carried out carefully. According to his report an Optimum Size of the pipe will yield least cost of installation and operation of desired flow rates.

Ioan Sarbu, (2010) developed an improved linear model which has the advantage of using not only the cost criteria but

also the energy consumption. The model is based linear programming and allows the optimal determination of diameters for each pipe in the network and length of the pipes which corresponds to these diameters.

Most of these studies have attempted to apply a variety of heuristic programming methods to the optimal design of water distribution systems but these methods cannot guarantee generation of even local optimal solutions, particularly for large-scale systems and can be extremely time consuming computationally. These study aims at Designing efficient water distribution network for an urban area reducing the efforts, manpower and time required in design.

1.3 Location of Study

MUMBAI previously known as Bombay is the capital city of state of Maharashtra, India. It is the most populous city in India, and fourth most populous city in the world, with a total metropolitan population of approximately 20.5 million. The escalating population and expansion of infrastructures are claiming for the basic services and water supply. Municipal Corporation of Greater Mumbai (MCGM) is entitled for the water supply to the city. The water supply services in the city are suffering from lots of problem. Location of study was the R/Northward Part of Mumbai City, which covers some part of Borivali and Entire area of Dahisar district as shown in Fig.1.



Figure 1. Map of Location

2. MATERIALS AND METHODS

2.1 Data collection

The total area of R/northward region was divided into 7-zones based on residential, industrial, educational, commercial and agricultural areas. For the design of water distribution network information about population data for last 4 decades of R/Northward region, existing water supply and demand data and road map of R/Northward region was collected from MCGM.

2.2 Population forecasting and Water Demand

On the basis of available data for the 4 decades, population was forecasted for the next two decades i.e. for 2021 and 2031 using S-curve method. Water Demand was obtained by

multiplying the projected population to per capita demand of 185 LPCD by taking into account various needs such as domestic, industrial, fire requirement and leakage losses.

2.3 Distribution System

The total area of R/northward region was divided into 7-zones based on residential, industrial, educational, commercial and agricultural areas. Network Map was created using autocad

PART	Year	1	2	3	4	5	6	7	TOTAL
PROJECTED POPULATION	2011	121,564	106,245	25,654	61,494	39,147	22,365	55,321	
	2021	187,209	163,617	39,507	94,701	60,288	34,442	85,194	664,958
	2031	288,301	251,970	60,840	145,839	92,843	53,040	131,198	1,024,035

software and google earth software was used to measure the elevation and pipe line length data. Network Analysis was carried out using EPANET to find out the hydraulic parameters such as flow, velocity, and water pressure.

2.4 Network analysis

EPANET is a computer program which is designed to be a research tool for improving our understanding of the movement and fate of drinking water constituents within distribution systems.

3. RESULT and DISCUSSION

3.1 Population Forecasting

Projected population for different parts of area under case study was summarized in Table 1. The maximum population of 2.88 lac was found in zone 1 while lower population lies in zone 6.

Table 1. Projected Population up to 2031

3.2 Water demand

On the basis of population data forecasted above, water demand for different parts was determined using Eq (1) and results summarized in Table 2.

$$\text{Demand at each node} = \frac{(\text{Population} \times \text{per capita demand})}{\text{Number of nodes}} \quad (1)$$

Table 2. Projected water demand

Part		1	2	3	4	5	6	7	Total
Projected water supply demand (MLD)	2011	22.49	19.66	4.75	11.38	7.24	4.14	10.23	79.88
	2021	34.63	30.27	7.31	17.52	11.15	6.37	15.76	123.02
	2031	53.34	46.61	11.26	26.98	17.18	9.81	24.27	189.45

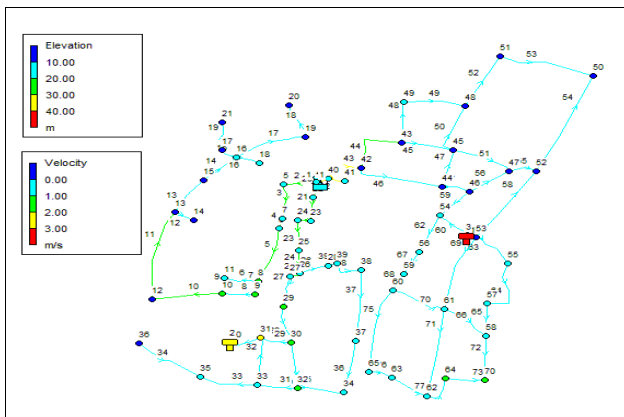


Figure 2.Water Distribution network

3.3 EPANET Results

Different hydraulic parameters obtained using EPANET software was presented in Table 3. It was found that in none of the pipe velocity is exceeding the standard limit of 3m/s. For pipe no. 2, 3, 4, 5, 10, 11, 20, 21, 22, 23, 44 and 61, velocity is between 1-2 m/s. For pipe no. 41, 42, 43 velocity is between 2-3 m/s and for the remaining pipes it is in the range of 0.2 -3 m/s.

Table 3. Hydraulic parameters obtained using EPANET software

	Length	Diameter	Roughness	Flow	Velocity	Unit Headloss
Link ID	m	mm		MLD	m/s	m/km
Pipe 2	230	500	100	21.25	1.96	13.62
Pipe 3	325	500	100	20.00	1.84	12.18
Pipe 4	90	500	100	18.75	1.73	10.80
Pipe 5	530	500	100	17.50	1.61	9.51
Pipe 6	230	500	100	7.79	0.72	2.12
Pipe 7	121	500	100	8.46	0.78	2.47
Pipe 8	230	500	100	7.21	0.66	1.84
Pipe 9	152	500	100	-6.54	0.60	1.54
Pipe 10	484	500	100	12.50	1.15	5.10
Pipe 11	831	500	100	11.25	1.04	4.19
Pipe 12	156	500	100	1.25	0.46	2.10
Pipe 13	345	500	100	8.75	0.81	2.63
Pipe 14	312	500	100	7.50	0.69	1.98
Pipe 15	133	500	100	2.50	0.23	0.26
Pipe 16	176	500	100	1.25	0.46	2.10
Pipe 17	513	500	100	2.50	0.23	0.26
Pipe 18	330	500	100	1.25	0.46	2.10
Pipe 19	330	500	100	1.25	0.46	2.10
Pipe 20	151	500	100	20.96	1.93	13.28
Pipe 21	221	500	100	20.40	1.88	12.63
Pipe 22	87	500	100	19.83	1.83	11.98
Pipe 23	276	500	100	19.26	1.77	11.35
Pipe 24	209	500	100	18.69	1.72	10.74
Pipe 25	81	500	100	10.89	1.00	3.95
Pipe 26	204	500	100	7.23	0.67	1.85
Pipe 27	289	500	100	10.32	0.95	3.58
Pipe 28	349	500	100	9.75	0.90	3.22
Pipe 29	207	500	100	8.62	0.79	2.56
Pipe 30	412	500	100	0.57	0.21	0.48
Pipe 31	279	500	100	4.39	0.40	0.73
Pipe 32	426	500	100	-2.69	0.25	0.30
Pipe 33	416	500	100	1.14	0.42	1.76
Pipe 34	528	500	100	0.57	0.58	5.86
Pipe 35	1000	500	100	-4.39	0.40	0.74
Pipe 36	460	500	100	-4.96	0.46	0.92
Pipe 37	650	500	100	-5.53	0.51	1.13
Pipe 38	230	500	100	-6.10	0.56	1.35
Pipe 39	61	500	100	-6.67	0.61	1.59

Pipe 40	1000	500	100	10.74	0.99	3.85
Pipe 41	90	500	100	26.30	2.42	20.22
Pipe 42	116	500	100	24.90	2.29	18.26
Pipe 43	231	500	100	23.49	2.16	16.40
Pipe 44	519	500	100	12.42	1.14	5.04
Pipe 45	370	500	100	5.00	0.46	0.93
Pipe 46	606	500	100	9.67	0.89	3.17
Pipe 47	775.59	500	100	0.98	0.36	1.34
Pipe 48	175	500	100	6.02	0.55	1.32
Pipe 49	368	500	100	4.61	0.43	0.81
Pipe 50	327	500	100	-0.09	0.22	0.55
Pipe 51	430	500	100	-4.49	0.41	0.76
Pipe 52	527	500	100	3.30	0.30	0.43
Pipe 53	645	500	100	1.90	0.70	4.56
Pipe 54	690	500	100	-0.29	0.43	4.22
Pipe 55	191	500	100	-3.80	0.35	0.56
Pipe 56	330	500	100	-1.51	0.56	2.99
Pipe 57	205.5	500	100	7.28	0.67	1.87
Pipe 58	732	500	100	-0.96	0.35	1.29
Pipe 59	311.5	500	100	4.36	0.40	0.73
Pipe 60	330	500	100	-2.36	0.22	0.23
Pipe 61	159.90	500	100	-20.86	1.92	13.17
Pipe 62	357	500	100	4.53	0.42	0.78
Pipe 63	334	500	100	7.02	0.65	1.75
Pipe 64	509	500	100	4.75	0.44	0.85
Pipe 65	345	500	100	1.27	0.47	2.15
Pipe 66	851.61	500	100	-3.33	0.31	0.44
Pipe 67	224	500	100	3.74	0.34	0.54
Pipe 68	152	500	100	3.05	0.28	0.37
Pipe 69	707	500	100	7.45	0.69	1.96
Pipe 70	430	500	100	1.21	0.45	1.98
Pipe 71	803	500	100	3.43	0.32	0.46
Pipe 72	371	500	100	1.12	0.41	1.70
Pipe 73	276	500	100	-0.09	0.03	0.02
Pipe 75	791	500	100	1.15	0.42	1.78
Pipe 76	171	500	100	0.46	0.47	3.89
Pipe 77	308	500	100	-0.23	0.35	2.77
Pipe 74	280	500	100	1.30	0.48	2.25
Pump 1	#N/A	#N/A	#N/A	68.51	0.00	-47.07

4. CONCLUSIONS

In this study, water distribution network has been proposed so that there would be no shortage of water in the future. Output results shows that minimum velocity present in all the pipes was lies well within the standard recommended range of 0.2 – 3 m/s. Also, all nodes have head pressure greater than the minimum standard limit (20 m), which means all of these nodes are capable to meet the future demands placed on it. Furthermore all the nodes have pressure lower than the maximum permissible head (100) m. The Findings of this study indicate that the proposed method and EPANET software analysis reduced time and efforts for network design and can be potentially applied for designing the water distribution network in urban areas at lower cost.

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Critical success factors for implementation of Public Private Partnership in Real Estate project

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ABSTRACT

The construction industry is an important sector in any economy and significantly contributes to socio-economic development of a country. The Indian realty sector if channelized properly, could catapult the growth of the other sectors in India through its forward and backward linkages. Public private partnerships (PPP) have existed for considerable period in infrastructure development. However, application of PPP's in real estate is relatively new and success stories have been few. Therefore, the objective of this study was to identify and analyze the critical success factors (CSF) that influences the success of PPP projects in real estate development. A questionnaire was designed and circulated to various respondents to obtain the information associated with project performance. The results of this study indicate that, 15 out of 29 CSF found to be "Extremely important" while 9, 3 and 2 were falls under "Very important", "Important" and "average" category, respectively.

Keywords

Critical Success Factors, Public Private Partnership, Project Management, Real Estate

1. INTRODUCTION

In developing country, major problems are the lack of infrastructure and shelter to accommodate growing migration of the people to urban areas. As per Govt. own estimates, there is a shortage of more than 25 million houses mostly in Low Income Group Category. This shortage is growing despite best efforts by the Government and the private sector and requires more than Rs. 4, 00,000 crore of investment. Problem of this magnitude cannot be handled either by Government or by Private Sector independently. Public-Private Partnership (PPP) is right approach to address this problem. Public-Private Partnerships (PPPs) is seen as a solution for producing high quality and cost effective real estate service delivery. PPPs enable the public sector to benefit from commercial dynamism, the ability to raise finances in an environment of budgetary restrictions, innovations and efficiencies, harnessed through the introduction of private sector investors who contribute their own capital, skills and experience.

Critical Success Factor as 'those key areas of activity in which favorable results are absolutely necessary for a particular manager to reach his/her goals' [1]. The concept of critical success factors (CSF) emanated from the Sloan school of Management as indicated reported in the studies of [2] and [3] This concept was first used in the context of information system and project management but later applied to construction management research [1]. Critical Success Factors are 'those fundamental issues inherent in a project which must be maintained for team working to take place in

an efficient and effective manner'[4]. Best practice framework was developed for implementing PPP in Hong Kong by looking at international experience. Major findings of study are benefits, difficulties and critical success factors of PPP [5]. Recently, the critical success factors for Indian PPP highway projects were identified and their relative importance to assess project viability Factor analysis was carried out for reducing number of factors obtained from unstructured interview. This paper gives systematic approach based on experience of concessionaires engaged in Indian Highway Projects and includes all the criteria and can accommodate subjective judgments [6]. A model based on theoretical and conceptual framework was developed analyzing the critical success factors of PPP in Kuwait [7]

It was observed that the most of the studies discussed above were mainly focused on involvement of PPP in infrastructure projects while very few instances of PPPs in real estate. Application of critical success factors have been well investigated in the Infrastructure projects however, these factors were not tested in real estate projects. Therefore, the aim of this study was to investigate application of CSF in Real Estate projects. The study is based on critical study of current projects on PPP basis, the reasons for their success or failure, if any.

2.0 MATERIALS AND METHODS

2.1 Critical Success factors (CSF)

Every construction project is unique and hence factors influencing the success or failure of each project also varies from one another [8-11]. Therefore identification and analysis of CSF plays crucial role for successful completion of project in terms of cost, time, quality, environment and safety [12, 13]. In the present study, various CSF were considered to measure their influence on the project performance. These CSF were divided into six main categories such as General, Contractual Governing, Technical, Operational and Supporting factors which are further divided into sub-categories as shown in Table 1.

Table 1 Different CSF considered to evaluate project performance

Code	General Factors (GF)	Code	Contractual Factors (CF)
GF-1	Correct structuring of project	CF-1	Formation of strong partnership
GF-2	Favorable location	CF-2	Appropriate risk allocation
GF-3	Demand of project		
GF-4	Duration	CF-3	Selecting the right partner
GF-5	Design		
GF-6	Availability of finance	CF-4	Project approval delay
GF-7	Competition	CF-5	Delay in land acquisition
Code	Governing Factors (GOF)	Code	Technical Factors (TF)
GOF-1	Governing body	TF-1	Geotechnical Conditions
GOF-2	Guaranteed revenue stream	TF-2	Quality Risk
GOF-3	Commitment and responsibility of PPP	TF-3	Workmanship
GOF-4		TF-4	Availability of Resources
GOF-5	Legal framework	TF-5	Proven Technology
	Statutory and political Environment	TF-6	Transparent Procurement
Code	Operational Factors (OF)	Code	Supporting Factors (SF)
OF-1	Operational cost over-run	SF-1	Independent authority for conflict resolution
OF-2	Execution	SF-2	Assistance in PPP
OF-3	Safety consideration	SF-3	Political and social support in drafting phase

2.2 Data collection

Primary data was obtained through the questionnaire survey. A questionnaire form was designed to measure the project performance and there were 50 questions were set to obtain the information about various CSF. The information about various CSF and opinions of different experts were obtained by circulating questionnaire to various managerial level persons having experience in such type of projects were recorded. The respondents were asked to give ratings to the success factors on basis of 5-point Likert scale (where 1= not that important, 2= average, 3= important, 4= very important and 5= extremely important)

2.3 Data Analysis

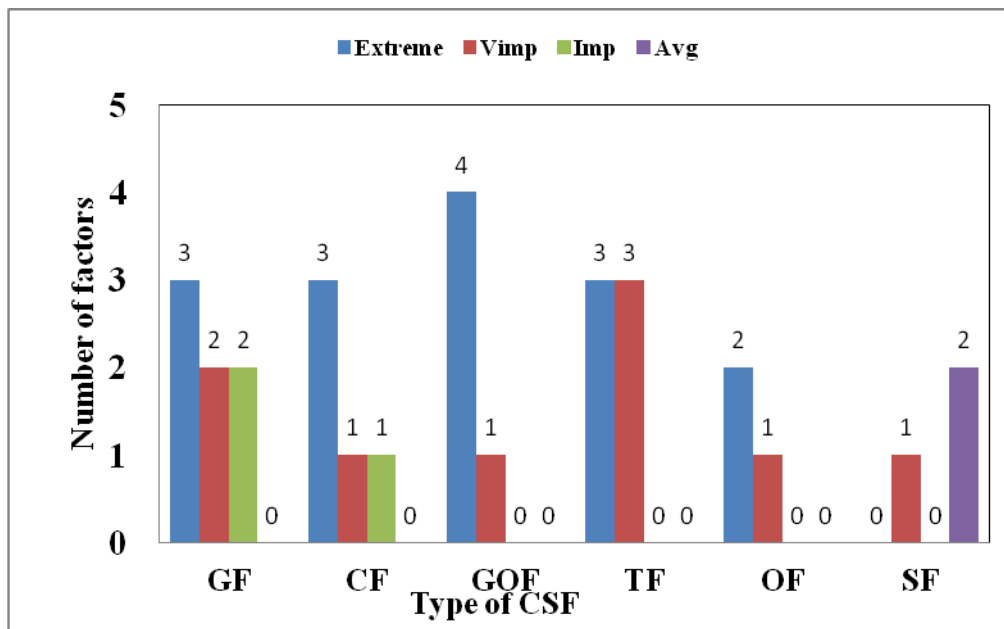
CSF were categorized and identified from existing literature, discussion with experts and on-site observation. Mean score of each factor were calculated and importance of success factors decided depending on the total score achieved.

3. RESULTS AND DISCUSSION

Results of this study shows that 15 out of 29 CSF found to be “Extremely Important” indicates their significance towards project success while 9, 3 and 2 falls under “Very Important”, “Important” and “Average” category, respectively (Table 2). Among these, majority of GF were found to be significant and requires higher degree of control with special attention to utilize the resources in the most efficient manner. Supporting factor found to be less important compared to other category and can be dealt with lower degree of control (Fig 1).

Table 2 Classification of CSF according to their category

Category	Extremely important	Very important	Important	Average	Not important
General	GF1 GF4 GF5	GF2 GF6	GF3 GF7		-
Contractual	CF2 CF3 CF4	CF5	CF1	-	-
Governing	GOF1 GOF 2 GOF4 GOF5	GOF3	-	-	-
Technical	TF2 TF3 TF4	TF1 TF5 TF6	-	-	-
Operational	OF1 OF2	OF3	-	-	-
Supporting	-	SF3	-	SF1 SF2	
Total	15	9	3	2	0



(GF-General Factors, CF-Contractual Factors GOF-Governing Factors, TF Technical Factors
OF-Operational Factors, SF-Supporting Factors)

Fig 1 Significance of CSF influencing project performance

4. CONCLUSION

By identifying and communicating these CSF, project manager can apply the different degree of control according to their importance. This will help parties working in the construction project to utilize resources in most useful manner. Most of the studies reported in the literature limited to the sole identification of these CSF without addressing their individual degree of relevance. This is the first time study has conducted showing the relative significance of CSF with regard to the individual phases of the project lifecycle. The findings of this study indicate the feasibility of CSF in Public private partnerships. Making CSF's explicit and communicating them with individuals involved, one can keep the project on track towards common aims and goals. This will help the project manager to identify the critical areas that affect project performance and necessitate careful planning. Further research is needed to carryout risk analysis depending upon the nature of CSF and scope of the project.

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Performance Evaluation of Earned Value Management in the Construction Industry

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ABSTRACT

Most of the construction projects suffer from cost and time overruns due to a multiplicity of factors. Earned value management (EVM) is a performance evaluation technique that has origins in industrial engineering, but has been widely adapted for application in project management. The Earned Value Analysis (EVA) gives early indications of project performance to highlight the need for eventual corrective action. In this study, the main parameters considered for EVA were discussed and the project performance was measured using Schedule Performance Index (SPI) and Cost Performance Index (CPI) for a construction project in the housing sector. CPI of 0.91 observed for the project under case study indicates it is running over budget while SPI of 1 demonstrates the project is progressing as per planning.

Keywords: Earned Value, Cost Performance Index, Project Management, Schedule Performance Index, Time Overruns, MS project.

1. INTRODUCTION

Earned Value analysis is a method of performance measurement. Earned Value is a program management technique that uses “work in progress” to indicate what will happen to work in the future. Earned Value is an enhancement over traditional accounting progress measures. Traditional methods focus on planned accomplishment (expenditure) and actual costs. Earned Value goes one step further and examines actual accomplishment. This gives managers greater insight into potential risk areas. With clearer picture, managers can create risk mitigation plans based on actual cost, schedule and technical progress of the work. It is an “early warning” program/project management tool that enables managers to identify and control problems before they become insurmountable [1].

It allows projects to be managed better – on time, on budget. Earned Value Management System is not a specific system or tool set, but rather, a set of guidelines that guide a company’s management control system. In the case of cost overrun, project management team may execute a value engineering program for cost reduction either reducing scope and quality in some sections of project or providing additional budget to cover overrun cost. Similarly, for time overrun case, they may plan some program such as fast tracking or time crashing for time reduction. Therefore, the role of EVM as well as correct and on time forecasting is very important to achieve project goals. This research includes implementation and improvement on EV to achieve a forecasting EAC based on statistical and econometrics techniques and traditional EV

indexes as well. This paper discusses measuring the project performance according to project cost and schedule in MS project [1].

2. EARNED VALUE ANALYSIS – CONCEPT

Earned Value analysis is a method of performance measurement. Earned Value is a program management technique that uses “work in progress” to indicate what will happen to work in the future [1]. Earned value management is system for planning and controlling the project cost performances. EVM establish work packages earned value baseline by integrating project scope, time schedule and cost objectives [2, 3].

This baseline is called as cost control and is used for performance evaluation of project on a given date. Analysis of variance from the baseline provides the cost related information’s for problem identification, trend analysis and corrective actions such as re-planning and revising budget. Earned value analysis serves two main purposes [2, 4].

It analyses cost changes which is resulting in time and cost over-run or under-run so that timely corrective actions are taken such as modification of cash flow, updating financial forecast and project profitability expectations. Analysis of variance from the baseline using earned value management systems gives variety of variances which are analysed to provide current status of project, to initiate corrective actions and to forecast future trends [2].

EVA uses cost as the common measure of project cost and schedule performance. It allows the measurement of cost in currency, hours, worker-days, or any other similar quantity that can be used as a common measurement of the values associated with project work. EVA uses the following project parameters to evaluate project performance:

Planned Value (PV) It is the cost of the project according to the schedule of the project. It is also called as Budgeted cost of work scheduled (BCWS).

Earned Value (EV) It is the budgeted cost of the work performed till date. It is cumulative budgeted cost incurred in activities that have been completed on the due date.

Actual Cost (AC) It is the actual cost that have spent on the project till date. It is also called as actual cost of work performed (ACWP).

As noted, there are many ways to calculate the EV, PV and AC of work packages that are in progress. Comparison of those figures can serve to identify specific work packages in

which performance and progress is inadequate or advanced, which will hopefully lead to remedial action by the project manager and team. Cost and schedule performance should be measured and analyzed as feasible with regularity and intensity consistent with project management need including the magnitude of performance risk. Analysis should be progressive and should follow the principle of management by exception. Variance thresholds should be established in the planning phase and should be used to guide the examination of performance [4].

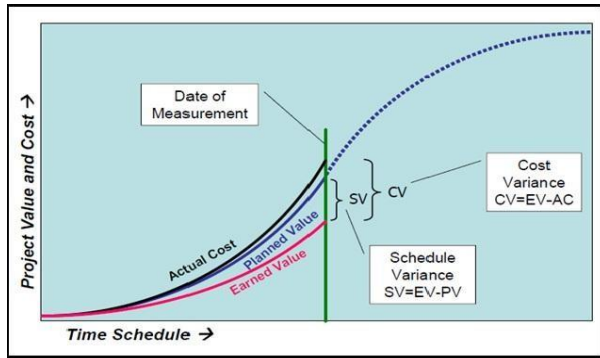


Fig 1: Standard Earned Value Analysis Graph Adopted from [1].

Earned value project management is a well-known management system that integrates cost, schedule and technical performance. It allows the calculation of cost and schedule variances and performance indices and forecasts of project cost and schedule duration. The earned value method provides early indications of project performance to highlight the need for eventual corrective action [5].

3. CASE STUDY

To perform the EVA, ongoing project for the construction of residential building (Tower D1), Pimpri-Chinchwad, Pune was selected. The total planned cost of this project is Rs. 26 Cr. and duration is 30 months. A tender document, bill of quantities and abstract sheets provides necessary data for project cost and scheduling activities. Information about the various construction activities considered for the substructure work and the progress was recorded during field visit.

4. PROJECT MONITORING

In this study, monitoring and controlling of the project was done using MS project software. The progress of work was recorded in the MS project and schedule updated. These updates need to be thoroughly monitored using MS project. Various Steps involved in monitoring and control of project are sequentially listed and discussed below:

- i) Creating an ideal schedule: To create a schedule for any project, first step is to collect data available for the project.
- ii) Enterprise project structure (EPS): Create the structure of the company with its branches, which is executing the project. This is known as Enterprise project structure (EPS).
- iii) Organizational breakdown structure (OBS): After the EPS, OBS is created which is a hierarchy that reflects the persons responsible for the projects in the enterprise.
- iv) Creating new projects: A project is a set of activities and associated information that constitutes a plan for creating a product or service. The project is created under the respective divisions in EPS and assigned the person in charge from OBS

to it. The project can be given planned start and must finish dates. The project is assigned a calendar which can be global, resource or project calendar.

v) Work breakdown structure (WBS): WBS is a hierarchy of work that must be accomplished to complete a project. Each project has its own WBS hierarchy with top level WBS element being equal to that of each EPS node or project. Each WBS element may contain more detailed WBS levels, activities, or both.

vi) Defining activities: Activities are the fundamental work elements of a project and form the lowest level of a WBS and, are the smallest subdivision of a project. An activity has the following characteristics like activity ID, name, start and finish dates, activity calendar, activity type, activity codes, constraints, expenses, predecessor and successor relationships, resources, roles etc.

vii) Relationship between activities: To form a network, the activities should be connected to each other, which is done by assigning preceding and succeeding activities with relationship to the other activities was established such as, Finish to start (FS), Finish to finish (FF), Start to start (SS) and Start to finish (SF) relationship.

viii) Updating activity information: Planned duration and actual duration for the completed activities was entered in the appropriate column in the MS project actual start, actual finish, planned start, and planned finish.

ix) Activity cost: The activity cost is the sum of all the cost incurred to complete the activities was entered.

x) Creating baselines: A simple baseline plan is a complete copy of the original schedule which provides a target against which a projects performance is tracked.

xi) Updating schedule: If the project is progressing exactly as planned, then only needed to estimate progress. However, if the project is not progressing as per plan then update should be done for activities and resources individually.

xii) Tracking: Tracking window is used for monitoring a projects progress using different types of layouts such as labour costs, project cost, resource forecasting, resource allocation unit wise and cost wise.

xiii) Earned value: Earned value is a technique for measuring project performance according to both project cost and schedule. The technique compares the budgeted cost of the work to the actual cost.

xiv) Claim digger: The claim digger is a schedule analysis tool that enables a company to generate a report that compares selected data fields in a revised project and a corresponding baseline.

xv) Project thresholds: Project thresholds consist of parameters assigned to WBS elements; they are used to monitor projects and generate issues.

xvi) Project issues: Project issues are the problems within a schedule that must be addressed before the project can be completed. They can either be created by thresholds or manually.

Final output parameters associated with the EVA analysis can be directly obtained from the MS project and can be inferred as per the Table 1.

Table 1. Parameter of Earned Value Analysis.

Name	Formula	Interpretation
Cost variance (CV)	EV – AC	NEGATIVE is over budget, POSITIVE is under budget.
Schedule variance (SV)	EV – PV	NEGATIVE is behind schedule, POSITIVE is ahead of schedule.
Cost Performance Index (CPI)	EV / AC	Less than 1 poor performance Greater than 1 good performance.
Schedule Performance Index (SPI)	EV / PV	Less than 1 poor performance Greater than 1 good performance.
Estimate At Completion (EAC)	BAC/ CPI	As of now how much do we expect the total project cost Rs--- Used if no variances from the BAC have occurred. Actual plus a new estimate for remaining work. Used when original estimate was fundamentally flawed. Actual to date plus remaining budget. Used when current variances are atypical. Actual to date plus remaining budget modified by performance. When current variances are typical.
Estimate To Complete (ETC)	EAC – AC	How much more will the project cost?
Variance At Completion (VAC)	BAC – EAC	How much over budget will we be at the end of the project?

5. RESULTS

The EVA for the present study was performed and the output parameters are demonstrated in Table 2. It was found that overall CPI for the substructure was 0.91 indicates project running over budget. CPI of 0.93 observed for column activity represent slightly running over budget compared to CPI of 0.90 for raft foundation and plinth beam activity. The project has a zero value for schedule variance (SV) which means that the project is on schedule. A SPI of 1 demonstrates that the project is progressing as per originally plan. The project has a favorable cost variance of Rs.1349113.99, positive value of CV means that the project is over budget. Cost variance percentage is -10% therefore the project is -10% below budget

for the work performed. A CPI of 0.91 would tell us that the project is currently running over budget.

Table 2. Result obtained from MS project.

Task Name Parameter	Substructure	Foundation/Raft	Columns Up to Plinth beam	Plinth Beam	Plinth Finishes	Column & Slab of Stilt floor Slab
Planned Value - PV (BCWS)	14,169,575.20 Rs	4,712,962.74 Rs	3,663,294.84 Rs	703,589.07 Rs	917,856.21 Rs	4,171,872.34 Rs
Earned Value - EV (BCWP)	14,169,575.20 Rs	4,712,962.74 Rs	3,663,294.84 Rs	703,589.07 Rs	917,856.21 Rs	4,171,872.34 Rs
AC (ACWP)	15,518,689.19 Rs	5,228,831.07 Rs	3,942,447.30 Rs	779,929.35 Rs	993,988.83 Rs	4,573,492.64 Rs
CV	(1,349,113.99 Rs)	(515,868.33 Rs)	(279,152.46 Rs)	(76,340.28 Rs)	(76,132.62 Rs)	(401,620.30 Rs)
CV%	-10%	-11%	-8%	-11%	-8%	-10%
CPI	0.91	0.9	0.93	0.9	0.92	0.91
SV	0.00 Rs	0.00 Rs	0.00 Rs	0.00 Rs	0.00 Rs	0.00 Rs
SV%	0%	0%	0%	0%	0%	0%
SPI	1	1	1	1	1	1
EAC	15,518,689.19 Rs	5,228,831.07 Rs	3,942,447.30 Rs	779,929.35 Rs	993,988.83 Rs	4,573,492.64 Rs
BAC	14,169,575.20 Rs	4,712,962.74 Rs	3,663,294.84 Rs	703,589.07 Rs	917,856.21 Rs	4,171,872.34 Rs
VAC	(1,349,113.99 Rs)	(515,868.33 Rs)	(279,152.46 Rs)	(76,340.28 Rs)	(76,132.62 Rs)	(401,620.30 Rs)

Earned value report at different project duration was prepared (Fig. 2). It is graphical representation of financial cash flow of a project. It is derived from activity usage profile, and it shows an “S” like shape, flatter at the beginning and end and steeper in the middle. This shows that costs involved in the project is low in the beginning as well as in the end, whereas

it increases at a rapid rate when the project is in its middle stage.

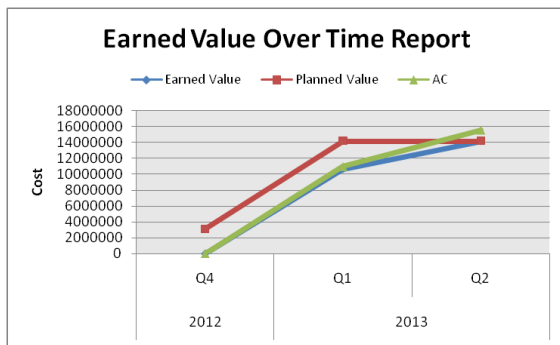


Fig2: Graph showing cost and schedule variation.

6. CONCLUSION

Results of this study indicates that Earn value analysis found to be a valuable tool to measure progress of the project in terms of cost and time. Cost Performance Index (CPI) observed for the project under case study indicates it is running over budget while Schedule Performance Index (SPI) demonstrates the project is performing as per plan. Findings of this study show the drawbacks of the existing project management practices and the importance of proposed methodology for efficient planning, monitoring and controlling of the project using project management software like MS project. The scope of study was limited to the substructure work in the residential project and further research can be done for the project in other areas such as infrastructure, commercial and industrial project.

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Role of Textile Engineers in Nation Building: Geosynthetics Materials

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ABSTRACT

Today role textile engineer in nation building is very important working with various engineering branches to improve the engineering aspects of material, structure as well as reducing cost and increasing life of engineered structure. This paper focus on geotextile materials used in civil engineering which are used to build structures and increase lifespan of structure.

General terms: Technical Textiles

Key words:

Geotextile, Geosynthetics, Erosion control, PVD

1. INTRODUCTION

This paper mainly focused on geotextile which comes under the head of technical textiles. Geotextile is a branch of technical textiles which deals with applications of textile

2. Type of Geotextile

On the basis of their structure geotextile can be classified as shown

material with civil engineering materials. The term geotextile was proposed by Dr. J.P.Giroud at the international conference on "The use of fabrics in geotechniques" held in Paris in 1977. The name geotextile initially related to knitted, woven and nonwoven fabrics structures now a day's webs, mats, nets, grids, etc also treated as geotextile.

Geotextile can be simply defined as "A textile material used in a soil (geo) environment" and include woven and non-woven polymeric materials and natural materials, such as jute, manufactured using textile processes.

According to ASTM, "Geotextile is any permeable textile material used with foundation soil, rock, earth or any other geotechnical engineering related material as an integral part of manmade project, structure or system"

These are non-Biodegradable Synthetics Woven/Non-Woven Fibre and perform discrete function

i.e. Separation, reinforcement, filtration, drainage and moisture barrier. Applying nonwoven

Geotextile stabilizes sub grades and prevents the fouling of ballast beneath railway tracks.

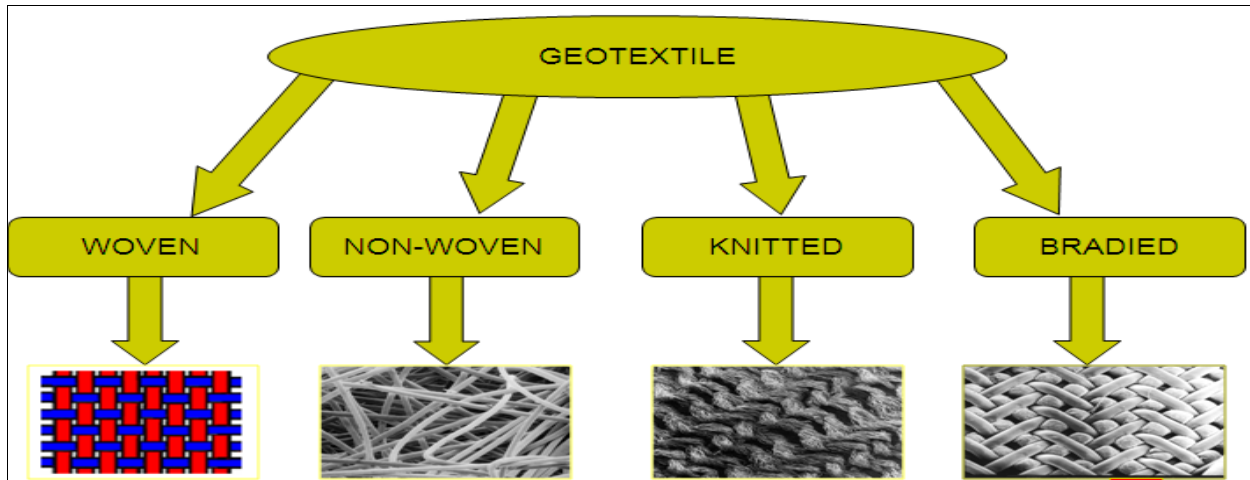


Fig. 1 Different structures of geotextile fabrics

Geotextile basically fall into two categories–

2.1 Woven Geotextile:

These are developed from synthetic or natural fibres using weaving techniques. The weaving process gives these geotextile an appearance of two sets of parallel threads interlaced at right angles. "Warp" runs along the length of the loom and "weft" runs in the transverse direction across the loom. The yarn used to produce a woven geotextile may be monofilament or multifilament or a combination of each type. However, slit film tapes have recently become the most common form of yarn used in the manufacture of woven geotextile. The yarn in the warp direction has to withstand the action of the loom's reeds continually pulling and pushing it apart to make way for the shuttle which pulls the weft yarn through. As a consequence it is usual for a slightly stronger yarn to be selected for the warp direction.

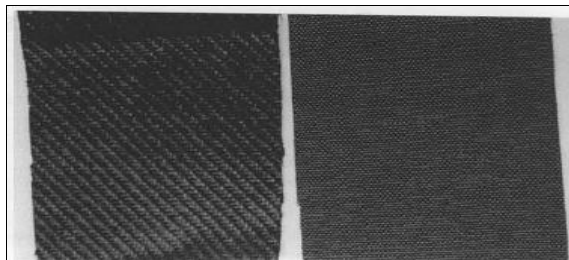


Fig. 2 Woven Geotextile Fabric

2.2 Non-woven Geotextile:

These are formed from filaments or fibres arranged at random and bonded together into a planar structure. The filaments or fibres are first arranged into a loose web, and then bonded together. Non-woven geotextile are also classified on the basis of their method of manufacturing and material used.

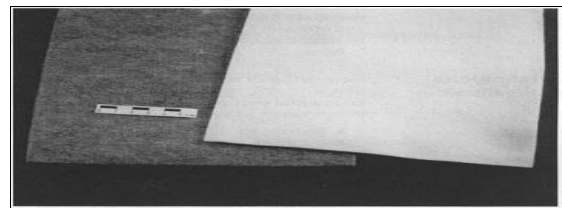


Fig. 3 Non-woven Geotextile Fabric

2.2.1 Thermal Bonding:

These non-woven geotextile are produced by spraying continuous polymer filaments on to a moving belt which is then passed through heated rollers. These rollers compress the layers of loose filaments and cause partial melting of the polymer, leading to thermal bonding of the filament at cross-over points. Thermally bonded geotextile tend to be relatively thin. The random distribution of the filaments results in a wider range of opening sizes than is found in a woven geotextile. The absence of any preformed orientation of the filaments results in a more isotropic strength compared to woven.

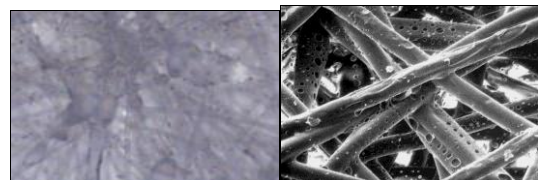


Fig. 4 Thermal Bonded Non-woven fabrics

2.2.2 Mechanical Bonding:

These non-woven geotextile are formed by introducing a fibrous web into a machine equipped with groups of specially designed needles. While the web is trapped between plates, the needles punch through it and re-orientate the fibres so that mechanical bonding is achieved among the individual fibres. In some cases, the needles may also vibrate or rotate to speed up the entanglement. This process produces fabrics which have a high density, considerable bulk, and thickness.



Fig. 5 Needle punched Non-woven Fabrics

2.2.3 Chemical Bonding:

This is the least common method for forming non-woven geotextile. They are produced by spraying polymer filaments on to a moving conveyor and then spraying or impregnating an acrylic resin on to or into the fibrous web. After curing or rolling, strong bonds are formed between the filaments. Often a forced-air drying operation is required to establish the fabrics open pore structure.

3. FUNCTIONS

Four basic functions of geotextile are: Separation, Filtration, Drainage and Reinforcement. These functions may be combined for specific applications, and may be sub-divided into primary and secondary function.

3.1 Separation

A geotextile placed between a fine soil and a coarse material to prevent the two materials from mixing. With the introduction of this barrier the dissimilar materials are each able to function properly.

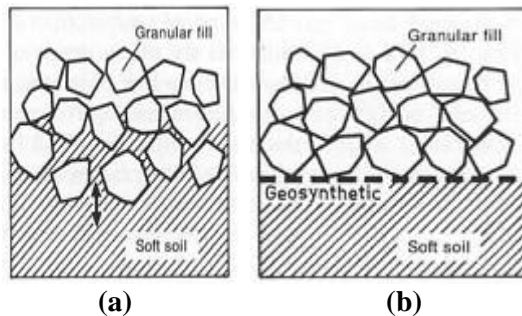


Fig. 6 (a) Soft soil without use of geotextile with granular fill (b) Soft soil without use of geotextile with granular fill

3.2 Filtration

A geotextile placed in contact with a soil, it allows water to pass through while preventing the passage of soil particles. Both adequate permeability (permittivity) and soil retention are required simultaneously over the design life of such application.

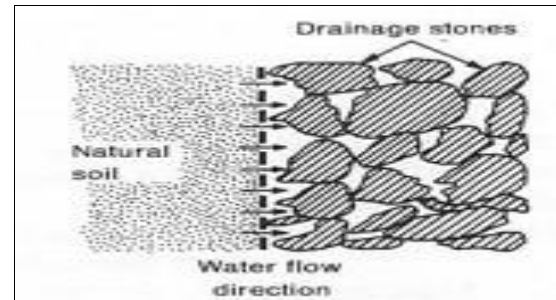


Fig. 7 Water Permeability through Geotextile Fabric

3.3 Drainage

A geotextile collects a liquid and conveys it towards an outlet. All fabrics can provide such a function, but a thin woven fabric obviously has less capacity than a thick needle punched non-woven. However, the capacity of fabrics is limited and geocomposite drains have been developed to provide increased capacity. The flow of water into the drain is controlled by the geotextile which must also perform a filter function to prevent loss of capacity due to soil entry into the drain. This drainage-in-the-plane is termed transitivity as contrast to permittivity for filtration.

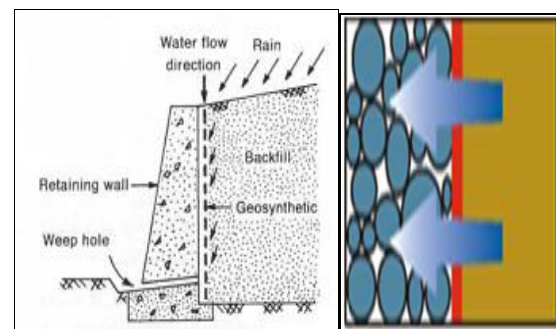


Fig. 8 Drainage of water with Geotextile Fabric

3.4 Reinforcement

A geotextile used to improve the mechanical properties of an earth structure by interacting with soil through interface shear.

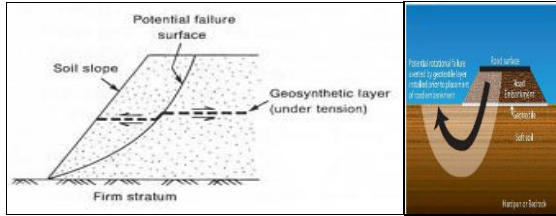


Fig. 9 Reinforcement with Geotextile Fabric

4. GEOSYNTHETICS:

The term geosynthetics is proposed in 1983 by Professor Robert M. Koerner, Director of Geosynthetics Research Institute. Which encompasses wide range of geomaterials now being increasingly used as GEOSYNTHETIC [1]? The geosynthetics are various polymers commonly used in wide variety of civil engineering applications to improve or modify soil/rock behavior, but the most common are polyolefin and polyester; although rubber, fiberglass and natural materials are also sometimes used. These may be used to function as a separator, filter, planar drain, reinforcement, and cushion/protection and/or as a liquid and gas barrier. These products have a wide range of

Geotextile
Geonets
Geogrids
Geomembranes
Geocomposites
Geosynthetics clay liners
Geofoam

5. APPLICATIONS:

Geotextiles are used in project of civil engineering applications.

applications and are currently used in many civil, geotechnical, transportation, geoenvironmental, hydraulic and private development applications including roads, airfields, railroads, embankments, retaining structures, reservoirs, canals, dams, erosion control, sediment control, landfill etc.

The term geosynthetics is generally regarded to encompass following main product categories

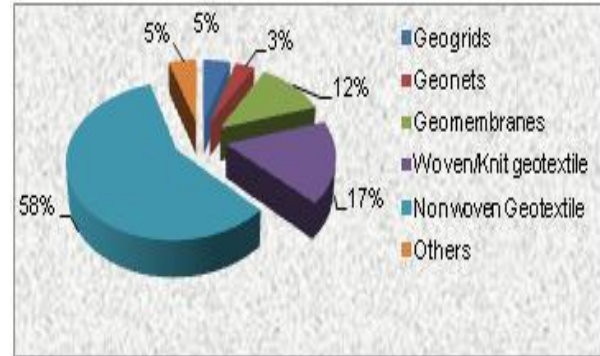


Fig.10 Market share of geotextile materials

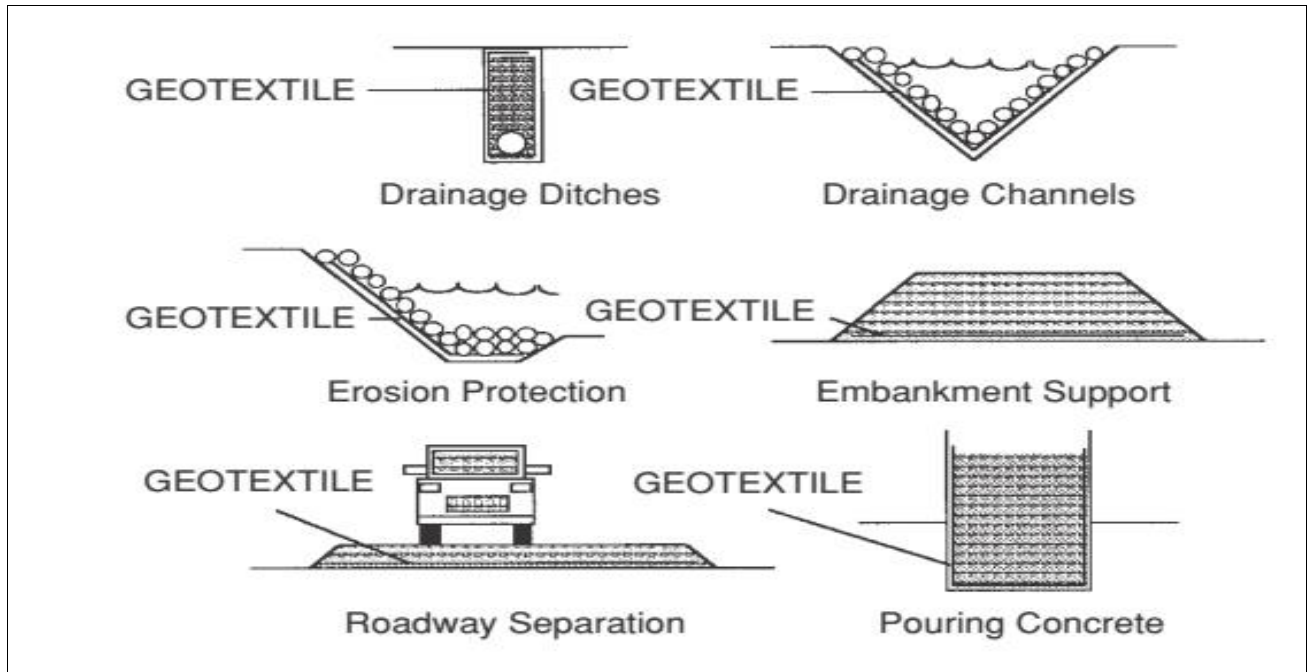


Fig.11 various applications of geotextile in civil engineering

5.1 Erosion Control

In erosion control, the geotextile protects soil surfaces from the tractive forces of moving water or wind and rainfall. These are used in ditch linings to protect erodible fine sands or cohesion less silts placed in the ditch and secured in place by stakes or covered with rock or gravel to secure it, shield it, from ultraviolet light and dissipates the energy of the flowing water. These are also used for temporary protection against erosion on newly seeded slopes. After the slope has been seeded, the geotextile is anchored to the slope holding the soil and seed in-place until the seeds germinate and vegetative cover is stabilize. The erosion control function can be thought of as a special case of the combination of the filtration and separation functions .



Fig. 13 Geotextile used for erosion control of soil

5.2 Vertical Drains

Vertical drains are positioned vertically through the ground, generally made of coarse granular material, particularly sand. Generally used for the acceleration of the rate of consolidation of the clay layer. Installation can be achieved in a various ways depending upon the type of drain to be installed and the nature of the ground. Installation of this drain causes significant disturbance in the surrounding soil. The permeability of the clay layer is greatly reduced due to the reorientation of the soil particles. This phenomenon is known as the “smear”. Reduction in the permeability takes place due to this effect and proper functioning of the drain is not achieved prefabricated vertical drains are serving for two purposes. Also new type of PVD as shown in Figure

can be used to consolidate the soil in coastal area where it create problem for construction of structure particularly used by civil engineers before constructing to reclaim land from wet and unstable soil.

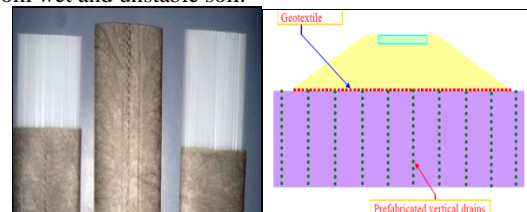
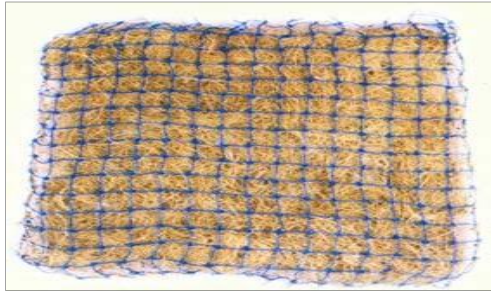


Fig. 14 Prefabricated vertical drains (PVD)

5.3 Garmat System:

It consists of coir fibre mulch mat sandwiched between



polymer rope nets which promote the growth of vegetation.



The net intertwines with the roots as shown in Figure.

Fig. 12 Garmat used in Hindustan Zinc Ltd., (Vishakhapatnam)

6. APPLICATION OF CARBON FIBER IN CIVIL ENGINEERING

Carbon fibers are a type of high-performance fiber available for civil engineering application. Carbon fibers have high tensile strength and are very strong for their size. In fact, carbon fiber might be the strongest material. They are chemically resistant and have high temperature tolerance with low thermal expansion with corrosion resistance. Several structural engineering applications utilize carbon fiber as a reinforced polymer because of its potential construction benefits and cost effectiveness. The usual applications include strengthening structures made with concrete, steel, timber, masonry, and cast iron; Retrofitting to increasing the load capacity of old structures like bridges which enhance shear strength and flexure in reinforced concrete structures. Other applications include replacement for steel, pre stressing materials and strengthening cast-iron beams.

7. MARKET FOR GEOTEXTILE

According to the information provided by Dornier, the global geotextile market is estimated to have been worth \$3 billion in 2009. The nonwoven sector accounts for 74.5% of the growth; woven, 25%; and other systems, 0.5%. According to GMA, the U.S. and Canadian geosynthetics market has a current estimated value of \$2.1 billion. With the share of market put at 90% and the Canadian share 10%. Within that market, geotextile has 32% share. Dornier reports that the growing Indian geotextile market has a value of some \$49.6 million but it is expected to nearly \$66 million by 2012. Projected annual growth is 12%, and long-term, it will increase 20%. The future of

geotextile is bright. As the use of geotextile significantly reduces civil engineering construction cost and drastically extends life of construction associated with geotechnical applications [3].

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Use of Solid Waste in Clay Bricks

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ABSTRACT: - There is increase in population in very large amount due to this the disposal of solid waste is a major problem. The main objective of this study is to investigate the potential use of various solid wastes for producing construction materials (such as bricks). The present paper is based on the innovative work in solid wastes in which various admixtures are used such as fly ash & glass fibers to increase brick strength. This paper also shows the results which are taken by the test on bricks.

Keywords: - Solid waste, Fly-ash, Brick

1. INTRODUCTION

Our world is facing severe problem of population. People are using various kinds of products, which are produced from household, industries, hospitals, public place, etc from which solid waste is generated in large quantities. Due to which pollution is generated. To recover this problem of pollution and disposal of solid waste in proper manner the invention is made of preparing fire bricks from solid waste for using it for firing. So from this we got the inspiration of using solid waste in construction field for casting bricks by using various materials. The cost of construction materials is increasing day by day because of high demand, scarcity of raw materials, and high price of energy. From the standpoint of energy saving and conservation of natural resources, the use of alternative constituents in construction materials is now a global concern. For this, the extensive research and development works towards exploring new ingredients are required for producing sustainable and environment friendly construction materials. The present study investigates the potential use of various solid wastes in the production of construction materials.

2. EXPERIMENTAL WORK:

Introduction: - The mass quantity of solid waste is generated in Nasik city is very big problem. Hence, by using such mass quantity of waste and by using some other admixture for manufacturing of bricks as construction material.

3. MATERIALS:

3.1 Solid waste: In Nasik city there is large amount of solid wastes, which are generated from household, hotels, streets and from commercial areas in the form of papers, plastic bags, bottles, jute bags, wrappers etc., then this solid waste made in powder form after drying it in sunrays.

3.2 Clay: Clay is a naturally occurring aluminium silicate composed primarily of fine –

grained minerals. Clay deposits are mostly composed of clay minerals, a subtype of phyllosilicate minerals, which impart plasticity and harden when fired or dried; they also may contain variable amounts of water trapped in the mineral structure by polar attraction. Organic material which does not impart plasticity may also be a part of clay deposit.

3.3 Formation: Clay minerals are typically formed over long period of time by the gradual chemical weathering of rocks, usually silicate bearing, by low concentration of carbonic asset and after leaching through upper weathered layers. In addition to the weathering process, some clay minerals are formed by hydrothermal activity. Clay deposits may be formed in place as residual deposits in soil, but thick deposits usually are formed as the result of secondary sedimentary deposition process after they have been eroded and transported from their original location of formation. Clay deposits are typically associated with very low energy depositional environment such as large lakes and marine deposits. This clay is used for making bricks.

3.4 Fly ash: Generally the ash is generated from thermal power plant to generate the electricity which has producing mass quantity of ash and this is also a major problem how to dispose the ash. Hence it can be used as one of the admixture for manufacturing of bricks.

3.5 Glass fibers: Glass fibre is made of silicon oxide with the additional of small amount of other oxides. The basic component of glass fibre is silica SiO₂ in its pure form is exist as polymer, (SiO₂). It has no true melting point but soften up to 2000 degree C, where it starts to degrade. It is usual to introduce impurities into the glass in the form of other materials to lower its working temperature.

SR. NO.	YEA R	POPULATION	WASTE GENERATION (TPD)
1	2011	163,630	33
2	2012	178255	36
3	2013	201139	41
4	2014	226,526	46

3.6 Water: The water available from river natural resource is used for mixing the clay, solid waste and admixture for manufacturing of bricks.

S.N	Type of brick	Compression strength in N/mm ²
1	CL+W	0.3508 N/mm ²
2	CL+SW+W	0.5263 N/mm ²
3	CL+SW+FA+W	2.80 N/mm ²
4	CL+SW+GF+W	2.16 N/mm ²
5	CL+SW+GF+FA+W	1.87 N/mm ²



Fig. 1 Molding of Brick



Fig. 2 Burnt brick for drying

4. PROCEDURE

The process of making brick generally consists the following steps: Gathering, crushing, grinding, screening, and mixing the raw materials; making the brick; and setting, drying, firing, packaging and inventing the final product. The mixing of raw material with solid waste and fly ash for manufacturing of bricks is same as conventional method and then drying it in sun rays. Then dried bricks make a small kiln and burnt it up to 2000 degree. Then after cooling the bricks the bricks are ready for transport and for use on the site. Manufacturing processes and percentage content of materials as shown in table no.1

5. RESULT & DISCUSSION

Test Setup:



Fig.3 Compression Testing Machine

Burned bricks are used for the compression test only. The test result is shown in the following table.

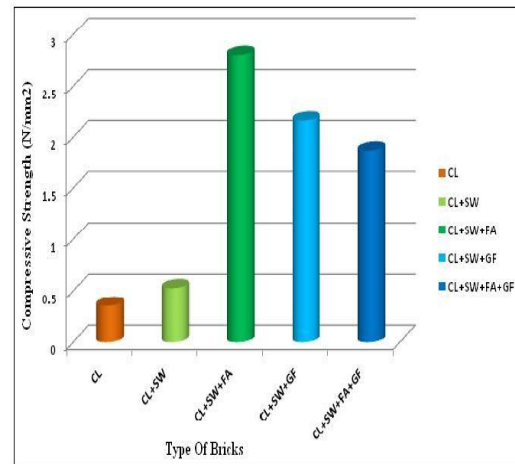


Fig.4 Compressive Load

Table no.1 Manufacturing processes and percentage content of materials.

S.N.	Material In (%)	Types of bricks				
		CL+W	CL+SW+W	CL+SW+FA+W	CL+SW+GF+W	CL+SW+GF+FA+W
1	Clay	100	60	30	60	32.6
2	Solid waste	----	40	40	38	32.6
3	Fly ash	----	----	30	----	32.8
4	Glass fibers	----	----	----	2	2

6. CONCLUSION

From this study on the solid waste used as construction material that means by making of bricks and it has been concluded that our study is successful, brick gave much higher strength and light weight as compared to normal brick used for construction. So the bricks can be used in construction work.

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AC SOLAR GENERATOR

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ABSTRACT

AC Solar Generator works on a very simple yet genius principle. It consists of standard solar cell arranged in circular pattern mounted on a base. Half of the cells are wired in one circuit and half in another circuit. Mounted above the solar cells is a spinning disk powered by a DC electric motor. The DC motor gets its power from four small DC solar cells mounted in the corners of the base. The disk has portals cut into it allowing light to pass through to every other solar cell below it. As the disk spins each of the banks of solar cells is alternately exposed to light and alternately produce power. When the portal is half way between the two cells the voltage cancels and drops to zero. The resulting voltage is sinusoidal or AC. Thus there is no need of conversion equipment's such as inverters, phase synchronizers, etc. This makes the overall concept quite simple yet effective and economical as well as compared to the current trend of extracting the solar energy in the market.

Key Words: Solar energy, Solar cells, AC solar generator, DC motor, Economical.

1. INTRODUCTION

There is a current global need for clean and renewable energy sources. Fossil fuels are non-renewable and require finite resources, which are dwindling because of high cost and environmentally damaging retrieval techniques. So, the need for cheap and obtainable resources is greatly needed. An efficient and more feasible alternative option is solar energy. Solar energy is a more practical type of energy due to its plentiful availability; it is derived directly from the sun. Many people probably wonder: if renewable energy is so beneficial, why don't we consume more of it? The answer to the question is that many of the renewable energy sources are more expensive and more difficult to retrieve. Thus, because of these limitations, the consumption of fossil fuels has grown to an exorbitant rate.

Electricity sector in India is growing, the following reveals the truth-

- Installed capacity from 1713 MW in 1950 is increased up to 89090 MW.
- Per capita consumption of electricity increased from 15 kWh 1950 to about 474 kWh.
- About 80% to 85% of the villages electrified by 2012. India is poised to achieve 100 % electricity penetration in every household in every village.

The electricity sector in India had an installed capacity of 225.133 GW as of May 2013, the world's fifth largest. Captive power plants generate an additional 34.444 GW. Non Renewable Power Plants constitute 87.55% of the installed capacity, and Renewable Power Plants constitute the remaining 12.45% of total installed Capacity.

Even after such a huge generation capacity there is still a huge shortage of power in India. This is due to the ever increasing demand of electricity, drastic achievements in technology, increase in population and also waste of electricity causes shortage. Still more than 40% of rural areas and more than 15% of urban areas are unelectrified and every effort is being made that electricity reaches every household in India. So for meeting this shortage there is a need to encourage the use of renewable energy sources such as solar, wind, tidal, etc. These sources of energy should be encouraged as they are never ending source of energy and so would never get extinct like other non-renewable sources such as coal, petrol, nuclear energy, etc.

1.1 Why only Solar?

- Sun, being the never ending source of energy, will be able to generate electricity even after millions and trillions of years to come.
- Compared to windmill, solar energy is very much noise free and the installation cost for solar is lesser than that of windmill
- Solar energy is almost maintenance free.
- Compared to tidal energy, which is another renewable energy source, solar is much cheaper.
- There is no need for heavy electrical machines such as 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 in meeting the ever increasing demand of electricity.

1.2 Photovoltaic (solar cell) Systems

Solar cells convert sunlight directly into electricity. Solar cells are often used to power calculators and watches. They are made of semiconducting materials similar to those used in computer chips.

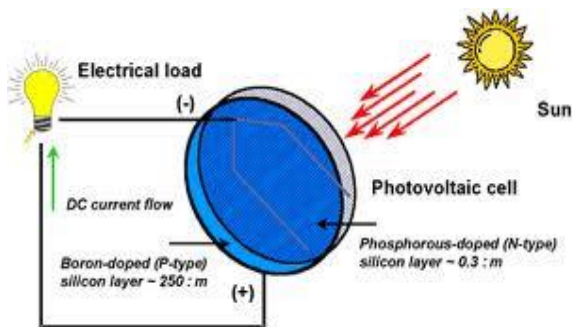


Fig 1: PV Cell

When sunlight is absorbed by these materials, the solar energy knocks electrons loose from their atoms, allowing the electrons to flow through the material to produce electricity. This process of converting light (photons) to electricity (voltage) is called the photovoltaic (PV) effect.

2. SOLAR AC GENERATOR



Fig 2: Block Diagram

Solar input

The sun which is the never ending source of energy and which is readily available is used as an input for our project. This reduces the ever increasing demand for fossil fuels such as coal, petroleum, diesel etc.

DC Motor

The DC motor of 9 volts is used for driving the metallic disc mounted above the solar panels. This motor will drive

the metallic disc at the speed of 60 rpm. This motor will be supplied from the power generated from the solar panels.

Disc

The disc is made up of the metallic material. The disk has portals cut into it allowing light to pass through to every other solar cell below it. As the disk spins each of the banks of solar cells is alternately exposed to light and alternately produce power.

Solar cells

The solar cells of rating 6 volts and 3 volts are used in the project. These cells are arranged in such a way that it gives us the output in sinusoidal form.

2.1 The Technology

We've heard about the promise of cheap solar energy now for decades. You'd think by now that at least in the world's sunniest areas all the cities would be supplementing their power with clean renewable solar power. Sadly this is not the case.

Here's the problem. Solar panels today produce DC power which has to be converted to AC to be used by most homes and businesses. The price of solar panels combined with the price of inverters, phase synchronizers, installation and maintenance has made the price of solar prohibitive. Add to that the loss of power from the different components used in the DC to AC conversion process and it becomes even more unattractive.

AC Solar Generator works on a very simple yet genius principle. It consists of standard solar cell arranged in circular pattern mounted on a base. Half of the cells are wired in one circuit and half in another circuit. Mounted above the solar cells is a spinning disk powered by a DC electric motor. The DC motor gets its power from four small DC solar cells mounted in the corners of the base. The disk has portals cut into it allowing light to pass through to every other solar cell below it. As the disk spins each of the banks of solar cells is alternately exposed to light and alternately produce power. When the portal is half way between the two cells the voltage cancels and drops to zero. The resulting voltage is sinusoidal or AC.

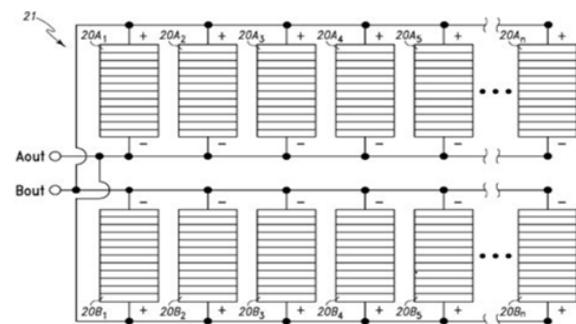


Fig. 3: Solar cell connection

Thus overall concept is quite simple yet effective and economical as well as compared to the current trend of extracting the solar energy in the market.

3. CIRCUIT DESCRIPTION

3.1 Panel Arrangement

The solar cell a/c electricity generator has a base, frame or other mounting structure 12 ("base 12") that supports the various components thereof. The base 12 may be formed of wood, plastic or other suitable material which is preferably, but not necessarily, a non-conducting material. It should be understood that while the base 12 is shown as a box or a box-like structure, the base may be a substrate, board or other suitable mounting or supporting structure. The base 12 includes an alternating current (a/c) electricity production portion 14 formed by a disk 15 and a plurality of photovoltaic or solar cells 20 (hereinafter, "solar cells 20").

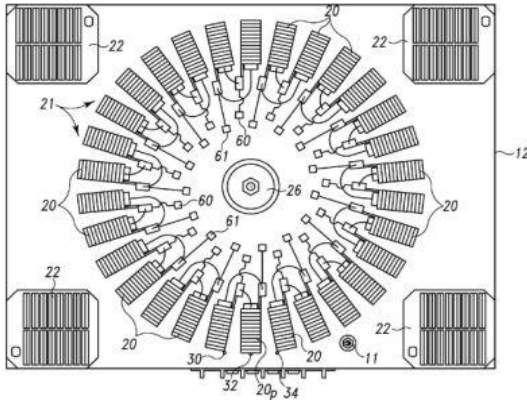


Fig. 4: Panel Arrangement

As best seen in Figure above, the plurality of solar cells 20 is arranged in a generally circular array 21 on an upper surface 13 of the base 12. It should be appreciated that arrays other than circular may be used within the present principles. It should also be appreciated that while the solar cells 20 are shown as rectangles, the size and shape of the solar cells 20 may be otherwise, such as truncated conical, triangular, polygonal or square.

3.2 Disc Arrangement

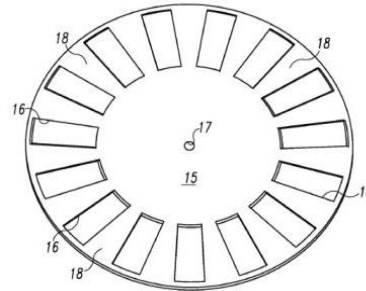


Fig 5: Disc Arrangement

As best seen in fig above, the disc 15 has a generally flat body made of a sunlight blocking material that is generally the circumference of the solar cell array 21 in order to extend over the solar cell array 21 when in use. The disc 15 is also preferably made of a lightweight material that resists warping or is not susceptible to warping. The disc 15 is preferably reflective inherently or via a coating, film, overlay or the like. It should be appreciated that the disc 15 may be partially reflective or non-reflective if desired. The disc 15 has a plurality of cutouts, openings, windows or the like 16 ("cutouts 16") formed thereabout. The size and shape of the cutouts 16 generally correspond to the size and shape of the solar cells 20 and particularly is sized and shaped to allow total exposure of a solar cell 20 to sunlight when the cutout 16 is positioned over the solar cell 20. The cutouts 16 are situated and spaced on the disc 15 so as to define a plurality of covers, coverings, blocks or the like 18 ("coverings 18"). The coverings 18 are sized and shaped to completely cover or block a solar cell 20 when the covering is over the solar cell 20.

4. ADVANTAGES

- Generates free energy from the sun
- Non-polluting energy reduces emissions: Has no direct impact on the environment
- It's easily scalable
- Grid-Tie systems allow you to sell excess electricity back to the utility
- Can be installed and operated anywhere including areas of difficult access and remote locations
- Helps get us off dependence on foreign oil
- PV cells make no noise and give off no exhaust

5. LIMITATIONS

- Depending upon the intensity of the sunlight, the output may vary.
- Circuit complexity.

- Chances of heat loss in metallic disc.
- Solar power stations can be built but they do not match the power output of similar sized conventional power stations.

- [11] http://www.solarwatt.de/fileadmin/user_upload/bild/referenzen/08_Modern_60M_Easy-In.jpg
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6. FUTURE SCOPE

- The AC solar generator has the potential to reduce the use of fossil fuels tremendously.
- Efforts are being made for developing a sensing technology to match the phase of the power from the panels to the phase of the power grid.
- Combining the phase matching with the alternating current generation is what allows the AC solar generator to create AC power without the losses and cost associated with the AC to DC power conversion process.

7. CONCLUSION

Considering the ever increasing demand of electricity, it has become a need of an hour to encourage the use of renewable sources of energy. Considering their advantages of low cost per unit of generation, less maintenance, reliability, etc. these renewable energy sources are the best alternative for the currently in use nonrenewable source of energy for power generation which are feared of becoming extinct in near future. AC SOLAR GENERATOR provides one such solution.

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MECHANICAL ENERGY STORAGE BY USING ELECTROMAGNETIC FLYWHEEL

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ABSTRACT

The world's electric systems are going through a dramatic transformation driven by advances in technology, societal demand for cleaner generating resources and an increasingly independent-minded customer base. Utilities are considering new business models, new ways to optimize asset utilization, and new ways to predict and manage balancing of generation and load. Customers and regulators are demanding more flexibility and reliability. Storage will play a key role in enabling the grid to meet those demands and foster the next generation of improvements. Many consumers are familiar with storage's capability for long-duration energy shifting but short-duration storage plays a critical role in delivering flexibility and reliability to the system. In this paper we are presenting electromagnetic flywheels which are far more agile and durable than competing energy storage technologies.

Keywords

Flywheel Technology, PCM, Control system

1. INTRODUCTION

The availability of a wide range of new technologies is enabling smarter, cleaner, more reliable production and delivery of electricity. These long overdue developments in the electric power sector impact users around the world – from large balancing systems to small island grids, across utilities and system operators of all sizes. In communities and boardrooms, industry stakeholders are discussing the demands of high renewable power penetration, increased energy security, and changing business models. Flywheels are the ideal tool for managing unpredictable, real-time changes in the electric power grid. Our systems have been proven over millions of operating hours in large and small-scale utility applications. The simple truth is that mechanical flywheels are far more agile and durable than competing energy storage technologies. They work continuously to precisely absorb and inject energy, providing flexible, cost-effective, low-maintenance grid support.

2. SHORT-DURATION STORAGE

Correcting momentary imbalances in generation and load is critical to maintaining a stable power grid. However, achieving this balance in real-time has always been a challenging task due to the time it takes conventional power generators to ramp their power output up or down to react to these constant power system fluctuations. Flywheel storage systems have much faster ramp rates than traditional generation and can correct imbalances sooner with much greater accuracy and efficiency. In fact, flywheels can inject or absorb full power nearly instantaneously. This range and fast response makes flywheels an ideal resource to provide regulation services thus freeing up thermal generators to service the energy market and operate at higher output levels, improving fuel efficiency and reducing emission rates. The steadier operation also

reduces generator wear and tear and associated system operation and maintenance costs.

Smart short-duration storage devices allow grid operators to provide a much more granular split of the Automatic Generation Control signal by allocating the heavy-duty workload to fast-responding and durable systems. Flywheels are currently providing grid balancing services dependably and accurately. Fast response and accurate flywheels allow conventional generation to operate more efficiently. The principle of applying the technology to the problem it is best suited to address unleashes efficiencies throughout the entire system.

Constantly available frequency regulation resources are becoming more critical to maintaining grid reliability, especially as intermittent generation increases alter the dynamics of the generation supply stack. Fast, accurate energy storage resources are already changing the way frequency regulation is being delivered. The efficiency and reliability offered by these resources enable grid operators to confidently integrate more renewable power.

3. LOWEST LIFETIME COST PER UNIT OF WORK

- Flywheels excel at handling heavy duty high-cycle workloads with no degradation, ensuring a consistent power and energy output over the 20 year design life.
- At all times, the full 100% depth-of-discharge range is available for regular use and state-of-charge (simply a function of rotational speed) is accurately known to deliver more useable range, precision, and value.
- There is no need to limit state-of-charge to specific ranges or to oversize storage capacity/duration to manage cycle life.
- Charge and discharge rates are symmetrical, meaning the units recharge at the same rate as they discharge which enhances operational effectiveness.
- Flywheel configurations deliver the high power-to-energy ratios most effective for grid stabilization and renewable power smoothing.
- With a lifespan of at least 100,000 full depth-of-discharge cycles, a flywheel storage system has a very high lifetime energy throughput (a direct measure of work performed) and thus, lifetime costs that are much less than competitive solutions in high-cycle applications.

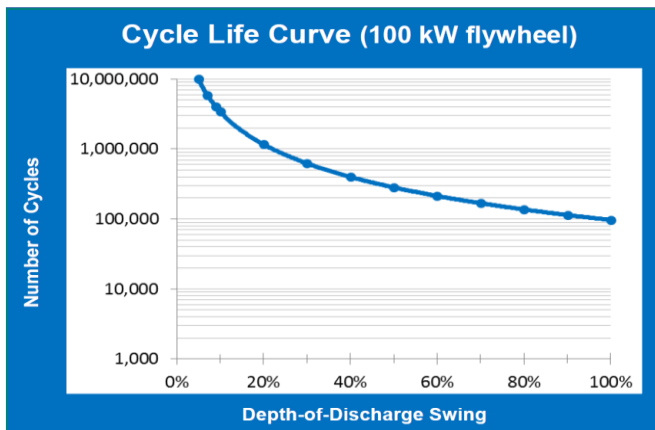


Fig. 1 No. of cycles vs Depth of discharge

4. ELEMENTS OF FLYWHEEL

- **Vacuum Chamber:** A strong vacuum provides a near frictionless environment and the containment protects all components from the atmosphere and contamination. This eliminates deterioration of the internal components.
- **Patented Composite Rim:** A rotating carbon and fiberglass composite cylinder stores the energy. It also optimizes mass and strength to provide energy storage safely and at the best price.
- **Magnetic Lift System:** A non-contacting magnetic field lifts and supports the rotor, further eliminating wear and extending the life of the parts while minimizing friction. Beacon's patented bearing system ensures the spinning rim maintains its axis of rotation with low bearing loads, resulting in a long life.
- **Hub:** Aluminum forging connects the rotating shaft and rim.
- **Shaft:** Steel forging rotates and maintains the rotor centerline.
- **Brushless Permanent Magnetic Motor / Generator:** Efficiently converts the electrical energy into mechanical energy when the flywheel is charging, and back to electrical energy when discharging.



Fig.2 Elements of Flywheels

4.1 Power Control Module

The PCM and its 2-stage power electronics control the flow of power between the flywheel and collection system that ties to the AC grid. Each PCM also controls and monitors the status and state-of-health of critical flywheel operating parameters and interfaces with the other subsystems that support flywheel operation, such as cooling and power control. PCM is an outdoor-rated, pad-mounted package. Design criteria include reliable operation in extreme conditions. Flywheel systems are designed to require low maintenance and their modular architecture allows units to be self-contained so service issues have minimal system impact.

4.1.1 Adaptable & Flexible

- Flywheels and bundled power electronics are designed in a custom configuration to cost-effectively convert the variable-speed / high-inertia motor output into a clean and stable source of AC electricity (with a DC option) and to effectively utilize the full capability of the flywheel.
- The PCM allows flywheel stored energy to be coupled seamlessly to the AC grid and enables instantaneous response and maximum operational flexibility.
- The power and energy duration settings can be changed on the fly, injecting or absorbing high power for a few seconds to address immediate frequency response needs or tailored to release energy over a longer period of 30 minutes to match longer duration system variances such as managing wind power generation ramping.
- At any operator selected power output level, the throughput is constant and the device can charge at the same rate as it discharges providing maximum flexibility.
- The flywheel system is a 'smart device' capable of operating based on Automatic Generation Control signals or sensing and responding to the activity on the grid. In addition to its active power flexibility, full four-quadrant inverters can deliver reactive power continuously.

4.2 Control System

Each flywheel storage system is managed by Master Controller that receives inputs and signals from a grid system operator or directly from the local grid depending on the application. Operating modes

available include frequency response, frequency regulation, renewable smoothing, VAR support, and custom applications. The Master Controller processes inputs, applies the operating mode logic and priorities in effect, and then directs the flywheel system to absorb or inject real and reactive power accordingly. It allocates the work between clusters consisting of up to 2 MW of flywheels and aggregates the state-of-charge and state-of-health information from the clusters. Operating modes and set points can be changed throughout the day and over the life of the system to meet evolving customer system needs.

At the 2 MW cluster level, a Cluster Controller commands individual flywheels based on the Master Controller instructions and the real-time status of each flywheel module. State-of-charge and state-of-health are determined for the cluster. In the event of a maintenance issue, the Cluster Controller can take any individual flywheel module offline and redistribute the commands to the remaining modules. This fully distributed modular architecture results in high availability and optimizes performance. Control system can receive signals in any standard protocol or type of communication medium, typically via a fiber or TCP/IP connection.

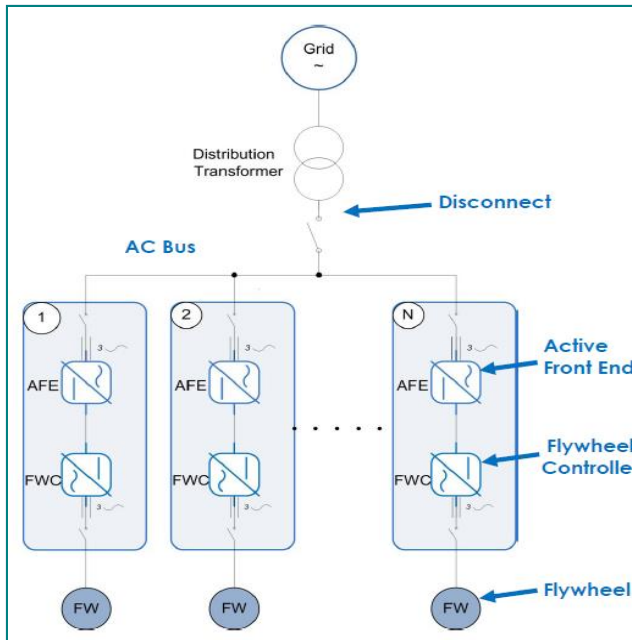


Fig.3 flywheel control system

5. INSTALLATION

The flywheel is mounted to a cement base buried underground to ensure a stable platform that will support the high-velocity spinning mass. During construction, 8-foot deep holes are dug and a crushed stone base added and leveled. Three-piece, pre-cast concrete flywheel foundations (similar in construction to highway storm drains) are installed in the ground, leveled, and surrounded by crushed stone. Concrete pads are built for the PCM, cooling systems and switchgear. Underground conduit is placed to run power and signal cables between components.



Fig.4 Installation of flywheel system



Fig.5 Representative Flywheel Energy Storage Module

6. APPLICATIONS

- Frequency Regulation
- Frequency Response
- Voltage Support
- Renewable Power Smoothing
- Low/High Voltage Ride Through
- Low/High Frequency Ride Through
- Grid Forming and Grid Reference
- Spinning Reserves

7. ADVANTAGES

- Maximize Renewable Penetration

- Ensure a Stable Grid
- Reduce Energy Costs
- Enable Independence from Fossil Fuels and Infrastructure
- Reduce Emissions
- Reduce O&M Costs
- Minimize Environmental Impact

8. CONCLUSION

Flywheels provide a new resource to help grid operators improve reliability. The durability, agility, and precision of Beacon flywheel energy storage systems make them an extremely effective stabilizing force. Flywheels are spinning machines like gas turbines but operate in a vacuum without any significant thermal stress or friction. The performance of the flywheel energy storage system does not degrade with cycling, depth-of-discharge, time or temperature. Flywheel systems can respond to an Automatic Generation Control signal or sense imbalances on the grid to provide active power for over 30 minutes or reactive power continuously. They can charge at the same rate as they discharge and do not need to operate within limited state-of-charge ranges.

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INTELLIGENT CIRCUIT BREAKER

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ABSTRACT

Normal circuit Breaker Trips only when short circuit occurs. But there are many other critical conditions, when main power should be cut out before any damage occurs. But normal circuit breaker is not capable of achieving this objective. Here we propose a new type of intelligent circuit breaker which will be keeping an eye on all critical parameters related to power line and if anything goes wrong, supply to mains will be cut out before any major incident occurs. In this project, we will be watching parameters like high voltage, low voltage, fire breakout, LPG gas leakage and flooding. All this parameters can cause great damage if mains supply is kept on. So, as soon as any one of this condition is detected, we will cut off the main supply via I.C.B. Besides above condition when normal circuit breaker trips we need to restart the system manually by going in dark to the place where C.B is installed. In our I.C.B we will have auto re-closer system

Keywords

Innovative, User friendly, compact.

1. INTRODUCTION

Circuit breaker is a vital protective device used in power system & domestic application. A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by overload or short circuit. It requires an additional sensing element in form of an RELAY. One such type of CB widely used on domestic applications is Miniature Circuit Breaker which detects and interrupts the circuit.

In comparison with a fuse, which operates once and then must be replaced, a circuit breaker can operate number of times or it can be reset (either manually or automatically) to resume normal operation. Circuit breakers are made in varying sizes, from small devices that protect an individual household appliance up to large switchgear designed to protect high voltage circuits feeding an entire city.

1.1 NEED

Circuit breaker is a vital protective device used in power system & domestic application. A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by overload or short circuit. It requires an additional sensing element in form of an RELAY. One such type of CB widely used on domestic applications is Miniature Circuit Breaker which detects and interrupts the circuit.

In comparison with a fuse, which operates once and then must be replaced, a circuit breaker can operate number of times or it can be reset (either manually or automatically) to resume normal operation. Circuit breakers are made in varying sizes, from small devices that protect an individual household appliance up to large switchgear designed to protect high voltage circuits feeding an entire city.

The existing technology used for electric circuit protection is been stable and less user oriented. It has been more protection savvy and too less for the end user comfort and smart techniques. New sophisticated devices reshape the way engineers apply circuit protection and open new possibilities for the savvy designer.

Electrical Distribution needs are :-

- Continuous residential, commercial and industrial sectors.
- Improved operational safety,
- Continuity of service,
- Greater convenience and operating cost have assumed a tremendous significance.

The latest technology has made electronic circuits smaller and more efficient. Power electronic devices have also evolved with improved quality and smaller in size, which can be used in circuit breakers. Programmable devices can be used in circuit breakers. Smart-protectors provide scope for programmable trip values and overload time delays. More-sophisticated protectors measure and report voltage and current values, alert control systems about tripped conditions, and can be reset remotely. As global markets become more important, designers must consider how circuit-protection devices can meet both domestic and international standards. Engineers and designers may need to consider VDE, the German Association for Electrical, Electronic, and Information Technology, or the broader European CE mark for products sold in European Union countries.

Considering Asian giant China, the CCC mark, or China Compulsory Certification, is mandatory for products exported to or sold in China. CCC approval covers low-voltage electrical products including circuit breakers, electric tools, household appliances, and telecom equipment. Embedded microprocessors now get built into a variety of products, and circuit-protection products are no exception with the arrival of intelligent devices. Many smart breakers include sensing circuits. These sensors feedback information to PLCs or other control units, on such factors as circuit status, current flows, and other relevant data. Some solid-state circuit breakers provide an analog output signal proportional to current.

2. CIRCUIT DESCRIPTION

Our project is based on new technology which makes use of new semiconductor devices for circuit breaking operation. Many protections can be provided in one single device. Here we are also providing protection other than overload and over voltage. Various sensors are used for sensing devices in place of

traditional relays which improves the speed of operation. Use of microcontroller enables the intelligent & smart operation. It is the brain of the whole circuit. For smart operation the device need to collect all the data then analyze it and accordingly it should operate. As all the parameter which are to be controlled are analog, ADC(analog to digital converter) is required. Analyzing and operation part is done by microcontroller. For intelligent operation it need to inform or communicate with the user about the various parameters and existing operating condition. A LCD display is used for the displaying current operating parameters. Fault condition is displayed on display and as well as it is informed to the user via SMS service using modem. By using the electronic devices the total operation time of the circuit breaker reduces drastically with comparison with normal MCB

2.1 WORKING OF CIRCUIT

We are using five sensors for sensing different parameters in circuit. These sensors are placed on specific location in system, first the data from sensor goes to in ADC IC 0808(Works on +5 V). This IC convert the sensor data from Analog to digital and it gives to microcontroller (40 pin IC 89s51 Working voltage +5V). To work microcontroller it needs basically three contents

1. Power supply +5V
2. Clock (crystal 11.0952 MHz)
3. Reset (to reset the program)

Microcontroller takes the data and check the status according to the program (Program in Embedded C language). Microcontroller gives the first out put on LCD display (16×2 +5V). On LCD display it shows the sensors data in digital value, if any sensors value goes above or below level to its certain value then microcontroller first output gives to LCD display, then second give to the relay driver IC (IC ULN 2803). Relay driver gives signal to relay (relay 12V SPDT) and alarm. Relay cuts the power supply in circuit. These systems monitor the circuit and control, protect the variable appliances and give us maximum security.

2.2 REGULATED POWER SUPPLY

Normal voltage available at any domestic place is Alternating in nature and of 230/440 volts, but for operation of all the electronic components of the circuit it needs stable D.C supply. ADC, Microcontroller, and whole control circuit operates on +_ 5 v DC. For this requirement we need an regulated power source. This circuit first steps down the normal operating voltage to very low voltage using transformer. Supply is taken from the line to be protected. This low A.C voltage is then rectified and converted to unstable D.C. This unstable D.C is then filtered and regulated to stable 5 volt DC supply. This D.C is then supplied to the circuit components.

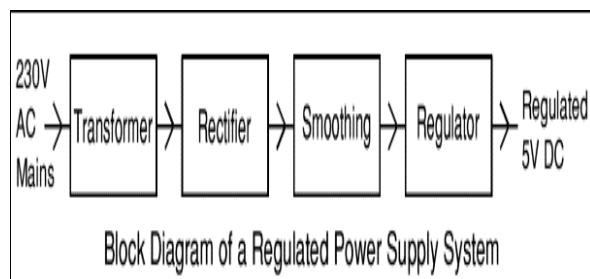


Figure 6.1: Regulated power supply

Stages of regulated power supply

- Transformer - steps down high voltage AC mains to low voltage AC.
- Rectifier - converts AC to DC, but the DC output is varying.
- Smoothing - smoothes the DC from varying greatly to a small ripple.
- Regulator - eliminates ripple by setting DC output to a fixed voltage.

The transformer used in this circuit has secondary rating of 7.5V. The main function of the transformer is to step down the AC voltage available from the main. The main connections are given to its primary winding through a switch connected to a phase line. The transformer provides a 7.5V AC output at its secondary terminals and the maximum current that can be drawn from the transformer is 1 Amp which is well above the required level for the circuit. The bridge rectified the AC voltage available from the secondary of the transformer, i.e. the bridge rectifier convert the AC power available into DC power but this DC voltage available is not constant. It is a unidirectional voltage with varying amplitude.

To regulate the voltage from the bridge rectifier, capacitors are connected. Capacitors C1 filter the output voltage of the rectifier but their output is not regulated and hence 7805 is connected which is specially designed for this purpose. Although voltage regulators can be designed using op-amps, it is quicker and easier to use IC voltage regulator. Furthermore, IC voltage regulators are available with features such as programmable output current/ voltage boosting, internal short circuit current limiting, thermal shut down and floating operation for high voltage applications.

3. IMPORTANT COMPONENTS OF ICB

Sensors

- Current Transformer – 10:1 A
- Potential Transformer – 230:3 V
- Gas sensor – MQ6
- Temperature Sensor – Thermistor - 10 K ohm
- Water level sensor

1. Thermistor

A thermistor is a type of resistor with resistance varying according to its temperature. The word is a portmanteau of thermal and resistor. Samuel Ruben invented the thermistor in 1930, and was awarded U.S. Patent No. 2,021,491. Thermistors are widely used as inrush current limiters, temperature sensors, self-resetting overcurrent protectors, and self-regulating heating elements. Assuming, as a first-order approximation, that the relationship between resistance and temperature is linear, then:

$$\Delta R = k \Delta T$$

Where, ΔR = change in resistance

ΔT = change in temperature

k = first-order temperature coefficient of resistance

Thermistors can be classified into two types depending on the sign of k . If k is positive, the resistance increases with increasing temperature, and the device is called a positive temperature coefficient (PTC) Thermistor, or posistor. If k is negative, the resistance decreases with increasing temperature, and the device is called a negative temperature coefficient (NTC) thermistor. Resistors that are not Thermistors are designed to have a k as close to zero as possible, so that their resistance remains nearly constant over a wide temperature range.

2. Gas sensor:- MQ 6

Hanwei sensors are applied to all practical fields of Domestic and Industrial Gas Detection. They not only safeguard the consumer ,i.e. domestic gas alarms for LPG gas, alcohol checkers etc, improve their standard of living, i.e. auto-matic ventilation systems, breath checkers etc, but benefit all mankind, industrially used as detectors for numerous gases, i.e carbon monoxide, methane, Hydrogen, organic vapors, to name a few.

3. Analogue to digital converter - ADC0808

The ADC0808, ADC0809 data acquisition component is a monolithic CMOS device with an 8-bit analog-to-digital converter, 8-channel multiplexer and microprocessor compatible control logic. The 8-bit A/D converter uses successive approximation as the conversion technique. The converter features a high impedance chopper stabilized comparator, a 256R voltage divider with analog switch tree and a successive approximation register. The 8-channel multiplexer can directly access any of 8-single-ended analog signals. The device eliminates the need for external zero and full-scale adjustments. Easy interfacing to microprocessors is provided by the latched and decoded multiplexer address inputs and latched TTL TRI-STATE® outputs.

Features

- Easy interface to all microprocessors operates ratio metrically or with 5 VDC or analog span adjusted voltage reference;
- No zero or full-scale adjust required;
- 8-channel multiplexer with address logic;
- 0V to 5V input range with single 5V power supply;
- Outputs meet TTL voltage level specifications;
- Standard hermetic or molded 28-pin DIP package;
- 28-pin molded chip carrier package;
- ADC0808 equivalent to MM74C949;
- ADC0809 equivalent to MM74C949-1.

Key Specifications

- Resolution 8 Bits
- Total Unadjusted Error $\pm 1/2$ LSB and ± 1 LSB
- Single Supply 5 VDC
- Low Power 15 mW
- Conversion Time 100 μ s

4. Microcontroller

An embedded microcontroller is a chip which has a computer processor with all its support functions (clock & reset), memory (both program and data), and I/O (including bus interface) built into the device. These built in functions minimize

the need for external circuits and devices to be designed in the final application.

- Embedded Microcontroller

When all the hardware required to run the application is provided on the chip, it is referred to as an Embedded Microcontroller. All that is typically required to operate the device is power, reset, and a clock. Digital I/O pins are provided to allow interfacing with external devices.

- Microcontroller 89s51

The AT89s51 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Phillips's high-density nonvolatile memory technology and is compatible with the industry-standard MCS-51 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 Flash on a monolithic chip, the Phillips AT89s51 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.

Features of 89s51

- 4K Bytes of In-System Reprogrammable Flash Memory Endurance: 1,000 Write/Erase Cycles
- Three-level Program Memory Lock
- 128 x 8-bit Internal RAM
- 32 Programmable I/O Lines
- Two 16-bit Timer/Counters
- Six Interrupt Sources
- Programmable Serial Channel
- Low-power Idle and Power-down Modes

3 MERITS

- Sophisticated security.
- Alert message to mobile phone for remote information.
- Mobile number can be changed at any time.
- Easier for end user to reset. (no touching of live parts).
- To improve the power quality efficient operation and monitoring of high voltage and a low voltage substations is very important.
- GSM based controlling lead to much power efficiency and better decision systems; it also brings intangibles like safety to the system.

4 FUTURE SCOPE

- ICB is in itself an small security system
- It can be interfaced with other security systems to form an complete and smart system for the application in industries, residential townships, etc...

5 CONCLUSION

The goal of our project is to provide an intelligent and reliable circuit breaker. Having a compact architecture and ability to monitor and control the parameters for improving the reliability and to reduce maintenance costs is of prime importance. Also it has a condition monitoring unit (microcontroller 89s51) for monitoring a variety of parameters associated with the circuit breaker, and to thereby reduce maintenance costs through proper maintenance and avoid costly unplanned outages by identifying various failures before they occur.

Intelligent circuit breaker acts as an alternative or substitution to the conventional circuit breaker i.e MCB & holds an upper hand over it. It can reset the AC power source after a fault or trip. It has a controller incorporated in it, which can intelligently diagnose and analyze any faults or trips on the AC line. Thus the automation of electrical circuit breaker is designed and implemented using GSM technology. This brings out the efficient way of power transmission and distribution in electrical substation.

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HIGH VOLTAGE TESTING OF INSULATORS

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ABSTRACT

With ever-increasing demand of electrical energy, the power system is growing both in size and in complexity. The generating capacities of power plants and application of high voltage has intensively increased due to its inherent advantages, such as, greater efficiency and cost effectiveness. It is, thus essential to know the property of the insulating materials for optimum solution in terms of cost and insulating capability. Moreover, the reliability of power supply is ensured by having a reliable insulation system.

Under normal working conditions, insulation gradually loses its dielectric strength and overvoltage capacity because of general aging as well as due to local defects appearing in the form of voids in the insulation during manufacture, particularly in extruded and cast type insulation. The quality of a solid insulation is judged in several ways, such as, hydrophobicity, electroluminescence, crystallization kinetics, hygrothermal, and chemiluminescence and breakdown voltage. Out of these, the breakdown voltage continues to evoke a lot of interest to the electrical engineers in general and high voltage engineers in particular. There are several potential applications of solid insulating materials such as, the underground cables, rotating machines, transformers and overhead transmission lines. Moreover, as the demand for electrical power is growing in the 21st century, better quality insulating materials starting from the generation to the distribution is a bare essential necessity.

Hence, it is extremely important to develop solid insulating materials with excellent breakdown strength and any attempt at modeling the phenomenon with the presence of void would go a long way in assessing the insulation quality.

Keywords

High voltage, breakdown, dielectric, leakage current

Introduction

1. Through this test we can study the different composite material used for the insulation purpose and for protection of the grid. Different materials and solid insulators have their own breakeven strength so they are classified according to their own classes and groups and thus obtaining the insulation coordination curve of the materials.

2. The process includes passage of high voltages through the material unless the breakdown of the material occurs and thus obtaining the breakdown strength of the materials at which it

has been withstand. Thus from the test we can obtain various parameters through which we can study the material and their

3. Accordingly strength of sustaining the voltages prescribed to it under observed and controlled condition with provision of protection to the test.

4. The project promises the scope to study of sustain rated withstand voltage capacity, assured disruptive voltage and pollution insulation deterioration.

5. The cause is to provide better field for studying the high voltage test for researching and reforming to increase the stability of power system, by study of new materials that has to be used in the system. With the challenging job of coordination with the programming component of the model for safety and precautionary measures of the project and thus providing precise results for the material of insulation

Block diagram

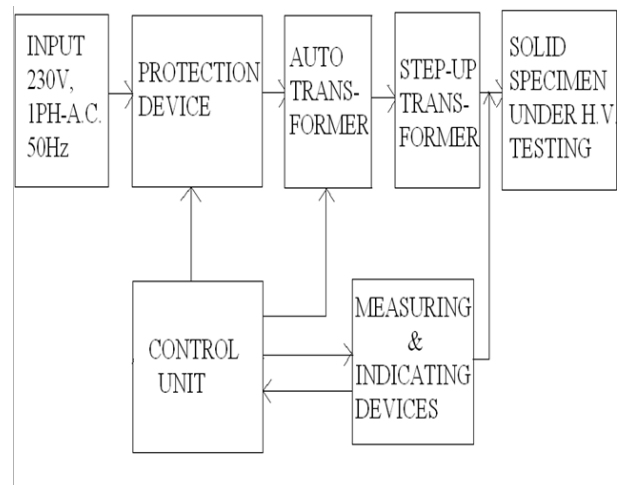


FIG.4.1 BLOCK DIAGRAM FOR HIGH VOLTAGE TEST ON INSULATIONS

Here the supply is 230V 50Hz from the main power terminals. Further the voltage is connected to the auto-transformer, it is used to vary the output voltage of the main step-up transformer and the main step-up transformer cannot be connected to the main supply because high inrush current will

flow i.e. high magnetizing current. Hence to protect the main step-up transformer an auto-transformer is used.

Further it consists of a measuring device and protection device. Measuring device is a current transformer and a voltmeter. Current transformer measure the secondary current from the main transformer secondary terminals and voltmeter measure the output voltage which is applied to the specimen. As in testing here there is a leakage current and current due to breakdown.

Hence the control unit must sense the different currents and protect the transformer from the breakdown current. Specimens used are normal insulators and the insulation i.e. solid insulation used in transmission line, rotating machines, etc. Here the earthing terminal must solidly ground to ensure perfect projection of the system.

Control unit is a simple protecting unit where it consist a timer and output of current transformer if the current exceed form the preset value then it will send the tripping signal to the circuit breaker.

Hence from this test we can study the different properties of the insulations.

Factors affecting breakdown of solid insulations

The breakdown of solid insulating materials depends on the following factors:

- NATURE OF WAVEFORM

The breakdown voltage of solid insulating material depends on the nature of the voltage waveform applied to i.e., DC, AC

- AGEING

The breakdown voltage of an insulating material, in general, decreases with the ageing of the dielectric. The deterioration process is due to the acceleration of the partial discharges and heat buildup in the voids and micro-cavities of the insulating material when frequency is increased.

- FREQUENCY

The variation of frequency has an important role to play in affecting the breakdown voltage of solid dielectrics. The breakdown voltage at higher frequencies is much lower than the breakdown voltage at 50 Hz. This is due to increased internal heating as well as intense partial discharges within the material.

- THICKNESS OF THE DIELECTRIC MATERIAL

The thickness of the dielectric material affects the breakdown voltage. The short time electric strength is more dependent on the thickness than the area of the samples.

- DIFFERENT MATERIALS

As materials have different dielectric constant, these constant describe the insulating strength of the materials. Hence every material has its own dielectric constants. Therefore every materials used as insulation has different operating and breakdown voltage limit

Dielectric constant & dielectric loss

A. DIELECTRIC CONSTANT

The ratio of capacity of storing the electric charge by an insulating material to that of air is called dielectric constant of the material.

Every insulating material has the property of storing electric charge 'Q', when a voltage V is applied across it.

The charge is proportional to the voltage applied i.e.

$$Q \propto V \quad \text{we get} \quad Q = CV$$

B. DIELECTRIC LOSS ($\tan \delta$)

Electrical energy absorbed by the insulating material and dissipated in the form of heat when an alternating voltage is applied across it is called dielectric loss.

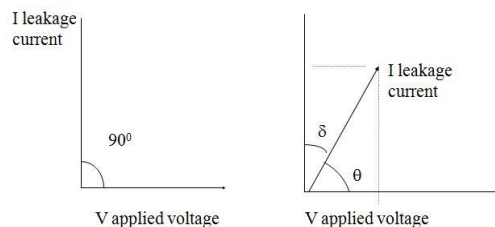


FIG. DIELECTRIC LOSS

FACTORS AFFECTING DIELECTRIC LOSS

- TEMPERATURE
- MOISTURE APPLIED
- VOLTAGE

Failure mechanisms of solid insulating material

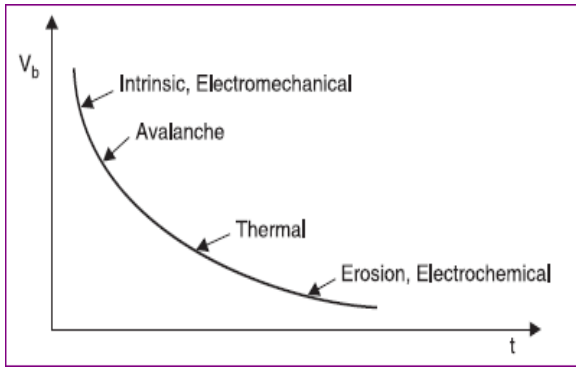


FIG.VARIATION OF BREAKDOWN STRENGTH WITH TIME AFTER APPLICATION OF VOLTAGE

Electrical breakdown or dielectric breakdown refers to a rapid reduction in the resistance of an electrical insulator when the voltage applied across it exceeds the breakdown voltage. Under sufficient electrical stress, electrical breakdown can occur within solids, liquids, gases or vacuum. However, the specific breakdown mechanisms are significantly different for each, particularly in different kinds of dielectric medium.

Types of breakdown

- A. Intrinsic or ionic breakdown
- B. Electromechanical breakdown
- C. Thermal breakdown
- D. Electrochemical breakdown
- E. Treeing and tracking

A. INTRINSIC BREAKDOWN

When voltage is applied only for short durations of the order 10⁻⁸Sec, the dielectric strength of a solid dielectric increases very rapidly to an upper limit called the intrinsic electric strength.

Maximum strength usually obtainable ranges from 5 - 10 MV/cm. Intrinsic breakdown depends upon the presence of free electron which capable of migration through the lattice of the dielectric.

B. ELECROMECHANICAL BREAKDOWN

Failure occurs due to electrostatic compressive forces, which can exceed the mechanical compressive strength. If the thickness of specimen, d_0 and is compressed to a thickness d under an applied voltage V , the highest apparent electric stress before breakdown is:

$$E_{MAX} = \frac{V}{d_0} = 0.6 \frac{\sqrt{Y}}{\epsilon_0 \epsilon_r}$$

Where, Y - Young's modulus

Mechanical instability occurs when $d/d_0 = 0.6$

C. THERMAL BREAKDOWN

When an electric field is applied to a dielectric, conduction current flows thru the material. Current heats up the specimen and the temperature rises. Heat generated is transferred to the surrounding medium by conduction and radiation. Equilibrium is reached when the heat generated (W_{dc} or W_{ac}) is equal to heat dissipated (WT). Breakdown occurs when W_{dc} or W_{ac} exceeds WT .

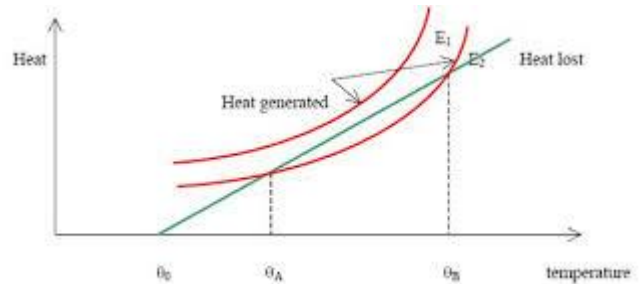


FIG. THERMAL BREAKDOWN

D. CHEMICAL AND ELECTROCHEMICAL DETERIORATION AND BREAKDOWN

In presence of air and other gases, dielectric materials undergo chemical changes when subjected to continuous electrical stresses. Chemical reactions that occur are:

Oxidation: In the presence of air or oxygen, materials such as rubber and polyethylene undergo oxidation giving rise to surface cracks.

Hydrolysis: When moisture or water vapour is present on the surface of the solid dielectric, hydrolysis occurs and the materials lose their electrical and mechanical properties. Materials like paper, cotton tape and other cellulose materials deteriorate very rapidly due to hydrolysis.

Chemical Action: Progressive chemical degradation can occur due to a variety of processes such as chemical instability at high temperature, oxidation, cracking and hydrolysis.

E. BREAKDOWN DUE TO TREEING AND TRACKING

Spreading of spark channels during tracking in the form of the branches of a tree is called **TREEING**.

In practice, the surface of solid dielectric material always ailing the conducting film, which is formed due to moisture. On application of voltage, the film starts conducting, resulting in generation of heat, and the surface starts becoming dry.

F. BREAKDOWN DUE TO INTERNAL DISCHARGES

Solid insulating materials contain voids or cavities within the medium or at the boundaries between the dielectric

and the electrodes. These voids are generally filled with a medium of lower dielectric strength, and the dielectric constant of the medium in the voids is lower than that of the insulation.

The electric field strength in the voids is higher than that across the dielectric. Therefore, even under normal working voltages the field in the voids may exceed their breakdown value, and breakdown may occur.

Result and conclusion

This high voltage test on solids materials aims at the providing insulation for better scope of transmission in power system through grading them according to their withstanding capacity and increasing the reliability of the system. Through this test we can study the different composite material used for the insulation purpose and for protection of the grid. Different materials and solid insulators have their own breakeven strength so they are classified according to their own classes and groups and thus obtaining the insulation coordination curve of the materials .The process includes passage of high voltages through the material unless the breakdown of the material occurs and thus obtaining the breakdown strength of the materials at which it has been withstand. Thus from the test we can obtain various parameters through which we can study the material and their accordingly strength of sustaining the voltages prescribed to it under observed and controlled condition with provision of protection to the test.

The project promises the scope to study of sustain rated withstand voltage capacity, assured disruptive voltage and pollution insulation deterioration.

6. ACKNOWLEDGMENTS

Our sincere thanks to Prof. Bhushan Save, H.O.D. of Electrical department, VIVA Institute of Technology and our project coordinator Prof. Pratik Mahale for their immense help and support during our course.

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BALANCED AND UNBALANCED VOLTAGE SAG AND SWELL MITIGATION USING DYNAMIC VOLTAGE RESTORER

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ABSTRACT

This paper examined the performance of a Dynamic Voltage Restorer (DVR) in mitigating voltage sags/swells in distribution system. A forced commutated three phase voltage sources converter is considered in the topology of DVR along with energy storage to maintain the capacitor voltage. The DVR handles both balanced as well as unbalanced situations and injects the appropriate voltage component to correct any variation in the supply voltage to keep the load voltage balanced and constant at the nominal value. In this paper sag mitigation aspect of DVR in distribution system has been taken into consideration. First, the basic DVR topology has been discussed. Different voltage injection methods have been presented. Detailed modeling of DVR is then derived and control strategy for the DVR is discussed in detail. Control strategy with DVR model has been simulated in MATLAB Simulink.

Keywords

Voltage sag, Voltage swell, Dynamic Voltage Restorer (DVR), Phase lock loop (PLL).

1. INTRODUCTION

The dynamic voltage restorer (DVR) is a series voltage controller which is connected in series with the protected load as shown in Figure 1. Usually the connection is made via a transformer, but configurations with direct connection via power electronics also exist. The resulting voltage at the load bus bar equals the sum of the grid voltage and the injected voltage from the DVR.

The converter generates the reactive power needed while the active power is taken from the energy storage. The energy storage can be different depending on the needs of compensating. The DVR often has limitations on the depth and duration of the voltage dip that it can compensate. Therefore right sized has to be used in order to achieve the desired protection. Options available for energy storage during voltage dips are conventional capacitors for very short durations but deep, batteries for longer but less severe magnitude drops and super capacitors in between. There are also other combinations and configurations used in practice. There are configurations, which can work without any energy storage, and they inject a lagging voltage with the load

current. There are also different approaches on what to inject to obtain the most powerful

solution. The main advantage with this method is that a single DVR can be installed to protect a whole plant (a few MVA) as well as

single loads. Because of the fast switches, usually IGBT's, voltage compensation can be achieved in less than half a cycle. Disadvantages are that it is relatively expensive and it only mitigates

voltage dips from outside the site. The cost of a DVR mainly depends on the power rating and the energy storage capacity.

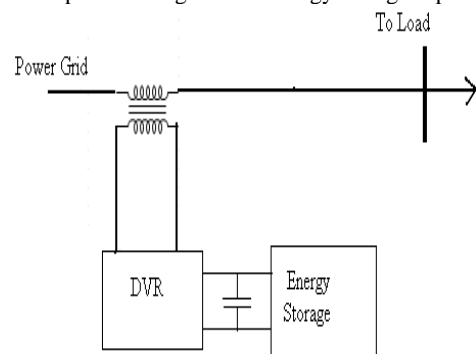


Figure 1: Standard Configuration for DVR

It is used to improve the power quality condition in the transmission as well as in distribution line. DVR is basically a power electronic device comprising of an inverter, energy storage device and a LC filter at the output of inverter [1]. This basic structure may have coupling transformer to couple it with transmission or distribution line. In a transmission line, it is used to improve maximum transmissible power, voltage stability, and transient stability and damp the power oscillations. In distribution system it is used to mitigate sag and also used as an active filter for harmonic compensation.

1.1 Series Voltage Injection

AC power transmission over long line was primarily limited by the series reactive impedance of the line as per the following equation.

$$P = \left(\frac{V_s V_r}{X_l} \right) \sin \delta$$

Where, V_s = sending end voltage
 V_r = receiving end voltage
 X_l = Line inductance
 δ = Power angle

To increase the power transmission earlier series capacitive compensation was introduced. These basically cancel a portion of reactive line impedance and thereby increase the maximum transmissible power. If we take the compensation factor k as

$$k = X_c / X_l \quad 0 \leq k < 1,$$

Power flow in the line can be written as

$$P = \left(\frac{V_s V_r}{(1-k)X_l} \right) \sin \delta$$

Series capacitive compensation reduces the line inductance and thereby increases the line current. This can be seen by in another way. To increase the line current, voltage across the line impedance must be increased. Capacitor also does the same thing as voltage across the capacitor is in opposition to the voltage drop in the line impedance. So the physical nature of series circuit element is irrelevant as long as it produces the desired compensating voltage. Thus an alternate compensating circuit may be envisioned as an ac voltage source which directly injects the desired compensating voltage in series with the line. This injected ac voltage can be controlled as per the required compensation level. Basic diagram of a variable series voltage compensated line is shown in Fig.1.1.

Voltage source inverter (VSI) can be used to generate the ac voltage at desired frequency with controllable amplitude and phase angle. This generated voltage can't be directly fed into the line as inverter output voltage has switching harmonics. DVR is the combination of VSI and filter. DVR is primarily used to mitigate the sag swell problems in receiving end voltage. In a transmission system, it can be used to improve the voltage stability, transient stability and to damp the power oscillations.

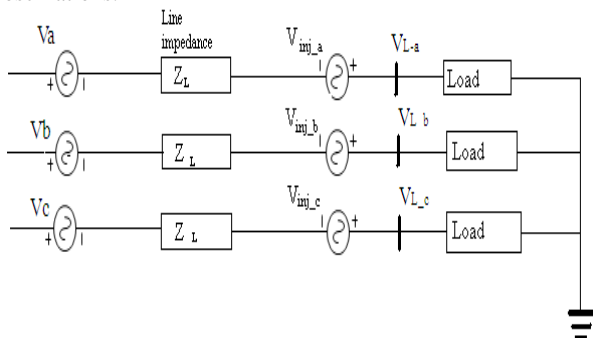


Figure 1.1: Basic Series Voltage Compensated Line

A typical DVR connection is shown in Fig.1.2. It is connected in series with the distribution feeder-2 that supplies a sensitive load. For a fault clearing or switching at point A of the incoming feeder or fault in the distribution feeder-1, the voltage at feeder-2 will sag. Without the presence of the DVR, this will trip the sensitive load causing a loss of production. The DVR can protect the sensitive load by inserting voltages of controllable amplitude, phase angle and frequency (fundamental and harmonic) into the distribution feeder via a

series insertion transformer shown in Fig.1.2. It is however to be mentioned that the rating of a DVR is not unlimited.

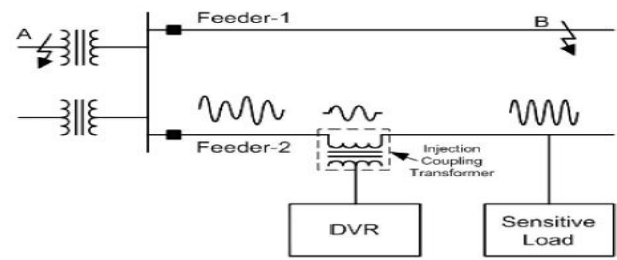


Figure 1.2: DVR in Line to Protect Sensitive Load

1.2 DVR Structure

The DVR is made of solid-state dc to ac switching power converter (inverter), usually a voltage source inverter (VSI) that injects a set of 3-phase ac output voltages in series and synchronism with the distribution feeder voltages. The dc input terminal of the DVR is connected to energy source or an energy storage device of appropriate capacity. The reactive power exchanged between the DVR and the distribution system is internally generated by the DVR without ac passive reactive components. The real power exchanged at the DVR output ac terminals is provided by the DVR input dc terminal by an external energy source or energy storage system. DVR is shown in Fig.1.3.

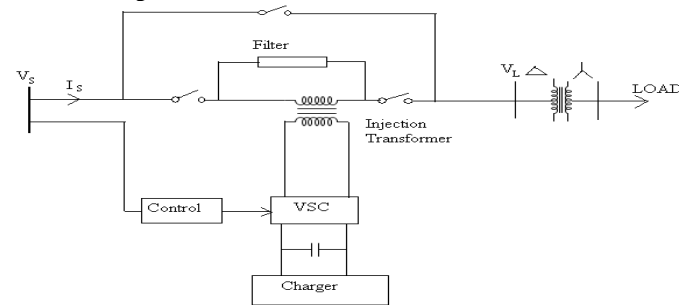


Figure 1.3: Dynamic Voltage Restorer

2. VOLTAGE INJECTION TECHNIQUES

Fig.2.1 shows the general topology of DVR connected in series with the line. V_s denote the source voltage, V_L denotes the load voltage and V_{inj} denotes the series voltage injected by the DVR. Depending on the reactive amplitude and phase of the injected, injection techniques are classified in three broad categories [7]. Aim of all these techniques is to maintain the load voltage magnitude at a nominal value of V_{nom} .

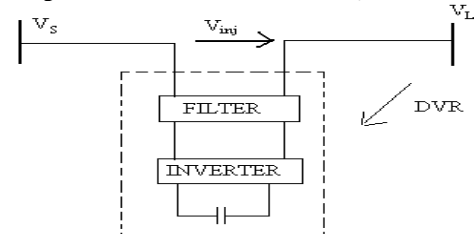


Fig.2.1 Block Diagram of Series Compensation

These techniques possess various degrees of accuracy in terms of voltage magnitude and phase shift correction. Selection of the appropriate technique in a given situation is primarily

decided by the load. In this paper Pre-sag Compensation Technique is used.

2.1 Pre-sag Compensation Technique

Some voltages are sensitive not only to rms value of the load but also to the phase of load voltage. In this case, illustrated in the Fig.2.2, DVR injects voltage such that the compensated load voltage is in the phase with pre-sag voltage.

The minimum source voltage that can be boosted to V_{nom} is

$$|V_s^{\min}| = |V_{nom}| \cdot \cos \Psi - \sqrt{|V_{inj}|^2 - |V_{nom}|^2 \sin^2 \Psi} \quad (2.8)$$

Where, V_{inj} is the maximum injection capability of the DVR. This technique also requires active power from the DVR, so load power factor affects the duration that the DVR can maintain the load bus voltage at V_{nom} .

$$T_{dur2} = \frac{E_{DC}}{|I_L| \cdot (|V_{nom}| \cdot \cos \phi - |V_s| \cdot \cos(\phi \pm \Psi))} \quad (2.9)$$

Where, E_{DC} is disposable energy of the storage device.

Ψ is the angle between load voltage and source voltage

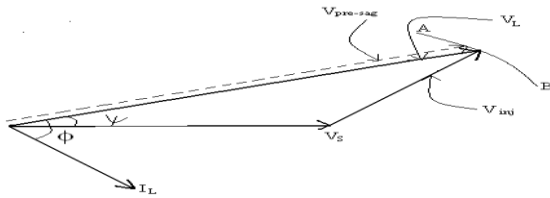


Figure 2.2: Phasor Diagram of Pre-sag Compensation Technique

3. MODELING OF DVR

The compensation of voltage sag/swell can be limited by a number of factors, including finite DVR power rating, loading conditions, power quality problems and types of sag/swell. If a DVR is a successful device, the control is able to handle most sags/swells and the performance must be maximized according to the equipment inserted. Otherwise, the DVR may not be able to avoid tripping and even cause additional disturbances to the loads.

3.1 Mathematical Modeling for Voltage Injection by DVR System

Consider the schematic diagram shown in Figure 3.1

$$Z_{th} = R_{th} + jX_{th} \quad (3.1)$$

$$V_{DVR} + V_{th} = V_L + Z_{th}I_L \quad (3.2)$$

When dropped voltage happened at V_L , DVR will inject a series voltage V_{DVR} through the injection transformer so that the desired load voltage magnitude V_L can be maintained [8].

Hence

$$V_{DVR} = V_L + Z_{th}I_L - V_{th} \quad (3.3)$$

$$I_L = \left(\frac{P_L + jQ_L}{V_L} \right)^* \quad (3.4)$$

When V_L is considered as a reference, therefore;

$$V_{DVR} \angle \alpha = V_L \angle 0^\circ + Z_{th}I_L \angle (\beta - \theta) - V_{th} \angle \delta \quad (3.5)$$

Here α , β and δ are the angle of V_{DVR} , Z_{th} and V_{th} , respectively and θ is the load power factor angle with

$$\theta = \tan^{-1} \left(\frac{Q_L}{P_L} \right)$$

The power injection of the DVR can be written as

$$S_{DVR} = V_{DVR}I_L^* \quad (3.6)$$

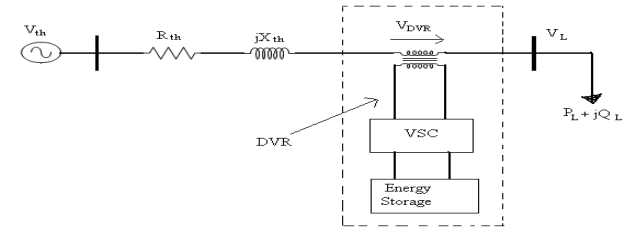


Fig 3.1: Calculation for DVR Voltage Injection

3.2 Modeling of DVR in MATLAB

The control strategy should be able to compensate for any of voltage sag/swell and consider the limitation the DVR. Figure 3.5 shows the supply voltage vector during the pre-sag stage which is represented as $V_{S,pre-sag}(t)$ on the $d_{pre-sag}$ axis, in the rotating phase angle θ is derived from Phase Lock Loop (PLL) [9]. Initially, the load voltage vector $V_L(t)$ is the same as $V_{S,pre-sag}(t)$ and is assumed to be 1.0 p.u. if the voltage drops across the series transformer are neglected. When the voltage sags occur, the actual source voltage vector $V_S(t)$ is moved to be $V_{S,sag}(t)$. To restore the load vector $V_L(t)$, an injected voltage vector $V_{inj}(t)$ is provided by the DVR.

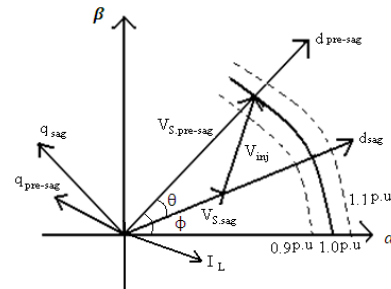


Fig 3.5: Compensation Strategy of DVR for Voltage Sags

Figure 3.6 shows the basic control scheme and parameters that are measured for control purposes. When the grid voltage is at its normal level the DVR is controlled to reduce the losses in the DVR to a minimum. When voltage sags/swells are detected, the DVR should react as fast as possible and inject an ac voltage to the grid. It can be implemented using a feedback control technique based on the voltage reference and instantaneous values of supply and load voltage. The control algorithm produces a three phase reference voltage to the series converter that tries to maintain the load voltage at its reference value [9], [11]. The voltage sag is detected by measuring the error between the dq voltage of the supply and the reference values. The d-reference component is set to a rated voltage and the q-reference component is set to zero.

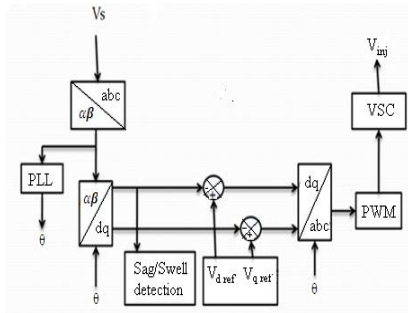


Figure 3.6: Control Structure of DVR

In Figure 3.6, the supply voltage is connected to a transformation block that converts stationary frame to $\alpha\beta$ -frame. Output of this block is connected to a phase lock loop and another transformation block that converts $\alpha\beta$ -frame to rotating frame (dq), which detects the phase and changes the axis of the supply voltage. The detection block detects the voltagesag/swell [10]. If voltage sag/swell occurs, this block generates the reference load voltage. The injection voltage is also generated by difference between the reference load voltage and supply voltage and is applied to the VSC to produce the preferred voltage, with the help of pulse width modulation (PWM).

4. SIMULATION RESULTS

Simulation of the SSSC is performed in MATLAB SIMULINK using the above control technique. MATLAB SIMULINK is a very popular tool for mathematical computation and model based design and SIMULINK Model is in generally pictorial representation of an application created using blocks provided by MATLAB as well as third parties. The parameters of the test system for simulation are given below.

Controllable Power rating (P) = 10 KW
Utility line to line Voltage = 400V
Line inductance (L) = 1.0 mH
Line resistance (R) = 0.04 ohm
Frequency = 50 Hz
Rms voltage of VC = 12V

A. Symmetrical sag

Symmetrical sag is simulated by connecting a three-phase reactance (inductance in series with resistance) to the bus bar. The three-phase reactance is a balanced one. The results are shown in Figure 4.3 (a), (b), (c) are the each phase voltages at point of common connection (PCC). In this the 40 % sag is initiated at 200ms and it is kept until 400ms, with total voltage sag duration 200ms.

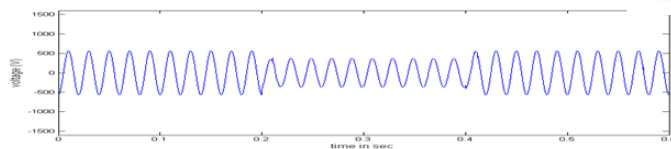


Fig (a) Phase 'A' Voltage at PCC

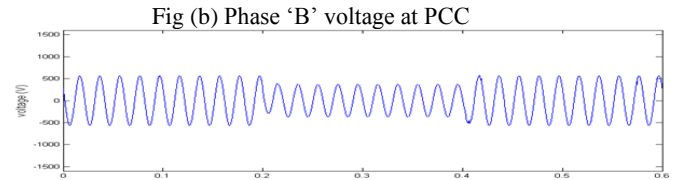
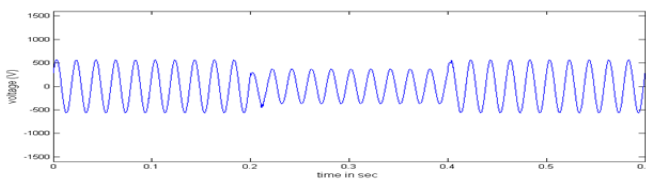


Fig (c) Phase 'C' Voltage at PCC

Figure 4.3: Phase voltages at PCC

In this simulation the sag is almost corrected. Here, 95% sag is corrected in each phase. Figure 4.4 (a), (b), (c) are the each phase voltages at load point. When sag is occurred the DVR automatically comes into the action. Here, the circuit breaker (C.B) is closed at 200ms and opened at 400ms.

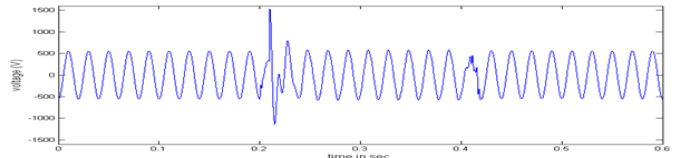


Fig (a) Phase 'A' load Voltage

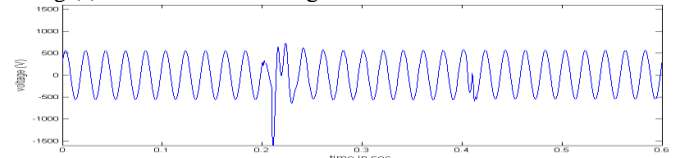


Fig (b) Phase 'B' load Voltage

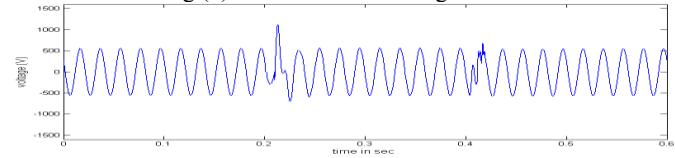


Fig (c) Phase 'C' load Voltage

Figure 4.4: Phase voltages at load point

As a result of DVR, the load voltage is kept at nominal value throughout the simulation, including the voltage sag period. Observe that during normal operation, the DVR is doing nothing. Fig 4.5 (a), (b), (c) show the 3-phase series injected voltage by DVR, load voltage and source voltage at PCC.

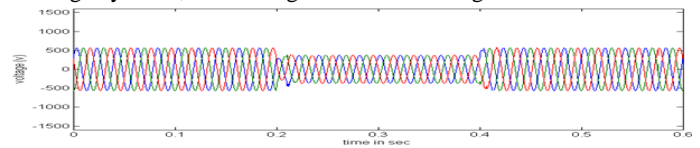


Fig (a) 3-Phase voltage at PCC

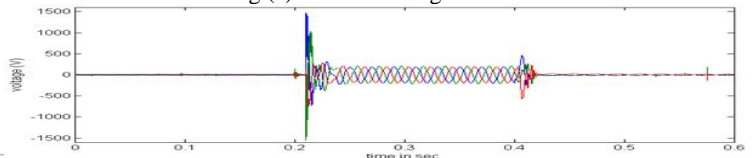


Fig (b) 3-Phase injected voltage

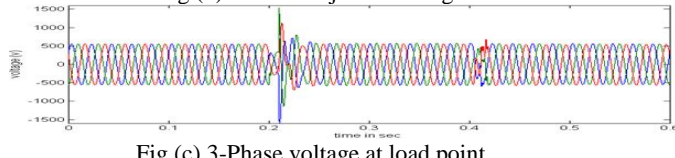


Fig (c) 3-Phase voltage at load point

Figure 4.5: Simulation result of DVR

B. Unbalanced Voltage Sag

In order to understand the performance of the DVR under unbalanced conditions, a single line-to-ground (SLG) fault at supply bus bar at 200ms is simulated. As a result of SLG fault, an unbalanced voltage sag is created immediately after the fault as shown in Figure 4.11 (a), (b) are the supply

voltage with two of the phase voltages dropped down to 60%.
Fig 4.11 (a), (b), (c) shows the single phase voltages at PCC.

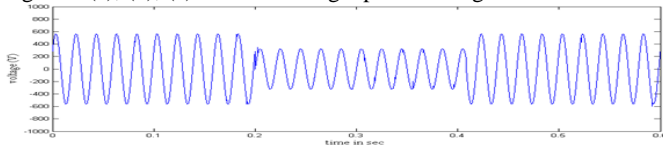


Fig (a) Phase 'A' voltage at PCC

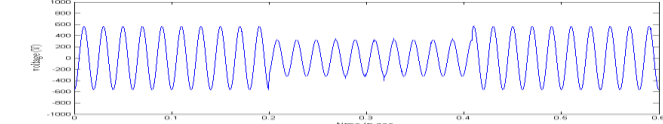


Fig (b) Phase 'B' voltage at PCC

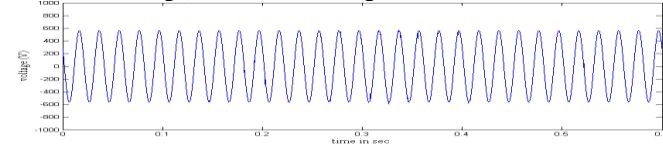


Fig (c) Phase 'C' voltage at PCC

Figure 4.11 single phase voltages at PCC

After applying fault on source side the DVR is automatically connected to system through the breaker. Here, the fault is applied at 200 ms and it is cleared at 400 ms. So, the DVR is inject the voltage in series with the system. Fig 4.12 (a), (b), (c) are the a, b, c phase voltages with sag compensation.

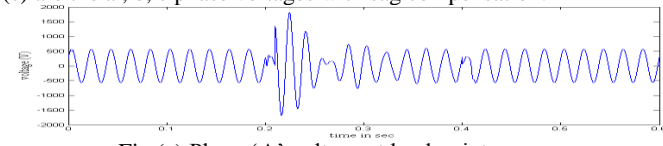


Fig (a) Phase 'A' voltage at load point

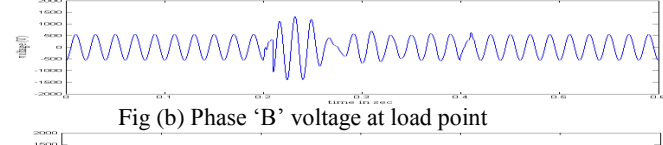


Fig (b) Phase 'B' voltage at load point

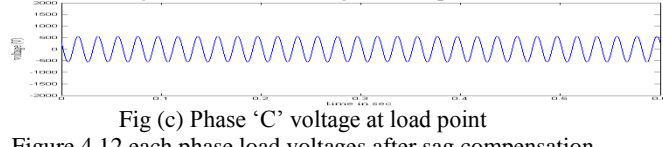


Fig (c) Phase 'C' voltage at load point

Figure 4.12 each phase load voltages after sag compensation

Fig 4.13 shows simulation result of DVR response to unbalanced voltage sag. Here, the breaker is connected at 200ms and opened at 400ms. In this almost the unbalanced voltage sag is corrected to the supply voltage.

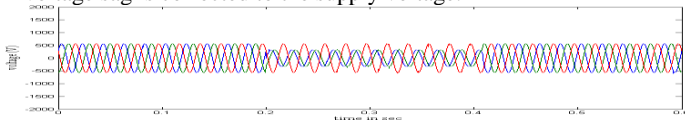


Fig (a) 3-phase voltage at PCC

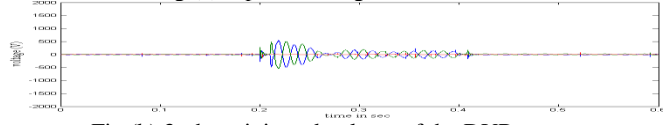
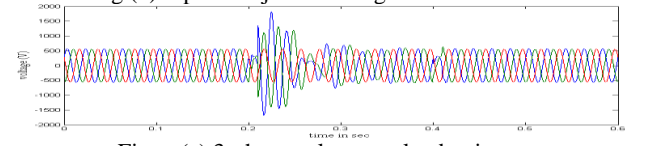


Fig (b) 3-phase injected voltage of the DVR



Figure(c) 3-phase voltages at load point

Fig 4.13 Simulation result of DVR response to unbalanced voltage sag

C. Balanced Voltage swell

The performance of DVR for a voltage swell condition is investigated. Here, voltage swell is generated by energizing of a large capacitor bank and the corresponding supply voltage is shown in Figure 4.14 (a). Voltage swells are simulated by temporary connection of balanced impedances at the supply side bus. Symmetrical swell is simulated by connecting a three-phase capacitive reactance to the bus bar..

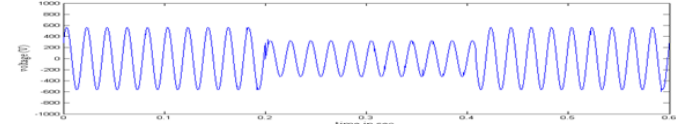


Fig (a)Phase 'A' voltage at PCC

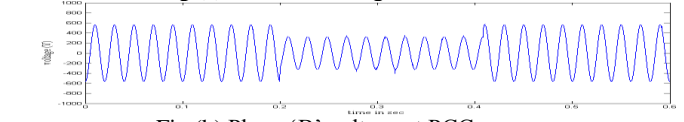


Fig (b) Phase 'B' voltage at PCC

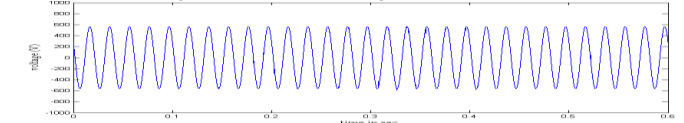


Fig (c) Phase 'C' voltage at PCC

Figure 4.14 single phase voltages at PCC

After applying fault on source side the DVR is automatically connected to system through the breaker. Here, the fault is applied at 200 ms and it is cleared at 400 ms. So, the DVR is inject the voltage in series with the system. Fig 4.15 (a), (b), (c) are the a, b, c phase voltages with sag compensation.

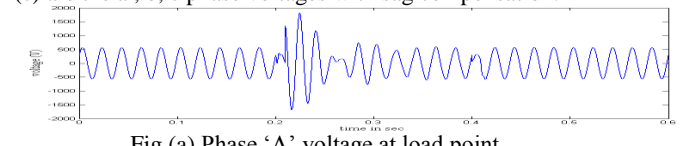


Fig (a) Phase 'A' voltage at load point

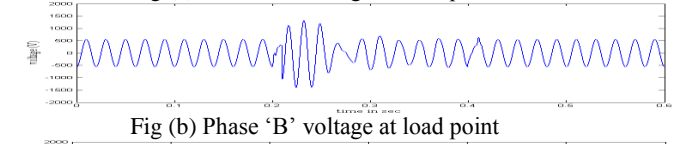


Fig (b) Phase 'B' voltage at load point

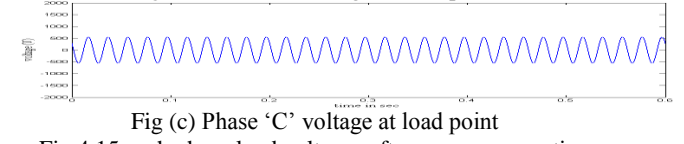


Fig (c) Phase 'C' voltage at load point

Fig 4.15 each phase load voltages after sag compensation

Fig 4.16 shows simulation result of DVR response to unbalanced voltage sag. Here, the breaker is connected at 200ms and opened at 400ms. In this almost the unbalanced voltage sag is corrected to the supply voltage.

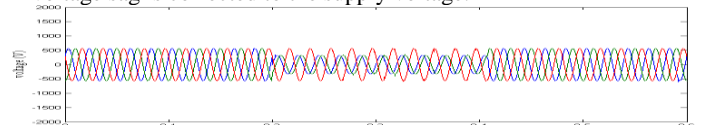


Fig (a) 3-phase voltage at PCC

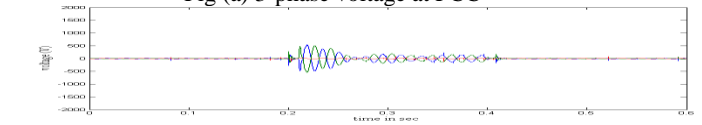
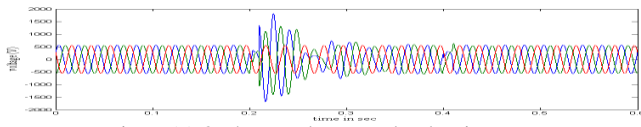


Fig (b) 3-phase injected voltage of the DVR



Figure(c) 3-phase voltages at load point

Fig 4.16 Simulation result of DVR response to unbalanced voltage sag

D. Balanced Voltage swell

The performance of DVR for a voltage swell condition is investigated. Here, voltage swell is generated by energizing of a large capacitor bank and the corresponding supply voltage is shown in Figure 4.17 (a). Voltage swells are simulated by temporary connection of balanced impedances at the supply side bus. Symmetrical swell is simulated by connecting a three-phase capacitive reactance to the bus bar. Here the voltage is increased to 130% of nominal voltage during swell period. DVR injected voltage in order to correct the load voltage. The single phase voltage at PCC and voltage at load is shown in Fig 4.18 and 4.19.

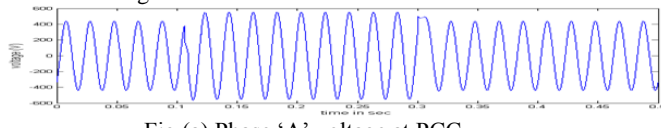


Fig (a) Phase 'A' voltage at PCC

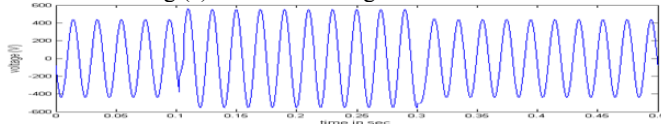


Fig (b) Phase 'B' voltage at PCC

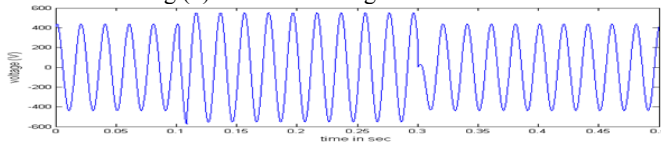


Fig (c) Phase 'C' voltage at PCC

Fig 4.18 single phase source voltage at PCC

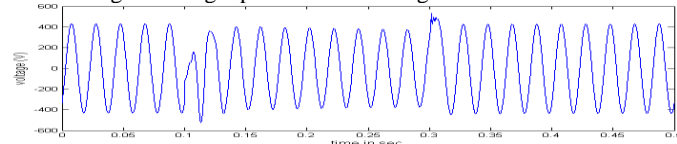


Fig (a) Phase 'A' voltage at load point

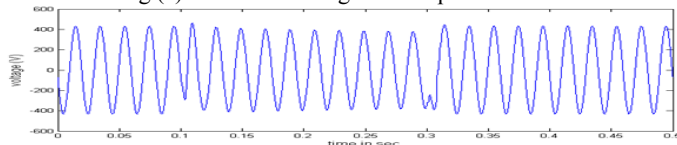


Fig (b) Phase 'B' voltage at load point

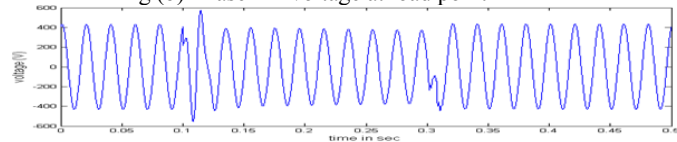


Fig (c) Phase 'C' voltage at load point

Figure 4.19 single phase voltages at load point

The load voltage is kept at the nominal value with the help of the DVR. Similar to the case of voltage sag, the DVR reacts quickly to inject the appropriate voltage component (anti phase with the supply voltage or negative voltage magnitude) to correct the supply voltage. The three phase source voltage at PCC, injected voltage and load voltage is shown in fig 4.20 (a), (b), (c) are respectively.

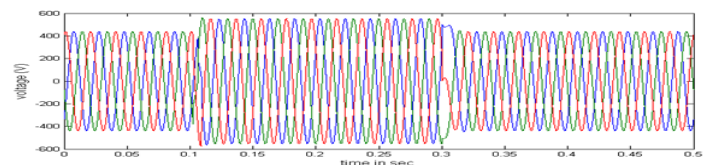


Fig (a) Three phase voltage at PCC

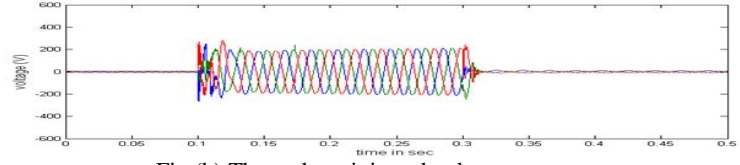


Fig (b) Three phase injected voltage

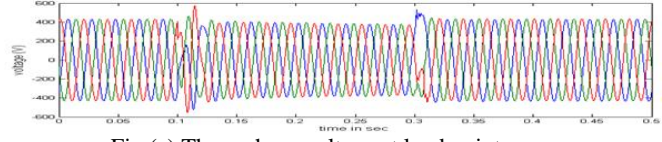


Fig (c) Three phase voltage at load point

Figure 4.20 Simulation results of DVR response to a balanced voltage swell

5. CONCLUSION

In this paper, performance of a DVR in mitigating voltage sags/swells in distribution system is examined using MATLAB platform. A forced commutated three phase voltage sources converter is considered in the topology of DVR along with energy storage to maintain the capacitor voltage. The DVR handles both balanced and unbalanced situations and injects the appropriate voltage component to correct any variation in the supply voltage to keep the load voltage balanced and constant at the nominal value. In the case of voltage sag, which is a condition of a temporary reduction in supply voltage, the DVR injects an equal positive voltage component in all three phases, which are in phase with the supply voltage to correct it. On the other hand, for a voltage swell case, which is a condition of a temporary increase in supply voltage, the DVR injects an equal negative voltage in all three phases, which are anti-phase with the supply voltage. For unbalanced conditions, the DVR injects appropriate unbalanced three-phase voltage components positive or negative depending on whether the condition is unbalanced voltage sag or unbalanced voltages well.

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SUPERCAPACITOR

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ABSTRACT

A new technology, the supercapacitors, has emerged with the potential to enable major advances in energy storage. Supercapacitors are governed by the same fundamental equations as conventional capacitors, but utilize higher surface area electrodes and thinner dielectrics to achieve greater capacitances. This allows for energy densities greater than those of conventional capacitors and power densities greater than those of batteries. As a result, supercapacitors may become an attractive power solution for an increasing number of applications. This brief overview focuses on the different types of supercapacitors, the relevant quantitative modeling areas, and the future of supercapacitor research and development.

1. INTRODUCTION

supercapacitors, also known as Electric double-layer capacitors, electrochemical double layer capacitors (EDLCs), or ultracapacitors, are electrochemical capacitors that have an unusually high energy density when compared to common capacitors, typically in the order of thousands of times greater than a high capacity electrolytic capacitor. For instance, a typical D-cell sized electrolytic capacitor will have a capacitance in the range of tens of millifarads. The same size electric double-layer capacitor would have a capacitance of several farads, an improvement of about two or three orders of magnitude in capacitance, but usually at a lower working voltage. Larger, commercial electric double layer capacitors have capacities as high as 5,000 farads.

The highest energy density in production is 30 Wh/kg. In response to the changing global landscape, energy has become a primary focus of the major world powers and scientific community. There has been great interest in developing and refining more efficient energy storage devices. One such device, the supercapacitor, has matured significantly over the last decade and emerged with the potential to facilitate major advances in energy storage.

Supercapacitors is to achieve capacitances several orders of magnitude larger than conventional capacitors. In doing so, supercapacitors are able to attain greater energy densities while still maintaining the characteristic high power density of conventional capacitors. This paper presents a brief overview of supercapacitors based on a broad survey of supercapacitor research and development (R&D).

2. BACKGROUND

Conventional capacitors consist of two conducting electrodes separated by an insulating dielectric material. When a voltage is applied to a capacitor, opposite charges accumulate on the surfaces of each electrode. The charges are kept separate by the dielectric, thus producing an electric field that allows the capacitor to store energy. This is illustrated in Figure 1. Capacitance C is defined as the ratio of stored (positive) charge Q to the applied voltage V :

$$C = \frac{Q}{V}$$

For a conventional capacitor, C is directly proportional to the surface area A of each electrode and inversely proportional to the distance D between the electrodes:

$$C = \epsilon_0 \epsilon_r \frac{A}{D}$$

The product of the first two factors on the right hand side of the last equation is a constant of proportionality wherein ϵ_0 is the dielectric constant (or “permittivity”) of free space and ϵ_r is the dielectric constant of the insulating material between the electrodes.

The two primary attributes of a capacitor are its energy density and power density. For either measure, the density can be calculated as a quantity per unit mass or per unit volume. The energy E stored in a capacitor is directly proportional to its capacitance:

$$E = \frac{1}{2} CV^2$$

In general, the power P is the energy expended per unit time. To determine P for a capacitor, though, one must consider that capacitors are generally represented as a circuit in series with an external “load” resistance R , as is shown in Figure 1.

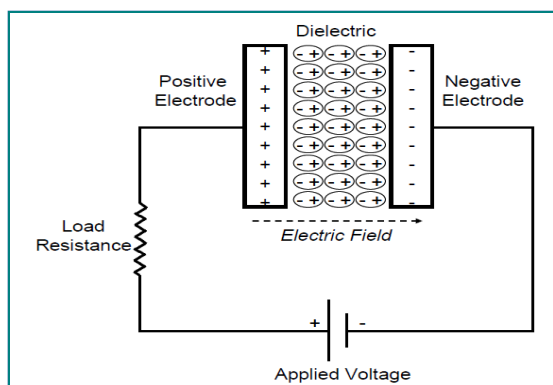


Figure .1 (Schematic of a conventional capacitor)

The internal components of the capacitor (e.g., current collectors, electrodes, and dielectric material) also contribute to the resistance, which is measured in aggregate by a quantity known as the equivalent series resistance (ESR). The voltage during discharge is determined by these resistances. When measured at matched impedance ($R = \text{ESR}$), the maximum power P_{max} for a capacitor is given by

$$P_{\text{max}} = \frac{V^2}{4 \times \text{ESR}}$$

This relationship shows how the ESR can limit the maximum power of a capacitor.

Conventional capacitors have relatively high power densities, but relatively low energy densities when compared to electrochemical batteries and to fuel cells. That is, a battery can store more total energy than a capacitor, but it cannot deliver it very quickly, which means its power density is low. Capacitors, on the other hand, store relatively less energy per unit mass or volume, but what electrical energy they do store can be discharged rapidly to produce a lot of power, so their power density is usually high.

Supercapacitors are governed by the same basic principles as conventional capacitors. However, they incorporate electrodes with much higher surface areas A and much thinner dielectrics that decrease the distance D between the electrodes.

Furthermore, by maintaining the low ESR characteristic of conventional capacitors, supercapacitors also are able to achieve comparable power densities. Additionally, supercapacitors have several advantages over electrochemical batteries and fuel cells, including higher power density, shorter charging times, and longer cycle life and shelf life. Figure 2 provides a schematic diagram of a supercapacitor, illustrating some of the physical features described above.

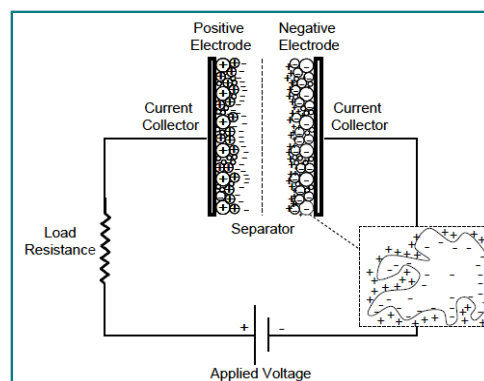


Figure.2 (Schematic of an electrochemical double-layer capacitor.)

3. TAXONOMY OF SUPER CAPACITORS

Based upon current R&D trends, supercapacitors can be divided into three general classes: electrochemical double-layer capacitors, pseudocapacitors, and hybrid capacitors. (Figure.3) Each class is characterized by its unique mechanism for storing charge. These are, respectively, non-Faradaic, Faradaic, and a combination of the two. Faradaic processes, such as oxidation-reduction reactions, involve the transfer of charge between electrode and electrolyte. A non-Faradaic mechanism, by contrast, does not use a chemical mechanism. Rather, charges are distributed on surfaces by physical processes that do not involve the making or breaking of chemical bonds.

This section will present an overview of each one of these three classes of supercapacitors and their subclasses, distinguished by electrode material. A graphical taxonomy of the different classes and subclasses of supercapacitors is presented in Figure 3.

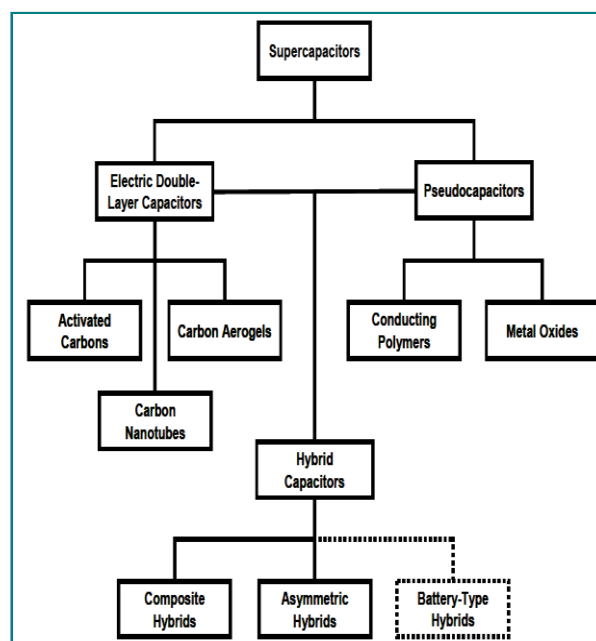


Figure.3(Taxonomy of supercapacitors)

3.1 Electrochemical Double-Layer Capacitors

Electrochemical double-layer capacitors (EDLCs) are constructed from two carbon-based electrodes, an electrolyte, and a separator. Figure 2 provides a schematic of a typical EDLC. Like conventional capacitors, EDLCs store charge electrostatically, or non-Faradaically, and there is no transfer of charge between electrode and electrolyte.

EDLCs utilize an electrochemical double-layer of charge to store energy. As voltage is applied, charge accumulates on the electrode surfaces. Following the natural attraction of unlike charges, ions in the electrolyte solution diffuse across the separator into the pores of the electrode of opposite charge. However, the electrodes are engineered to prevent the recombination of the ions. Thus, a double-layer of charge is produced at each electrode. These double-layers, coupled with an increase in surface area and a decrease in the distance between electrodes, allow EDLCs to achieve higher energy densities than conventional capacitors.

Because there is no transfer of charge between electrolyte and electrode, there are no chemical or composition changes associated with non-Faradaic processes. For this reason, charge storage in EDLCs is highly reversible, which allows them to achieve very high cycling stabilities. EDLCs generally operate with stable performance characteristics for a great many charge-discharge cycles, sometimes as many as 106 cycles. On the other hand, electrochemical batteries are generally limited to only about 103 cycles. Because of their cycling stability, EDLCs are well suited for applications that involve non-user serviceable locations, such as deep sea or mountain environments.

The performance characteristics of an EDLC can be adjusted by changing the nature of its electrolyte. An EDLC can utilize either an aqueous or organic electrolyte. Aqueous electrolytes, such as H₂SO₄ and KOH, generally have lower ESR and lower minimum pore size requirements compared to organic electrolytes, such as acetonitrile. However, aqueous electrolytes also have lower breakdown voltages. Therefore, in choosing between an aqueous or organic electrolyte, one must consider the tradeoffs between capacitance, ESR, and voltage. Because of these tradeoffs, the choice of electrolyte often depends on the intended application of the supercapacitor.

While the nature of the electrolyte is of great importance in supercapacitor design, the subclasses of EDLCs are distinguished primarily by the form of carbon they use as an electrode material. Carbon electrode materials generally have higher surface area, lower cost, and more established fabrication techniques than other materials, such as conducting polymers and metal oxides. Different forms of carbon materials that can be used to store charge in EDLC electrodes are activated carbons, carbon aerogels, and carbon nanotubes.

4. CONCEPT

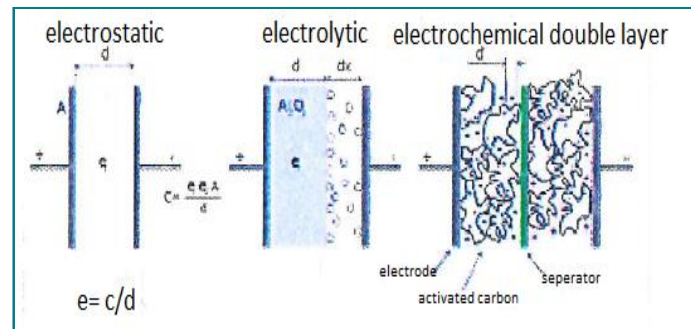


Figure.5 (Comparison of construction diagrams of three capacitors.)

In a conventional capacitor, energy is stored by the removal of charge carriers, typically electrons, from one metal plate and depositing them on another. This charge separation creates a potential between the two plates, which can be harnessed in an external circuit (Figure 5). The total energy stored in this fashion is proportional to both the number of charges stored and the potential between the plates. The number of charges stored is essentially a function of size and the material properties of the plates, while the potential between the plates is limited by the dielectric breakdown. Different materials sandwiched between the plates to separate them result in different voltages to be stored. Optimizing the material leads to higher energy densities for any given size of capacitor.

In contrast with traditional capacitors, electric double layer capacitors do not have a conventional dielectric. Rather than two separate plates separated by an intervening substance, these capacitors use "plates" that are in fact two layers of the same substrate, and their electrical properties, the so-called "electrical double layer", result in the effective separation of charge despite the vanishingly thin (on the order of nanometers) physical separation of the layers. The lack of need for a bulky layer of dielectric permits the packing of "plates" with much larger surface area into a given size, resulting in their extraordinarily high capacitances in practical sized packages. In an electrical double layer, each layer by itself is quite conductive, but the physics at the interface where the layers are effectively in contact means that no significant current can flow between the layers. However, the double layer can withstand only a low voltage, which means that electric double-layer capacitors rated for higher voltages must be made of matched series-connected individual electric double-layer capacitors, much like series-connected cells in higher-voltage batteries. In general, electric double-layer capacitors improve storage density through the use of a nanoporous material, typically activated charcoal, in place of the conventional insulating barrier. Activated charcoal is a powder made up of extremely small and very "rough" particles, which in bulk form a low-density volume of particles with holes between them that resembles a sponge. The overall surface area of even a

thin layer of such a material is many times greater than a traditional material like aluminum, allowing many more charge carriers (ions or radicals from the electrolyte) to be stored in any given volume. The downside is that the charcoal is taking the place of the improved insulators used in conventional devices, so in general electric double-layer capacitors use low potentials in the order of 2 or 3 V.

Activated charcoal is not the "perfect" material for this application. The charge carriers are actually (in effect) quite large - especially when surrounded by solvent molecules - and are often larger than the holes left in the charcoal, which are too small to accept them, limiting the storage. Recent research in electric double-layer capacitors has generally focused on improved materials that offer even higher usable surface areas. Experimental devices developed at MIT replace the charcoal with carbon nanotubes, which have similar charge storage capability as charcoal (which is almost pure carbon) but are mechanically arranged in a much more regular pattern that exposes a much greater suitable surface. Other teams are experimenting with custom materials made of activated polypyrrole, and even nanotube-impregnated papers.

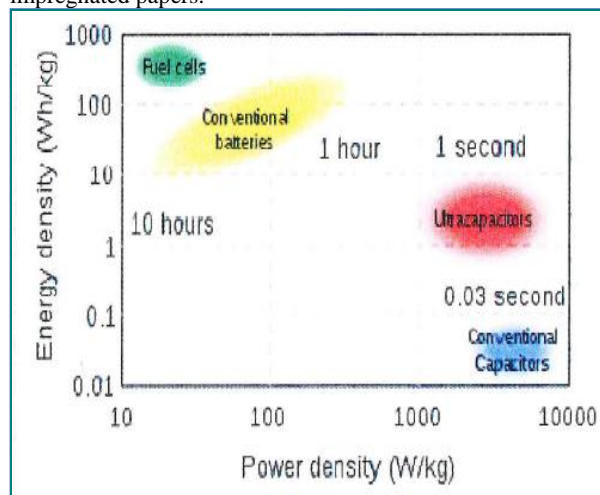


Figure 6. (Ragone chart showing energy density vs. power for various energy-stored device)

In terms of energy density, existing commercial electric double-layer capacitors range around 0.5 to 30 Wh/kg, with the standardized cells available from Maxwell Technologies rated at 6 Wh/kg and ACT in production of 30 Wh/kg. However capacitor is actually a Lithium ion capacitor, known also as a "hybrid capacitor". Experimental electric double-layer capacitors from the MIT LEES project have demonstrated densities of 30 Wh/kg and appear to be scalable to 60 Wh/kg in the soft term, while other claims their examples will offer capacities about 400 Wh/kg. For comparison, a conventional lead-acid battery is typically 30 to 40 Wh/kg and modern lithium-ion batteries are about 160 Wh/kg. Also gasoline has a net calorific value (NCV) of around 12,000 Wh/kg, which in automobile applications operates at 2070 tank-to-wheel efficiency giving an effective energy density of 2,400 Wh/kg.

Additionally, electric double-layer capacitors offer much higher power density than batteries. Power density combines the energy density with the speed that the energy can be drawn out of the device. Batteries, which

are based on the movement of charge carriers in a liquid electrolyte, have relatively slow charge and discharge times. Capacitors, on the other hand, can be charged or discharged at a rate that is typically limited by current heating of the electrodes. So while existing electric double-layer capacitors have energy densities that are perhaps 1 to 10 that of a conventional battery, their power density is generally ten to one-hundred times as great (see Figure 6).

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MULTIPLE PROPELLER WIND TURBINES

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ABSTRACT

A concept developed of rather than a single giant rotor with 50-foot-long blades, a new approach of capturing wind energy that is based on the principle of multiple propellers on a single shaft. A model built at two different altitude points with a dynamo attached at the lower side. One side of a highly flexible shaft is connected to the generator while the remaining shaft length is kept airborne by balloons or by poles. By placing the rotors in precise positions and angles, each rotor can harvest its own wind, and avoid stealing the wind from the adjacent rotor. The entire turbine is hooked up to a generator, which produces about the same amount of power as a turbine that uses 10 times as much blade material.

Keywords

Single giant rotor, multiple propellers, flexible shaft, airborne, precise positions and angles, generator

1. INTRODUCTION

1.1 Need of Wind Energy Source

Renewable Energy Sources are those energy sources which are not destroyed when their energy is harnessed. Human use of renewable energy requires technologies that harness natural phenomena, such as sunlight, wind, waves, water flow, and biological processes such as anaerobic digestion, biological hydrogen production and geothermal heat. Amongst the above mentioned sources of energy there has been a lot of development in the technology for harnessing energy from the wind.

Wind is the motion of air masses produced by the irregular heating of the earth's surface by sun. These differences consequently create forces that push air masses around for balancing the global temperature or, on a much smaller scale, the temperature between land and sea or between mountains.

Wind energy is not a constant source of energy. It varies continuously and gives energy in sudden bursts. About 50% of the entire energy is given out in just 15% of the operating time. Wind strengths vary and thus cannot guarantee continuous power. It is best used in the context of a system that has significant reserve capacity such as hydro, or reserve load, such as a desalination plant, to mitigate the economic effects of resource variability.

The origin of wind energy technology traces back to 7th century AD in Iran. Today, it is spread the world over. The technology has become increasingly affordable due to reductions in manufacturing and installation costs, and hence, is more prevalent. With the growing increase in the demand for alternate sources of sustainable energy worldwide, wind power is gaining importance across the globe.

1.2 Different Segments of Wind Turbine and Overall Capacity

Wind energy currently accounts for nearly half of the clean energy produced worldwide and is predicted to grow 25% each year. Below are the different segments of the wind turbine market:

- Horizontal Axis Wind Turbine (HAWT)
- Vertical Axis Wind Turbine (VAWT)
- Small Wind turbines
- Airborne wind turbines

According to data from the Global Wind Energy Council (GWEC) and Greenpeace International, by the year 2020, wind turbines will supply 12% of the global electricity and also will be a major contributor in reducing CO2 emissions (a reduction of 1.5 billion tons of CO2 per year). In addition to the environmental benefits, wind energy will be a sustainable solution to the mounting concerns over the security of energy supply and volatile fossil fuel prices.

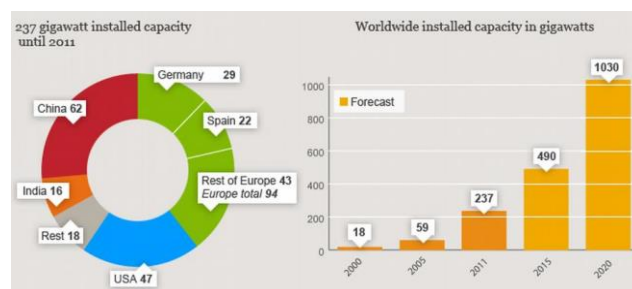


Fig 1: Graphical analysis of wind power generation [5]

Wind doesn't blow all the time in most places. To harness the available wind energy, scientists and engineers are now seeking a new wind resource at very high altitudes, i.e., Airborne Wind Energy Systems (AWE). When compared to the conventional wind turbines, the high altitude wind power (airborne wind turbines) extracts 100 times greater kinetic energy.

Wind at high altitudes is almost constant and hence, is a vast energy resource than surface winds. Since high altitudes have fast and more consistent wind blowing, airborne wind turbines (ATW) can generate more power compared to traditional wind turbines. Further, ATWs make energy harvesting possible even at inaccessible locations, such as offshore, but at lesser installation costs. Given these merits, the airborne wind energy industry is uniquely positioned to contribute to the growth of the overall wind industry. Airborne wind turbines are suspended in the air without a tower, thus saving any expenses on tower construction.

The airborne wind turbine technology can be categorized under four major types based on their design concept:

- Kite type
- Balloon type
- Kytoon type (Combined Kite & Balloon)

2. BLOCK DIAGRAM

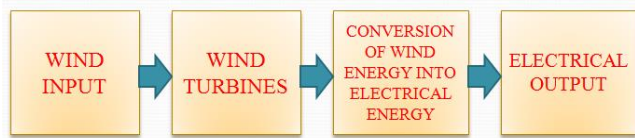


Fig 2: Typical block diagram of airborne wind turbine

Here the input is wind energy which is freely available in the air. This wind input is passes through the multiple turbine blades as we know this blades converts the kinetic energy of the wind into the mechanical output. This mechanical output is converts into electrical using dynamo. Hence at last we get the electrical output. This is the basic principle of the wind turbine. But here is one major different than the conventional wind turbine i.e. here we are using multiple rotor blades in small size and it has so many advantages.

3. WORKING

In the past few years, the renewable energy industry has seen various designs of wind turbines coming to the market. However, a few of them have significantly proved their worth through their performance. Hence this is one such type of project that uses the wind turbine concept but in a peculiar way.

Most of the electricity generated from wind energy comes from huge wind farms located miles away from the city that uses the power. Installation of such turbines requires a significant amount of investment, in money as well as human labor. This is one such project that can be fixed on a building or a nearby place and can still be used to supply a substantial amount of energy.

Here a long shaft suspended in the air, on which approximately 25 wind turbines revolve with the help of rotors. The multiple rotors are attached to a single generator, which generates the electricity. It has a capacity of generating power of up to 3 Kw. Moreover, as the construction of the system is simple with fewer materials, the maintenance required is low.

The shaft that holds the rotors can vary in length, and use any number and size of rotors, depending on its application. The rotors can even be mounted on poles that are light enough to be hand-held or attached to the roof of a house. Using ten 18-inch rotors, this model can generate between 100 and 400 watts, depending on wind speed.

Fig 3 shows the working of AWT. Here the as the all the turbine blades are rotated together so this is try to move the dynamo as the dynamo moves, we get the electrical output this output is stored in the battery.

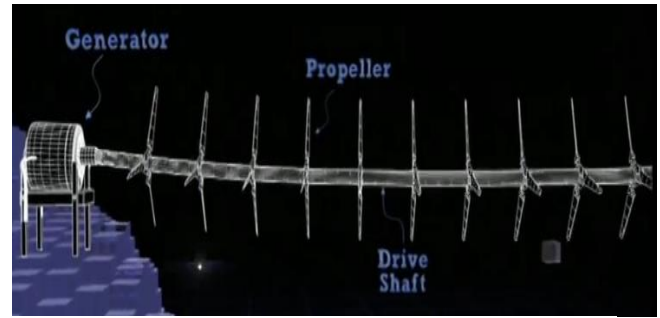


Fig 3: Working of airborne wind turbine

Each of the turbines is approximately 20 inch in diameter and produces about half a kilowatt of energy. Most often, the shaft is attached to a pole exactly at the center. The turbines are generally attached to both the sides of the pole at an angle from the horizontal, making a staircase. This arrangement is to avoid interference of one rotor's wind with the other. The greater the number of rotors attached to the shaft, the greater the amount of output power generated.

The turbine uses massive parallel wind processing to increase the wattage from all the turbines. The Serpent is capable of generating 200 watts easily in the wind speed of 20 miles per hour, which can easily light four 50 watts bulb.

4. ANALYSIS OF WIND SPEED AND POWER OUTPUT

The power available in the wind is proportional to the cube of its speed. This means that if wind speed doubles i.e. x , the power available to the wind generator increases by cube i.e. x^3

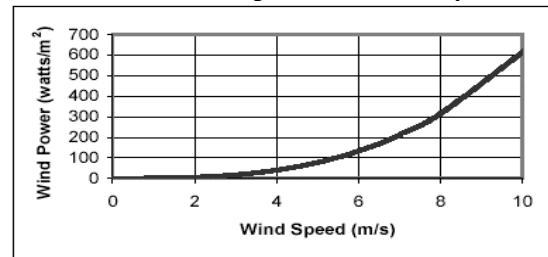


Fig 4: Relationship between wind speed and wind power

The power P available in the wind impinging on a wind driven generator is given by:

$$P = \frac{1}{2}CA\rho v^3$$

Where,

C is an efficiency factor known as the Power Coefficient which depends on the machine design,

A is the area of the wind front intercepted by the rotor blades (the swept area),

ρ is the density of the air (averaging 1.225 Kg/m^3 at sea level) and v is the wind velocity.

5. REQUIRED COMPONENT

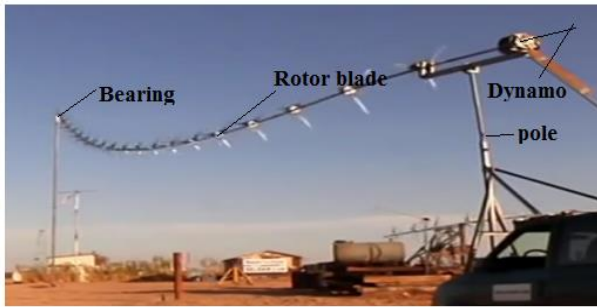


Fig 5: Typical arrangements for each component

5.1 Turbine Blades

When the wind blows over the blades, the rotor turns, causing the generator or alternator in the turbine to rotate and produce electricity. Wind turbine design is the process of defining the form and specifications of a wind turbine to extract energy from the wind. A wind turbine installation consists of the necessary systems needed to capture the wind's energy, point the turbine into the wind, convert mechanical rotation into electrical power, and other systems to start, stop, and control the turbine.

5.2 Dynamo

A dynamo is an electrical generator that produces direct current with the use of a commutator. Dynamos were the first electrical generators capable of delivering power for industry, and the foundation upon which many other later electric-power conversion devices were based, including the electric motor, the alternating-current alternator, and the rotary. Today, the simpler alternator dominates large scale power generation, for efficiency, reliability and cost reasons. A dynamo has the disadvantages of a mechanical commutator. Also, converting alternating to direct current using power rectification devices (vacuum tube or more recently solid state) is effective and usually economic.

5.3 Bearing

A bearing is a machine element that constrains relative motion and reduces friction between moving parts to only the desired motion. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts. Many bearings also facilitate the desired motion as much as possible, such as by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts.

5.4 Pole for Stand

The standing of wind turbine we are using pole at the both the end. So that it improve the mechanical strength of wind turbine and also gives the support.

5.5 Fiber Pipe

Multiple rotor blades are placed in a fiber pipe or flexible pipe. Here all the rotor blades are placed together at certain fixed distance.

5.6 Mechanical Shaft

A drive shaft, drive shaft, driving shaft, propeller shaft (prop shaft) is a mechanical component for transmitting torque and rotation, usually used to connect other components of a drive train that cannot be connected directly because of distance or the need to allow for relative movement between them. As torque carriers, drive shafts are subject to torsion and shear stress, equivalent to the difference between the input torque and the load. They must therefore be strong enough to bear the stress, whilst avoiding too much additional weight as that would in turn increase their inertia.

5.7 Battery for Storage

The output of dynamo is stored in a battery for the further use of this output or else we are direct use of this output also.

6. MERITS

- Airborne wind turbine light, easy to deploy and can be made in various sizes depending on the need. If we required more output the no. of the turbine blade mounted on the line can be increased by which we get the more output and if we required less output the no. of blade mounted on the line can be reduced so as per our required the output can be increased or decreased by which we get the desired output.
- It minimizes the harm of the wild life. As we know that the lift mode system required the large space or land should be clear because of which the natural habitation will occur. As well as the blade of airborne wind turbine is light so when the flying bird will come in contact with lift mode there may be no injuries to a flying bird.
- The operation is less noisy as compared to conventional wind turbine.
- This design can be feasible and very cheap to install. As a matter of fact, it only uses one-tenth of the traditionally used blade material, but delivers the same wattage of power.
- This design is such like as a portable device but the present or air at higher altitude is compulsory to generate the power.
- Wind at high altitudes is almost constant and hence, is a vast energy resource than surface winds. Since high altitudes have fast and more consistent wind blowing, airborne wind turbines (ATW) can generate more power compared to traditional wind turbines.
- The design relies upon economy of scale to maximize efficiency, employing multiple rotors along a lightweight, flexible shaft that allows it to shift and move with wind currents. Since the turbines rotate at higher rpm than traditional turbines, a small and light direct-drive generator can be used instead of a hulking gearbox.
- Air borne wind turbine would be easier to transport and set up at offshore locations than traditional wind generators.

- In addition to the environmental benefits, wind energy will be a sustainable solution to the mounting concerns over the security of energy supply and volatile fossil fuel prices

7. FUTURE SCOPE

- Global Wind Energy Council (GWEC) and Greenpeace International, by the year 2020, wind turbines will supply 12% of the global electricity and also will be a major contributor in reducing CO₂ emissions (a reduction of 1.5 billion tons of CO₂ per year).
- High-altitude wind is an enormous reservoir of energy, the second biggest energy flow after sun radiation. It also highly exploitable without causing environmental issues, as a recent study found 1800terrawatts can be generated without impacting the climate.
- Air borne wind turbine offer an innovative approach to the problem with a scaled-down system of multi-rotor stalks that are extremely versatile, more efficient, and cheaper and easier to produce than large lumbering windmills.
- This design wills conceptual ways to deploy on a larger scale like open sea water.

8. CONCLUSION

With the demand for energy requirements increasing tremendously, it can be met by alternative energy resources such as wind. Particularly, wind at high altitudes can generate more power compared to the conventional wind turbines. In addition, this alternative energy source offers benefits such as easy deploying, low installation cost and maintenance systems, and less wind fluctuations. In terms of operational lifetime, installation cost and reliability, airborne systems attract the interests of many.

While airborne wind turbines are considered as a promising alternate for traditional power sources, their advantages are questioned by many critics. Generating electricity at high altitudes has its own challenges, such as unforeseen crashing, and therefore needs an automated control piloting to design robust and reliable AWTs with additional safety. Like any other technology, airborne wind turbines too have their own pros and cons, and great efforts are made across the globe to develop AWT as a great supporting technology for the eco-friendly wind energy market.

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VARIABLE FREQUENCY TRANSFORMER

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ABSTRACT

Variable Frequency Transformer (VFT) is a controllable bi-directional transmission device that can transfer power between asynchronous networks. It avoids both HVDC link and FACTS based power transmission control system. Basically, it is a rotatory transformer whose torque is adjusted in order to control the power flow. In this paper, a simulated model of VFT is used as a controllable bidirectional power transmission device that can control power flow through the connected asynchronous power systems. A simulation model of VFT and its control system models are developed with MATLAB and a series of studies on power flow through asynchronous power systems are carried out with the model. The response characteristics of power flow under various torque conditions are discussed. The voltage, current, torque and power flow plots are also obtained. The construction of VFT is similar to conventional asynchronous machines, where the two separate electrical networks are connected to the stator winding and the rotor winding, respectively. One power system is connected with the rotor side of the VFT and another power system is connected with the stator side of the VFT. The electrical power is exchanged between the two networks by magnetic coupling through the air gap of the VFT and both are electrically isolated

General Terms

Ac interconnection problems, asynchronous operation failure, double fed induction machine as compensator

Keywords

Phase-Shifter, Converter, Asynchronous interconnection, Variable Frequency Transformer (VFT), Rotating transformer, Wound rotor machine.

1. INTRODUCTION

The world's electric power supply systems are widely interconnected. This is done for economic reasons, to reduce the cost of electricity and to improve reliability of power supply. There are two ways of transmission interconnection. One is AC INTERCONNECTION. Another is BACK TO BACK HVDC INTERCONNECTION.

These types of interconnection have some or the other problem and complication.

VARIABLE FREQUENCY TRANSFORMER is a controllable bi-directional transmission device that can transfer power between asynchronous networks. It avoids both HVDC link and FACTS based power transmission control system. Basically, it is a rotatory transformer whose torque is adjusted in order to control the power flow. In this paper, a

simulated model of VFT is used as a controllable bidirectional power transmission device that can control power flow through the connected asynchronous power systems. A simulation model of VFT and its control system models are developed with MATLAB and a series of studies on power flow through asynchronous power systems are carried out with the model. The response characteristics of power flow under various torque conditions are discussed. The voltage, current, torque and power flow plots are also obtained. Advantages of vft are bidirectional power flow and more controllable and can transfer power between two asynchronous system. Other advantage are Bump-less Startup, Easy Integration with Grid, Modular Design, Small Space Requirements, Low Harmonic Generation, Low Complexity High Efficiency, Low Maintenance.

2. NEED OF INTERCONNECTION

Economic and technical considerations are usually the underlying factors for interconnecting neighboring electric power systems. Among some of the benefits that may be realised are plant capacity savings, interchange due to diversity, emergency power interchange, spinning reserve savings. However, planning of interconnections is a demanding task and must cover a wide range of technical aspects. This is the advantages, requirements arising from the interconnection of electric power systems in the world. It also presents the planning principles for grid systems, procedures for power system development planning, technical aspects of interconnection and possibilities of increasing interconnection capacity by limited means. We need these interconnections because apart from delivery, the purpose of the transmission network is to pool power plants and load centers in order to minimize the total power generation capacity and fuel cost. Transmission interconnections enable taking advantage of diversity of loads, availability of sources and fuel price in order to supply electricity to the loads at minimum cost with a required reliability.

2.1 Types of interconnection and power flow techniques

There exist two traditional electric power transmission systems to deliver electric power from sources (generators) to loads (customers) power-frequency alternating current (ac) and direct current (dc) electric power transmission systems. One is AC NTERCONNECTIOIN, just connects the two synchronous networks with ac transmission lines. These are the following ac interconnection:

1. Prime mover and excitation control of generators
2. Reactive Power Compensation
3. Phase shifting transformer
4. Tap-Changing-Under-Load (TCUL) Transformer

1.1.1 Ac Interconnection

The former works at power-frequency, 50 Hz or 60Hz. It is obvious that they both utilize constant transmission frequency. Fig 1(a) shows the point to point traditional power frequency ac electric power transmission system (PFTS) structure. The power-frequency electric source feeds the utility grid through a step-up/-down transformer, transmission line, and a step-down/-up transformer. For the PFTS, increasing transmission distance and capacity mainly depends on raising the voltage level of transmission lines. At present, the highest voltage level of the ac power transmission line in operation is 1000 kV. The power frequency ac transmission is the dominant mode to transfer electric power from power generators to loads in modern electric power systems. It, however, has the following conceptual and theoretical barriers and limitations.

1. It is not easy for electric power with power-frequency to transfer for long distance. For long transmission length, the stability is critical. In order to enhance the stability, extra equipments are needed. 2. The whole system should be synchronized under the same frequency, 50 Hz or 60 Hz. 3. The transmission capacity is limited by many factors. 4. There are huge capacitance currents when underground/ undersea cables are used. This results in decrease of the transmission capacity and increase of the transmission loss.

1.1.2 Back To Back HvdC Interconnection

The Back-to-Back HVDC is asynchronous interconnection, which is implemented via HVDC for most cases at present. It is easy for bulk power transfer and also flexible for system operation. It shows the traditional dc electric power transmission system (DCTS) structure. The power frequency electric source feeds the utility grid through a step-up/-down converter station, a transmission line, and a step-down/-up converter station. Here, the electric source and utility grid work at power-frequency, and the transmission line works at 0 Hz. The now highest voltage level of the dc transmission line in operation is ± 800 kV. However, the dc transmission system has the following conceptual and theoretical barriers and limitations. 1. It is unable to change voltage levels in dc networks by transformer. 2. Converter substations generate current and voltage harmonics, while the conversion process is accompanied by large reactive power consumption. As a result, it is necessary to install expensive filter compensation units and reactive power compensation units.

3. High voltage dc circuit breakers are difficult to build because some mechanism must be included in the circuit

breaker to force current to zero, otherwise arcing and contact wear would be too great to allow reliable switching. This results that realizing multiterminal systems is very difficult.

3. PRINCIPLE OF VARIABLE FREQUENCY TRANSFORMER

The variable frequency transformer (VFT) is essentially a continuously variable phase shifting transformer that can operate at an adjustable phase angle. The core technology of the VFT is a rotary transformer with three-phase windings on both rotor and stator (Fig. 1). The collector system conducts current between the three-phase rotor winding and its stationary bus work. One power grid is connected to the rotor side of the VFT and another power grid is connected to the stator side of the VFT. Power flow is proportional to the angle of the rotary transformer, as with any other AC power circuit. The impedance of the rotary transformer and AC grid determine the magnitude of phase shift required for a given power transfer. Power transfer through the rotary transformer is a function of the torque applied to the rotor. If torque is applied in one direction, then power flows from the stator winding to the rotor winding. If torque is applied in the opposite direction, then power flows from the rotor winding to the stator winding. Power flow is proportional to the magnitude and direction of the torque applied. If no torque is applied, then no power flows through the rotary transformer. Regardless of power flow, the rotor inherently orients itself to follow the phase angle difference imposed by the two asynchronous systems, and will rotate continuously if the grids are at different frequencies. Torque is applied to the rotor by a drive motor, which is controlled by the variable speed drive system. When a VFT is used to interconnect two power grids of the same frequency, its normal operating frequency is zero. A new power transmission technology has been developed. The variable frequency transformer (VFT) is a controllable, bidirectional transmission device that can transfer power between asynchronous networks. Functionally, the VFT is similar to a back-to-back HVDC converter. Speed is zero. Therefore, the motor and drive system is designed to continuously produce torque while at zero speed (standstill). However, if the power grid on one side experiences a disturbance that causes a frequency excursion, the VFT will rotate at a speed proportional to the difference in frequency between the two power grids. During this operation the load flow is maintained. The VFT is designed to continuously regulate power flow with drifting frequencies on both grids. A closed loop power regulator maintains power transfer equal to an operator set point. The regulator compares measured power with the set point, and adjusts motor torque as a function of power error. The power regulator is fast enough to respond to network disturbances and maintain stable power transfer. Reactive power flow through the VF follows conventional AC-circuit rules. It is determined by the series impedance of the rotary transformer and the difference in magnitude of voltages on the two sides. Unlike power-electronic

alternatives, the VFT produces no harmonics and cannot cause undesirable interactions with neighboring generators.

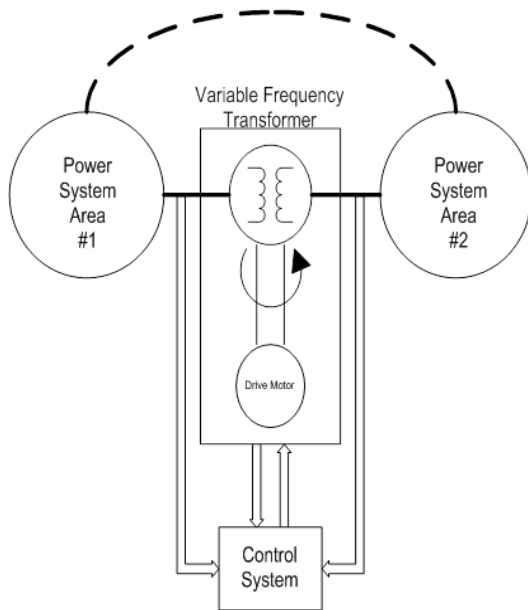


Fig1: Block diagram of VFT

(Source: Modelling Analysis and Simulation of VFT by Brian C Raczkowski and Peter W.Sauer)

4. CONSTRUCTION OF VFT

The VFT consists of following core components: a rotary transformer for power exchange, a drive motor to control the movement or speed of the rotor and to control the transfer of power. A drive motor is used to apply torque to the rotor of the rotary transformer and adjust the position of the rotor relative to the stator, thereby controlling the magnitude and direction of the power transmission through the VFT. Construction of VFT majorly consist of these dominant parts.

4.1 Rotary Transformer

The rotary system is the heart of the VFT. It is comprised of well-proven components and sub-systems to form this new product. The rotating machine has a stator core and winding very similar to that of high efficiency synchronous rotating machines, such as hydro-generators. The rotor design features are the same as those of the stator, including bar windings and low loss laminated cores. The machine design is based on a vertical, air-cooled concept for simplicity and reliability.

4.2 High Power Collector

Transferring 100MW from the rotor to stationary bus is accomplished with well-proven carbon-brush slip rings. The low speed permits large diameter slip rings to attain adequate

insulation while simultaneously providing a substantial surface area for spreading the current among many parallel Brushes.

4.3 Drive Motor

The drive machine is a proven DC torque motor, well established within the industry. Previous models have been used for mine hoists, telescope and antennae tracking, turret drives, and steel rolling mills.

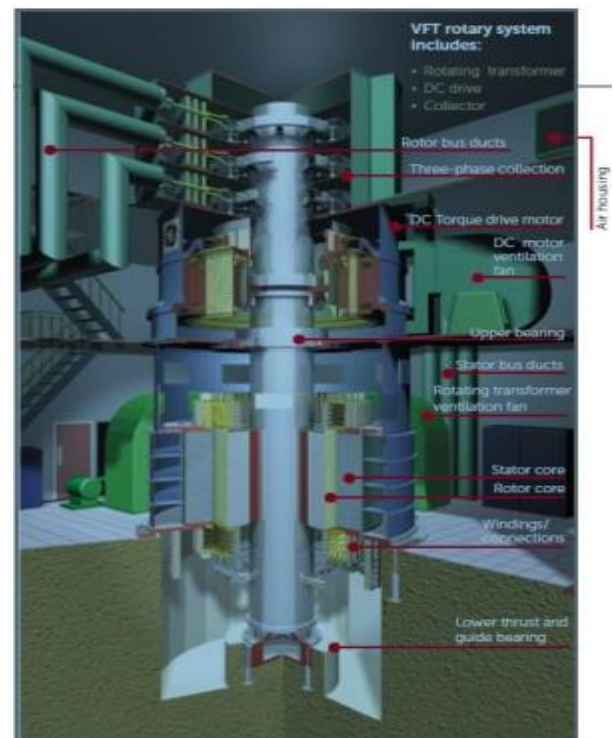


Fig2: Construction of VFT

(Source: Variable frequency transformer for asynchronous power transfer by Einar Larsen, Richard Piwko and Donald McLaren, GE Energy)

Hydro-Quebec's Langlois substation is located southwest of Montreal, Quebec, at the electrical inter face between the Quebec and USA power grids. A 100 MW VFT was installed at Langlois to enable power transfer between the two asynchronous power grids.

shows a simplified one-line diagram of the Langlois VFT, which is comprised of the following:

- One 100 MW, 17 kV rotary transformer
- One 3000 HP DC motor and variable speed drive system
- Three 25 MVar switched shunt capacitor banks
- Two 120/17 kV conventional generators step-up transformers.

The Langlois VFT station has been designed to be expandable, accommodating another 100 MW rotary transformer and its auxiliary equipment. The yard has space for transformers, capacitor banks, and switchgear associated with the second

5. WORKING IN DIFFERENT CONDITION

5.1 Synchronous mode:

A stable power exchange between the two asynchronous systems is possible by controlling the torque applied to the rotor, which is controlled externally by the drive motor. When the power systems are in synchronism, the rotor of VFT remains in the position in which the stator and rotor voltage are in phase with the associated systems. In order to transfer power from one system to other, the rotor of the VFT is rotated. If torque applied is in one direction, then power transmission takes place from the stator winding to the rotor winding. If torque is applied in the opposite direction, then power transmission takes place from the rotor winding to the stator winding. The power transmission is proportional to the magnitude and direction of the torque applied.

5.2 Asynchronous mode:

When the two power systems are no longer in synchronism, the rotor of the VFT will rotate continuously and the rotational speed will be proportional to the difference in frequency between the two power systems (grids). During this operation the power flow is maintained. The VFT is designed to continuously regulate power transmission even with drifting frequencies on both grids. Regardless of power transmission, the rotor inherently orients itself to follow the phase angle difference imposed by the two asynchronous systems. When a VFT is used to interconnect two power grids of the same frequency, its normal operating. A new power transmission technology has been developed. The variable frequency transformer (VFT) is a controllable, bidirectional transmission device that can transfer power between asynchronous networks. Functionally, the VFT is similar to a back-to-back HVDC converter speed is zero. Therefore, the motor and drive system is designed to continuously produce torque while at zero speed(standstill). However, if the power grid on one side experiences a disturbance that causes a frequency excursion, the VFT will rotate at a speed proportional to the difference in frequency between the two power grids. During this operation the load flow is maintained. The VFT is designed to continuously regulate power flow with drifting frequencies on both grids .A closed loop power regulator maintains power transfer equal to an operator setpoint. The regulator compares measured power with the setpoint, and adjusts motor torque as a function of power error. The power regulator is fast enough to respond to network disturbances and maintain stable power transfer.

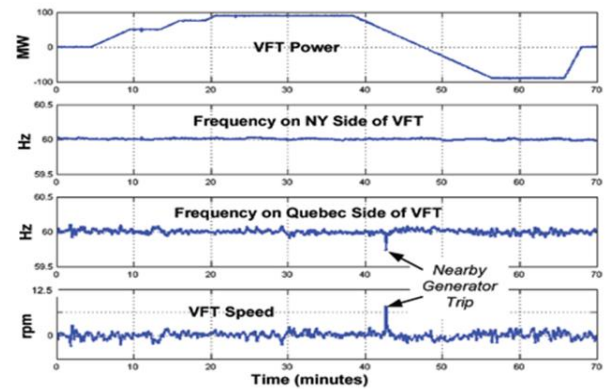


Fig3: Power transfer between quebec and newyork

(Source: Variable frequency transformer for asynchronous power transfer by Einar Larsen, Richard Piwko and Donald McLaren, GE Energy)

Fig. 3 Illustrates the Langlois VFT power transfer between the asynchronous Quebec energize and New York power grids. Note that the time scale covers 70 minutes. The top trace shows VFT power in MW as the operator ramped power from zero to +100 MW to -100 MW and back to zero. Unlike conventional HVDC transmission that cannot operate below about 10% power, the VFT's ramp through zero MW is smooth. Also note that power transfer is smooth despite frequency variances in the two grids – including the trip of a large unit in the Quebec grid during the measuring period.

5.3 Short circuit condition:

Figure illustrates the response of the VFT to a fault in the AC network. The voltage on the machine terminals remains above zero, due to contribution from the unfaulted side. The large inertia holds the rotor relatively stationary during the fault, and after recovery the control readjusts the position to meet the desired power flow.

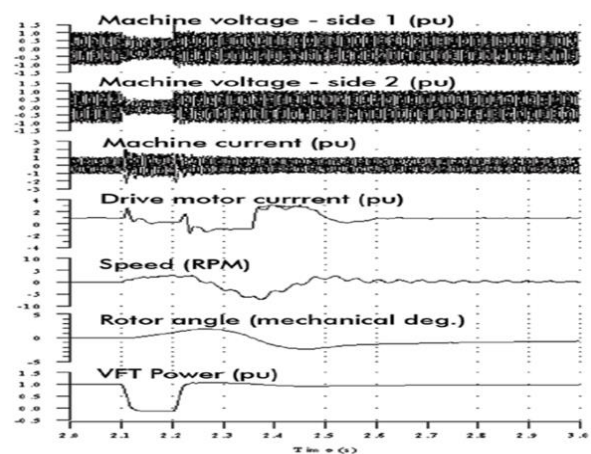


Fig4: Short circuit condition between two system

(Source: Variable frequency transformer for asynchronous power transfer by Einar Larsen, Richard Piwko and Donald McLaren, GE Energy)

It shows that the electrical power flowing out of the rotor winding being proportional to mechanical power of the drive system, stator frequency and rotor frequency. Hence, if the stator frequency and rotor frequency are kept constant, then the electrical power flowing out of the rotor winding being only proportional to mechanical power of the drive system.

6. MATLAB SIMULATION RESULTS

6.1 Power Flow from Power system-1 to Power system-2

It is evident from the simulated results that under different external torque condition, the power flow through the power system-1 and power system-2 is not zero. The magnitude and frequency of voltage are kept same for all operating conditions and the power flow through power system-1 and power system-2 under different torque condition are shown

Table1: Simulation result for torque in clockwise direction

S.No	T_D (Nm)	I_s (A)	P_s (W)	I_r (A)	P_r (W)
1	0	6.813	214	3.338	36.65
2	5	5.401	1089	3.088	-781.9
3	10	4.635	2010	2.528	-1564
4	15	4.827	2967	3.096	-2304
5	20	5.871	3964	4.518	-3005

It is clear from table I that under zero torque condition the power flow through the VFT is zero even though there is power flow through power system-1 and power system-2 i.e. VFT is taking power from both the power systems. The negative sign represents the power flow towards the power system-2.

6.2 Power Flow from Power system-1 to Power system-2

When the applied torque is in opposite direction then power flow direction reverses as shown in Table II

Table2: Simulation for torque flow in anticlockwise direction

S.No	T_D (Nm)	I_s (A)	P_s (W)	I_r (A)	P_r (W)
1	0	6.813	214	3.338	36.65
2	-5	8.587	-624.2	4.937	901
3	-10	10.57	-1416	6.829	1808
4	-15	12.68	-2162	8.882	2763
5	-20	14.91	-2583	11.07	3768

It is clear from table II as the applied torque direction reverses the power flow direction also reverses. The negative sign represents the power flow towards the power system-1. The power flow through power system-1 and power system-2 with the applied torque achieved is shown in fig. 5

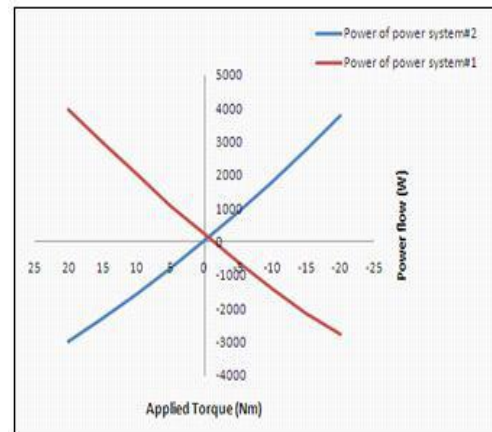


Fig.5 The power flow with the applied torque

(Source: Modeling, Analysis and Simulation of VFT for Power Flow Control through Asynchronous Power Systems by Farhad Ilahi Bakhsh, Shirazul Islam, and Mohammad Khursheed)

7. CONCLUSION

From the simulated results it is evident that both the magnitude and direction of the power flow through the connected power systems are controllable by the external torque applied to the rotor. Moreover, power flow is directly proportional to the applied torque. Hence VFT technology provides an option for achieving real power flow control through asynchronous power systems. The model developed is successfully used to demonstrate the power flow control through asynchronous power systems. The direction and the magnitude of power flow control are achieved. Thus, the VFT concept discussed and its advantages are verified by simulation results.

8. ACKNOWLEDGEMENT

On this occasion of presenting our semester report, 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...

Our sincere thanks to **Prof. Bhushan Save, H.O.D. of Electrical department, Viva Institute of Technology** and our **project coordinator Prof. Pratik Mahale** for his immense help and support during our course

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AUTOMATIC SOLAR TRACKING WITH MPPT

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1. ABSTRACT

The paper deals with use of alternative energy resource for power generation which can be used to supply power in domestic application. Solar energy is a never ending energy resource, available free in nature and Green Energy resource. Solar energy has a major advantage for no impure outlets but problem associated with solar is less efficiency and high cost. The power from the sun intercepted by the earth is approximately 1.8×10^{11} MW, which is many thousands of times larger than the present consumption rate on the earth of all commercial energy sources. Solar tracking system which can be used as a power generating method from sunlight. This method of power generation is simple and is taken from natural resource. This needs only maximum sunlight to generate power. This paper presents for power generation and sensor based solar tracking system to utilize the maximum solar energy through solar panel by setting the equipment to get maximum sunlight automatically in real time. This proposed system is tracking for maximum intensity of light. When there is decrease in intensity of light, this system automatically changes its direction to get maximum intensity of light. The proposed method is to design an electronic circuit to sense the intensity of light and control the DC motor driver for the panel movement, and construct a Buck-Boost converter for to step up and step-down the voltage, and store the maximum utilized output voltage in Lead-Acid Battery.

KEYWORDS

Solar energy, Solar tracking, MPPT, Buck Boost Converter, LDR (Light Dependent Resistors) Renewable energy, Microcontroller

2. INTRODUCTION

Solar energy is very most promising future power generation energy resource. However, there are many problems associated with its use, the main problem is that it is dilute source of energy. Even in the hottest regions on the earth, the solar radiations flux available rarely exceeds 1 KW/m, which is a low value for technological utilization. Problem associated with the use of solar energy is that its availability varies widely with time and place. The variation in availability occurs daily because of the day night cycle and also seasonally because of the earth's orbit around the sun and due to irradiance in temperature due to changing atmospheric conditions.

Recently, research and development of low cost flat panel solar panel, thin film devices, concentrators systems and many more innovation concepts have increase. In the future, the cost of small solar modular unit and small hybrid solar & wind or

solar & hydro power plants will be economically feasible for large scale production and use of solar energy.

In this paper we have presented the photovoltaic solar panel operation. The foremost way to increase the efficiency of a solar panel is by using

- 1 .A mechanical solar tracking system which tracks the sun from east to west for maximum point of light intensity
2. Use of maximum power point tracker (MPPT) which is an electronic device regulates the output to get maximum efficiency.

To rectify these above problems the solar panel should be such that it always receives maximum intensity of light. For existing solar panels, which are without any control systems typical level of efficiency varies from 10% to 4% - a level that should improve measurably if the present interest continues. For mechanical tracking system we have selected a single axis mechanical tracking system using a bipolar stepper motor for our design.

In addition we attempted to design the system by using an algorithm of selected MPPT method which is Perturb and Observe method and implement it by using a DC-DC convertor and we have selected Buck-Boost converter.

3. OBJECTIVE

The aim of the project is to utilize maximum solar energy through solar panel. For this a digital based automatic sun tracking system and MPPT circuit is being proposed. The solar panel traces the sun from east to west automatically for maximum intensity of light .PV generation system generally uses a microcontroller based charge controller connected to battery and load. A charge controller is used to maintain proper charging voltage on battery by concept of load impedance matching. And input voltage from the solar array, the charge controller regulates the charge to the battery preventing overcharge. By using a microcontroller based design we are able to control both operations with more intelligent control and thus increases the efficiency of the system.

4. LITERATURE REVIEW

Daniel A. Pritchard had given the design, development, and evaluation of a microcomputer-based solar tracking system in 1983. Then Manny studies for solar tracking appeared using the microprocessor, Saxena and Dutta in 1990, A. Konar and A.K. Mandal in 1991, and A. Zeroual in 1997 using electro-optical sensors for sun finding . The microcontroller is used as base for automatic sun tracker to control a dc motor in 1998 by F. Huang, and used as base for maximum power point tracking controller by Eftichios Koutroulis in 2001. Hasan A. Yousef, had given the PC-based fuzzy logic controller design

and Implementation to control a sun tracking system in 1999, the tracking system was driven by two permanent magnet DC motors to provide motion of the PV panels in two axes. Chee-Yee Chong, in 2000 had given the process architectures for track fusion, they presented different approaches for fusing track state estimates, and compared their performance through theoretical analysis and simulations, they used the concept of multiple targets tracking because it had shown that tracking with multiple sensors can provide better performance than using a single sensor. Many studies for novel maximum power point tracking (MPPT) controller for a photovoltaic (PV) energy conversion system was proposed by Yeong Chau Kuo in 2001, K. K. Tse in 2002, and Henry Shu-Hung Chung in 2003, Kimiyoshi Kohayashi in 2004. Z.G. Piao, proposed a solar tracking system in 2003, using DC motors, special motors like stepper motors, servo motors, real time actuators, to operate moving parts, it was highly expensive. A. A.Khalil, had presented a sun tracking system in 2003, This Tracking system easy to implement and efficient for solar energy collection. Many methods was proposed to achieve the objective of maximum power point tracking (MPPT), and the active sun tracking scheme without any light sensors, S. Armstrong et al. had proposed a quantitative measure of the effectiveness MPPT efficiency in 2005, a vector methodology was used to track the direction and path of the sun throughout the day. And Rong-Jong Wai. had given grid connected photovoltaic (PV) generation system with an adaptive step-perturbation method and an active sun tracking scheme in 2006. Cemil Sungur had given the electromechanical control system of a photovoltaic (PV) panel tracking the sun using Programmable Logic Controls (PLC) in 2007. Many FPGA-based PV systems fuzzy MPPT control was proposed, A. Messai, A. Mellit describes the hardware implementation of a two-inputs one-output digital Fuzzy Logic Controller (FLC) on a Xilinx FPGA using VHDL language in 2009, Cheng, Ze; Yang, Hongzhi; Sun, Ying had proposed a simple, reliable method in 2010.

There are many MPPT algorithm which can be used for implementation viz. Incremental conductance method, constant voltage method, Fuzzy logic based method etc. Different MPPT algorithms [8], [11], [12] are briefed about their features and limitations as follows

1. Incremental conductance (INC) method of tracking the MPP does not depend upon PV array, tracking efficiency is good, and implementation is medium. Sensing parameters are voltage and current, convergence speed is medium and of analog type.
2. Fuzzy logic control based MPPT is PV array dependent, Tracking efficiency is good, implementation is very complex, convergence speed is fast and of digital type.
3. Neural network based MPPT is also PV array dependent, tracking efficiency is good, implementation is very complex, convergence speed is fast and of digital type.
4. Perturb and observe based MPPT is not PV array dependent, tracking efficiency is good but with unstable operating points, implementation is simple, sensing parameters are voltage and current.
5. Advanced Perturb and Observe based MPPT is not PV array dependent, tracking efficiency is very good with stable MPPs, implementation is medium, sensing parameters are voltage and current.

Out of many MPPT algorithms, Perturb and observe (P&O) algorithm is mostly used for increasing the efficiency of PV system due to its simpler implementation, high reliability and better efficiency.

5. METHODOLOGY

The prototype model of a solar microcontroller based SOLAR maximum power tracking will be made in the following steps:

1. Complete layout of the whole set up will be drawn in form of a block diagram.
2. Day and night sensor will first sense the condition and give its output to the microcontroller.
3. The photovoltaic panel will be mounted at an optimum angle of 67 degree in the month of April for the latitude of MUMBAI as referred from Solar Electricity handbook 2013 edition solar electricity from the vertical as on a d.c motor driven by a driver I.C. such that the panel moves and the microcontroller checks the output voltage at various points.
4. Identification of points where maximum voltage and hence maximum power received by the solar panel.
5. Maximum power will be detected by MPPT Algorithm developed, then fed to Analog to Digital converter and stored in microcontroller.
6. The motor and hence the panel will be stopped when maximum power will be received by the solar panel and then it will start charging the battery.

6. SYSTEM DESCRIPTION

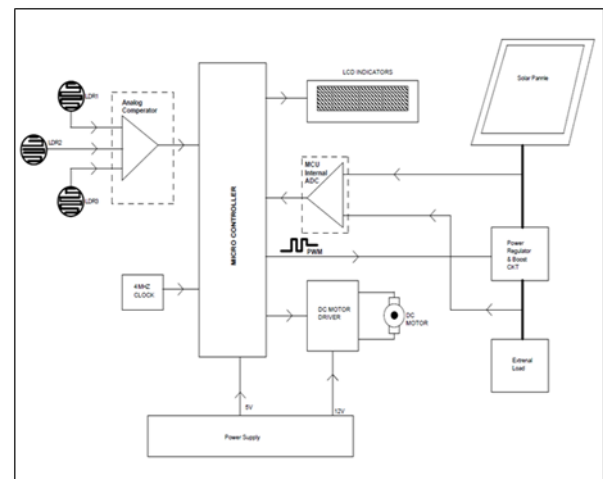


Fig.1 Block Diagram of system

7. ALGORITHMS

1.SUN TRACKING SYSTEM

For single axis rotation we have to take two LDR s therefore we rotate the panel in east west direction and hence we take east LDR and west LDR .now whenever light intensity falls on the east and west LDR the comparator compare the voltage

between two LDRs.. When it compares then there are two possibilities:

If $V(\text{east}) - V(\text{west}) > \text{threshold}$ or maximum voltage then corresponding transistors in motor driving circuit are biased and moves motor in east

If $V(\text{east}) - V(\text{west}) < \text{threshold}$ or maximum voltage then then corresponding transistors in motor driving circuit are biased and moves motor in west and one more possibility not mentioned in algorithm if $V(\text{east}) - V(\text{west}) = \text{threshold}$ or maximum voltage then motor automatically moves in the east direction by biasing the corresponding transistors

effectiveness, it is the most commonly used MPPT method.

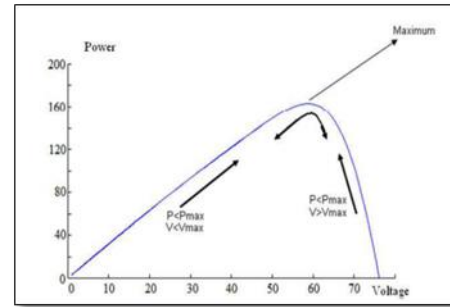


Fig.2 P/V characteristics of PV [1]

The voltage to a cell is increased initially, if the output power increase, the voltage is continually increased until the output power starts decreasing. Once the output power starts decreasing, the voltage to the cell decreased until maximum power is reached. This process is continued until the MPPT is obtained. This result is an oscillation of the output power around the MPP. PV module's output power curve as a function of voltage (P-V curve), at the constant irradiance and the constant module temperature, assuming the PV module is operating at a point which is away from the MPP.

This P&O algorithm periodically increment or decrement the output terminal voltage of the PV cell and comparing the power obtained in the current cycle with the power of the previous one. If the power is increased, then it is supposed that it has moved the operating point closer to the MPP. Thus, further voltage perturbations in the same direction should move the operating point toward the MPP. If the power decreases, the operating point has moved away from the MPP, and the direction of perturbation should be reversed to move back toward the MPP.

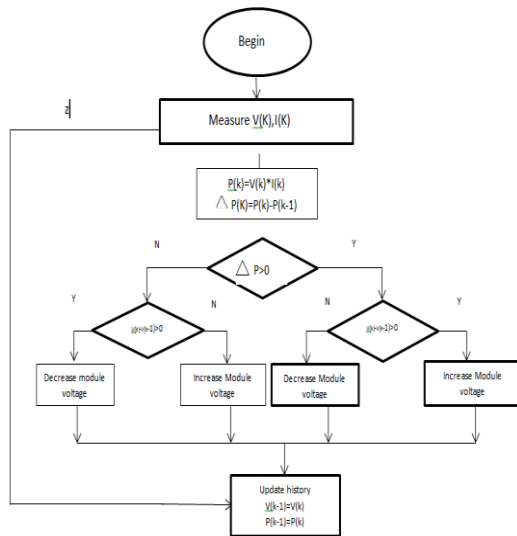


Fig. 2 Algorithm for sun tracking system

1. P & O

A typical solar panel converts only 30 to 40 percent of the incident solar irradiation into electrical energy. Maximum power point tracking technique is used to improve the efficiency of the solar panel. According to Maximum Power Transfer technique, the output power of a circuit is maximum when the source impedance matches with the load impedance. In the source side a buck converter is connected to a solar panel in order to enhance the output voltage. By changing the duty cycle of the buck converter appropriately by PWM signal the source impedance is matched with that of the load impedance. There are various MPPT techniques are proposed [3]. Among those methods, the perturb and observe (P&O) and incremental conductance (INC) methods are widely used although they have some problems such as the oscillation around MPP and confusion by rapidly changing atmospheric conditions [5]

In this paper perturb and observe MPPT algorithm is used. In this method the controller adjusts the voltage by a small amount from the array and measures power, if the power increases, further adjustments in the direction are tried until power no longer increases. This is called P&O method. Due to ease of implementation and cost

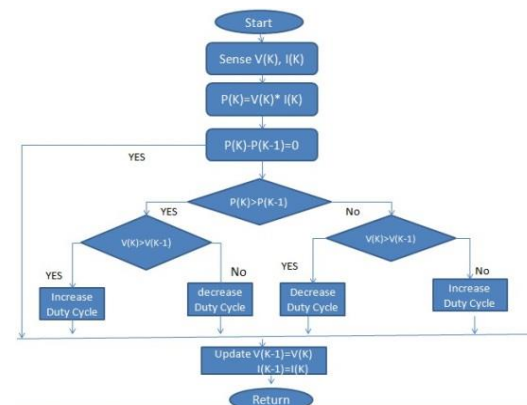


Fig.3 Algorithm of perturb and observe method

8. HARDWARE DESCRIPTION

1. LDR:-

The characteristic of the LDR is to vary the input voltage into the comparator as the sun moves over it. The LDR is a resistor whose resistance decreases with increasing light intensity. The LDR are made up of cadmium sulphide (CdS) type or a Gallium Arsenide (GaAs) type. The sun tracker uses cadmium sulphide (CdS) photocell for sensing.

2. Motor driving circuit:-

A stepper motor is used because it rotates in both directions by reversing the direction of current supplied. The input to the stepper motor (motor driving circuit) is obtained from the comparator which compares the voltage and gives input to the stepper motor.

3. Microcontroller (PIC16F876):-

The microcontroller senses both the panel and battery voltages and takes decisions to activate different components of the circuits such as, transistors, relays and LED indicators. It is powered up by the lead-acid battery connected to it through a voltage regulator (LM7805) which converts the 12V into 5V.

4. Buck Boost regulator:-

The buck boost converter is obtained by using the duality principle on the circuit of a buck-boost converter. Similar to the Cuk converter, the buck boost converter provides a negative polarity regulated output voltage with respect to the common terminal of the input voltage. The output voltage magnitude can be same, larger or smaller than the input depending on the duty cycle.

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9. ACKNOWLEDEMENT

Our sincere thanks to Prof. Bhushan Save, H.O.D. of Electrical department, Viva Institute of Technology and our project coordinator Prof. Pratik Mahale for their immense help and support during our course. We would like to express our gratitude to Prof. Vinayak Gaikwad our project guide and all our faculty members for enlightening and guiding us throughout our course and helping us to cope up with the problems we faced during our project.

10. CONCLUSION

PV has a powerful attraction because it produces electric energy from a free inexhaustible source, the sun, using no moving parts, consuming no fossil fuels, and creating no pollution or greenhouse gases during the power generation. So, it is our wish to make the P-V system more efficient so that it can help for betterment of life. This project has presented a means of controlling a sun tracking array with an embedded microcontroller system, a working software solution for maximizing solar cell output by positioning a solar array at the point of maximum light intensity and using MPPT technique to get maximum utilization of solar power.

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BATTERY EQUALIZER (BEQ)

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ABSTRACT

This paper includes the definition of battery equalizer, need of battery equalizer in now days. Block diagram required to make battery equalizer. Also include some results and analysis at of making battery equalizer. In the present work, a switched-capacitor converter is shown to be a simple and effective method to maintain equal cell or mono block charge conditions.

Battery are most of the connected in series strings in many applications and because of manufacturing variations, temperature differences, and aging, the individual cells perform differently. When a complete pack is charged and discharged, some cells are chronically overcharged, undercharged, or over discharged, all of which act to reduce cell life. The performance and life of the complete pack is limited by the weakest cell. This is the reason battery equalizer is required to maintain battery life more powerful.

Keywords

Battery, transformer, MOSFET, capacitor, equalization.

1. INTRODUCTION

The idea of battery equalizer is to balance the charge level of two batteries by drawing energy from the one with the higher charge and transferring it to the other. The most efficient means of achieving this transfer is by using a switched capacitor. A switched capacitor system for battery equalization can be used with series coupled batteries as well as primary and backup batteries which are alternately compliable to a load.

Series strings of storage batteries are extensively used in telephone industry, the utility industry, and in military application. Series strings are expected to be used in forthcoming electric vehicles and new power backup application. The ability to uniformly charge the batteries in such string is very important in this situation. The individual cells within a battery string differ due to manufacturing variations, temperature gradients, and aging effects.

If the series string is charge as a unit, slight mismatches or temperature differences between batteries cause charge imbalance. Once imbalance occurs, it tends to grow with time. "Charge equalization" cycles must be used in an attempt to correct imbalance. It has been recognized that such processes stress the batteries, shorten their lives (by factors if three or more in some application), and are not very effective. Users of battery strings have long been aware of the charge of

imbalance problems associated with series charging, although it is only recently that imbalance has been considered to be a major limiting factor. The extent of the problem depends on specific application.

During the charging process, an imbalance will cause some cells to be undercharged while others to be overcharged. The operation of a series string is limited by the weakest cell, so local undercharging is a problem. It is well known that fast charging is more likely to create imbalance than slow "trickle" charging. Even a few tens of millivolts of voltage imbalance will tend to alter the charge process so that imbalance increases over time.

In practice, charge balance, or "equalization", must be carried out periodically to avoid long term severe imbalance. Equalization is most often performed by extending the charging process. Using this approach, the cells having the highest voltage are forcibly overcharged while those having lower voltages are brought up to the full charge. Therefore the need of equalization occurs in order to get better efficiency.

2. BLOCK DIAGRAM

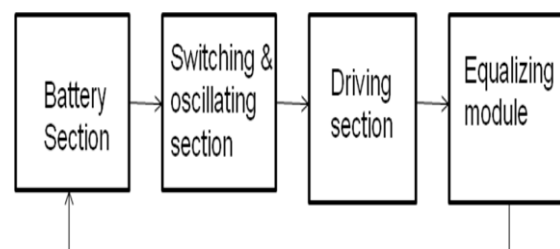


Fig. 1. Block Diagram

Fig.1. shows the block diagram. It consists of following block:-

- Battery
- Equalizer module
- Switching circuit
- Driving circuit

1. Battery:



Fig. 2. Lead acid battery

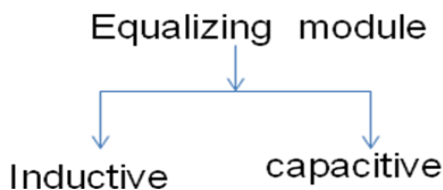
Fig .2. The battery is a lead acid battery of 12V/12Ah. The two batteries are connected in series.

2. Equalizer module:-

Depending upon storing element there are two method of making of equalizing model

Inductive: inductor use to store the transfer energy

Capacitive: capacitor use to store transfer energy.



We choose capacitive equalization process to make battery Equalizer because it is easier than inductive method. And capacitor is better than inductor protection point of view.

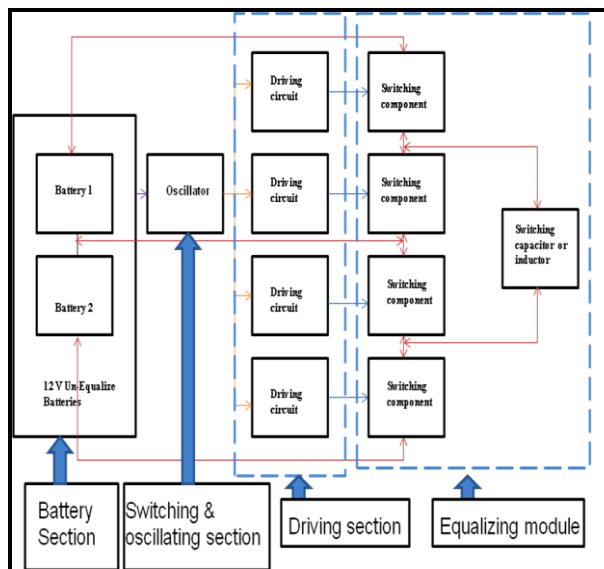


Fig. 3. .Block Diagram Of Capacitive Equalizer

Fig.3. consists of four MOSFET and one switched capacitor. Battery positive terminal is connected to the drain of first MOSFET and negative terminal is connected to the source of

3. Switching circuit :-

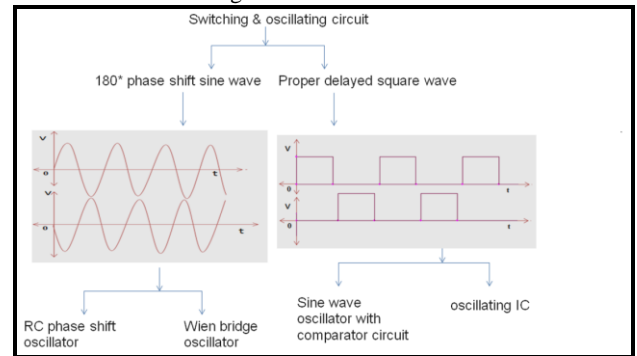
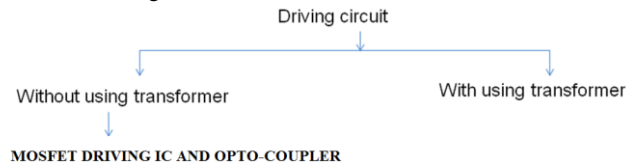


Fig. 4. Method To Achieve Pulsating Output

Fig.4.shows the method of delayed pulsating output. First we tried with sine wave generator then chopped that as we required but that becomes complex. So we tried alternate option and we found switching and self oscillating IC. It has internal adjustment of frequency. It gives two outputs and it is given to the driving circuit.

4 Driving circuit:-



The driving circuit is as pulse transformer driver. The output of switching circuit is given to the input of pulse transformer. This will drive the MOSFET. The output of pulse transformer is given to gate and source of the MOSFET. We test battery equalizer with transformer but for this transformer is very costly and specific for required operation and circuit also become bulky and size of BEQ increases.

For alternatives we also tried transformer less circuit as MOSFET driving IC .This configuration also required isolation component between oscillator and driving part for that we are using specific high speeds opto-coupler IC this part is still under development.

3. EQUALIZER TECHNIQUE

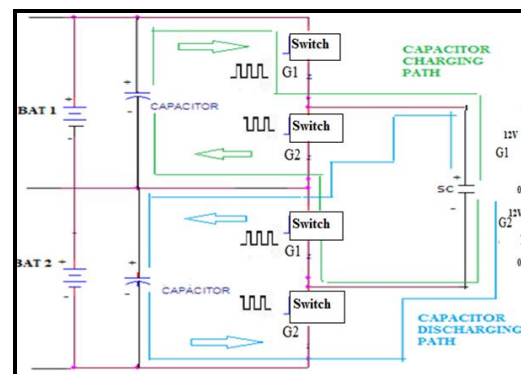


Fig. 5. Switched Capacitive equalization technique

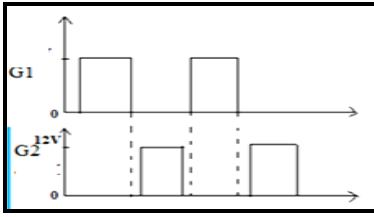


Fig. 6. Input of G1 and G2 switch

Fig.5. shows the basic switched capacitor equalization circuit. There are two sets of capacitors. The capacitors directly across the battery terminals decouple inductance in the battery leads, while the others are switched to perform equalization. There are two sets of MOSFETs. Set one (G1) connects the switched capacitors to all of the positive battery terminals, while set two (G2) connects the switched capacitors to the entire negative battery terminal. The two sets are switched alternately.

If battery1 voltage is 12V and battery2 is 11V. Switched capacitor will be charged and MOSFET1 & MOSFET3 will be ON. After some time (the delay of 2-3usec) switched capacitor will discharge. This time MOSFET2 & MOSFET4 will be ON.

Selection of SC (switching capacitor):-

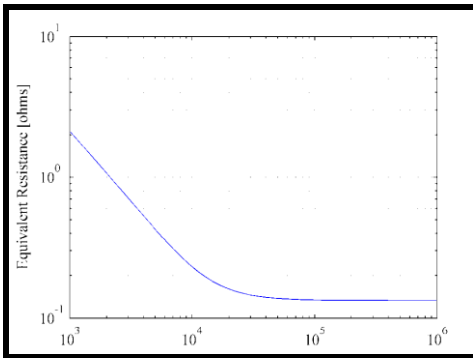


Fig. 7. Frequency Verses Equivalent Resistance Graph

Fig.7. shows an equivalent resistance for a SC equalizer using a 470 microfarad capacitor, Total resistance of 30 milliohm $D=0.45$, as switching frequency varies.

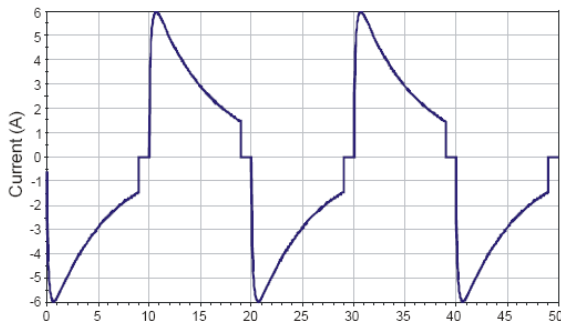


Fig. 8. Waveform Across Capacitor

Fig.8. shows current in the switched capacitor equalizer with a 0.1 V differential in the battery cell voltages. Capacitor is 470 microfarad switched at 50 kHz with $D=0.45$ and a total ESR of 30 ohm.

4. EXPERIMENTS AND ANALYSIS

Experiment I:-First use normal local transformer with circuit.

Analysis: -In this all the MOSFETs were triggering at different voltages. It was consuming more current. When lower side battery was connected to the oscillator input then both the battery voltage were decreasing.

Readings:-

Table I

Time	Battery1 voltage	Battery2 voltage	Difference
0	12.04	10.74	1.3V
30	12.02	10.84	1.18V
60	12.01	10.86	1.15V
90	12.00	10.90	1.1V
120	12.00	10.91	1.09V
150	12.00	10.91	1.09V
180	11.99	10.94	1.00V
210	11.98	10.95	1.03
240	11.98	10.87	1.11V
270	11.97	10.81	1.16
300	11.96	10.67	1.29

Graph:-

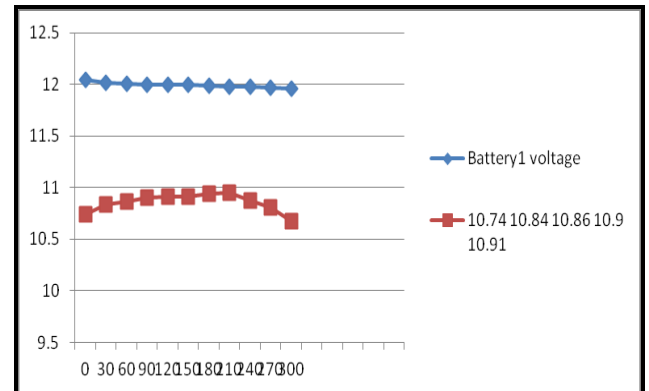


Fig. 9. Graph for experiment I

Fig. 10.

Experiment II:-We change the transformer (1mA/1mA).

Analysis: - It was having a 400mV difference and consumption was 10mA.

Readings:-

Table II

Time	Battery1 voltage	Battery2 voltage	Difference
0	11.85	10.5	1.35
10	11.77	10.83	0.94
25	11.77	10.83	0.94
55	11.75	11	0.75
1.2	11.74	11.04	0.7
1.75	11.75	11.06	0.69
3.3	11.74	11.04	0.7
4.47	11.73	11.15	0.58
6.25	11.72	11.2	0.52
7	11.71	11.23	0.48
8.12	11.71	11.24	0.47
9	11.7	11.25	0.45

Graph:-

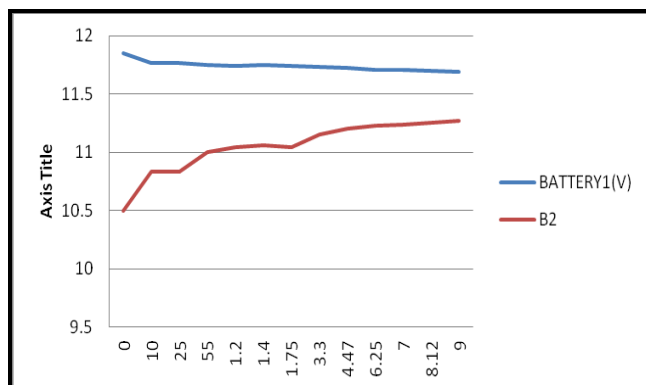


Fig. 11. Graph Of Experiment II

Experiment III:-Tried with 1:1:1 transformer.

Analysis:-In this the MOSFET were triggering but the amplitude was 6V. The consumption was more. Change the switched capacitor to surface mounted device capacitor.

Readings:-

Table III

Time	Battery1 voltage	Battery2 voltage	Difference
3.16	10.95	11.97	1.02
3.26	11.17	11.72	0.55
3.36	11.19	11.69	0.5
3.46	11.2	11.68	0.48
3.56	11.21	11.66	0.45
4.06	11.21	11.66	0.45
4.16	11.21	11.65	0.44
4.26	11.21	11.64	0.43
4.36	11.23	11.61	0.38
4.46	11.23	11.6	0.37

Graph:-

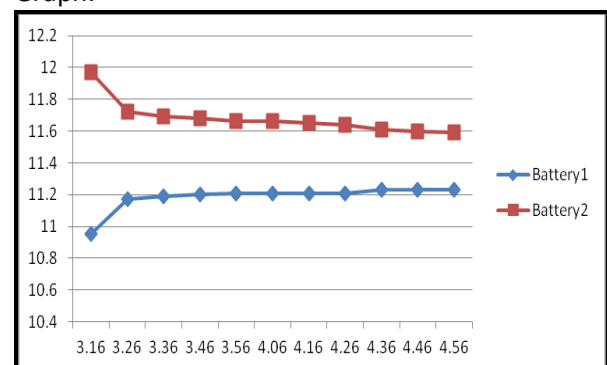


Fig. 12. Graph Of Experiment III

Experiment IV: - Then change the transformer, and used iron core transformer (1:1).

Analysis: - In this the difference was around 400mV and consumption was more than 10mA.

Readings:-

Table IV

Time	Battery1	Battery2	Difference
10.5	11.77	11.08	0.69
11	11.73	11.12	0.61
11.1	11.71	11.14	0.57
11.2	11.7	11.15	0.55
11.3	11.69	11.16	0.53
11.4	11.69	11.16	0.53

11.5	11.69	11.17	0.52
12	11.68	11.18	0.5
12.1	11.69	11.19	0.5
12.3	11.69	11.19	0.5

Graph:-

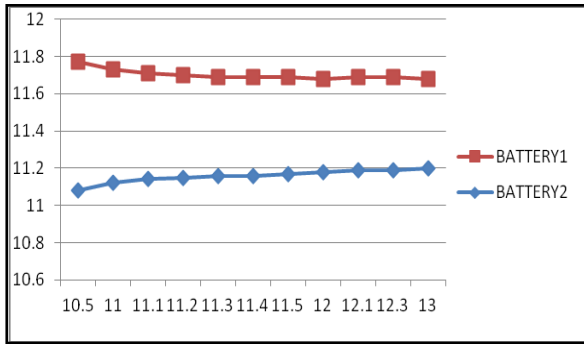


Fig. 13. Graph Of Experiment IV

Experiment: It was decided to take the full 24V from battery and not 12V so used regulator 7812.

Analysis: - By adding zener diode back to back at the secondary side, the gate voltage increased. The difference came to 100mV but after that both the battery voltage were decreasing. The consumption was about 30mA.

Readings:-

Table V

Time	Battery1	Battery2	Difference
0	8.45	12.13	3.68
5	10.03	11.95	1.92
10	10.21	11.93	1.72
15	10.47	11.93	1.46
20	10.77	11.92	1.15
25	10.98	11.92	0.94
30	11.1	11.91	0.81
35	11.12	11.91	0.79
40	11.15	11.91	0.76
45	11.17	11.9	0.73
50	11.2	11.9	0.7
55	11.23	11.9	0.67
60	11.25	11.89	0.64
65	11.25	11.89	0.64
70	11.26	11.89	0.63
75	11.28	11.88	0.6
80	11.29	11.87	0.58
85	11.3	11.86	0.56

90	11.32	11.85	0.53
95	11.32	11.85	0.53
100	11.33	11.85	0.52
105	11.34	11.84	0.5
110	11.34	11.84	0.5
115	11.35	11.84	0.49
120	11.36	11.83	0.47
125	11.37	11.8	0.43
130	11.37	11.8	0.43
135	11.37	11.8	0.43
140	11.37	11.8	0.43
145	11.37	11.8	0.43
150	11.37	11.8	0.43
155	11.37	11.8	0.43
160	11.37	11.8	0.43
165	11.37	11.8	0.43
170	11.38	11.8	0.42
175	11.38	11.8	0.42
180	11.38	11.8	0.42
185	11.38	11.8	0.42
190	11.38	11.8	0.42
195	11.38	11.8	0.42
200	11.39	11.79	0.4
205	11.39	11.79	0.4
210	11.39	11.79	0.4
215	11.39	11.78	0.39
220	11.39	11.78	0.39
225	11.39	11.78	0.39
230	11.4	11.77	0.37
235	11.4	11.77	0.37
240	11.4	11.77	0.37
245	11.4	11.77	0.37
250	11.4	11.77	0.37
255	11.4	11.76	0.36
260	11.4	11.76	0.36
265	11.4	11.76	0.36
270	11.41	11.75	0.34
275	11.41	11.75	0.34
280	11.41	11.75	0.34
285	11.41	11.75	0.34
290	11.41	11.75	0.34
295	11.41	11.75	0.34
300	11.42	11.74	0.32
305	11.42	11.74	0.32
310	11.42	11.74	0.32
315	11.42	11.74	0.32
320	11.42	11.74	0.32

325	11.42	11.74	0.32
330	11.42	11.74	0.32
335	11.42	11.74	0.32
340	11.42	11.74	0.32
345	11.43	11.73	0.3
350	11.43	11.73	0.3
355	11.43	11.73	0.3
360	11.43	11.72	0.29
365	11.43	11.72	0.29
370	11.43	11.72	0.29
375	11.43	11.72	0.29
380	11.43	11.71	0.28
385	11.43	11.71	0.28
390	11.43	11.71	0.28
395	11.43	11.71	0.28
400	11.44	11.7	0.26
After	11.39	11.46	0.07

Graph:-

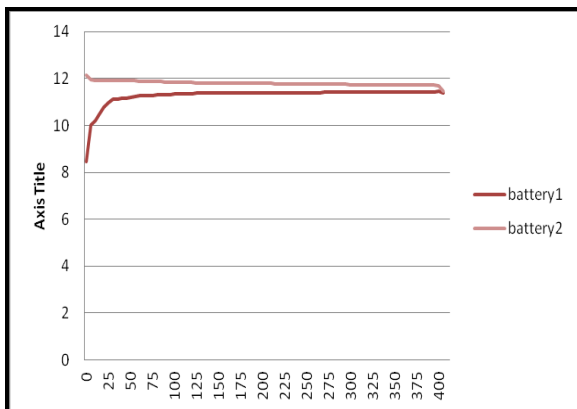


Fig. 14. Graph Of Experiment V

5. RESULT:

Result with using imported transformers

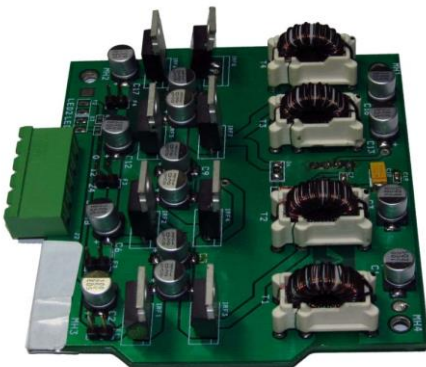


Fig. 15. Product under development

5. ADVANTAGES:-

- When there are more than 2 batteries in the series, it will equalize the voltage in them and ensure they do not have different voltages.
 - Protects your batteries from undercharging and overcharging, which reduces their working life.
 - Extends battery life and capacity appreciably.
 - Reduces the battery replacement, which again greatly reduces the cost.
 - Appropriate for Gel, Sealed and AGM Lead Acid batteries.
 - Extends battery life and run time.
- Prevents over and under charge due to battery imbalance

5. APPLICATION:-

- Battery Bank
- Electric Vehicles
- Solar Systems
- Generators
- Trucks & Buses etc

6. CONCLUSION

We successfully equalize battery from the above methods, in iron core transformer the difference between the two battery readings came to 100mV and less than that and the consumption is up to 30mA and other future improvement also carried out continuously on this project.

7. ACKNOWLEDGMENT

Thanks to Agv system pvt Ltd and Mr. Harshvardhan Thakkar for giving me chance to work on this and guide throughout all project work and giving me confidence to apply knowledge practically project during implant training and Shree L R Tiwari College Of Engineering to giving me all support.

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Biogas Compression and Bottling: A solution to Energy Crises

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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 is one of the important renewable energy sources which would cope up to cater for heat and power. 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.

Keywords

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. BIOGAS POTENTIAL

Biogas is primarily methane that is generated from anaerobic digestion of organic waste by micro-organisms. It is relatively

simple and produces a fuel from waste, while technically biogas can be produced from any type of organic waste. This waste could comprise agricultural and crop waste, human waste and animal waste (cow dung for instance) with a calorific value of about 5000Kcal/m³. Biogas is an excellent fuel for heating purposes as well as for generating electricity [10]. It is estimated that India can produce power of about 17,000 MW using biogas. This is over 10% of the total electricity installed capacity in India. Biogas production has been quite dominant in India at household and community levels (especially in rural areas). In villages especially, thousands of small biogas plants use the cattle waste and provide biogas for household heating and cooking. It is estimated that over 1.8 million such biogas plants have been installed all over India [10].

Table 1. Biogas production from different substrates.

Substrate	TS	Biogas production		Methane concentration
	[%]	[m3/ ton TS]	[m3/ ton wet weight]	[%]
Waste water treatment plants	5	300	15	65
Fish waste	42	1279	537	71
Straw	78	265	207	70
Sorted food waste	33	618	204	63
Liquid cattle waste	9	244	22	65
Potato haulm	15	453	68	56
Slaughter house waste	16	575	92	63
Liquid pig slurry	8	325	26	65

3. 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. Manifold block

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. 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.

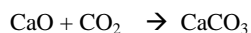
4. SCRUBBING UNIT

The purification of biogas is carried out in the scrubber unit which consists of the following sub units;

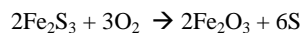
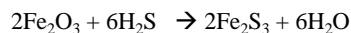
1. CO₂ separation unit.
2. H₂S separation unit.
3. Moisture separation unit.

The function of each unit is as follows,

CO₂ separation Unit - The raw biogas is first passed through a CO₂ separation unit. Limestone crystals are used to remove carbon dioxide. Limestone reacts with carbon dioxide to form calcium carbonate. The chemical reaction is as follows;



H₂S separation Unit – After CO₂ removal, the biogas is passed through a H₂S separation unit. Hydrogen sulphide is removed by using catalyst iron oxide in the form of oxidised steel wool or iron turning from any workshop. Once biogas comes in contact with this wool, iron oxide is converted into elemental sulphur. The chemical equations are as follows; [5]



Moisture separation Unit – Finally the biogas is passed through a moisture separation unit. Here silica gel crystals are proposed to separate moisture. Silica gel crystals should be replaced after a specific time according to the rate of purification. The capacities of the scrubbing units are decided according to the size of the biogas plant. Now the out coming biogas from the scrubbing unit is 98% pure. Further, if the purification is required the multiple number of scrubbing units can be used. Fig. 2 depicts the actual assembly of one of the biogas scrubbing unit [7]



Fig 2. Biogas scrubbing unit.

It consists of one inlet for raw biogas to enter the unit and one outlet for clean biogas. The glass jar is tightly closed with a lid and hose attachment in order to prevent gas leakage. Likewise two more scrubbing units are connected in series for carbon dioxide and moisture separation. Finally the clean biogas from scrubbing unit is allowed to pass through a compressor.

5. COMPRESSOR UNIT

Pure methane is then compressed and stored in small cylinders or bottles which make it easy to transport at the point of application. For the purpose of biogas compression two types of compressors are suggested;

1. Automatic Biogas Compressor.
2. Manual OR Hand Compressor.

Automatic biogas compressors are readily available in the local market. They are available in the pressure range of 2.5 bars up to 200 bars. So depending on the capacity of biogas plant and storage systems appropriate compressor should be chosen. On the other hand if the capacity of biogas plant & storage systems is small a suitable hand compressor can be used. The hand compressor works on the principle of suction and compression similar to that of a bicycle pump.



Fig. 3 Compressor unit assembly

6. EXPERIMENTAL RESULTS

Once the 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 litres per minute

7. OIL SAVINGS

Percentage of oil savings is calculated by running an IC engine with the help of purified and compressed biogas. Loading arrangement of engine is shown in figure below,



Fig. 4 Loading arrangement.

The engine is operated under three different cases,

1. Oil only
2. Oil + raw biogas
3. Oil + purified & compressed biogas.

Percentage of oil savings was calculated in each condition and graphical results were plotted as follows,

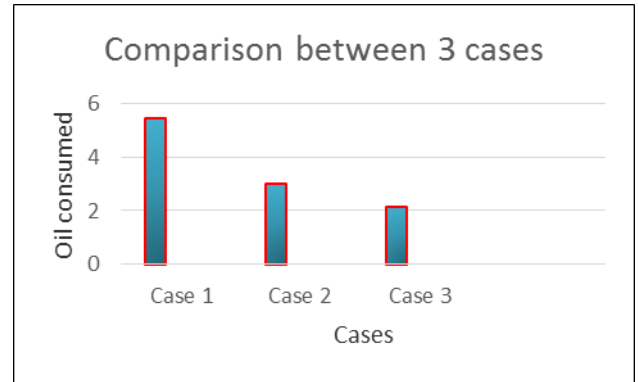


Fig. 5 Oil savings Bar chart

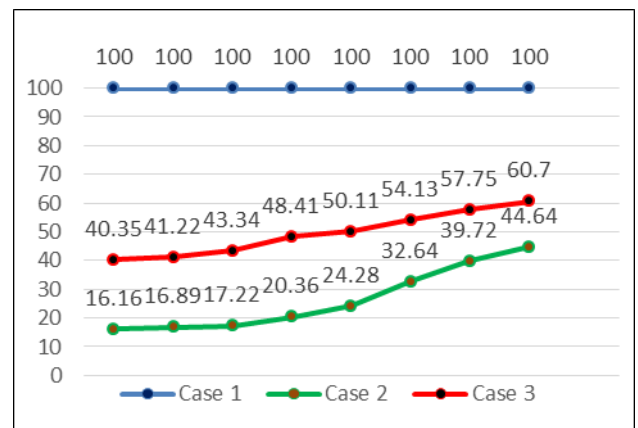


Fig. 6 Line graph for oil savings.

8. 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. Testing of gas consumption has been carried out by running IC engine. It is also observed that with raw biogas oil replacement takes place from 16.6% to 44.64% , whereas the purified and bottled biogas could successfully replace from 40.35% to 60.7%. Finally, therefore it is very clear that purification and bottling of biogas will ease mobilization of gas as an energy source while improving the efficiency. Thus, it is felt that commercial application of bottling of bio energy could led to revolutionarize use of renewable energy and could reduce the foreign exchange pressure.

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MODELLING AND SIMULATION OF DYNAMIC VOLTAGE RESTORER

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ABSTRACT

Power quality is one of major concerns in the present era. It has become important, especially, with the introduction of sophisticated devices, whose performance is very sensitive to the quality of power supply. Power quality problem is an occurrence manifested as a nonstandard voltage, current or frequency that results in a failure of end use equipment's. One of the major problems dealt here is the power sag.

To solve this problem, custom power devices are used. One of those devices is the Dynamic Voltage Restorer (DVR), which is the most efficient and effective modern custom power device used in power distribution networks. Its appeal includes lower cost, smaller size, and its fast dynamic response to the disturbance. This paper presents modeling, analysis and simulation of a Dynamic Voltage Restorer (DVR) using MATLAB.

General Terms

Power Quality Problems, Custom Power Devices, Storage Devices.

Keywords

DVR- serves only the missing part of the power in line.

1. INTRODUCTION

Nowadays, modern industrial devices are mostly based on electronic devices such as programmable logic controllers and electronic drives. The electronic devices are very sensitive to disturbances and become less tolerant to power quality problems such as voltage sags, swells and harmonics.

Voltage support at a load can be achieved by reactive power injection at the load point of common coupling. The common method for this is to install mechanically switched shunt capacitors in the primary terminal of the distribution transformer.

The mechanical switching may be on a schedule, via signals from a supervisory control and data acquisition (SCADA) system, with some timing schedule, or with no switching at all. The disadvantage is that, high speed transients cannot be compensated. Some sag is not corrected within the limited time frame of mechanical switching devices. Transformer taps may be used, but tap changing under load is costly. Another power electronic solution to the voltage regulation is the use of a dynamic voltage restorer (DVR). DVRs are a class of

custom power devices for providing reliable distribution power quality. They employ a series of voltage boost technology using solid state switches for compensating voltage sags/swells. The DVR applications are mainly for sensitive loads that may be drastically affected by fluctuations in system voltage.

2. POWER QUALITY PROBLEMS

2.1 Sources and Effect of Power Quality Problems.

1. Voltage dip: A voltage dip is used to refer to short-term reduction in voltage of less than half a second.
2. Voltage sag: Voltage sags can occur at any instant of time, with amplitudes ranging from 10 – 90% and a duration lasting for half a cycle to one minute.
3. Voltage swell: Voltage swell is defined as an increase in rms voltage or current at the power frequency for durations from 0.5 cycles to 1 min.
4. Voltage 'spikes', 'impulses' or 'surges': These are terms used to describe abrupt, very brief increases in voltage value.
5. Voltage transients: They are temporary, undesirable voltages that appear on the power supply line. Transients are high over-voltage disturbances (up to 20KV) that last for a very short time.
6. Harmonics: The fundamental frequency of the AC electric power distribution system is 50 Hz. A harmonic frequency is any sinusoidal frequency, which is a multiple of the fundamental frequency. Harmonic frequencies can be even or odd multiples of the sinusoidal fundamental frequency.
7. Flickers: Visual irritation and introduction of many harmonic components in the supply power and their associated ill effects.

2.2 Solution to Power Quality Problems:

There are two approaches to the mitigation of power quality problems. The solution to the power quality can be done from customer side or from utility side. First approach is called load conditioning, which ensures that the equipment is less sensitive to power disturbances, allowing the operation even under significant voltage distortion. The other solution is to install line conditioning systems that suppress or counteracts the power system disturbances.; some of the effective and economic measures can be identified as following: Lightning

and Surge Arresters: Arresters are designed for lightening protection of transformers, but are not sufficiently voltage limiting for protecting sensitive electronic control circuits from voltage surges.

2.2.1 Thyristor Based Static Switches:

The static switch is a versatile device for switching a new element into the circuit when the voltage support is needed. It has a dynamic response time of about one cycle. To correct quickly for voltage spikes, sags or interruptions, the static switch can be used to switch one or more of devices such as capacitor, filter, alternate power line, energy storage systems etc. The static switch can be used in the alternate power line applications. Both schemes are implemented preferable with voltage source PWM inverters, with a dc bus having a reactive element such as a capacitor.

2.2.2 Energy Storage System

Storage systems can be used to protect sensitive production equipment's from shutdowns caused by voltage sags or momentary interruptions. These are usually DC storage systems such as UPS, batteries, superconducting magnet energy storage (SMES), storage capacitors or even fly wheels driving DC generators. The output of these devices can be supplied to the system through an inverter on a momentary basis by a fast acting electronic switch. Though there are many different methods to mitigate voltage sags and swells, but the use of a custom Power device is considered to be the most efficient method. For example Flexible AC Transmission Systems (FACTS). Just as FACTS improves the power transfer capabilities and stability margins, custom power makes sure customers get pre-specified quality and reliability of supply. There are many types of Custom Power devices. Some of these devices include: Active Power Filters (APF), Battery Energy Storage Systems (BESS), Distribution STATic synchronous COMPensators (DSTATCOM), Distribution Series Capacitors (DSC), Dynamic Voltage Restorer (DVR), Surge Arresters (SA), Super conducting Magnetic Energy Systems (SMES), Static Electronic Tap Changers (SETC), Solid-State Transfer Switches (SSTS), Solid State Fault Current Limiter (SSFCL), Static Var Compensator (SVC), Thyristor Switched Capacitors (TSC), and Uninterruptible Power Supplies (UPS).

3. CUSTOM POWER DEVICES

3.1 Introduction

Among the power quality problems (sags, swells, harmonics...) voltage sags are the most severe disturbances. In order to overcome these problems the concept of custom power devices is used,

1. Distribution STATic synchronous COMPensator
2. Distribution Series Capacitors (DSC)
3. Super conducting Magnetic Energy Systems (SMES)
4. Solid-State Transfer Switches (SSTS)
5. Dynamic Voltage Restorer (DVR)

3.2 Distribution STATic synchronous COMPensators (DSTATCOM)

A DSTATCom is a custom power device which is utilized to eliminate the harmonics from the source currents and also balance them in addition to providing reactive power

compensation to improve power factor or regulate the load bus voltage.

3.3 Dynamic Voltage Restorer (DVR)

Dynamic Voltage Restorer (DVR), which is the most efficient and effective modern custom power device used in power distribution networks. DVR is a recently proposed series connected solid state device that injects voltage into the system in order to regulate the load side voltage. It is normally installed in a distribution system between the supply and the critical load feeder at the point of common coupling (PCC). Other than voltage sags and swells compensation, DVR can also added other features like: line voltage harmonics compensation, reduction of transients in voltage and fault current limitations.

3.4 Solid-State Transfer Switch (SSTS)

SSTS is also custom power device which can be considered as the combination of DSTATCom and DVR.

4. DYNAMIC VOLTAGE RESTORER (DVR)

4.1 Introduction

Among the power quality problems (sags, swells, harmonics...) voltage sags are the most severe disturbances. In order to overcome these problems the concept of custom power devices is introduced recently. One of those devices is the Dynamic Voltage Restorer (DVR), which is the most efficient and effective modern custom power device used in power distribution networks. DVR is a recently proposed series connected solid state device that injects voltage into the system in order to regulate the load side voltage. It is normally installed in a distribution system between the supply and the critical load feeder at the point of common coupling (PCC). Other than voltage sags and swells compensation, DVR can also added other features like: line voltage harmonics compensation, reduction of transients in voltage and fault current limitations.

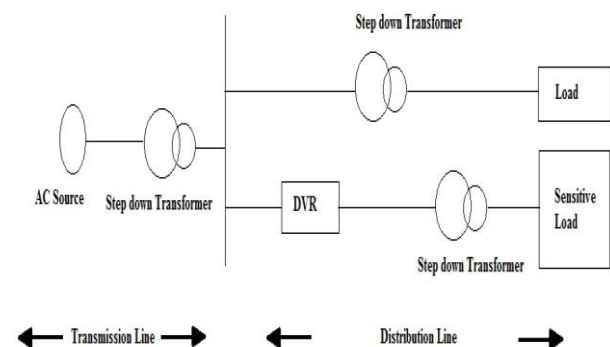


Fig 1: Location of DVR.

(Source: modelling and simulation of Dynamic Voltage Restorer by Amit Kumar Jena)

4.2 Principle of DVR Operation.

A DVR is a solid state power electronics switching device consisting of either GTO or IGBT, a capacitor bank as an energy storage device and injection transformer. It is linked in series between a distribution system and a load that shown in fig 4.2. The basic idea of the DVR is to inject a controlled voltage generated by a forced commuted converter in a series

to the bus voltage by means of an injecting transformer. A DC or AC inverter regulates this voltage by sinusoidal PWM technique. DVR injects only a small voltage to compensate for the voltage drop of the injection transformer and device losses.

Note that DVR is capable of generating and absorbing only reactive power but the active power injection of the device must be provided by external energy source and energy storage system.

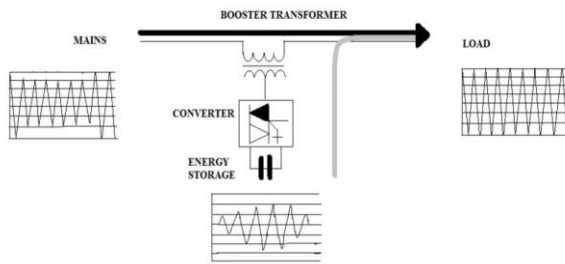


Fig 2: Principle of DVR.

(Source: power quality improvement of distribution networks using Dynamic Voltage Restorer by Amandeep Bangar)

4.3 Basic Configuration of DVR

The general configuration of the DVR consists of:

1. An Injection/ Booster transformer
2. A Harmonic filter
3. Storage Devices
4. A Voltage Source Converter (VSC)
5. DC charging circuit
6. A Control and Protection system

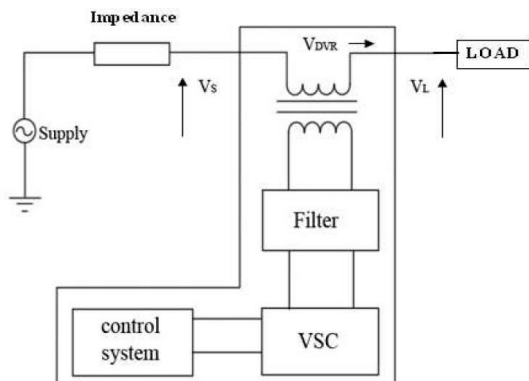


Fig 3: Schematic diagram of DVR

(Source: modelling and simulation of Dynamic Voltage Restorer by Amit Kumar Jena)

4.3.1 Injection/ Booster transformer

The Injection / Booster transformer is a specially designed transformer that attempts to limit the coupling of noise and transient energy from the primary side to the secondary side. Its main tasks are: It connects the DVR to the distribution

network via the HV-windings and transforms and couples the injected compensating voltages generated by the voltage source converters to the incoming supply voltage. In addition, the Injection / Booster transformer serves the purpose of isolating the load from the system (VSC and control mechanism).

4.3.2 Harmonic Filter

The main task of harmonic filter is to keep the harmonic voltage content generated by the VSC to the permissible level.

4.3.3 Voltage Source Converter

A VSC is a power electronic system consists of a storage device and switching devices, which can generate a sinusoidal voltage at any required frequency, magnitude, and phase angle. In the DVR application, the VSC is used to temporarily replace the supply voltage or to generate the part of the supply voltage which is missing. There are four main types of switching devices: Metal Oxide Semiconductor Field Effect Transistors (MOSFET), Gate Turn-Off thyristors (GTO), Insulated Gate Bipolar Transistors (IGBT), and Integrated Gate Commutated Thyristors (IGCT). Each type has its own benefits and drawbacks. The IGCT is a recent compact device with enhanced performance and reliability that allows building VSC with very large power ratings. Because of the highly sophisticated converter design with IGCTs, the DVR can compensate dips which are beyond the capability of the past DVRs using conventional devices. The purpose of storage devices is to supply the necessary energy to the VSC via a dc link for the generation of injected voltages. The different kinds of energy storage devices are Superconductive magnetic energy storage (SMES), batteries and capacitance.

4.3.4 DC Charging Circuit

The dc charging circuit has two main tasks. The first task is to charge the energy source after a sag compensation event. The second task is to maintain dc link voltage at the nominal dc link voltage.

4.3.5 Control and Protection

The control mechanism of the general configuration typically consists of hardware with programmable logic. All protective functions of the DVR should be implemented in the software. Differential current protection of the transformer, or short circuit current on the customer load side are only two examples of many protection functions possibility.

4.4 Operating Modes of DVR

The basic function of the DVR is to inject a dynamically controlled voltage V_{DVR} generated by a forced commutated converter in series to the bus voltage by means of a booster transformer. The momentary amplitudes of the three injected phase voltages are controlled such as to eliminate any detrimental effects of a bus fault to the load voltage V_L . This means that any differential voltages caused by transient disturbances in the ac feeder will be compensated by an equivalent voltage generated by the converter and injected on the medium voltage level through the booster transformer. The DVR has three modes of operation which are: protection mode, standby mode, Injection / boost mode.

4.4.1 Protection Mode

If the over current on the load side exceeds a permissible limit due to short circuit on the load or large inrush current, the DVR will be isolated from the systems by using the bypass switches (S2 and S3 will open) and supplying another path for current (S1 will be closed).

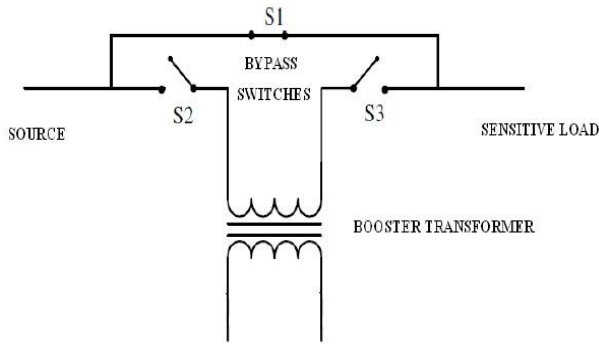


Fig 4: Protection mode

(Source: modelling and simulation of Dynamic Voltage Restorer by Amit Kumar Jena)

4.4.2 Stand-By Mode ($VDVR=0$)

In the standby mode the booster transformer's low voltage winding is shorted through the converter. No switching of semiconductors occurs in this mode of operation and the full load current will pass through the primary.

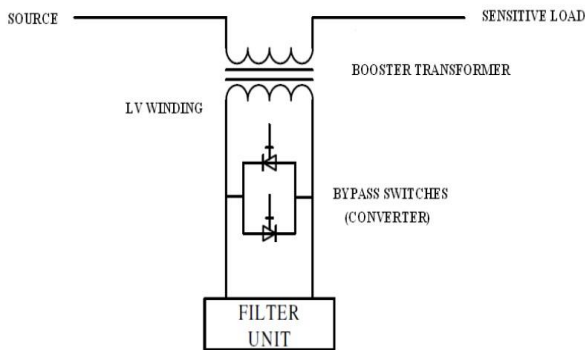


Fig 5: Stand-By mode

(Source: modelling and simulation of Dynamic Voltage Restorer by Amit Kumar Jena)

4.4.3 Injection/Boost Mode ($VDVR>0$)

In the Injection/Boost mode the DVR is injecting a compensating voltage through the booster transformer due to the detection of a disturbance in the supply voltage.

4.5 Voltage Injection Methods of DVR

Voltage injection or compensation methods by means of a DVR depend upon the limiting factors such as; DVR power ratings, various conditions of load, and different types of voltage sags. Some loads are sensitive towards phase angle jump and some are sensitive towards change in magnitude and others are tolerant to these. Therefore the controls strategies depend upon the type of load characteristics. There are four different methods of DVR voltage injection which are

1. Pre-sag compensation method
2. In-phase compensation method
3. In-phase advanced compensation method
4. Voltage tolerance method with minimum energy injection.

5. RESULT AND CONCLUSION

This paper has presented the power quality problems such as voltage dips, swells, distortions and harmonics. Compensation techniques of custom power electronic devices DVR was presented. The design and applications of DVR for voltage sags and comprehensive results were presented. A PWM-based control scheme was implemented. As opposed to fundamental frequency switching schemes already available in the MATLAB/ SIMULINK, this PWM control scheme only requires voltage measurements. This characteristic makes it ideally suitable for low-voltage custom power applications.

6. ACKNOWLEDGMENTS

Our sincere thanks to Prof. Bhushan Save, H.O.D. of Electrical department, VIVA Institute of Technology and our project co-ordinator Prof. Pratik Mahale for their immense help and support during our course.

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Series Connected Forward-Flyback Converter For High Step-Up Power Conversion

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ABSTRACT

Recently, small-scale and highly-distributed photovoltaic power sources have been researched for the high generation efficiency even under severe partial shading conditions. However, power conditioning systems for the sources needs high step-up voltage gain due to the low output of the generating sources. This paper presents a newly-suggested high step-up topology employing a Series-connected Forward-Fly-Back (SFFB) converter, which has a series-connected output for high boosting voltage-transfer gain. SFFB is a hybrid type of forward and fly-back converter, sharing the transformer for increasing the utilization factor. By stacking the outputs of them, extremely high voltage gain can be obtained with small volume and high efficiency even with a galvanic isolation. The separated secondary windings in low turn-ratio reduce the voltage stress of the secondary rectifiers, contributing to achievement of high efficiency. The single-ended scheme is also beneficial to the cost competitiveness. In this paper, the operation principle and design guidelines of the proposed scheme are presented, along with the performance analysis and numerical simulation. Also, a 100 W SFFB DC/DC converter hardware prototype has been implemented for experimental verification of the proposed converter topology.

Index Terms—DC-DC power converters, forward-fly-back converter, photovoltaic systems, power conditioning.

Keywords

Forward converter, Fly-back converter, MOSFET

1. INTRODUCTION

The solar power generation has some prominent advantages in the installation condition and manufacturing cost compared to other sustainable renewable energy sources. Solar array can be installed on top of commercial buildings or residential houses in urban area. Sometimes, specially manufactured arrays even occupy no extra spaces for installation such as building-integrated photovoltaic systems. These features have brought about much concern with small-scale solar power generation systems as a highly distributed power sources. The small-scale generator has been developed under a modularizing concept because the power capacity

extension of the system is quite easy by standardized photovoltaic modules compared to some large-scale centralized PV power generation systems. From the perspective of the small-scale power systems, some accommodated schemes such as “ac-module” and “module-integrated converter” have emerged. AC module is a PV module including a small ac inverter with no external dc connector, which is the smallest and most complete system as a kind of solar energy harvesters. Module-integrated converter is more a general concept including a few series/parallel-connected dc-dc converter modules with a centralized inverter.

However, with the advent of extremely distributed small-scale energy sources that have high-power generation efficiency even with partial shading occurrence, extremely high voltage-boost gain is required from the power conditioner design. Since the electrical characteristic of the typical small-scale solar array is low-voltage output, the high step-up dc-dc converter is necessary for the grid-connected power conditioning systems. For example, many PV panels of small-capacity distributed power generation systems have less than dozens of voltage output, calling for boosting voltage to higher than 300 V for grid connection.

Though there are some existing topologies applicable to such high voltage-boost power converters, such as soft-switching converters where a coupled inductor is applied or switched-capacitor manner, they have poor reliability due to the absence of isolation. On the other hand, an isolation type converter has an advantage of the safety and system reliability, in spite of the negative potential of the massive volume or the high power conversion efficiency. Therefore, many emerging applications including renewable energy conditioner demands the isolation requirement in their design specification.

For insulation, the use of a magnetic-coupled transformer is essential. However, this requires a reset circuit that has disadvantages in performance and cost, resulting in the difficulty of circuit design. This reset also has loading effect by its impedance, which increases the voltage stresses of the switching devices and the turn ratio of the main transformer.

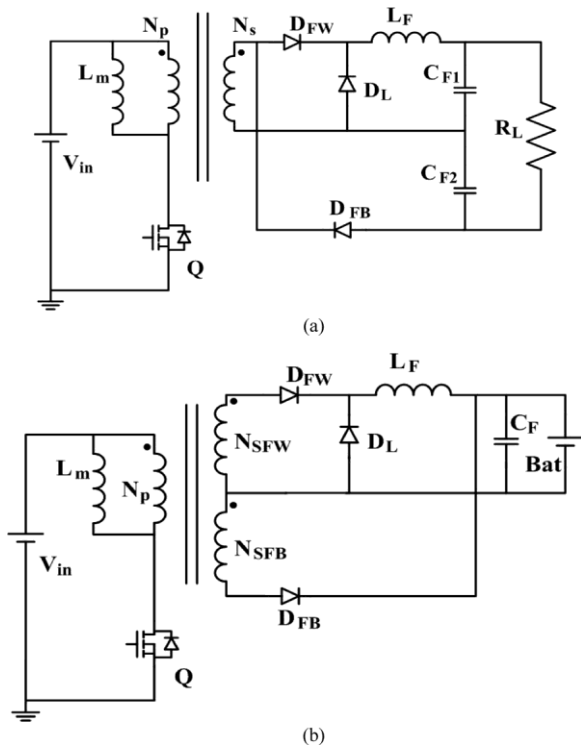


Fig. 1. Conventional forward-fly-back power converters. (a) Double-winding forward-fly-back converter. (b) Triple-winding parallel-output forward-fly-back converter.

Conventional re- search has suggested some solutions for high-power high-boost applications; however, still there are material cost and design complexity issues for the optimal design.

In this paper, an output-series forward-fly-back (SFFB) dc-dc switching converter has been suggested, which serially connects the secondary outputs of a multi-winding forward-fly-back converter in order to solve these isolation-type disadvantages. Forward-fly-back converters deliver the required energy to the load through a transformer no matter when the main switch turns ON or OFF, holding an advantage in terms of supplying more power to the load than any other single-ended isolation schemes does at the same volume. Of course, the SFFB converter has a single-ended scheme, which contributes to the cost competitiveness in industry market. Fig. 1 shows some example of the conventional SFFB converter circuit diagrams.

However, the conventional forward-fly-back converters are confined to power factor collection circuit applications where multiple outputs or paralleled outputs are used. The dc-dc converter resolved the engineering problems of large voltage enhancement issue such as manufacturing cost and low reliability, which had been pointed out as a problem of the various conventional circuit topologies. At the same time, the proposed scheme improves the weaknesses of insulation-type converters, such as low efficiency, big volume, and high cost, by utilizing the structure of the forward-fly-back converter.

Technically, the suggested high step-up converter has a reduced voltage rating of rectifying diodes by separating

secondary winding. The extremely high enhancement gain is also separated by the attenuated boost conversion of forward converter and fly-back converter; thus, the device stress is reduced and the power efficiency is improved. Also, a utilization factor of the transformer is highly enhanced up by continuous power delivery from primary to secondary which contributes to the reduced volume of the forward-fly-back converter.

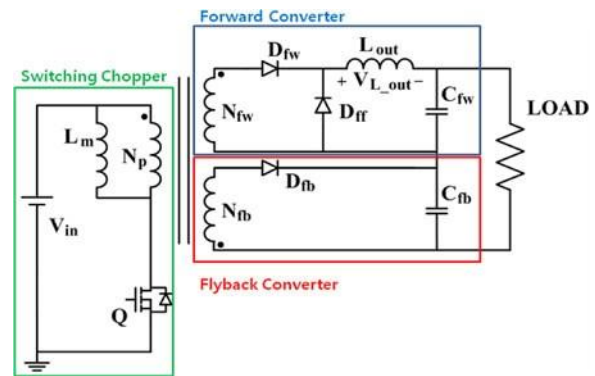


Fig. 2. Circuit diagram of the proposed SFFB converter.

2. OPERATING PRINCIPLES

The proposed converter has four operating mode as shown in Figs. 3 and 4, according to the switching state of switching circuits.

Mode 1: Current flows to the magnetizing inductance and the primary winding N_p as a result of turning ON switch Q . The primary current is transferred to the secondary N_{fw} coil of the forward converter via the magnetic linkage. Then, 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} . Since a fly-back diode D_{fb} is reverse biased, the output capacitor provides the load current during this mode.

Mode 2: When switch Q is turned OFF, a forward diode D_{fw} is reverse biased and the energy stored in L_{out} is transferred to the load by the freewheeling current via D_{ff} , and at the same time, the energy magnetically stored at L_m is also supplied to load through D_{fb} of the fly-back converter. Thus, all the freewheeling current in magnetic devices decreases linearly.

Mode 3: The forward converter starts to operate in DCM when all the energy in L_{out} is discharged, and then a freewheeling diode D_{ff} is reverse biased. The energy only stored in L_m is supplied to load through the fly-back converter.

Mode 4: The transformer of the forward-fly-back converter is demagnetized completely during this period and the output

voltage is maintained by the discharge of the output capacitors C_{fw} and C_{fb}. All the rectifier diodes are reverse biased.

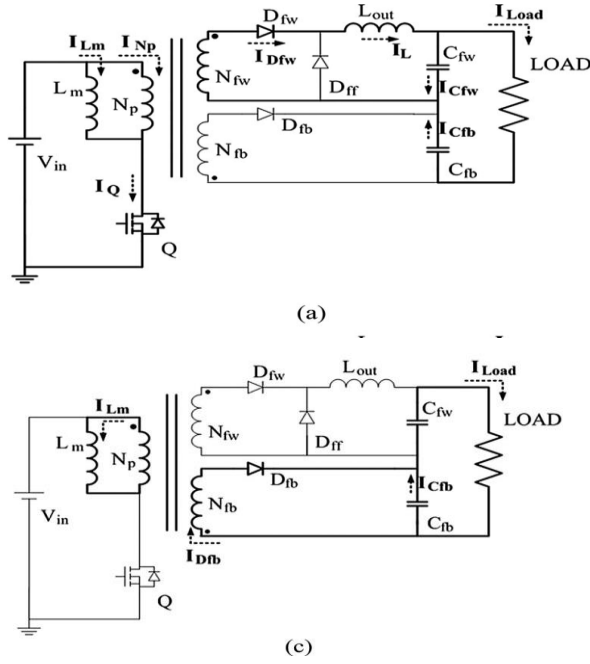


Fig.3. Different Operating Modes

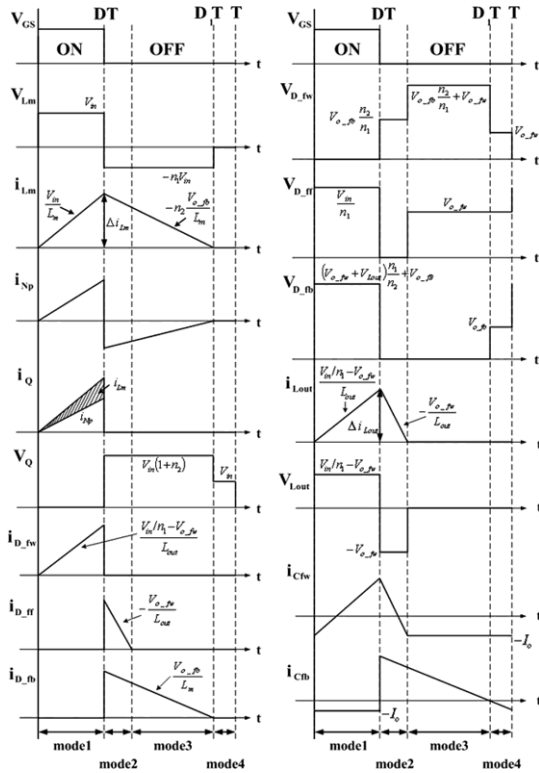
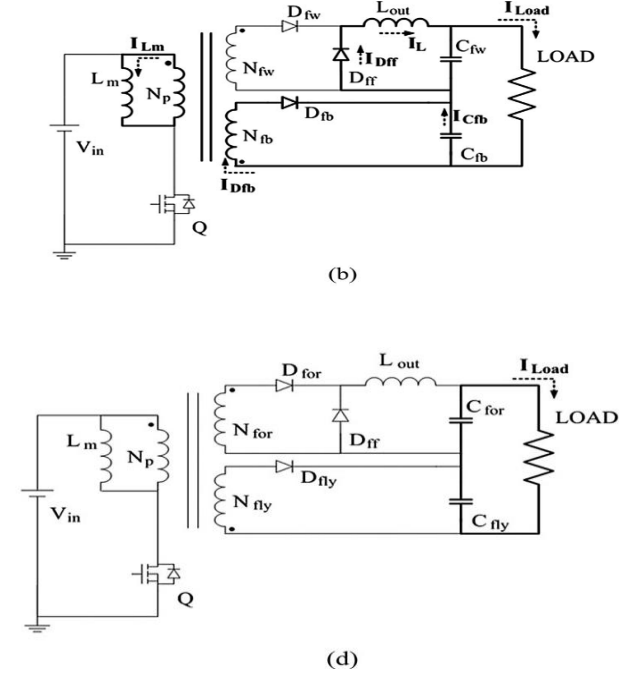


Fig. 4. Waveforms of the proposed converter.



3. ACKNOWLEDGEMENT

Our sincere thanks to Prof. Bhushan Save, H.O.D of Electrical department, VIVA Institute of Technology and our project coordinator Prof. Pratik Mahale for their immense help and support during our course.

4. CONCLUSION

In this paper, a pre-regulating dc-dc converter of an SFFB converter for multistage PV power conditioning systems has been proposed. The single-ended forward-fly-back 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, low-current output has a filter inductor under DCM operation that contributes to better performances by eliminating reverse recovery of the rectifying diodes.

The operation principle and the design-oriented analysis of the forward-fly-back converter have been presented through obtaining the optimal load-sharing ratio from the power loss analysis. The experimental result with a 100-W hardware prototype is also included to show that the proposed converter has a high efficiency greater than 92% with isolation from 20–40-V in-put range to 340-V output. Loss breakdown and temperature distribution are also included in this paper.

As a future work, it will be worthwhile to obtain the soft-switching operation in extremely step-up applications for the more various specifications such as high-frequency applications, high/low voltage/current applications, etc.

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Spyware Detection Using Data Mining

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ABSTRACT

Malicious programs have been a serious threat for confidentiality, integrity and availability of a system. A new type of malicious program has gained momentum called Spyware. Spyware are more dangerous for confidentiality of private data, they may collect the data and send it to third party. Traditional techniques have not performed well in detecting Spyware. Traditionally two approaches Signature-based Detection and Heuristic-based Detection have performed well against known Spyware but have not been proven to be successful at detecting new spyware. We intend to use a different Spyware detection approach by using Data Mining technologies where binary features are extracted called n-grams, from both spyware and legitimate software and apply a supervised learning algorithm to train classifiers that are able to classify unknown binaries by analyzing extracted n-grams.

General Terms

Data Mining, Spyware, Naïve Bayes Classification Algorithm.

Keywords

Malicious Code, Feature Extraction, N-Gram, ARFF (Attribute Relation File Format), CFBE (Common Feature-based Extraction), FBFE (Frequency-based Feature Extraction).

1. INTRODUCTION

Programs that have the potential to threaten the privacy and security of a system are spywares. They collect information from the user and send it to a third party. They are capable of storing personal details of the user, authentication credentials, saving screenshots, taking images and stealing the user files. Often, spyware is difficult to remove without detailed knowledge of how it works or by taking drastic measures such as wiping the system clean and starting over. In many cases, verifying the integrity of the system requires the operating system, patches, and applications to be reinstalled. These difficulties, combined with the efforts necessary to recover user data, can take a lot of time. Researchers doubt if spywares can take complete control over the system in near future. Another definition of spyware is given as, "Any software that monitors user behavior, or gathers information about the user without adequate notice, consent, or control from the user" [1]. The major difference between the definitions involves user consent, which we regard as an important concept when it comes to understanding the difference between spyware and other malicious software [3]. This paper presents detection of spyware using data mining approach. Here binary feature extraction takes place from executable files, which is then followed by feature reduction

process so that it can be used as training set to generate classifiers. This method is unique amongst the traditional signature-based and heuristic-based methods. Hence, the generated classifiers classify new and previously unseen binaries as benign files or spywares. We use metrics like TP, TN, FP and FN as evaluation metrics to analyze the accuracy.

2. DEFINITION

Federal Trade Commission Staff Report in USA defines spyware as:

"Software that aids in gathering information about a person or organization without their knowledge and that may send such information to another entity without the consumer's consent, or that influences some control over a computer without the consumer's knowledge."[4]

3. BACKGROUND

3.1 History

The term spyware first appeared in a Usenet post on October 16, 1995 about a piece of hardware that could be used for espionage. In 2001, the use of data mining was investigated as an approach for detecting malware and this attempt attracted the attention of many researchers. Since then, several experiments have been performed to investigate the detection of traditional malicious software such as viruses, worms, and so forth, by using data mining technologies [2].

3.2 How Spyware is harmful?

The sensitive information collected by spyware often includes authentication credentials that may be used for future access to the infected system. Most people often use the same login details for many different systems, so these stolen credentials may be used to access other systems not yet infected. Once access is gained, additional information theft or malware installation can take place. Another way spyware puts systems at future risk is by installing backdoor access mechanisms. These secret doors give the malware operator access to control the system and to command the system to download and run many arbitrary applications. Attackers can build vast collections of compromised systems without originally compromising a single system [3].

3.3 Existing Spyware Detection Techniques

Traditional techniques for spyware detection come under two categories: Signature-based detection and Heuristic-based detection.

Signature based detection:

Signature based methods maintain a database consisting of unique strings or specific features called Signatures. For detection it extracts specific features from binaries and compares it with existing database. This method is not good enough to detect new and previously unseen spyware executables.

Heuristic based detection:

In Heuristics based detection, Generic Signature is used to locate variations of viruses. Many viruses are re-created and make themselves known by a variety of names, which essentially come from the same family (or classification).

4. DATA MINING BASED APPROACH

It is seen that data mining based malicious approach has proven to be successful in the detection of viruses and worms. Many different learning algorithms can be used for classifying spyware and benign files. Here in this paper, we use Naïve Bayes' Classifier algorithm for generating a classifier. The algorithm is evaluated by performing cross-validation tests so as to ensure that the generated classifiers are not tested on the training data. According to the classifier-response the relevant confusion matrices can be created.

The elements of the matrix are the following metrics: True Positives (TP), False Positives (FP), True Negatives (TN) and False Negatives (FN) [6].

Table 1. Evaluation Metrics [6]

Metric	Abbreviations	Meaning
True Positives	TP	It is number of correctly identified benign files.
False Positives	FP	It is number of wrongly identified Spyware executables.
True Negatives	TN	It is number of correctly identified Spyware executables.
False Negatives	FN	It is number of wrongly identified benign files.

4.1 Performance Evaluation

Evaluation of the performance of each classifier is done using the true positive rate, false positive rate and overall accuracy. They are defined as follows [6]:

True Positive Rate (TPR): It is the percentage of correctly Identified Benign files.

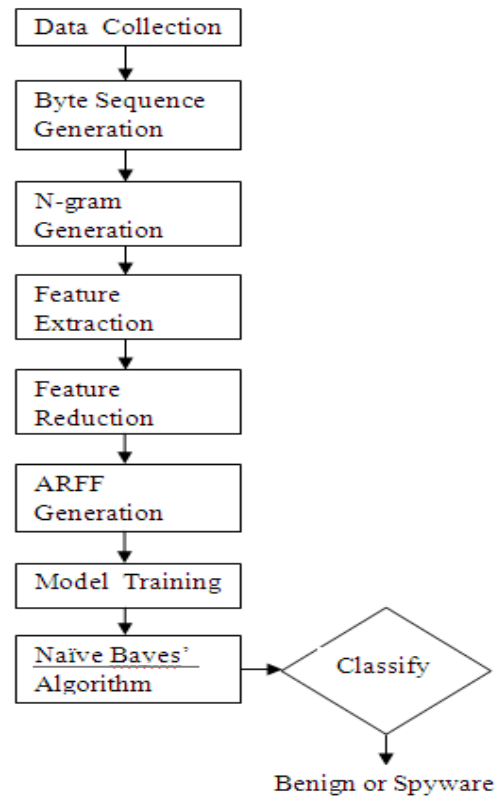
False Positive Rate (FPR): It is the percentage of wrongly Identified Spyware executables.

Overall Accuracy (ACC): It is the percentage of correctly Identified Spyware executables.

$$TPR = \frac{TP}{TP + FN}$$

$$FPR = \frac{FP}{TN + FP}$$

$$ACC = \frac{TP + TN}{TP + TN + FP + FN}$$

5. WORK FLOW**Fig 1: System View [5]****6. STEPS TO BE UNDERTAKEN**

1. Data Collection
2. Byte Sequence Generation
3. N-gram Generation
4. Feature Extraction
5. Feature Reduction
6. ARFF Generation
7. Model Training

6.1 STEPS IN DETAIL

The steps are described below in a detailed manner for easy understanding.

6.1.1 Data Collection $(TP / (TP + FN))$

The data set consists of two classes of binary files[2]:

- Benign files
- Spyware files $(FP / (TN + FP))$

These files were collected from various sources like www.spywareguide.com [12] and www.download.com [11].

6.1.2 Byte Sequence Generation

In this process file conversion from binary to byte sequence is carried out in each class. Byte sequences are used as dataset features by us in this paper and these byte sequences represent fragments of machine code from an executable file. Here we use “xxd”, which is an UNIX-based utility and is used for generating hexadecimal dumps of the binary files. And from these hexadecimal dumps byte sequences can be extracted, in terms of n-grams of different sizes [2].

6.1.3 N-gram Generation

Here in this process, byte sequences are converted into “n” of fixed size. An n-gram is a sequence of n elements. This step also makes sure that each line consists of one n-gram and single line length is equal to the size of “n” [2].

6.1.4 Feature Extraction

In this step, we extract the features by using two different approaches: the Common Feature-based Extraction (CFBE) and Frequency-based Feature Extraction (FBFE). The purpose behind employing two approaches is evaluation of two different techniques that use different types of data representation, i.e., the feature occurrence and the frequency of a feature. Both these methods are used to obtain Reduced Feature Sets (RFSs) which are then used in generating the ARFF files [2].

6.1.5 Feature Reduction

The common features gained from all files were sorted in CFBE. In one class, only one representation of each feature was considered. CFBE produces a better reduced feature set. [2].

6.1.6 ARFF Generation

The two types of standard common feature based ARFF database are generated in this process. They are Spyware ARFF database and Benign ARFF database, which are later used for performing experiments in WEKA. [2]

6.1.7 Model Training

In this step, the classifier is trained. The ARFF file is used as an input to WEKA for applying machine learning algorithms [1].

7. Classifier Learning Algorithms

Classifier Learning Algorithms[1]:

Different algorithms are used for classification such as ZeroR, Random Forest, Naive Bayes, SMO, JRip, J48. These algorithms have been utilized in various studies for detecting Spyware.

7.1 ZeroR:

ZeroR is used as a baseline for comparison with other algorithms. In ZeroR, the value of an attribute is predicted as it should be equal to its average value on the training set. ZeroR classifier functions by classifying all instances as they belong to same class, consequently produce same results for ACC and AUC because the classes are represented by an equivalent number of instances[1].

7.2 J48:

J48 is decision-tree-based learning algorithm. Decision trees recursively partition instances from the root node to some leaf node and tree is constructed. In learning they adopt top-down approach and traverse tree to make a set of rules which is used for classification[1].

7.3 JRip:

JRip is a rule based classifier. This classifier produce mode on the basis of positive or negative / accept or reject. They keep adjusting their model and at some moment obtain perfect model which is not affected by further examples [1].

7.4 SMO:

SMO is used for solving quadratic programming optimization problems. For solving the problem SMO breaks up large problems into a series of smallest possible. It is widely used for the training of Support Vector Machines (SVM). SVMs are used for classification and regression. In SVM data is considered as linear and non-linear. SVMs are used for finding the optimal hyper plane which can maximize the distance margin between the two classes. In simple words SVMs use decision planes to define decision boundaries. A decision plane is one that separates objects, in a set, having different class memberships [1].

7.5 Naive Bayes:

A Naive Bayes classifier is a probabilistic classifier based on Bayes theorem with independence assumptions, i.e., the different features in the data set are assumed not to be dependent of each other [1].

8. TOOL TO BE USED

Weka (Waikato Environment for Knowledge Analysis) is a popular suite of machine learning software written in Java, developed at the University of Waikato, New Zealand. Weka is free software available under the GNU General Public License [13].



Fig 2: WEKA UI [13]

9. RESULT & ANALYSIS

In reference [1], experiments have been performed with n-gram size 4,5 and 6, in which the experiment yields better results with n-gram size 6. The results have been shown in Table 2. J48 have yielded 90.549 which is best result in ACC among all and is slightly better than Naive Bayes. Random Forest and JRip are at middle level. SMO is at lowest level. The difference between higher and lowest performance is 3.175. All the algorithms have performed better than base line. The highest TPR is given by J48 which is 1. The feature sets generated by the CFBE feature selection method generally produced better results with regard to accuracy than the feature sets generated by the FBFE feature selection method. Results from different studies have indicated that data mining techniques perform better than traditional techniques against malicious code. The main objective of this study was therefore to determine whether spyware could be successfully detected by classifiers generated from n-gram based data sets [3]. Thus we conclude with this paper that Data Mining is an efficient technique for detection of spyware.

Table2. Results for n-gram=6 [1]

N-gram size = 6	Classifier	TPR	TNR	FPR	FNR	AUC	ACC
Common n-gram Based							
	ZeroR	1.000	0.000	1.000	0.000	0.500	86.923 (2.726)
	Naive Bayes	0.992	0.260	0.740	0.008	0.612 (0.194)	89.802 (4.894)
	SMO	0.960	0.290	0.710	0.040	0.625 (0.174)	87.374 (6.989)
	J48	1.000	0.260	0.740	0.000	0.630 (0.161)	90.549 (4.330)
	Random Forest	0.974	0.300	0.700	0.026	0.751 (0.224)	88.747 (5.758)
	JRip	0.981	0.255	0.745	0.019	0.618 (0.164)	88.775 (5.405)

10. CONCLUSION AND FUTURE WORK

Using data mining approach, detection rates will be more than signature-based and heuristic-based method. This method also helps in reducing the false negative alert. Additional advantage is that it helps in detecting known as well as new unseen spyware. For future work we can collect large collection of binary files and we can evaluate our approach when the dataset features represent opcode instead of bytes. Additionally, we aim to develop a hybrid spyware identification method that is based on the combination of EULA-based and executable based detection techniques.

11. ACKNOWLEDGEMENT

We are thankful to our Principal Dr. Shrikant Kallurkar, Project Coordinator Prof. Deepali Maste and other senior faculties of Computer Department for technical assistance and feedback through discussions. Our thanks to some of our colleagues who contributed towards development of the flowchart, leading to a success of this project.

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ROBOTIC ARM VEHICLE USING HAPTICS

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ABSTRACT

Robotics is an engineering field which is evolved and developing since many decades and is proving to be helpful in reducing the human work. Robotics can be used for building some robotic machines where humans are not able to work or perform any task.

However human-machine interaction and wireless communication can be represented with a robotic technology for interactivity with virtual objects and such a robotic technology used to sense a touch and gestures is known as Haptics. This paper focuses on designing a haptic robotic arm vehicle which can be controlled using an exoskeleton structure on transmitter side. In this project haptic technology is used for basic pick and place operation. Also the robotic arm interprets the gestures made by exoskeleton structure. The robotic arm is designed to have three joints consisting of DC motors to provide two degrees of freedom including vehicle. The Vehicle movement can be performed by following the gestures of user hand's.

General Terms

Haptics, AVR, Potentiometers, ADC

Keywords

Haptics Technology, Exoskeleton, Robotics Arm, Haptikos.

1. INTRODUCTION

Haptics is science of applying touch sensation and control for interaction with virtual or physical application. Haptics at large refers to anything that has to do with the sense of touch [12]. Haptics is one of the growing areas in human-computer collaboration which deals with sensory interaction with computers. The word Haptic is derived from Greek word haptikos which means pertaining the sense of touch.

The project is based on controlling Robotic Arm Vehicle using Haptics technology. Here Exoskeleton structure is used to move the vehicle as well as the robotic arm. Exoskeleton structure of right hand controls robotic arm whereas exoskeleton structure of left hand controls the vehicle. Measurement of angle, speed and position is done by potentiometer and ADC used in exoskeleton structure. Advanced Virtual RISC 8535 accepts input from potentiometer and touch pad then processes this input and then generate code using programming for digital data. RF Module CC2500 (Transmitter) send digital data serially to RF Module CC2500 (Receiver). RF Module CC2500 (Receiver) accepts digital data, convert it into analog data and compute it.

Camera streams live video through USB TV tuner that is given to AVR 8535(Receiver) which is connected to RF Module CC2500 (Receiver) by which live video can be seen on pc or laptop. So accordingly actions can be decided like forward, backward left, right, open, close for robotic arm and vehicle respectively.

Haptics is divided into main 3 types:

1. Human Haptics
2. Machine Haptics
3. Computer Haptics

HUMAN HAPTICS: Human Haptics refers to the study of human sensing and manipulation through tactile and kinesthetic sensations. When a person touches an object, the interaction force or pressure is imposed on the skin [9].

MACHINE HAPTICS: Machine Haptics involves designing, constructing, and developing mechanical devices that replace or augment human touch. These devices, also called haptic interfaces, are put into physical contact with the human body for the purpose of exchanging (measuring and displaying) information with the human nervous system [9].

COMPUTER HAPTICS: Computer Haptics is related to the design and development of algorithms and software that compute interaction forces and simulate physical properties of touched objects, including collision detection and force computation algorithms [9].

2. RELATED WORK:

Many Researches have been made on Haptics for constructing different kinds of robots and machines for many applications in real world. In Sense of touch Paper published shows that Haptic device acts as an input and output device tracking user physical manipulations as an input and providing realistic touch sensations as an output coordinated with events. . This technology has proved that virtual objects can also be touched, felt and controlled [1].

An analog haptic robotic arm is designed and implemented for lifting of an object weighing up to 250 grams w. A high level of precision is observed in the movement of the robotic arm due to generation of accurate control signals for the servo motors. Use of analog haptic is made for controlling robot by giving signals to robotic arm through a wired medium and robotic arm replicates the same action performed by human hand [2]

Mojtaba Hosseini, Francois Malric, Nicolas D. Georganas proposed a *haptic virtual environment application for industrial training*. It presents a series of Haptic Virtual Environments used for an industrial training application built

on a generic framework for developing distributed virtual environments and making use of various commercial haptic devices. It serves as a discussion of the various haptic-related issues encountered in developing these prototypes as well as a presentation of the multitude of components required to Develop advanced distributed HVEs [3].

3. PROPOSED SYSTEM:

3.1 TRANSMITTER

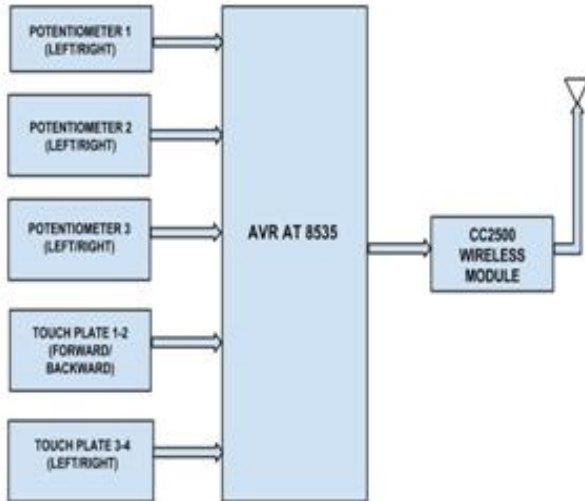


Figure 1- Transmitter

The transmitter uses two hands for controlling of robotic arm (Right Hand) and Vehicle (Left Hand).

Haptic Glove

The haptic glove will be placed on right hand side and that will control the robotic arm on vehicle. The device is fixed on user hand as exoskeleton structure consisting of potentiometers on finger, wrist that makes a movement using a change in resistance by user hand [4].

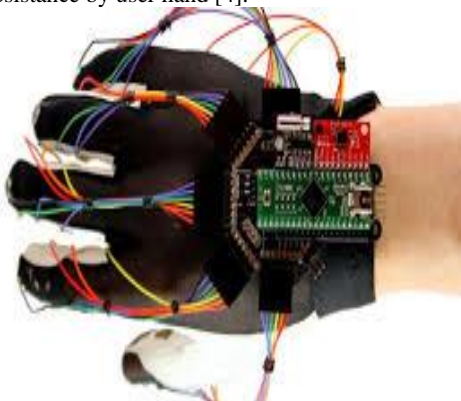


Figure 2- Haptic Glove

Potentiometer

A potentiometer is an instrument used for measuring the potential (voltage) in a circuit. Before the evolution of the moving coil and digital volt meters, potentiometers were used in measuring voltage many application [5]. The Potentiometer as shown in figure 3 are used as position feedback devices that measures the angle, position and speed of hands and gives such input to the AVR 8535. It gives the feedback in the form of voltage.

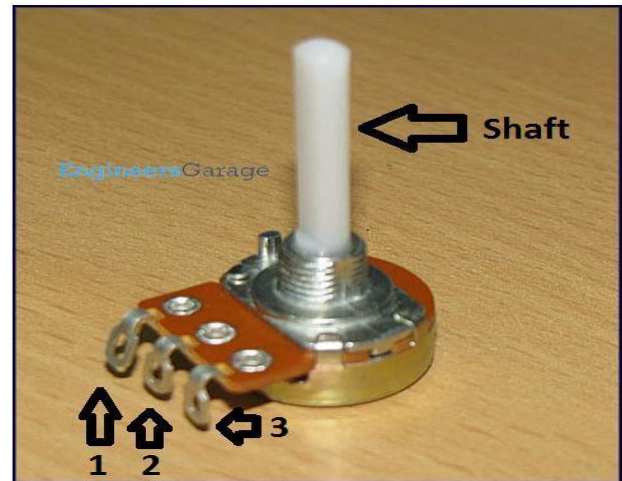


Figure 3-Potentiometer [14]

Microcontroller AVR 8535

The AT90S8535 is a low-power CMOS 8-bit microcontroller based on the AVR RISC architecture. It has inbuilt ADC. Hence electrical signal receive at ADC port are converted into equivalent digital signal. The microcontroller processes it and generates code using programming for this digital data[4]. Here the AVR 8535 converts the electrical signal using ADC (analog to digital converter). It accepts the input from potentiometers and touch pad (left glove) and processes it and generates code using programming for digital data.

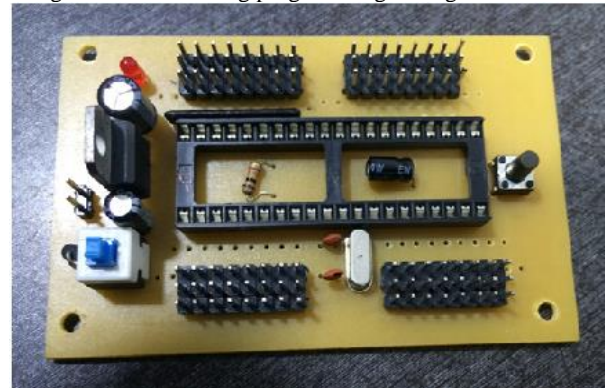


Figure 4-AVR 8535

RF Modules CC2500

The CC2500 is a low cost single chip 2.4GHz Transceiver device designed for very low power wireless applications [6]. It acts as transmitter module. Here the AVR 8535 uses RF module CC2500 (Transmitter) as shown in figure 5 to transmit this digital data serially to the receiver side where RF module CC2500 (Receiver) will accept the digital data and convert it using generated code into analog data and then computes the data and decides the action of Forward, Backward, Left, Right, Up, Down, Open, and Close respectively.

Similarly the motions for vehicle are carried out using the touch pads, where each touch pad gives a different movement for forward, Backward, Left and Right that drives the motor drivers on receiver side.

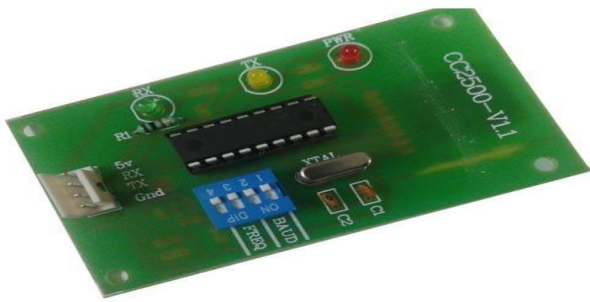


Figure 5- RF Module cc2500 [15]

3.2 Receiver

The Receiver as shown in figure 6 is combination of robotic vehicle with a robotic arm mounted on it. Also a wireless camera is fixed on robotic vehicle for live streaming videos.

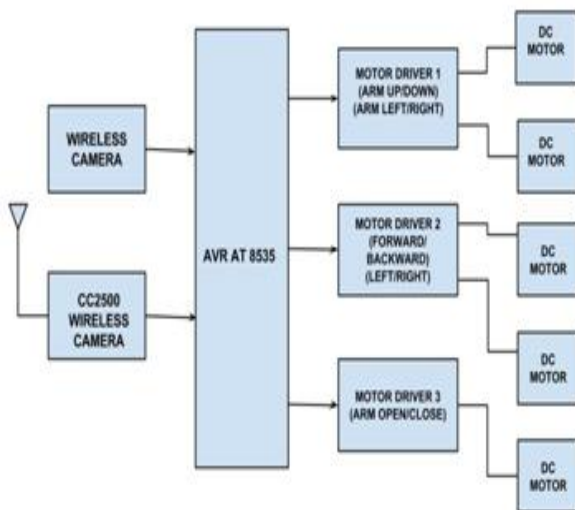


Figure 6-Receiver

Wireless Camera

Figure 7 shows the wireless camera. The camera is mounted on the vehicle that is used to stream the live videos that is connected to the single pin on AVR 8535 (receiver). The Camera gives an input to USB TV Tuner that is given to AVR 8535 which gives it to RF module cc2500 (receiver) and a video input can be seen on laptops or Pc's.



Figure 7-Wireless Camera [13]

RF transceiver module-CC2500

On receiver side RF module CC2500 acts as a receiver module. The demodulation of received data is done. This data is then send serially to microcontroller on PD0 (RXD) pin [4].The receiver accepts the input from transmitter side and converts digital data the received into analog data using AVR 8535.

Motor Driver

A motor controller is a device or group of devices that serves to guide in some pre known manner the performance of an electric motor. A motor controller can include a manual or automatic for starting up and stopping down the motor, selecting the forward or reverse rotation, and also regulating the speed, or limiting the torque of motor, and also protecting against overloads and faults in real world. [7] Here figure 8 shows the circuit of motor driver.

The AVR 8535 gives command to motor drivers for the movement of robotic arm like Up, Down, Left, Right, Forward, Backward with respect to motor drivers. Similarly the input from touch pads is taken by RF module cc2500 (receiver) fed to AVR 8535 that gives command to motor drivers of robotic vehicle.

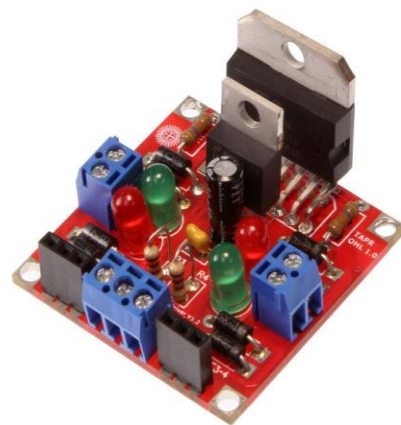


Figure 8- Motor driver

DC Motor

The DC Motors are used in robotic vehicle for movement of wheels of vehicle. The Motor drivers are responsible for movement of dc motors. The motors drivers give command to multiple dc motors either randomly or simultaneously.



Figure 9- DC Motor

4. RESULT

The system has been developed as Robotic Arm Vehicle that is controlled by means of Haptics. The Haptic Glove transmits the data to transceiver or RF module mounted on robotic vehicle. The robotic vehicle replicates the movements made by Haptic Glove and moves in a specific direction. Also wireless camera streams the live videos of real objects and displays it using USB TV Tuner on laptop or pc. It successfully performs the Pick and Place operation with 1 DOF (Degree of Freedom) Robotic Arm.

5. CONCLUSION

This system proposes the robotic arm vehicle which provides a good, efficient application of pick and place operation with real-time videos from environment for direction and working in places where humans can't see or perform some operation. Hand motion is utilized as an input to the system for movements of vehicle.

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IMAGE RESTORATION USING DIGITAL INPAINTING AND SUPERRESOLUTION

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ABSTRACT

This paper introduces combination of two image processing techniques i.e. Inpainting and Super resolution. It consist of performing inpainting on input image using Enhanced Exemplar based algorithm and then converting it into high resolution using Single frame super resolution algorithm. Enhanced exemplar based algorithm fills selected target region with suitable patches from the surrounding image area. Once the input image is inpainted, it is then converted to high resolution using single frame super resolution algorithm. The single frame super resolution algorithm used in this approach does not require a predefined training set thus increasing its performance for its practical use.

General Terms

Image Processing, Image restoration

Keywords

Inpainting, superresolution, single frame superresolution, exemplar algorithm.

1. INTRODUCTION

There are various factors that affects the quality of image like degradation, scratches, and defects or degradation during acquisition or transmission. In order to remove these defects, image restoration and image enhancement techniques were developed. Image restoration is a process in which a degraded image is restored to its original appearance. This technique is widely used in restoration of damaged painting, digital photographs to improves visual appearance [4] [5].

Ages ago, people used to preserve their visual work carefully. As time passes, photographs get damaged & scratched. People then used inpainting to remove scratches from degraded images. Inpainting is an ancient art of restoring images in which damages from an image are removed so that they appear to be visually plausible. It can also be used to remove unwanted objects, overlaid text from images, scratches, stains etc. from the input image.

Once the image is been inpainted, superresolution technique is applied to improve visual quality of image. Superresolution can only be applied if input image is of low resolution. Superresolution is a technique to convert low resolution image into high resolution image. Superresolution can be classified

as: Single Frame Superresolution & Multi Frame Superresolution [4] [7].

Multi Frame superresolution uses multiple low resolution images of same scene from different perspective to generate

high resolution output. Single Frame on the contrary, uses single low resolution image to produce high resolution image [10]. It may or may not require collection of training data of low & high resolution patches. Our approach uses single frame super resolutions which do not require training set with high and low resolution patches, which may limit its use. The algorithm used here, uses SVR models to convert input low resolution image to super resolved version.

2. RELATED WORK

Various Digital Image Processing Techniques have been invented since years ago. Two of the image processing techniques are Inpainting and superresolution. Many Inpainting algorithms have been developed over the years and Bertalmio was first to introduce image inpainting.

The basic idea of digital inpainting is to fill correct patches from the neighboring region into the selected region to be inpainted. Bertalmio used partial differential equation and Chan and Shen used a Total Variation Inpainting model, yet such algorithms fails to inpaint large regions.

Another approach of Inpainting was developed by Criminisi known as Exemplar based Inpainting which is an isophote driven image sampling process. In order to fill the region, Criminisi used SSD (sum of squared differences) to find the best matching patch which was then filled in the targeted region. SSD criteria may generate an error match in the targeted region and as a result it may give inaccurate output. In this paper, variation in the selection of best matching patch is used [2] explained in section 3.1.

In most digital image processing applications, high resolution image is required for later image processing and analysis. Image Superresolution technique is one which produces a high resolution image from one or more low resolution images. The basic idea behind superresolution is to generate high resolution image by combining non-redundant information present in multiple low resolution frames.

The theory of super resolution was first proposed by Tsai and Hung in the year 1984. They considered the problem of

developing a high quality image from several downsampled and transactionally displaced images. Their training dataset consisted of geographical images taken from Landsat satellites. They used the shift property of Fourier transform for obtaining a set of equations in the frequency domain. Optical Noise and Blur were not considered in this method. Later the Tsai-Hunag theory was extended by Tekalp, Ozkan and Sezan which contains the point spread function for imaging system and observation of noise.

Basically, there are two approaches for superresolution based on the number of input images. First, Single Frame super resolution in which a single input image is used to produce a high resolution image. A dictionary of high resolution patches are used in [7]. Second is Multi frame super resolution which has multiple frames of an image as an input, which gives a high resolution output.

In this approach a single frame super resolution algorithm is used, which is more convenient than multiframe super resolution.

3. PROPOSED METHOD

The proposed method combines two techniques of image processing for enhancing the image from the perspective of its visual quality. The algorithm can be explained in the steps given below:

Step 1: Input an image which the user wish to inpaint.

Step 2: This steps performs inpainting using enhanced exemplar based algorithm which is explained in section 3.1

Step 3: Once the image is inpainted, super resolution of this image is done using single frame super resolution as explained in section 3.2.

Step 4: if the result is satisfactory, user can save the result or can again process it for inpainting.

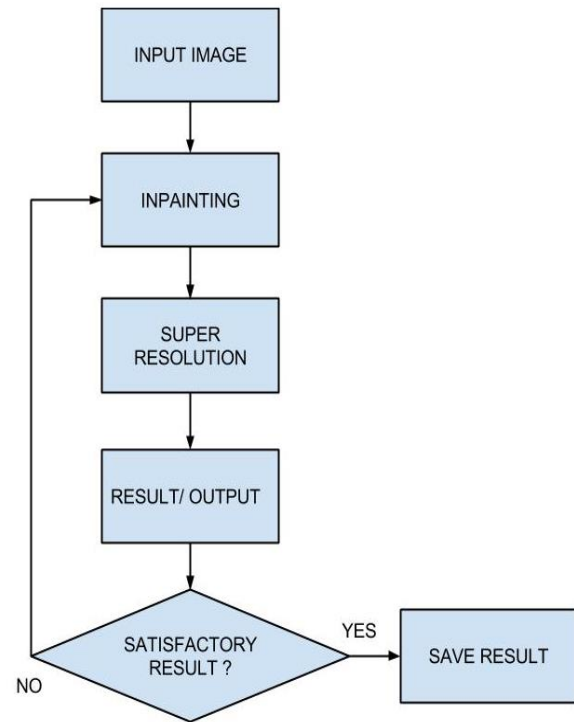


Fig 1: Flow chart of proposed method.

This section aim to trace the methods used for inpainting and superresolution.

3.1 Inpainting Algorithm

Enhanced Exemplar based algorithm uses the core Exemplar based algorithm [1] with a variance in the process of selecting best matching patch.

As shown in the figure 1 below, user manually selects a target region Ω to be inpainted from the input degraded image I . Φ is the entire image excluding target region Ω ($\Phi = I - \Omega$). $\partial\Omega$ denotes the boundary of Ω and Ψ_p is the patch we wish to fill in the targeted region, centered at p [1][2].

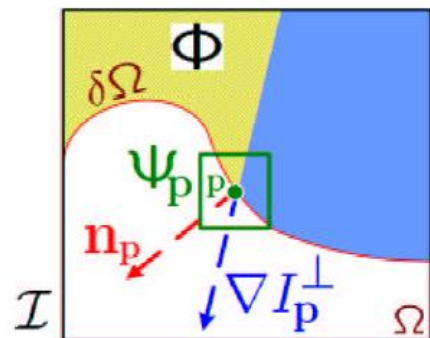


Fig 2: Notation diagram showing source region and target region [2].

The proposed Enhanced Exemplar based algorithm as described in [2] has following steps:

3.1.1 Computing patch Priority for filling in target region.

Computation of patch filling priority is based on patches which are located along the strong edges and are surrounded by high confidence pixel. The confidence term represent the texture characteristics. For selecting the best matching patch Criminisi [1] in his approach used SSD, which is difference between current patch and corresponding pixel of matching patch. Thus patch with minimum SSD value will be selected as best matching patch. However, correlation between damaged area of current patch and corresponding pixel of matching patch is not taken into consideration, which may generate error match resulting in inaccurate output.

Instead [2] uses a variation in SSD criteria to make correct patch selection. Variance can be expressed as a mathematical expectation of the average squared deviation. In order to maintain stability of image patch, variance is used. The proposed method compare variance to select the best matching patch from current patch and candidate patch, which avoids error match.

3.1.2 Filling in target region with computed best patch.

Once the variance is calculated, the best patch will be selected. This patch is then copied in the target region that is most similar to the selected patch [2].

3.1.3 Updating the information

After the patch is been filled in the target region the confidence is updated and the process is repeated till the target region is completely filled [1].

3.2 Super resolution Algorithm

This section describes single frame super resolution algorithm as in [10] [11]. In this approach of super resolution, collection of training data is not required. Predefined training data limits its practical application and also affects its performance.

3.2.1 Learning of Sparse Representation

Low Resolution (LR) image is synthesized into its high resolution (HR) using Bicubic Interpolation. Once the input LR image is up-sampled, all 5×5 patches are extracted from this HR image. Now from these extracted patches proper patches are selected to represent image features. To represent the image features sparse representation is used. Sparse representation can be determined by learning the extracted patches. The resulting sparse coefficient for each patch will be the feature of interest [10].

3.2.2 Support Vector Regression (SVR)

Support vector regression is an extension of Support vector machine, which is powerful function used for classification, regression. SVR has the ability to fit data in high dimension feature space. In this approach the mean value of each patch is subtracted from its pixel value and then sparse coefficient is calculated. The same value is then subtracted from the corresponding pixel in high resolution image. Once the training of SVR is complete, it can be used to predict the final super resolved output. To refine the HR image to final SR image, sparse representation is used for each patch and the center pixel value of each patch is updated using SVR models [11].

The above explained process of super resolution can be summarized; first the input low resolution images are up-

sampled to produce high resolution images with different scales using Bicubic interpolation. After getting the HR images, sparse representation is applied to the patches and using SVR models final SR output is generated [10].

4. EXPECTED RESULTS

In this paper combination two techniques i.e. Inpainting and Super resolution is done. An extended version of the core exemplar based Inpainting algorithm is used for removing defects or objects from the input image, which uses a variance in the patch selection step for Inpainting. This gives better results than the core Exemplar based algorithm [1]. Conventional super resolution methods uses a dictionary of low and high resolution patches, but instead the method used in this paper[10] do not require a predefined training data and uses the single input low resolution image instead of multiple frames of the same scene. This increases the practical use and do not restricts its application. We expect the proposed algorithm to work for variety of images and give a satisfactory result.

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TEXTUAL IMAGE PROCESSING WITH COMPLEX BACKGROUND REMOVAL

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ABSTRACT

This paper presents a paper in which we are going to improve degraded document images using binarization technique. Degraded document images consist of uneven illumination document smear involving smudging of text, ink seeping to the other side of page, degradation of paper ink due to aging etc.

The scanned copies of images will be given as input to our system. After this, we will apply different methods like contrast image construction, thresholding using local image gradient and local image contrast etc. Also, if the text is appropriate, but the background of that image is complex, then we will remove such complex background by making the background plain using robust algorithm.

General Terms

Image Processing

Keywords

Textual image, Complex background, Thresholding.

1. INTRODUCTION

Document is very important if we consider any legal procedure, no legal formality can be processed without documents. Therefore it is essential that the document which is been used should be proper and visible to the user properly.

Since, documents are widely used in almost every field here in this paper we have implemented an idea of improving the degraded textual document images. This is done so that one can easily retrieve the information from those textual images. These images can be images that are very old which got degraded due to time, or due to other factors like seeping of ink, smudging of text etc. also there are some historical images which are important, that images can also be easily retrieved.

In this paper we are also going to implement the concept of complex background removal. This means that there are some images whose text is perfect but due to the images containing complex background the text in the images is not properly visible. Hence we will apply different techniques on such images to make background simple. Hence the text becomes easily accessible.

This paper implements many methods like binarization technique using local image gradient and local image contrast, Thresholding, contrast image construction, which will give

satisfactory results. Since it deals with text of the images all the techniques applied will work for particular font and size specified by user.

2. RELATED WORK

For text region localization, various methods have been used. The methods can be categorized into two: connected component based methods and texture based methods.

First approach consists of analyzing the geometrical arrangement of edges or homogeneous color and gray scale components that belong to characters.

Ex. Cai et al.[1] have presented a text detection approach which is based on character features like edge strength, edge density and horizontal distribution.

Lienhart and Effelsberg [2] have proposed an approach which operates directly on color images using the RGB color space.

Agnihotri and Dimitrova [3] have presented an algorithm which uses only the red part of the RGB color space, with the aim to obtain high contrast edges for the frequent text colors.

Second approach regards texts as regions with distinct textural properties, such as character components that contrast the background and at the same time exhibit a periodic horizontal intensity variation, due to the horizontal alignment of characters.

Gabor filtering and spatial variance were used to locate text regions.

Wu et al. [4] have proposed an automatic text extraction system, where second order derivatives of Gaussian filters followed by several non-linear transformations are used for a texture segmentation process.

3. PROPOSED METHOD

The different steps of our approach are as follows.

Step 1: Image Preprocessing.

If the image data is not represented in YUV color space, it is converted to this color space by means of an appropriate transformation.

Step 2: Edge Detection.

This step focuses the attention to areas where text may occur. We employ a simple method for converting the gray-level image into an edge image. Our algorithm is based on the fact that the character contours have high contrast to their local neighbors. As a result, all character pixels as well as some

non-character pixels which also show high local color contrast are registered in the edge image. In this image, the value of each pixel of the original image is replaced by the largest difference between itself and its neighbors (in horizontal, vertical, diagonal direction). Despite its simplicity, this procedure is highly effective. Finally, the contrast between edges will be increased by means of a convolution with an appropriate mask.

Step 3: Detection of Text Regions

The horizontal projection profile of the edge image is analyzed in order to locate potential text areas. Since text regions show high contrast values, it is expected that they produce high peaks in horizontal projection. First, the histogram H is computed, where H is the number of pixels in line of the edge image exceeding a given value.

In subsequent processing, the local maxima are calculated by the histogram determined above. Two thresholds are employed to find the local maxima. A line of the image is accepted as a text line candidate if either it contains a sufficient number of sharp edges or the difference between the edge pixels in one line to its previous line is bigger than a threshold. Both thresholds are defined empirically and are fixed. In this way, a text region is isolated which may contain several texts aligned horizontally (whereby their y-coordinates are already defined). In a later step, we determine the x-coordinates of the leftmost and rightmost, top and bottom point of the text region. Finally, the exact coordinates for each of the detected areas are used to create bounding boxes.

Step 4: Enhancement and Segmentation of Text Regions

First, geometric properties of the text characters like the possible height, width, width to height ratio are used to discard those regions whose geometric features do not fall into the predefined ranges of values. All remaining text candidates undergo another treatment in order to generate the so called text image where detected text appears on a simplified background. The binary edge image is generated from the edge image, erasing all pixels outside the predefined text boxes and then binarizing it. This is followed by the process of gap filling. If one white pixel on the binary edge image is surrounded by two black pixels in horizontal, vertical or diagonal direction, then it is also filled with black. The gap image is used as a reference image to refine the localization of the detected text candidates. Text segmentation is the next step to take place. It starts with extraction of text candidates from the gray image. Then, the segmentation process concludes with a procedure which enhances text to background contrast on the text image.

Algorithm 1: Pseudo code for generating the edge image, see step 2.

```
Image generateEdgeImage(Image grayImg)
comment: Create an X*Y output image edgeImg
comment: grayImg is the X*Y result image created in step1.
X ← 0
Y ← 0
Left ← 0
Upper ← 0
rightUpper ← 0
for all pixel(x,y) belongs to grayImg do
  if(0<b<X-1) and (0<y<Y) then
    left ← |pixel(x,y)| - |pixel(x-1,y)|
    upper ← |pixel(x,y)| - |pixel(x,y-1)|
    rightUpper ← |pixel(x,y)| - |pixel(x+1,y-1)|
    edgeImg(x,y) ← max(left, upper, rightUpper)
```

```
else
  edgeImg(x,y) ← 0
end if
end for
edgeImg ← sharpen(edgeImg)
return(edgeImg)
```

Algorithm 2: Pseudo code for localizing text candidates, see step 3.

```
textRegion[] detectTextRegions(Image edgeImg)
comment: edgeImg is created with algo. 1.
comment: textRegion is a data structure with 4 fields: x0,
y0, x1, y1
comment: determine Y-Coordinates uses the algo. 3.
comment: determine X-coordinates uses the algo. 4.
Integer[] H ← calculateLineHistogram(edgeImg)
textRegions[] TC ← determine Y-Coordinate(H)
TC ← determine X-Coordinate(edgeImg,TC)
return(TC)
```

Algorithm 3: Pseudo code for determining the y-coordinates of text regions, see step 3.

```
textRegion[] determine Y-Coordinate(Integer[] H)
comment: H is the line histogram, see step 3
textRegion rect
textRegion[] TC
y ← 1, j ← 0
insideTextArea ← false
for ely belongs to H do
  if((ely>MinEdges)or((ely-ely->MinLineDiff)) then
    if not insideTextArea then
      rect.y0 ← y
      insideTextArea ← true
    end if
  else if insideTextArea then
    rect.y1 ← y-1
    if((rect.y1-rect.y0)>MinLines) then
      TC[j] ← rect
      j ← j+1
    end if
  end for
return(TC)
```

Algorithm 4: Pseudo code for determining the x-coordinates of text regions, see step 3.

```
textRegions[] determine X-Coordinate(Image edgeImg,
textRegion[] TC)
left ← maxInt, right ← -1
for textCandidate(i) belongs to TC do
  for all pixel(x,y) belongs to textCandidate(i) do
    if(edgeImg(x,y) = 0) then
      if(left>x) then
        left ← x
      end if
      if(right<x) then
        right ← x
      end if
    end for
    textCandidate(i.x0) ← left
    textCandidate(i.x1) ← right
  end for
return(TC)
```

Algorithm 5: Pseudo code for generating the text image, see step 4.

```
Image SegmentTextRegion(Image edgeImg, textRegions[]
TC)
```

comment: edgeImg is created with algo.1.
 comment: TC is the array returned from algo. 4
 Image reducedImg \leftarrow erase(TC, edgeImg)
 Image binaryImg \leftarrow binarize(reducedImg)
 TC \leftarrow refineCoordinates(edgeImg, gapImg, TC)
 Image textImg \leftarrow extractImage(grayImg, TC)
 textImg \leftarrow enhanceContrast(textImg)
 return(textImg)

Algorithm 6: Edge width estimation algorithm

Ensure: The Estimated Text Stroke Edge Width EW

1. Get the width and height of I
2. for Each Row $i = 1$ to height in Edge do
3. Scan from left to right to find edge pixels that meet the following criteria:
 - a) its label is 0 (background);
 - b) the next pixel is labeled as 1(edge).
4. Examine the intensities in I of those pixels selected in Step 3, and remove those pixels that have a lower intensity than the following pixel next to it in the same row of I.
5. Match the remaining adjacent pixels in the same row into pairs, and calculate the distance between the two pixels in pair.
6. end for
7. Construct a histogram of those calculated distances.
8. Utilize the most frequently occurring distance as the estimated stroke edge width EW.

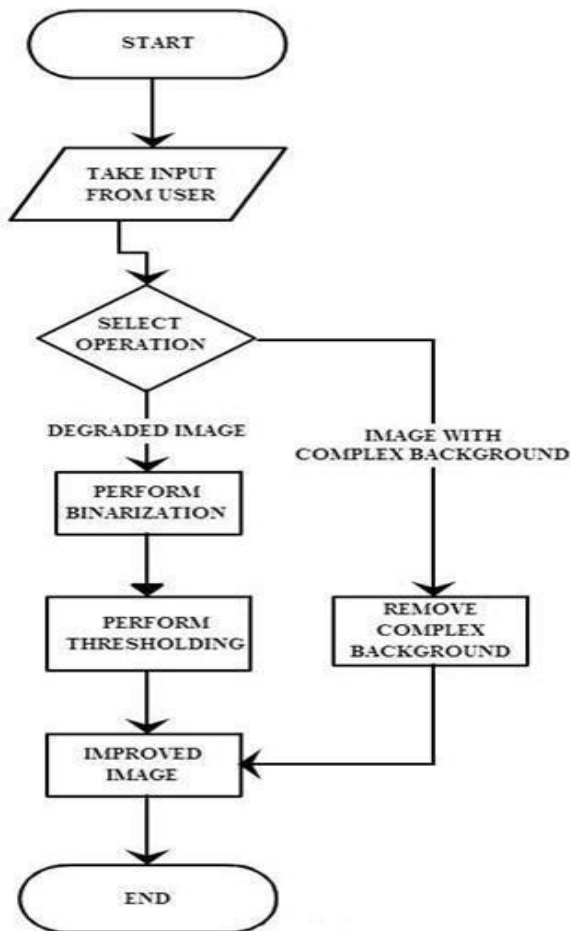


Figure 1: Flow of proposed system

4. EXPECTED RESULTS

This project takes the textual image that is degraded and it performs operations and finally gives output image that has text visible properly.

Also if the user inputs the image that is completely perfect in text but the background being complex does not allow us to read the text then in such case the background is removed. So by default the text is visible.

We expect the proposed algorithms to work for variety of images and give a satisfactory result.



Figure 2: Input image [6].



Figure 3: Output image [6].

5. CONCLUSION

We will get the improved textual images with all text properly visible. The first figure shows the binarization technique that helps us in retrieving text from degraded textual image. The second figure shows the removal of complex background where the text was perfect but due to complex background it was not visible. Henceforth, our project improves such textual images and retrieves the data easily.



Figure 4: Input image [7].



Figure 5: Output image [7].

6. ACKNOWLEDGMENT

We would like to thank expertise for helping and guiding us as and when needed.

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A SURVEY OF DISEASE PREDICTION SYSTEM UNDER DATA MINING

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ABSTRACT

In today's age, there is large amount of information available in the field of medicine and there is a great need of such powerful analytical solution or the system which can extract that information whichever useful and whenever required.

Generally data mining is the process of analyzing the data from perspectives and summarizing it into useful information that can be used to increase revenue, cuts costs, or both. There are many data mining software tool which analyzes the data. It summarizes the relationships which are identified.

This paper introduces the use of data mining technique in the field of medicine. Data mining system can be proved as a boon in the field of medicine, helping the doctors as well as patients to diagnose the disease and to give the proper treatment to cure the disease.

General Terms

Database, Data Mining algorithms

Keywords

Disease prediction, Naïve Bayes, C4.5 algorithm.

1. INTRODUCTION

In day to day life all the healthcare organizations contain the healthcare data in large volumes. But they want this data automatically extracted whenever required. With the help of data mining techniques it is possible to extract the required information and useful knowledge. And this information can be used to improve the work efficiency and enhance the quality of decision making process.

Hence by thinking on these points we come to know that there is a great need for new generation of computer theories and tools to help people with extracting useful information from constantly growing volume of digital data whenever required [1].

Data mining is the process of extracting hidden knowledge from large volumes of raw data. The knowledge must be known, not obvious, and one must be able to use it. Data mining has been defined as "The significant extraction of previously unknown, implicit and potentially useful information from the large data." It is the "Method of extracting required information from large databases or

warehouses." It is one of the tasks in the process of knowledge discovery from the database [1].

There are many algorithms implemented as earlier for this decision making. Traditionally researchers developed search techniques which predicted the diseases according to symptoms given by the user. Since advanced search techniques were not developed, the field was restricted only to a certain parts of the body such as heart or lungs etc. So this restricted the scope of the field or the systems which were included the data mining techniques. Such systems are available freely for normal users. Our research is about different data mining algorithms which are used to implement such disease prediction systems.

2. ALGORITHMS USED TO IMPLEMENT DISEASE PREDICTION SYSTEM

2.1 Naive Bayes Algorithm

Most of the system which predicts the diseases are implemented on the basis of Naïve Bayes algorithm. Naïve Bayes algorithms is considered as the best probabilistic classifier for machine learning. It is based on famous Bayes' theorem and hence named as Naïve Bayes classifier algorithm.

Naïve Bayes is the basis for all the machine learning tools and for data mining methods. This algorithm is used for better prediction by creating a model with predictive capabilities.

Ms. Rupali R. Patil used this algorithm in her system. The reasons behind that is firstly the system was having large dataset, all the attributes were independent on each other and the main thing was to get efficient results. With naïve bayes she had also used Jelinek-mercer smoothing technique for work on complex queries.

System was implemented to extract hidden knowledge from the historical heart disease database. This system was expandable in such a way that it would be able to sense large number of records and attributes and able to generate new significant rules [2].

Same system was implemented by Shadab Adam Pattekari and Asma Parveen that would predict the heart disease but the change was that they enhanced the visualization and ease of

interpretation to display the results in tabular form or in PDF form [3].

2.2 C4.5 Algorithm

Basically C4.5 is the algorithm used to make decision tree. It is the enhanced version of ID3 (Iterative Deepening till level 3) algorithm. The main intension of using this algorithm for such systems is that the decision trees created with the help of this algorithm can directly be used for classification. And because of this reason it can be also referred as a best statistical classifier.

C4.5 is a famous classification technique for making decision tree and this technique has been implemented by Abdelghani Bellaachia and Erhan Guven with Naïve Bayes algorithm. They have made such system for the analysis of prediction of survivability rate for the breast cancer patients. There were very large data with along 1,51,886 records and they have been selected theses records from SEER database. To perform a real experiment they used Weka toolkit. At that time they compared their results with the existing systems at that time and concluded that the model generated by C4.5 worked much better than the others [4].

2.3 Decision Tree

Decision tree is one of the most popular and important classifier which is easy to understand and simple to implement. Basically it is a support tool that uses concept of graph which is tree based or uses model of decisions and their possible chances. It is a one way to display an algorithm.

Jyoti Soni, Ujma Ansari, Diptesh Sharma and Sunita Soni [5] proposed three different supervised machine learning algorithms which have been used for analyzing the dataset which would contained the heart disease database. They used tangara tool for data mining. Decision tree does not have any domain knowledge or any settings for parameters. It can handle huge amount of data. The use of Decision tree is always better for exploratory knowledge discovery. The results given by the decision tree are easy to understand and grasp.

2.4 K-Nearest Neighbor

K-Nearest Neighbor is one of the best method which is used to classify the objects based on closest training set available in the feature space. Among all the machine learning algorithms this is the simplest algorithms which is widely used in many prediction systems. But the main disadvantage of this algorithm is the accuracy. The accuracy of K-NN algorithm degraded due to noisy features. They have concluded in that the Naïve Bayes with Decision tree gives better outputs [6].

2.5 SVM

SVM stands for Support Vector Machine. It is a supervised learning model and it represents the algorithms which is able to perform analysis on data, different pattern recognition, and classification on data and can also perform regression analysis. In infinite dimensional space it can build single hyper plane or set of hyper planes. This model is adopted by many machine learning algorithms as a major functional unit. SVM takes set of data as an input and performs prediction of this data set. It creates two possible classes and one of these

classes can be output for the particular record. The SVM model is made on the basis of maximum margin linear discriminates and having similar probabilistic values. The attribute are independent [7].

3. CONCLUSION

The experimental results shows that different classification techniques behave differently on various datasets depending on the nature of their attributes and size. The classification technique which has shown the highest accuracy rate and lowest error rate over a dataset has been selected as the best classification technique for that dataset.

Table 1: Results obtained for different algorithms [9]

Technique applied	Used tool	Accuracy rate (%)	Error rate (%)
Naive Bayes	WEKA	85.40	14.6
C4.5	TANAGRA	95.42	4.58
K-NN	TANAGRA	97.28	2.72
SVM	TANAGRA	97.13	2.87

After overall observation we can conclude that how the K-NN classification algorithm is the best algorithm for disease prediction system. If the number of records are less in number and dataset is being considered as a training set or historical dataset then the Naive Bayes algorithm is more efficient. But for large dataset the K-NN algorithm is best. Finally it may be dependent on the tool which we are using.

When we see the use of these algorithms for prediction of any disease then we come to know that data mining has great importance in the field of medicine and it represents comprehensive process that demands thorough understanding of needs of the healthcare organizations. The knowledge which is gained by using such data mining algorithms can be used to make best decision that will improve the quality of healthcare organizations and health.

The research or any implementation done over till is limited only for the particular body part as we seen. And it will be a great challenge that implementing such disease prediction system using data mining techniques which would be capable of predicting the diseases for all the human body part parts with great accuracy rate.

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Profile Switching & Reporting in Android using GPS

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ABSTRACT

Profile Switching and Reporting is the application that uses GPS to find the current location and assign a profile (Silent/General/Vibrate).

Using GPS, the application keeps track of the user's current location and changes the profile when user enters or exits the location.

Keywords

Android, Control Panel, Profile, Global Positioning System (GPS), Tracking Location.

1. INTRODUCTION

Android is the most widely used operating system and the highest retailing operating system in the world. It is aimed for touch screen cellular devices such as smart mobile phones and tablets.

Android can be fully studied and understood as it is an open-source project, thus it enables ideas for application development, bug fixing and further improvements regarding new functionalities.

Control/Notification panel has the best quick settings for Android. It Takes control of the phone in a simple, fast and easy way. It has quick access to the volume, ringtone and bright adjustments selector. It can access all Android settings and can be customized easily.

Profile Switching and Reporting is the application that uses GPS to find the current location and assign a profile (Silent/General/Vibrate). Using GPS, the application keeps track and alters the user's profile when user enters or exits the saved locations.

Global Positioning System (GPS) is top notch equipment used for detecting a device position precisely. Once a location along with the user profile is saved into the database, this stored information will be used to change the user profile in accordance with the corresponding locations. Moreover, the user can easily change the profile associated with the saved location as and when required.

This application can be of great use when a user wants to ensure his phone is always in silent/vibrate mode at work place or when user forgets to change the profile while moving between places.

2. RELATED WORK

An overall significance and detailed introduction about the Android device has been stated. Introduction of the new operating system to the world is described with more accurate detail[1].

The challenges and solutions related to location based services are stated here. The challenges faced in designing a omnipresent application has been put forth. Android OS is suggested as a best tool for designing context aware application by ZS Hassan[2].

The anatomy of Android architecture, components of Android platform such as activities, services, content providers and broadcast receivers are stated here which provide better insight of an application development by Xianhua[3].

Location Based Services using Android (LBSOID) states all the services which can be done over the Android OS using GPS. Detailed work has been mentioned in the context provided by the authors[4].

Tracing real time location of a friend in mobile system[5] gives the idea about tracking the current location about a cellular device more accurately.

3. PROPOSED METHOD

The application strives to obtain the current location of the cellular phone using GPS found in most of the Android smartphone. Cellular tower along with cellular device interacts with the GPS satellite to state the current location of the phone.

As the user gets into a particular location, the user arranges the profile according to his requirement. The current saved profile of the user gets stored in the SQLite database. Location tracing is done using the GPS. Changes in

location can be matched with (KeyHoleMark-up language) KML file in Android. The tasks linked with the current location change is compared with the database entries to see if there are corresponding task information which is on the mobile screen.

Desired location gets saved and frequent visits to those places will turn the user's profile into the mode the user used on his first visit. Required changes can be done to the profile as per user specification.

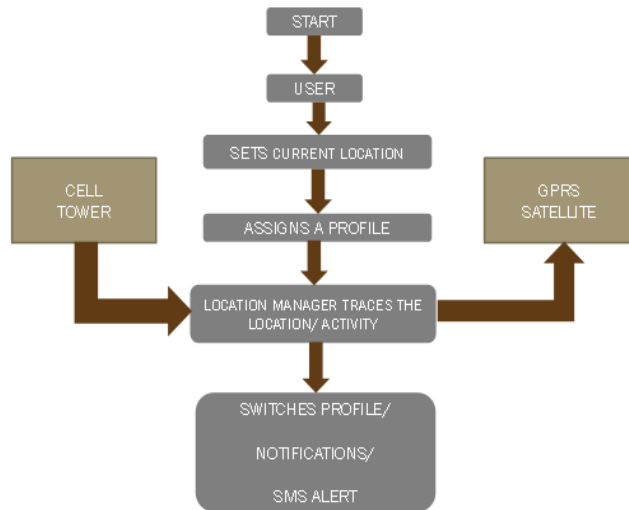


Fig 1.System flow chart

An example for an application use is when a user visits a hospital and changes his profile to vibrate mode. Therefore, on his further visits to hospital his profile will automatically change into vibrate mode. Thus the user can be carefree about the modes of his profile.

4. ANALYSIS AND ADVANTAGES

1. When the application will be launched the first activity that will appear to the user will be a list consisting of following options – add new profile, edit existing profile, add notifications, modify notifications, SMS service, modify SMS list and exit.
2. Add profile will represent the various options to set up the profile. It will include profile name, latitude & longitude and distance threshold.
3. Edit existing profile will get the list of all profile name saved by the user.
4. The user can add any notification that needs to be reminded of.
5. SMS activity will provide user to send text message to a contact if you reach a particular location.

5. CONCLUSION

Profile Switching & Reporting application using GPS will add value and organize user's task intelligently as the future battle among the cellular devices would be based on the enhanced user friendly applications and adaptability for such applications provided by device manufacturers.

The system is being made with much care that it is free from errors and at the same time it is efficient and less time utilizing. The system will be strong, tough and free from glitches. Also provision will be provided for future developments in the system.

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ABSTRACT

The main aim of our project is to create an app used for translation of one language to another. This application is useful for native travelers and tourist who possess smart phones. It enables travelers and tourists to easily capture the native country language books pages, banners, signboards etc. There is no remote computing overhead because the application has built in OCR suite as well as image processing suite both installed in the Android device. The built-in OCR converts the text embedded in the captured image into unicode text format. This text is then extracted. Since we are not going to use internet we are going to add dictionaries. The extracted text will be divided in characters and these characters will be matched in the dictionary using the exact match algorithm and by this process the translations will take place.

General Terms

Optical Character Recognition (OCR) technique, K-means algorithm, Exact Match algorithm

Keywords

Translator app, Tesseract OCR Engine, Eclipse, Android

1. INTRODUCTION

In day to day life, each and every person requires an application which is easy to implement and easy to operate. The next generation open operating systems are not on desktops or mainframes but on the small mobile devices people carry every day. Optical character recognition (OCR) is a powerful tool for bringing information from our analog lives into the increasingly digital world. The main aim of our project is to create an app used for translation of one language to another. This application is useful for native tourists and travelers who possess smart phones.

2. RELATED WORKS

2.1 ATMA

ATMA stands for Android Travel Mate Application. In ATMA language translation process works using internet. Here camera is used to capture image and this image is processed using OCR technique. In OCR technique, the text

from the image is extracted. This extracted text is translated using Google translator. Our project enables Travellers and Tourists to easily capture the native country language books pages, banners, signboards etc. The OCR converts the text embedded in the captured image into Unicode text format. It provides facility of translation so that Tourists can translate the Native Language Unicode text into their own country language. This would prove enormously beneficial with respect to the aspects about localization being a common phenomenon now-a-days. Also android platform has been increasingly being common in accordance with its features like low-cost, customizable, lightweight operating system and more [8].

3. PROPOSED TECHNIQUE

3.1 The application consists of four major subsystems/modules as depicted in the system architecture diagram. They are explained below:

(a) Camera Capture Module

In camera mode, image is captured and transferred for the OCR processes [8].

(b) Tesseract OCR Engine Module

In this mode, the text is extracted from the image. The binarization of image is done. Then the layout is detected and blobs are found then finally words and lines are detected. This words and line are chopped into different characters by using k-mean algorithm then a Unicode text is formed [11].

(c) Dictionary words Matching Module

In this module each group of sequential characters is searched for a dictionary based word match process, which helps in identifying the word more accurately rather than just giving a meaningless word as result [8].

(d) Unicode Text Post processing Module

In this module, the recognized characters are displayed as Unicode characters and the user is allowed to translate the recognized text into his desired language available [8].

- a. In English
 - i. Subject -> Verb -> Object
- b. In Hindi
 - i. Subject -> Object -> Verb

3.2 System diagram

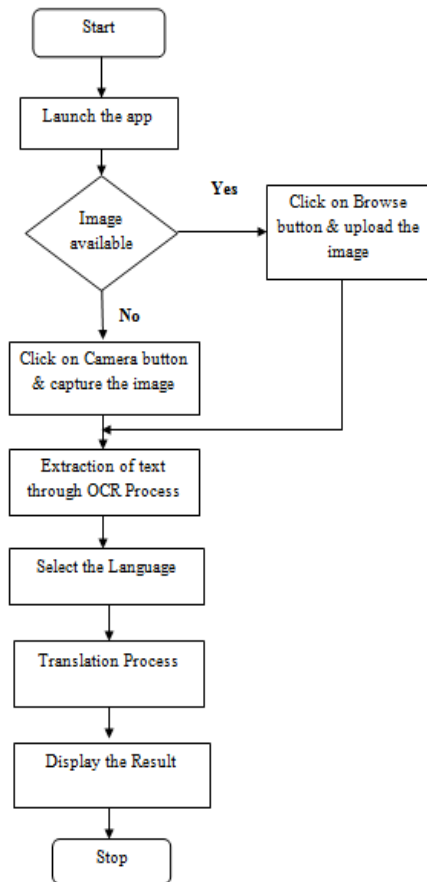


Fig 1: System Architecture

3.2.1 Algorithm for the system:

- 1) Launch the app
- 2) Browse an image if present or else click an image using a camera.
- 3) Then the OCR process will take place using k-mean algorithm (refer 3.3.2) in which the unicode text will be extracted from the image and this text will be displayed on the screen.
- 4) Then select the desired language in which the text is to be translated.
- 5) The translation process will take place using exact match algorithm (refer 3.3.1).
- 6) And then the results will be displayed on the screen.
- 7) Stop

3.3 Algorithms used

3.3.1 Exact match algorithm

Algorithm used in our project is EXACT MATCH ALGORITHM. It is used for pattern matching, pattern recognition and helps to translate one language to another.

Basics:

3.3.2 K-mean algorithm

Algorithm used in OCR technique is K-MEAN ALGORITHM. It is used for generating Unicode text. It works by recognizing the nearby pixel values. It matches the pixel which is closer to each other forming a character.

4. JUSTIFY RESULTS OF EXISTING AND OUR TECHNIQUE

In existing result, the app is used with the help of internet. It needs internet for the translation of language. In our technique we are providing a language translation app which can be operated without using internet. There will be many such conditions in which there is low network connectivity or there is no network in the device. So our app will be used easily under such conditions.

5. EXPECTED RESULTS

The results to be expected in this proposed system are as follows:

- 1) The text will be extracted from the Captured image.
- 2) The extracted text will be translated into the desired language.
- 3) The translation will be grammatically correct.

This Application provides robust, fast and high quality performance because of having improved auto focus behavior, continuous dynamic preview, improved noise tolerance feature and no remote computing overhead. It is configured to read a set of formats, currently English and Hindi. The systems have the ability to provide excellent results as per the user needs.

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Frequent Pattern Matching

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ABSTRACT

A computationally simple yet effective approach of Data Mining tools is presented in this paper. This work proposes efficient mining algorithms for knowledge discovery in databases which contains huge amount of historic data to find patterns, trends, correlations, anomalies in the databases which can help in making accurate future decisions. This will help users to know which items are purchased together and frequently as well as to study customer behavior of purchasing the products and hence increase the profit and provide ease to the customers. In this paper, a new algorithm named Apriori-Eclat based on Apriori algorithm and Eclat algorithm is been proposed. This algorithm combines the advantages of both Apriori algorithm and Eclat algorithm.

General Terms

Apriori, FP-growth, Eclat algorithm, data mining.

Keywords

Itemset, frequent itemset, support, candidate set

1. INTRODUCTION

Market Basket Analysis is been implemented as an example of Frequent Pattern Matching. It is generally used in supermarkets to find the most frequent combinations of items. It is a technique of "Association Rule Mining" which itself is one of the type of Data mining. The better we make use of customer purchasing behavior, better will be profit and sales to the supermarket. Knowing what products people purchase as a group can be very helpful to a retailer or to any other company. A store or a shopping complex can use this information to place products frequently sold together into the same area. Direct marketers could use the Market basket analysis results to determine what new products to offer their prior customers.

2. RELATED WORK

The Market Basket Analysis has been implemented using Apriori and FP-Growth algorithm called as Apriori-Growth algorithm [1]. The detailed Apriori-Growth algorithm is as follows:

Procedure: Apriori-Growth

Input: data Set D, minimum support minsup

Output: frequent item sets L

(1) L₁= frequent 1 item sets

(2) For (k=2; L_{k-1}≠∅; k++)

(3) {

(4) C_k= Apriori_Gen (L_{k-1}, minsup);

(5) For each candidate c ∈ C_k

(6) {

(7) Sup=FP-treeCalculate(c);

(8) If (sup > minsup)

(9) L_k = L_k ∪ c;

(10)}

(11)}

(12) Return L = {L₁ ∪ L₂ ∪ L₃ ∪ ∪ L_n};

The above mentioned algorithm takes a long time to execute and scan the database.

This Limitation of Apriori-Growth is being removed using Apriori and Eclat algorithm. The advantages of Apriori and Eclat algorithms is been hybrid in this paper for a better performance. The main problem in Apriori-Growth algorithm is finding frequent item sets. Itemsets that are contained in the candidate set of transaction database has many possible combination of frequently occurring items [1]. This makes it infeasible due to their unacceptable execution time. Hence, to avoid this problem, more sophisticated approaches known as Apriori and Eclat algorithms are being used. Both algorithms follow topdown search technique in the subset lattice of the items. Apriori and Eclat algorithm differ mainly in two ways, first, their way of traversing the prefix tree and second, determining the support of an itemset. Apriori determines the support of item sets by checking for each candidate item set or by traversing for a transaction of all subsets of the currently processed size. Eclat on the other hand traverses the prefix tree using depth first search technique. An item set prefix is extended until the frequent and infrequent itemsets boundary has been reached and then backtracks to work on the next prefix. Eclat constructs a list of identifiers through the transactions contained in the itemset to determine the support of an item set

3. PROPOSED TECHNIQUE

The paper proposes Market Basket Analysis as an example of Frequent Pattern Matching which is mostly used in supermarkets. It does analysis of which combinations of products does the customer buys frequently.

The **objectives** of frequent pattern matching are:

1. To make more informed decisions about product placement, promotion, pricing and profitability.
2. To learn about customer behavior and to find out which products should be cross sold.

3. To find which products perform similarly and what products should be placed near each other.
4. To satisfy customer requirement.

Implementation of frequent pattern algorithms is as follows:

1. Apriori (Used for mining frequent itemset in the transaction).
2. FP-growth (selects and sort frequent items in the transaction database).
3. Eclat (scans the database once and identifies each item in the list of transaction that supports the items).

Eclat algorithm helps in efficient execution of dense database. Also, it helps us remove the drawbacks of Apriori such as:

- a. It is less useful in applications where support is very small. It may need to generate a huge number of candidate set.
- b. It may need to repeatedly scan the database and check a large set of candidates by pattern matching.

A hybrid of Apriori and Eclat algorithm overcomes the drawback of Apriori-growth algorithm with respect to execution time and memory. Thus, this paper provides a faster output to the retailer since the hybrid algorithm of Apriori and Eclat reduces the time complexity of the software. FP-growth algorithm selects and sorts all the frequent itemsets that are generated in the transaction database.

3.1 Algorithms

This paper includes following algorithms:

3.1.1. Apriori Algorithm:

Apriori is an influential algorithm for mining frequent itemset for association rules. The algorithm is based on the fact that it uses prior knowledge of frequent itemset properties [2].

Algorithm:

1. Ck: candidate itemset of size k
2. Lk: frequent itemset of size k
3. L1 = {frequent items};
4. For (k=1; Lk != null; k++) do begin
5. Ck+1 = candidates generated from Lk;
6. For each transaction t in database do
7. Increment the count of all candidates in
8. Ck+1 that are contained in t
9. Lk+1 = candidates in Ck+1 with min_support
10. End
11. Return Lk;

Limitations:

1. It is less useful for applications where supports are not very large. This algorithm may need to generate number of candidate sets.
2. It may need to repeatedly scan the database and check a large set of candidates by pattern matching.

3.1.2. FP-Growth Algorithm:

Apriori needs n+1 scans, where n is the length of the longest pattern, we can use frequent pattern (FP) growth method to reduce the number of scans of the entire database.

This approach is efficient due to:

1. Compression of large database into smaller data structure.
2. It is a fragment growth mining method.
3. It adopts a divide and conquer strategy.

Procedure FP-growth:

1. IF Tree contains a single path P THEN
2. FOR all combination (denoted as β) to the nodes in the path P DO

3. Generate pattern β_a where support=minsupport of nodes in β ;
4. ELSE FOR all α_i in the header of Tree DO
5. BEGIN
6. Generate pattern $\beta=\alpha_i_a$ where support= α_i .support;
7. Construct conditional pattern base and generate Tree β ;
8. IF Tree $\beta \neq \emptyset$ THEN CALL FP-growth (Tree β , β);

3.1.3. Eclat Algorithm:

ECLAT is termed as Equivalence Class Clustering and bottom up Lattice Traversal algorithm.

It is the first algorithm that uses depth - first search technique to find frequent patterns and hence performs better than the other frequent mining algorithms. Eclat and FP-Growth algorithms differ in their way of storing the transaction database in the memory. Eclat keeps item covers in memory, while FP-Growth stores all transactions into FP -Tree which is a tree-like data structure. The difference between Eclat and Apriori is that Apriori scans original database while Eclat continuously scans the database and then update it.

The procedure of Eclat algorithm in detail is as follows:

Eclat algorithm is an iterative approach known as level-wise search, where k-itemsets are used to explore (k+1) - itemsets.

1. Firstly, the set of frequent 1-itemsets is found by scanning the database to accumulate the count for each item, and collecting those items which satisfy minimum support denoted L. Later update the database using the following principle:
2. For every itemset in 1 L, if an itemset can be found in a certain TID, then TID is devoted to the itemset.
3. Secondly, produce candidates from 1 L, and then use candidates to search updated database to find 2 L. And update the database according to 2 L. Continue the procedure for 2L to find 3L until no more frequent patterns can be found [6].

4. ADVANTAGES

1. System provides optimal solution.
2. Using scalable mining methods like Apriori and Eclat helps in faster execution of transactions and also saves memory.
3. It includes features like object model programmability as well as integration and extensibility.

5. CONCLUSION

This paper proposes efficient association rule mining algorithms such as Apriori-Eclat and FP-growth for improving the efficiency of the system.

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AUTOMATED TIME-TABLE GENERATOR

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ABSTRACT

A college timetable is a temporal arrangement of a set of classes and classrooms in which all given constraints are satisfied. Timetabling has long been known to belong to the class of problems called NP hard. This paper introduces a practical timetabling algorithm capable of taking care of both strong and weak constraints effectively, used in an automated timetabling system. We have used the SOA framework, for the same purpose. Our paper reduces the overhead on server of rendering client's UI components and makes room for processing time of Timetable Generator Algorithm.

Our Timetabling Algorithm is main component of our paper which produces the HTML based weekly timetable sheet as the output. Our paper takes various inputs from the user such as Teacher List, Course List, Semester List, Room List, Day List and Timeslot as well as various rules, fact and constraints using web based forms, which are stored in XML based knowledge base. This knowledge base serves as input to our Timetable Generator Algorithm residing on server machine.

Both Client Side UI code and our algorithm are written in PHP, which makes our paper framework attractive. Further benefits of choosing these frameworks are explained in later part of report with practically acceptable results.

General Terms

Heuristic Algorithms, Pattern

Keywords

SOA, SOA Testing, Web Services, Resource Scheduling, Time Table generation.

1. INTRODUCTION

Time has always been regarded as one of the most important factors in life. Most of the activities and advancement in science and technology has been carried out either to provide ease and comfort or to utilize the time in optimized manner. Problem of resource scheduling causes a lot of effort to handle various constraints. Time table generation in educational institute is a problem that has a number of constraints which, if not properly managed, cause many resource clashes and

results in poor management. Manual approach to generate time table is tedious and time consuming. In this paper, we propose an algorithm that is dynamic in nature. It deals in managing certain constraints as input in novel and dynamic manner, then using heuristic approach, scanning all the constraints on priority basis. Important that the sequence of checking of constraints is dynamic in itself, thus we can alter the sequence.

2. RELATED WORK

Earlier works to solve time tabling problems divide constraints into hard and soft constraints. The former are unavoidable, while later are compromised somewhat. As far as the real life scenario is concerned it is usually not possible to conform all soft constraints. The main constraint under consideration is that one person cannot be at two places simultaneously or that there is limit on the number of persons accommodated in a room. Many methods have been proposed to treat the hard constraints, few worth-mentioning methods include constraint based reasoning to timetable generation, ordering heuristics, hybrid approach based on heuristic based on genetic algorithms. To achieve the task of designing intelligent time table generator system, it is very imperative to consider soft constraints as well and this, in turn, would necessitate having some rules to indicate the soft constraints as well. Rule-based timetable generation has been suggested. Ref [1] not only has formulated mathematical model to solve timetabling problem but also proposed local search heuristics to accomplish this task. A wide variety of other approaches to solve timetabling problems have been investigated. Our earlier works has helped us a lot to do the current research work. Another two phased model uses two-phase linear integer programming to solve the problem. This reduces the required computation time, by decomposing the problem to determine the day and then, in the second phase, to generate a daily schedule. Recent review paper cites a lot of work done in this regard that is recommended for further work referencing.

3. BACKGROUND

The proposed system is based on heuristic algorithm takes values and manages the constraints and resource scheduling one by one. In the proposed methodology, we have mentioned the features and the novel algorithms.

3.1 Heuristic Optimization Algorithm

Heuristic optimization methods are explicitly aimed at good feasible solutions that may not be optimal where complexity of problem or limited time available does not allow exact solution. Generally, two questions arise (i) How fast the solution is computed? and (ii) How close the solution is to the optimal one? Tradeoff is often required between time and quality which is taken care of by running simpler algorithms more than once, comparing results obtained with more complicated ones and effectiveness in comparing different heuristics. The empirical evaluation of heuristic method is based on analytical difficulty involved in the problem's worst case result. In its simplest form the scheduling task consists of mapping class, teacher and room combinations (which have already been pre-allocated) onto time slots.

3.2 Assumption

This algorithm is designed to solve and generate school time tables. The following is a list of assumptions made while developing this algorithm:

- The algorithm produces optimum outputs in a five-day week.
- The number of subjects (s_1, s_2, \dots, s_n) need to be finalized before the algorithm begins execution.
- Number of teachers (t_1, t_2, \dots, t_n) entered before execution of the algorithm are assumed to be constant and cannot be changed during or after the algorithm has been executed. Any change in the above two assumptions will require a new generation of Timetable for the changed data.
- In each time table, all time-slot is filled with, a unique combination of subjects without any repetition of subjects.

3.3 Proposed Algorithm

- The system generates intermediate level as well many final reports including weekly time table, teacher time table, room wise time table, student time table, department level time table etc.
- The system generates separate as well as combined time table for female campus as well as for male campuses.
- It distributes workload of lectures equally among all the specified time slots.
- It prioritizes time slots according to customized priority. If lecture cannot be adjusted then it can be moved up in higher priority slot until adjusted accordingly.
- User can set gap of the number of days among the lectures, it can dynamically be adjusted as well.
- The time tabling algorithm tries to adjust courses to user customized slots according to specified time.
- The time table software adjusts the course lectures for the groups of female and males separately.
- It tries to adjust the lectures of a course on the same time within the weekdays.
- All parameters are customized by the user.
- It depicts the progress of courses adjustment at intermediate report level and if clashes cannot be removed and impossible to adjust then displays that course and number of lectures which cannot be adjusted.

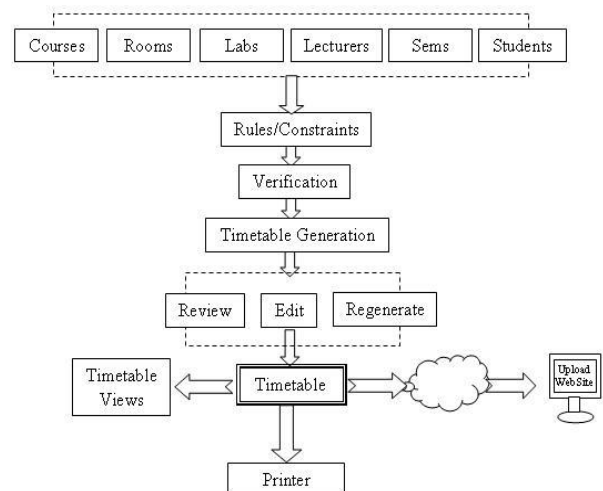


Fig 1.Flowchart of System

4. CONCLUSION

The intention of the algorithm to generate a time-table schedule automatically is satisfied. The algorithm incorporates a number of techniques, aimed to improve the efficiency of the search operation. It also, addresses the important hard constraint of clashes between the availability of teachers. The non-rigid soft constraints i.e. optimization objectives for the search operation are also effectively handled. Given the generality of the algorithm operation, it can further be adapted to more specific scenarios, e.g. University, examination scheduling and further be enhanced to create railway time tables. Thus, through the process of automation of the time-table problem, many an-hours of creating an effective timetable have been reduced eventually.

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PEOPLE'S CORNER: A WAY TO INTERACT THROUGH ANDROID USING NLP

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ABSTRACT

People's corner will help the citizen of a municipal corporation to register their complaints about day to day problems in their ward through a mobile application. People's corner will provide a common man to deliver his complaints and problems to municipal authority as well as let the municipal authorities to address the issue at the earliest. This application will provide an interface to register one's complaint and follow it up. This interface will provide a camera module which help clicking up a picture of any generalized problem that people are facing and people can upload this photo along with the complaint. The location of complaint will be tracked by Global Positioning System (GPS). This module will provide exact location of that particular issue. Also only the basic concepts of Natural Language Processing (NLP) techniques will be used within the server side application. The complaint, once registered, will be redirected to specific department of Municipal Corporation. For example; a complaint about damage road will be directed to PWD department.

General Terms

Baye's theorem, Edit Distance Algorithm

Keywords

NLP, GPS

1. INTRODUCTION

People's Corner application is a state of art complaint management system tuned for organization across a wide spectrum of government departments, public sector enterprises and private establishments. It is a single point web and mobile based complaint management system linking all departments in the organization that could make administration efficient. The system will benefit the Municipal Corporation. One of the key features is the provision for citizens / consumers / employees to lodge complaint / grievances using their mobile phones with a software application specially designed to file complaints. Complaint can also be filed through a web complaint, telephone and traditional writing letters can be integrated in this application.

2. RELATED WORKS

Today there are so many issues to make complaint at Municipal Corporation such as paper works, server down, etc. If complaint paper gets lost then municipal employees forget about complaints. For efficiency of customer & municipal corporation we will be using following modules in the application.

2.1 Android

Android is most popular mobile Operating System nowadays. Around 82% mobile users worldwide have Android OS in their cell phone. This is the reason of preferring android App for complaint management. So that most of the people can do complaint through their cell phones[2][5].

2.2 Global Positioning System

The Global Positioning System (GPS) is a space- based satellite navigation system that provides location and time information in all weather conditions. Once person take picture of site and make complaint, it will give the exact location of complainer. The advantages of this are user with no idea of proper address could complaint also. Another advantage is people cannot give fake address as GPS track their exact location[1].

2.3 Natural Language Processing

One of the ultimate goals of NLP is to derive intelligence from unstructured content expressed in a natural language such as English, using a variety of techniques from the Artificial Intelligence and Computational Linguistics domains. Text Mining is an immensely popular application of NLP that aims at extracting patterns and structured information from textual content. Due to its importance, many frameworks have been developed to facilitate the development of text mining applications, such as the open source General Architecture for Text Engineering (GATE) [11], designed both for language experts who need to implement concrete NLP pipelines, as well as software developers seeking to embed NLP capabilities in their applications. It can be use for spelling correction and auto word replacement. In country like India many people are not comfortable with English. Many times people insert wrong spellings. In normal condition machine cannot understand

these words hence it removes such complaints. Due to use of NLP, it will auto correct such words and replace with word which machine can understand[3][6].

3. PROPOSED TECHNIQUE

Application design consist three main parts as follows:

3.1 Client side Development

It contain Android App development for users / peoples to make complaint. This App make use of Camera to take picture and GPS for location.

3.2 Server side Development

It contains server side Database which contains all incoming complaints. It uses NLP for spell correction & auto word replacement. It has timer which remind municipal people about complaint. It also send complaint id to user as acknowledgement. Using this Complaint-id Client can check status of his/her complaint.

3.3 Middleware

After developing both server and user side App, it is very essential to make connectivity. This is very essential part. Only after connectivity user complaints get store in server database. We have used Baye's Theorem which is useful to check probability of words.

Algorithm for Proposed System

Step 1: Launch the App.

Step 2: Take picture of site and make complaint to Municipal Corporation.

Step 3: Server collects complaint and provide complaint id. It then corrects all words using NLP techniques.

Step 4: Server gives reminder to municipal peoples about complaint.

Step 5: Municipal Corporation solve the problem and send feedback to customer.

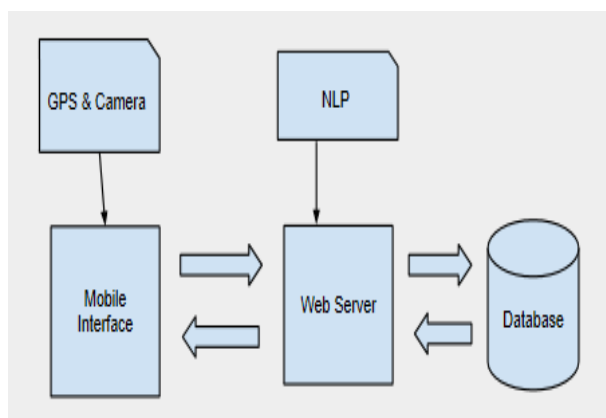


Fig 1: Design Flow

3.4 Baye's Theorem

Baye's Theorem is important in the mathematical manipulation of conditional probabilities. Baye's Rule can be derived from more basic axioms of probability, specifically conditional probability[12]. Baye's Theorem is equivalent to: $\text{argmax}_c P(w|c) P(c) / P(w)$

Since $P(w)$ is the same for every possible c , we can ignore it: $\text{argmax}_c P(w|c) P(c)$

There are three parts of this expression:

$P(c)$ is probability that a proposed correction c stands on its own. This is called the language model.

$P(w|c)$, the probability that w would be typed in a text when the author meant c . This is the error model.

argmax_c , the control mechanism, which says to enumerate all feasible values of c , and then choose the one that gives the best combined probability score.

4. EXPECTED RESULT

The user will register their complaints either by taking the photo or by entering the complaint in the text format. While registering the complaint in the text format by the user, there are possibilities of spelling mistakes and using improper english words. In such case NLP will auto replace the improper english words with proper english words. The system will be developed with much care and at the same time it will be efficient and robust. Also provision will be provided for future development in the system. The entire system will be secured. The application will be very user friendly due to use of GPS & NLP. Because GPS will provide accurate address of complaint with landmarks. NLP will provide spell check and error correction. So in the case of spelling mistake also complaint will be registered successfully. Android app will run on android OS 4.2 & above versions.

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DEVICE FREE GESTURE INTERACTION FOR DESKTOP SYSTEM

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ABSTRACT

This paper proposes new method which gives a new approach for movement of mouse and its function using a real time camera. Most of the existing technologies depend on the mouse as an input device. Here we will use camera, colored substance as hardware and image processing and motion detection technology. This concept has related work in mouse free and sixth sense System. It will be useful for virtual and augmented reality, gaming and image development, etc.

General Terms

Gesture Recognition, Image Processing, Template Matching Algorithms.

Keywords

Gesture, Vision based, HCI, Hand recognition, DFGIFDS, Computer Vision.

1. INTRODUCTION

Human computing interaction (HCI) is one of the most important research areas where people try to improve the computer technology. Smaller devices are being used to improve technology.

Computers become a necessary resource at every work place and entertainment area. Computer is very useful for web surfing, typing documents, sharing information and playing games, etc. Firstly based in the past on punched cards, reserved to experts, the interaction has evolved to the graphical interface paradigm. The interaction consists of the direct manipulation of graphic objects such as icons and windows using a pointing device [3].

A gesture may be defined as a physical movement of hand, arm, face and body with the intent to convey information or meaning. Hand gesture is an attractive alternative to keyboard and mouse interface devices for human computer interaction. User generally use hand gesture for expression of their feelings and notification of their thoughts.

The primary goal of this paper is to create a system which can identify specific human gesture and use them effectively to convey information as semantically meaningful commands. This system work will fine on new platform and easily get adapted by users.

2. RELATED WORK

2.1 Mouseless: It is an invisible mouse of computer that provides the familiarity of interaction of a physical mouse

without actually needing real hardware mouse. Computer mouse has not changed over the last decades; we have become more familiar at operating the two-button mouse which fits in palm of our hand as shown in Fig 1. Nowadays, so many multi touch, speech and gestural interaction technologies have been explored as means to implement alternative methods to interact with a computer. This Mouseless invention removes the necessity of having a physical mouse altogether but still provides the feel and freedom of a physical mouse that we are familiar with.

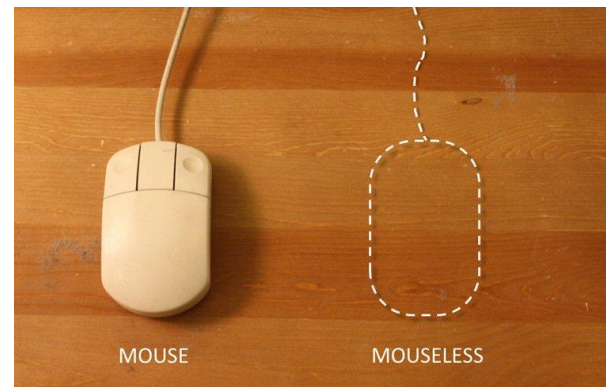


Fig 1: Mouse vs. Mouseless [17]

2.2 Sixth Sense: It is a wearable gestural interface that augments the physical world around us with digital information and let us uses natural hand gestures to interact with that information. Initially sixth sense technology was implemented with neck worn projector and with a camera system as shown in following Fig 2. Sixth-Sense is termed as Wear your world (WUW) [1].

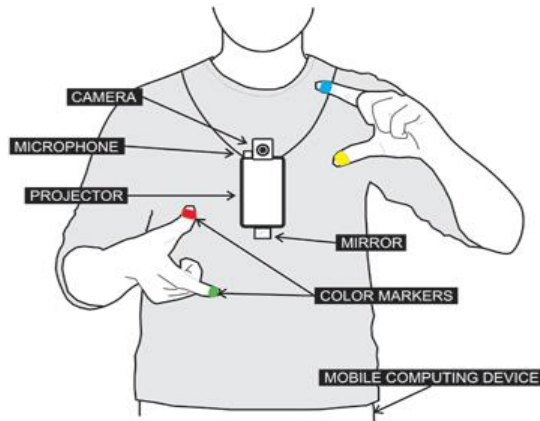


Fig 2: Wear Your World – Sixth Sense [18]

The prototype is containing a pocket projector, a mirror and a camera. The hardware components are coupled in a pendant like mobile wearable device in the user pocket. Projector projects visual information enabling walls, surfaces and physical objects around us to be used as interfaces. Using computer vision based techniques the camera recognizes and tracks user's hand gestures.

2.3 Vlcj: The vlcj project is an Open Source project. It provides java binding for the efficient Vlc media player from Video LAN. Vlcj as shown in Fig. 3 is useful to capture the images given by the user [2].



Fig 3: Vlcj [19]

Client and Server media player softwares are developed by using these java bindings of Vlcj. So it is simple to play local media and video on demand streaming server. Vlcj is useful in many applications, helping to provide video capabilities to different softwares in use on oceanographic research vessels and home cinema solutions. Vlcj is also being used to create software for an Open Source video camera at video mapping for the Open Street Map project [14].

3. PROPOSED METHOD

Gesture recognition enables humans to communicate with the machine (HMI) and interact naturally. This concept is used to control mouse pointer by just pointing to screen or projector. This could potentially make conventional input devices such as mouse, keyboards and even touch-screens redundant. Gesture recognition can be conducted with techniques from computer vision and image processing [15].

3.1 Common approaches for Gesture Interpretation are as follow:

3.1.1 Model based Approaches (Kinematic Model):

Model based approaches are based on different poses of palm and also different joint angels. Such an approach would be ideal for realistic interactions in virtual environments.

Generally, the approach consists of searching for the kinematic parameters that brings the 2D projection of a 3D model of hand into correspondence with an edge-based image of a hand. A common problem is the feature extraction. Edges which are used to identify objects not give the proper or exact output [4].

3.1.2 View based Approaches:

There are some fitting difficulties associated with kinematic model based approaches; many have sought alternative type of representations of the hand. A new and better approach that has garnered significant focus in recent years is view-based approach. It models hand by collection of 2D intensity images. Gestures are modeled as sequence of views [4].

3.1.3 Low Level Features based Approaches:

Many gesture applications required only one common thing which is a mapping between input video and gesture. Many have argued that the full reconstruction of the hand is not essential for gesture recognition. Instead many approaches have utilized the extraction of low-level image measurements that are fairly robust to noise and can be extracted quickly. This approach includes centroid of hand regions, principle axes defining elliptical bounding region of hand with optical flow of hand region in scene [4].

3.1.4 Rule-based approaches:

It consists set of manually encoded rules between feature inputs. Given an input gesture a set of features are extracted and compared to the encoded rules, the rule that matches the input is outputted as the gesture. But disadvantage is that it rely on human ability to encode rules [4].

3.1.5 Machine Learning based Approaches:

Machine learning approach is very popular. It treat a gesture as the output of a stochastic process. Of this class of approach Hidden Markov Models (HMMs) by far get the most attention in the literature for classifying gestures [4].

3.2 Steps for Implementation:

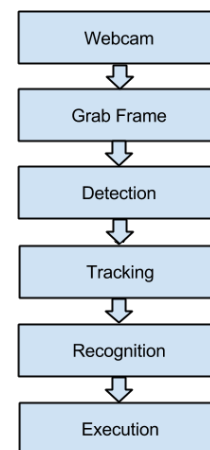


Fig 4: Basic steps of Implementation

Webcam is input device gives a live-video. Then frames are grabbed for further processing. To accurately compute the position of points from frames, details of each camera's intrinsic and extrinsic parameters are required. Camera calibration is carried out to determine these parameters. It is represented in terms of a fundamental matrix which provides

a linear projective mapping between camera pixels coordinates and real world coordinates. In the current system, problem is during the image acquisition phase system extracts the static background and sits idle till user puts his hand in front of the corresponding camera [3].

Detection is done with haar like features. A haar cascade xml is created for detection of hand [3]. As shown in Fig 4 Tracking is the process after detection, which detects static and dynamic gestures. Image processing is used for detection and tracking process. When user provides input some image processing functions such as background removal, convert to gray, edge detection, blob detection etc. are performed on input frame [5].

Recognition compare input image frame with standard database images. It uses very popular Exhaustive template matching function provided by AForge.NET framework. If input image matches with any image in database then respective program or methods get executed [5].

3.3 IMAGE PROCESSING:-

Input Image is an image captured through any one of the plugged cameras (i.e. integrated camera or external web camera). Please refer Fig 5.

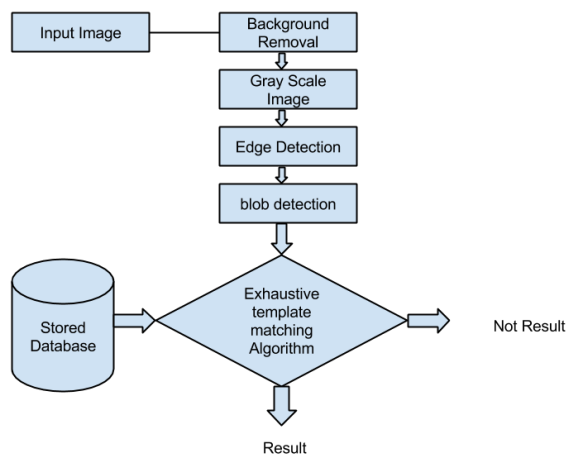


Fig 5: Steps in Image Processing

Gray Scale Image is converted into light black & white color shade (i.e. in gray scale form) to remove the color variation effect. In Cany Image process edge points of all the objects in the captured images are mapped through its shape and convert it into negative image pattern. That image is then input to the bb_image function [5].

BB Image (Big Blob Image) uses Cany image to calibrate the maximum surface area from the frame. That surface area is then cropped from the frame and stored as bb_image in database. This bb_image is also used to match with the pattern of those stored images in database. The standard database is stored in SQL database server [5].

3.4 DYNAMIC HAND GESTURE RECOGNITION:

Kalman Filtering is widely applied to model the dynamics of the hand for tracking purposes. A linear dynamical system is a partially observed stochastic process with linear dynamics and linear observations, both subject to Gaussian noise [6].

Dynamic gesture recognition also minimizes the problems associated with hand movements in static hand gesture

recognition systems [7].

3.5 SYSTEM REQUIREMENTS:

The two fundamental hardware components are the web camera and the computer system that it is connected to. Frame grabbing in this case was done through an API (application programming interface) in order to abstract frame capture as much as possible while allowing the software to run on any computer using a particular operating system. It is easy to make a Linux-based application for live motion gesture recognition using webcam input in C++. Vlcj is also very useful to get live video and frames [16]. Here in our paper implementation is based on the Microsoft Windows operating system written in the C# programming language, Open source image processing library, AForge.NET and OpenCV are very useful for gesture recognition [8].

AForge.NET is a computer vision and artificial intelligence library originally developed by Andrew Kirillov for the .NET Framework. The source code and binaries of the project are available under the terms of the Lesser GPL and the GPL (GNU General Public License) [12]. OpenCV (Open Source Computer Vision) is a library of programming functions mainly aimed at real-time computer vision, developed by Intel Russia research center. It is free for use under the open source BSD license. The library is cross-platform. It focuses mainly on real-time image processing [13].

4. ANALYSIS AND ADVANTAGES

For motion detection there is a simple procedure given below. This gray scale image is then converted to a binary image by examining which pixels are above and below a certain threshold.

```

function Binary_frame_difference (F, R, T)
{
    //Current frame F, Reference frame R, Threshold T
    //Binary frame difference D
    D = | F - R | ;
    foreach ( pixel p of D )
    {
        if ( D ( p ) > T )
            D ( p ) = 1;
        else
            D ( p ) = 0;
    }
}
  
```

The resulted binary image processed more effectively [8].

4.1 TEMPLATE MATCHING ALGORITHM:

The template matching method is used to track objects or patterns that we want to search for in the input image data. This is a simple algorithm recognizes a segment with the highest correlation as a target. This method is similar to that of SNF (Strongest Neighbor Filter) that regards the measurement with the highest intensity as target-originated among other measurements [5]. Also the Shape Matching module provides a way to match a binary image to a known database of images. The module is used to recognize shapes and provides statistical relationships between the currently viewed object and that stored in the image database. It is important that the shape matching is based on actual image shape and not on direct pixel matching as done in image

template matching [16]. Serge B. [11], presented an approach to measuring similarity between shapes and exploits it for object recognition. In this framework, the measurement of similarity is preceded by (1) solving for correspondences between points on the two shapes, (2) using the correspondences to estimate an aligning transform.

Rachit Puri [10], proposed a system in which gestures are get recognized by colors or markers to execute mouse events. Different colors can be assigned to respective fingers. This model used in gesture recognition is YCbCr.

4.2 ADVANTAGES:

1. According to one survey, gesture based interaction device has more simple, usable and interesting user interface compare to other [9].
2. It will be used for interactions with 2D display that simulates 3D interface and real 3D displays [4].
3. It is very effective gaming tool as well as good tool for 2D and 3D picture editing.
4. Applications can be executed by gestures only.
5. Pointer on desktop is easy to control with all mouse operations.
6. Using this system, more than one user can access the computer by creating more mouse pointer which will be controlled by users (by alternatively access). Here projectors can be used as more space and split screen feature of latest windows 8/8.1 O.S.

5. CONCLUSION

We successfully developed an application in which we implement above algorithms to complete the requirements. It works very well than our expectation. However there are some algorithms which are more dynamic but difficult to implement.

In future we plan to implement new algorithms with optimization in order to get good result and new standard gestures to execute applications.

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MOBILE COLLABORATIVE LEARNING APPLICATION USING ANDROID

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ABSTRACT

Mobile devices are becoming universal as they are remodeled into smaller, more economical and capable agents. They can connect over various network infrastructures. India is one of the countries having rapidly growing telecom network in the world. Many users are switching to smart phones. An offbeat and an innovative habitat is recommended by mobile technology that can be exploited further to upgrade studying. Taking attention towards this encouraging framework, we proposed an idea for providing campus information inside and outside of campus using an environment enabled by android platform. we will be implementing the android application which promotes high usage of mobile phones by students into a system through which the students can learn and to present an informative tool which they can use to solve their queries, interact with teacher and also receive the latest news running around the campus on their mobile phone devices. Thus, mobile collaborative learning can be utilized as reasonable and powerful learning tool.

General Terms

Design, Development, Security, Testing, Smart Phones

Keywords

Android Mobile, Notification, M-Learning, Mobile Collaborative Learning [MCL]

1. INTRODUCTION

Mobile technology has entered into the mainstream society, affecting the lives of many in recent years. This novel technology is slowly making its presence in the educational realm, which accords many opportunities to the learning and training. Its emergence in the educational world seems timely given the nature of today's learning requirements: wider, fast access to learning materials and persistent needs for prompt communication. Thus, learning institutions must seek every avenue for improvements to cope with new demands of teaching and learning process. Not surprisingly, new and emerging technologies are being passionately sought after by many institutions to provide better learning environments to their stakeholders, namely students and educators.

Use of mobile devices has steadily grown in popularity to become one of the most common consumer devices. Mobile devices have enlarged in performance from merely a device to dial numbers to PDA, and also they are reasonable in comparison to laptop computers so that we can carry and use

them anywhere[1]. Evolution of mobile and wireless communication technology created a new habitat with a combination of real and digital world resources. Other than India all over the world has boom in mobile with many applications that are useful in day today life such as photograph apps, shopping apps, games, video calls, easy search options[2] etc. Mobile technology has been adapted as a main communication since it is well suited in engaging collaborative learning environments. The concept of mobile collaborative learning (MCL) is completely different from classroom-based learning [1]. This pedagogical method of the learning provides many possibilities, such as giving opportunities to the group of people, working in same or distinct organizations to participate in achievement of definite goal using mobile devices.

We introduce an idea to share information via an android application between students and lecturers in order to enhance quality of information in & outside of campus environment. The idea is to enable the user to find and access all information that is of relevance to him. All he requires is a smart phone which permits the execution of an android application.

1.1 Mobile Collaborative Learning

Collaboration highlights the social interaction in any learning process. The most general definition of collaborative learning is: 'a situation in which two or more people learn or attempt to learn something together' [5]. This definition is composed of three elements that play a combined role in creating a collaborative learning environment: (a) scale of participation, (b) learning contexts and (c) methods of collaboration. The first element, scale of participation, measures the size of the participants' group (i.e. a pair, a small group, a class, or a society), and the collaboration time span (i.e. extending from hours to lifelong learning). In the participants' groups, researches focus on identifying the partners (i.e. human vs artificial agents), the relations (e.g. peers vs. instructor-students), and the distribution of roles (e.g. leadership).

Collaborative learning is a situation in which two or more people learn or attempt to learn something together. Unlike individual learning, people bounded in collaborative learning exploits on one another's resources and skills (asking one another for information, evaluating one another's ideas, monitoring one another's work, etc.). More specifically,

collaborative learning is based on the model that knowledge can be created within a population where members actively interact by sharing experiences and take on asymmetry roles [3]. Collaborative learning refers to methodologies and environments in which learners engage in a common task where each individual depends on and is accountable to each other. These include online forums, chat etc. Collaborative learning represents a significant shift away from the typical teacher or lecture-centered milieu in college classroom. To build collaborative learning competence, the following cycle is generally proposed as a road map. Following are the phases of the collaborative learning cycles [4].

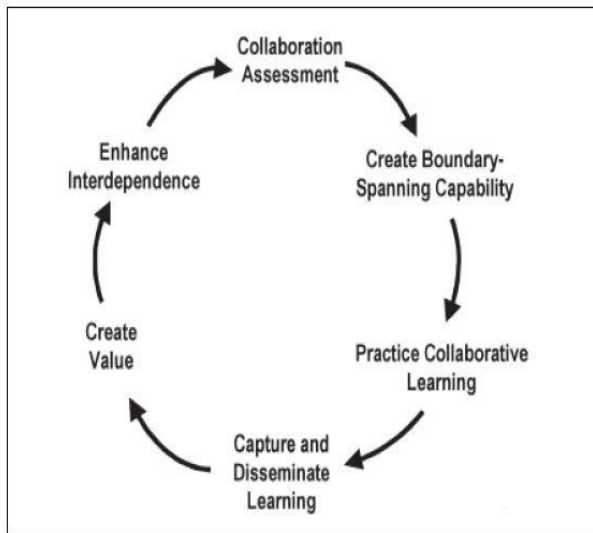


Fig 1: Collaborative Learning Cycles

After introducing collaborative learning and mobile learning, the next stage of learning can be explored, computer supported collaborative learning (CSCL) as enhancement to collaborative learning and mobile computer supported collaborative learning (MCSCL) as the next step of mobile learning, and a similar approach to CSCL called virtual collaborative learning (VCL) is introduced.

A definition of computer supported collaborative learning is “an emerging branch of the learning sciences concerned with studying how people can learn together with the help of computers”[6]. Using mobile computer supported collaborative learning (MCSCL) the conventional desktop/laptop workspace will be replaced or extended by a large amount of mobile devices, such as handheld computers[7]. Virtual collaborative learning is the approach to produce technology-based learning where the students can interact and cooperate over virtual networks and communication platforms. In general these platforms resemble more to gathering and sharing knowledge in a collaborative way [3].

1.2 Learning Applications

According to a survey conducted [8], the three most frequently used activities on mobile devices are writing notes, reading e-books and using the Web. Several attempts were made to categorize mobile learning applications. These applications are divided based upon their educational theory into behaviorist, constructivist, situated, collaborative,

informal and life-long learning. Applications are also differentiated based on their textual and constructivist learning theories. These applications range from productivity, supported by simple tools, to communication and collaboration which require complex applications [9]. In this section the focus is on applications and activities, designed to allow and enhance collaboration among users in several contexts. These applications can replicate, augment and even create new learning opportunities [3].

1.3 Design issues in learning application

Mobility is the largest benefit in MCL process as we mentioned above. However there are still uncommon issues caused by mobile hardware limitation and carrier network environment [10]. The mobile devices cause problems as follows:

- There are some technical limitation in the devices such as small memories, short battery life, limited calculation, and computation capabilities.
- Wide variety of devices acquiring different characteristics, so the application must be flexible to all of them.
- The devices' use is difficult because of their size: very small screens, small-scale keyboards.
- Security problems can arise when mobile devices are lost, due to possible unauthorized access.

Also, when using the learning system over the wireless network for wide audience, the network causes other problems as follows:

- Limited bandwidth that impacts video-clips' display directly.
- Moderate or conflicting connections stability and transfer delays that interfere with learning
- Continuity in network.
- Varied standards and protocols, some with high overhead, decrease performances level.
- Issues of security, privacy, and confidentiality will arise.
- High costs of operations, especially when users are low-budget students.

Successful mobile applications tend to consider the above restrictions when installing and evolving a new MCL. However, various conceptual collaborative learning applications proposed do not suggest a total solution covering these issues [1].

1.4 Need of MCL campus application

The learning process is based on the communication between learners among themselves or the guide or teacher. It is important for all educational environments. Mobile devices had reached nearly all levels of society along with the wireless technology. Today mobile technology is used as main communication medium. Mobile Collaborative Learning [MCL] is different approach as compared to classroom learning. MCL provides many features such as group discussion, or virtual classroom, etc. So, the demand of collaborative learning over the mobile device has been increasing as a major education element.

2. SYSTEM INFORMATION

2.1 Existing System

The existing system is not user friendly. In that if student wants to ask doubts to the teacher, he has to take an

appointment. All the important notification is displayed on the notice board. All the important notes are given in hands and students make the print. This is standard method works in the college.

Following are the disadvantages of the existing system:

1. Not the user friendly.
2. Synchronization between the student and teacher is needed.
3. User has to wait for the notification and all other stuff.

2.2 Proposed System

From the Student End:

- Students have to download an .apk file and install that .apk file in his/her android based device.
- After clicking on the icon, mobile collaborative learning application will be started.
- Student can get the access to system by providing his/her username (email id) and password.

Then Students can perform tasks like Events, Notification, question & answer and Resources modules.

- **Events:** - Students will get updates about college events and he/she can register for that event from a device.
- **Notification:** - Students will get updates about lectures status, like timing of the lecture, cancellation of the lecture etc.
- **Question & Answer:** - Students will directly interact with the professor for any doubts regarding any subject.
- Also students can interact with each other on that topic (Group Discussion).
- **Resources:** - In this module student can directly upload the notes regarding any subject easily on the device and also access it anytime, anywhere.

From the Admin End:

- Administrator has to launch the website using web browser.
- Administrator first login for the site and accesses the site.
- **Manage Student:** - In this module admin will insert the students information on the site also can edit or delete that student's entry from the database.
- **Manage Resources:** - In this module admin can upload notes on the site for the student reference.
- **Manage Messages:** - In this module admin will broadcast the message about lectures status to the student.
- **Manage Question:** - In this module admin will answer to the student's queries.
- **Manage Events:** - In this module admin will broadcast the message related to any event in the college like workshop, IT festival, seminar, fresher's party etc. and also providing a facility for the registration to that event.

3. SYSTEM ARCHITECTURE

The architecture is needed to be constructed with the support of latest technologies, to meet student expectations. System is designed on client-server based infrastructure, this will avoid overload on user devices. In the client side, tablet phones, smart phones can access to content server using wireless technologies. Students can access and learn from anywhere

through server with the help of web services middleware architecture.

To make a successful collaboration meeting for users' expectations, we need to set up architecture with support of the latest technologies [1]. Learning system should be designed on client-server based infrastructure to avoid running overload on mobile devices.

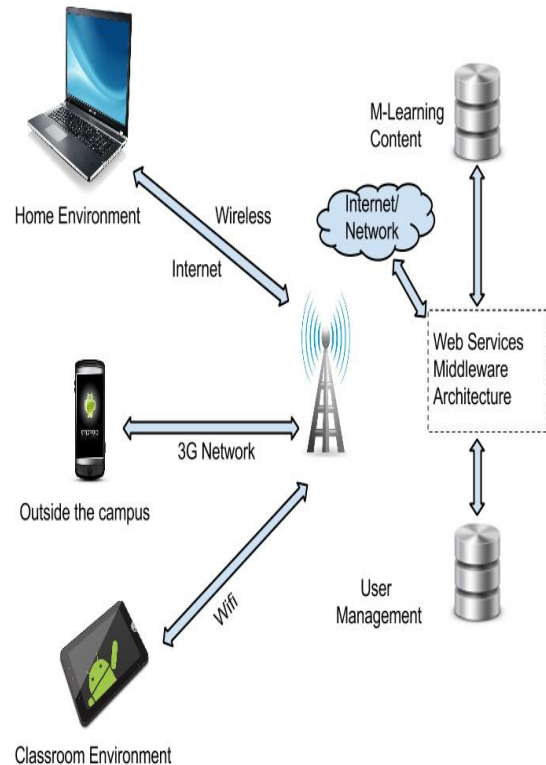


Fig 2: System Architecture

In the client side, mobile devices, notebooks, tablet PCs, PDAs, cell phones, smart phones and other devices can access to content server using wireless technologies. Fig. 3 [11] states that students learn anywhere outside classroom and they use diverse devices to link the server module that runs on university server through web services middleware architecture in order to attend learning process.

The learning system for this prototype also adapted and modified four-layered components of collaborative framework [12], which consists of content generation layer, communication layer, content regeneration layer, and content visualization layer. The construction has been improved and clearly determined with admittance of new sub components, and each layer has been appointed a different authority. Fig. 3 illustrate the conceptual and architectural framework for the mobile collaborative learning environment. Thus, for building up these middleware, the university or organization should need to co-work with a mobile service provider which is able to support e-learning. This approach can be more

advantageous for the institution to provide online course preparations on the interest of students.

4. IMPLEMENTATION

4.1 Requirement gathering

The required softwares such as eclipse, android sdk, MySQL etc are installed. The roll or functionality of admin and user is decided with the help of usecase diagram. Then we created required database using MySQL, and finally a web page is created for admin.

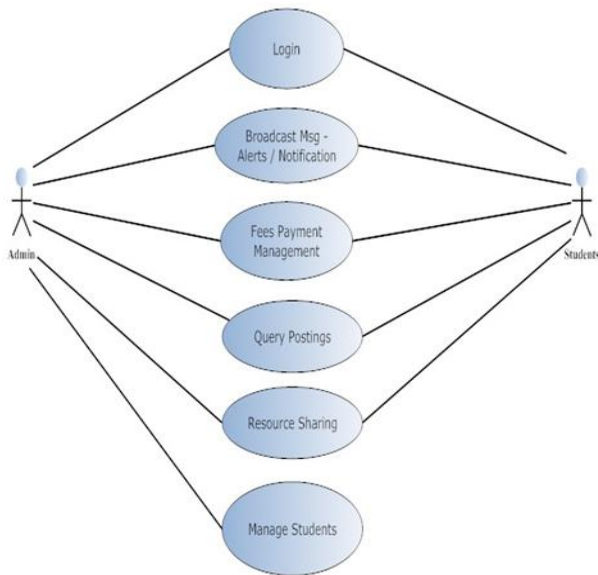


Fig 3: Use Case Diagram

4.2 Graphical User Interface

After the requirement gathering, graphical user interface for application has been developed. This includes login, home screens for user. User has to enter username and password for authentication. After successful authentication user can use the functionalities provided by the application. The graphical user interface is created using eclipse. The GUI for administrator is developed using ASP.

4.3 Creation of Database

The data of application has been stored on the server. So we have to create database to store data, this database is created using MySQL. This database contains all information about students and professors. It also includes fest information, detail of events etc. The database maintained at server has to be updated to provide updated information to student.

4.4 Server Side Implementation

- **Web Services:** To communicate with clients the server makes use of web service. These interfaces can be used by the client to either send or retrieve data. JSON is used for the data interchange [2] between server and client.

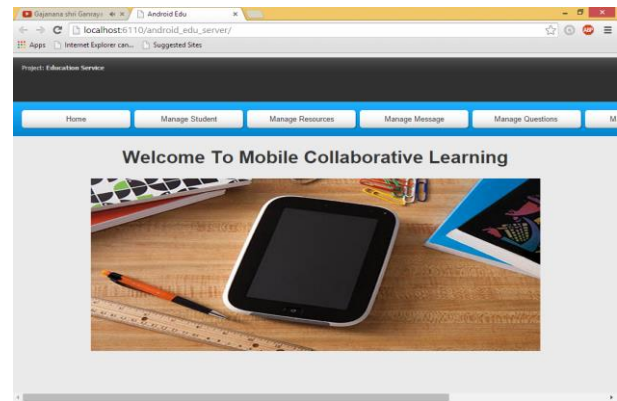


Fig 4: Admin Web Page

- **JavaScript Object Notation:** As an exchange format to communicate between server and client JSON [2] is used. It is a structured way to store data in a text based format. The media type of JSON is application/json and it is the only return type the server produces. To transform Java objects into a JSON format and vice versa the JSON library developed by Google [2] is used. The POST and GET parameter can be passed to a Java method. Based on these parameters and the resource path the server gathers the requested information from one or more data sources and returns the result in JSON back to the client.

5. CONCLUSION

In this paper, we presented mobile collaborative learning application based on android platform. This study focuses on the development of a mobile application that supports information services in and outside of campus environment. It is clear that there is a need for development for mobile services and terminals in and outside of campus environment.

A key question in applying mobile terminals to campus environment is easiness of usage. Thus one way to enhance m-Information is to raise the usability of mobile terminals. Thus by using this application, students are able to request and retrieve check announcement, view files and other information, register for events etc.

The practical value of mobility in teaching will be greater in the future because mobile terminals are flexible to use and they enable real time and place independence. The system can be further enhanced to become a more powerful and sophisticated system. Therefore, enhancement in the future will extend the usability of this system. We can include student attendance feature, video lectures in future in our application and thus expand its scope.

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DTMF BASED HYBRID ROBOT FOR AIR AND LAND

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ABSTRACT

This research and development focused on hybrid robot for air and land. Hybrid robot is combination of wheeled robot and unmanned aerial vehicle (UAV) system also called as Drone. Drone is controlled by using Telemetry module and wheeled robot is controlled by using Dual Tone Multi-Frequency (DTMF) module. Electronic Speed Controllers (ESC's) are used for balancing the speed of Drone and Flight Controllers are used for take-off and landing. Humidity, light and temperature sensors are implemented for measuring the weather in surrounding environment. Ultra sonic Sensors are used for proper landing and obstacle avoidance. Signals originating from sensors are sensed by microcontroller. This system results in hovering of drone with maintaining its proper balance and constant stability. Maximum time operated of drone is eight minutes using 2200 mAh Lipo battery. Battery performance can be increased by using large battery capacity.

General Terms

DTMF, ESC, IMU.

Keywords

Drone, DTMF, UAV, Multi rotors, Hybrid robot.

1. INTRODUCTION

Dual Tone Multi Frequency (DTMF) is used over the analog telephone lines in the frequency band of voice between the communication devices. DTMF technology is used in telecommunication system for signaling purpose. DTMF was developed by western Electric and it was first used in Bell system [12]. In this system, the DTMF is used to control the wheeled robot and Telemetry module is used to control the drone system. Electronic Speed Control (ESC) is used to control the thrust that has been produced by motors which is attached to body of drone system. Flight Controller is used for controlling the flight of Drone and landing [9].

Over the conventional helicopter, Drone system has several advantages such as overall design is simple and cost is low. Collective and cyclic pitch control is not required in this system [7]. GSM calling technique can be used, which in turn uses DTMF signals for communication. This is done by touch tone technique of GSM. UAV can be used in variety of applications such as military, survey, film making, agriculture aerial photography and others [8]. In recent researches, there

is an active focuses on Quad rotor, which is one of the UAV. This system includes the human computer interaction as follows:

- Human interaction: Controlling the robot by giving specific inputs.
- Computer interaction: Microcontroller placed on DTMF module to control the system.

Important component in this system are:

- DTMF Module.
- AtMega Microcontroller.
- Electronics Speed Controllers.
- Flight Controller.
- Motors & Sensors

2. RELATED WORK

Researches had proposed several methods for constructing a Drone system using different technology. Duckgee Park in 2001 studied on 3-DOF control free-flying vehicle. Non-linear control, optimal control for attitude control is used for flying in the drone system. The inputs and outputs are heavily coupled [1].

K. aruna and A. sri ramsagar proposed a land rover system which operates on DTMF. In this the robot is controlled by mobile phone which in turn sends the signal to the micro controller. Two mobile phones are used for communication. One is attached to robot and other one is with user. A call is made between mobiles. During the call, if any button is pressed then the corresponding tone is heard at the end of microcontroller. According to the received tone the microcontroller act up to it. Phoned stacked is used in robot to perceive the DTMF tone in this system [5].

Dirman Hanafi and Mongkhun Qetkeaw in 2012 proposed a remotely operated Quad-copter system. In this system, the graphical user interface is used for communication with Quad-copter. Communication between GUI and Drone is also done using wireless system. Balancing condition is done by FY90 controller and IMU 5DOF. Arduino Uno microcontroller is used. An ultra-sonic sensor sends an ultra-sonic signal which is used for detection of obstacles in path [3].

3. DRONE MODEL

In this system, the hybrid robot is constructed by making the combination of wheeled robot and multi rotor system. Using radio transmitter and receiver Drone is controlled. Components such as Cell phone, Microcontroller, ESC, Flight Controller, battery, motors and propellers are mounted on the frame [6]. The hover ability will be increased with the less weight as much as possible which in turn results in less power consumption [2].

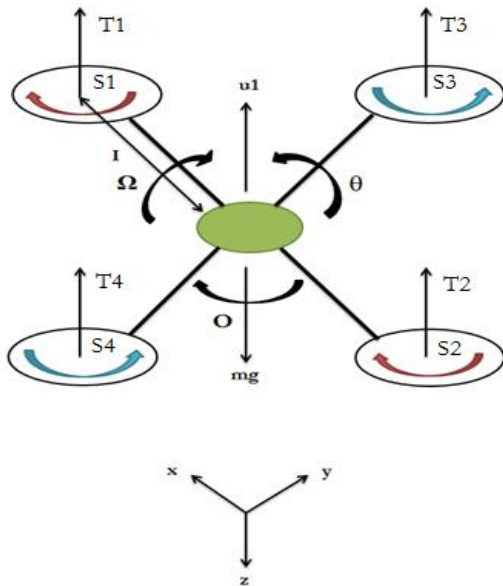


Figure 1: Drone model.

Figure 1 shows Drone model which uses Telemetry module for communication. Radio transmitter and receiver are used for transmission and reception of signals. Sensors are implemented for obstacles avoidance and camera is mounted for live streaming. All over thrust generated is shown in Figure 1 as well as the position, acceleration of gravity and pitch, roll and yaw are shown by using three Euler angles.

Table 1: Drone model description.

U1	Sum of the thrust of each motor
T1	Thrust generated by front motor
T2	Thrust generated by rear motor
T3	Thrust generated by right motor
T4	Thrust generated by left motor
M	Mass of Quad Drone
G	Acceleration of gravity
L	Half length of the Quad Drone
X, Y, Z	Three position
Θ, Ω, ϕ	Three Euler angles representing pitch, roll and yaw

In Table 1, Drone model description is given which includes Thrust generated by all four motors, mass of Quad Drone, Three position and Three Euler angles representing pitch, roll and yaw.

4. WHEELED ROBOT MODEL

In this system, the wheeled robot is constructed by using a DTMF module. It includes the proximity sensors to detect the obstacles. ATMEGA micro-controller is used in this model. Data communication can be done in parallel as well as in serial. Operating voltage is between 5 V – 24 V [11].

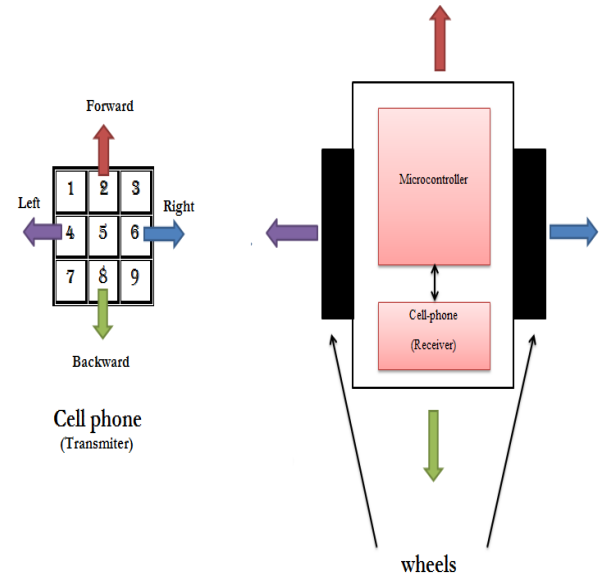


Figure 2: Wheeled robot model.

In Figure 2, wheeled robot model is shown. System is developed using DTMF Module. Touch tone method is used for communication which in turn uses GSM calling technique. Sensors are implemented for obstacle avoidance.

5. PROPOSED TECHNIQUE

Drone model and wheeled robot model is shown in figure 1 and figure 2. Drone system cannot be used as land rover is the major drawback. Similarly, limitations of wheeled robot are that it is used on land only. It cannot be used in air. Advantage of developing a hybrid robot is that both Drone and Wheeled robot system can be controlled using single device and can be used on land as well as in air. Using DTMF, the range of operating is increased.

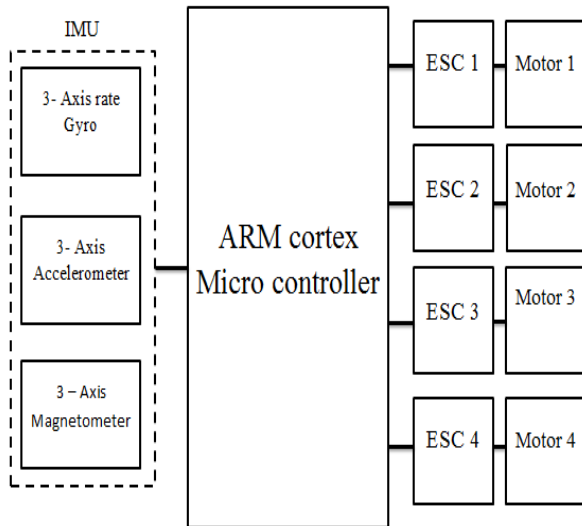


Figure 3: Drone system overview.

In figure 3, Drone system overview is shown. Inertial measurement unit (IMU) is measurement units consist of Gyro meter, Accelerometer and Magnetometer are connected to ARM cortex Microcontroller. ESCs are connected to microcontroller to control the speed automatically through Pulse width modulation (PWM) Channels. Motors are connected to ESCs.

Programming and controlling the Drone can be done in many ways. In this system, RC transmitter is used in acrobatic and stable mode [8]. Gyroscope values are used to control the Drone in Acrobatic mode [10]. Joystick on the RC transmitter is used to control the 3 axes rotation speed. The orientation of Drone in the stable mode is determined by the sensors. To balance the Drone system, speed should be automatically controlled and this is done by implementing sensors. Using joystick, angle of rotation can be changed [12].

Controlling the wheeled robot is done by using several methods such as Bluetooth, zee bee, Wi-Fi, remote etc. This method has their own limitations such as designing issue and limited range. GSM calling technique for wheeled robot provides the wireless control ability to the robot.

5.1 GSM Calling:

The basic advantages of GSM calling technique is they can be controlled by any region of world by using camera [11]. Wheeled robot system overview is shown below.

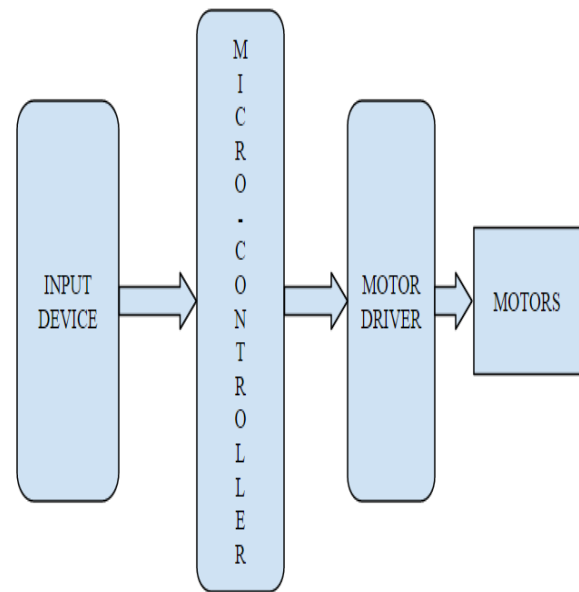


Figure 4: wheeled robot system overview.

Figure 4, shows wheeled robot system overview. Microcontroller is implemented on frame of robot. Microcontroller accepts the inputs from user and preforms the desired action. Motor drivers are the software which is connected to microcontroller. Motors drivers are used for clockwise and counter clockwise rotation of motors.

The keypad of DTMF is 4 x 4 matrixes which include low and high frequencies. Low frequencies are determined row wise whereas high frequencies are determined column wise [4]. DTMF keypad frequencies are shown below.

Table 2: DTMF keypad frequencies

Frequencies	1200-1210 Hz	1330-1340 Hz	1470-1480 Hz	1630-1640 Hz
697 Hz	1	2	3	A
770 Hz	4	5	6	B
852 Hz	7	8	9	C
941 Hz	*	0	#	D

In table 2, DTMF keypad frequencies are shown. Keypad from 0 – 9 and A-D are listed according to their defined Touch Tone frequency.

6. RESULTS AND ANALYSIS

DTMF based hybrid robot for land and air is successfully developed. The system developed is used as a hybrid robot for land and air use. Hybrid system is developed by combining land rover and Drone system together. Camera and sensors are implemented for aerial photography, recording, military and surveillances purpose and for detecting obstacles in path.

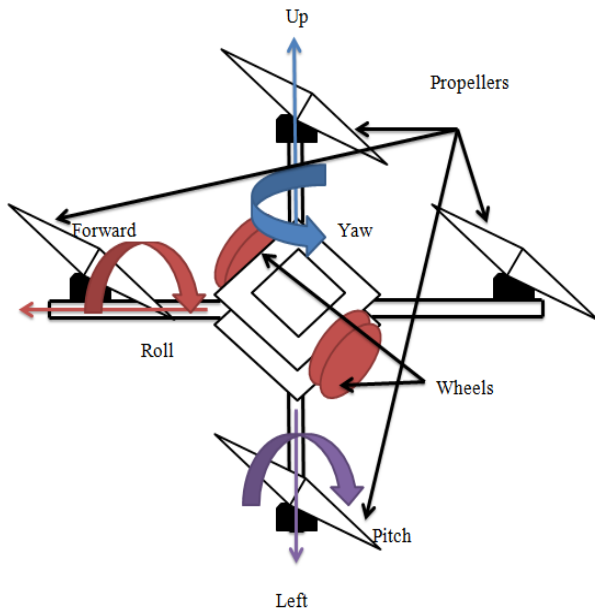


Figure 5: Hybrid robot model.

In figure 5, final product model that is hybrid robot is shown. This system is developed by attaching wheels to Drone and controlling it by using Touch Tone method of DTMF. The Yaw, Pitch and Roll angle is also shown. This system reduces the efforts of using two different systems for land and air use. Since the system is combination of land rover and drone, user can use a single system for both land and air uses. Wheeled robot model described above is used to control wheel part. Using GSM calling technique the wheeled robot is successfully controlled. Using Touch-Tone, keypad control of wheeled robot is done. Keypad 2 is press for forward movement whereas keypad 8 is press for backward movement. Similarly, key pad 4 and 6 is used for left and right movement.

The Drone system described previously is successfully controlled and implemented using Telemetry module which uses radio transmitter and receiver for communication. Wheeled robot moves in given direction along with Drone attached to it. While Drone take-off leaving behind the wheeled robot when it is not in use. The take-off and landing motion of drone is shown below.

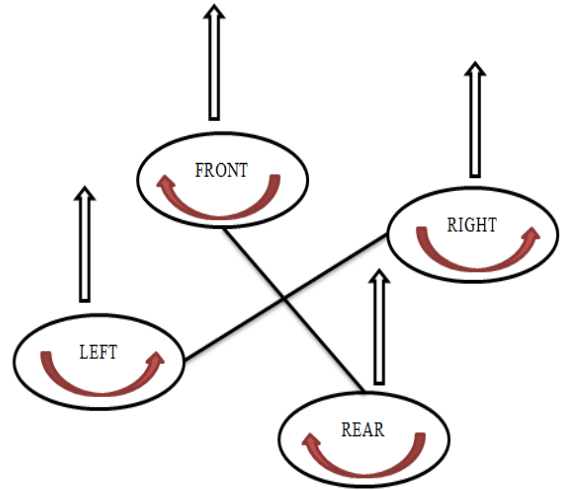


Figure 6: Take-off motion of Drone system.

In figure 6, Take-off motion is shown. By increasing the speed of four rotors, take-off motion is controlled. Vertical motion is changed. Front and rear rotor has clockwise motion whereas left and right rotor has counter clockwise motion.

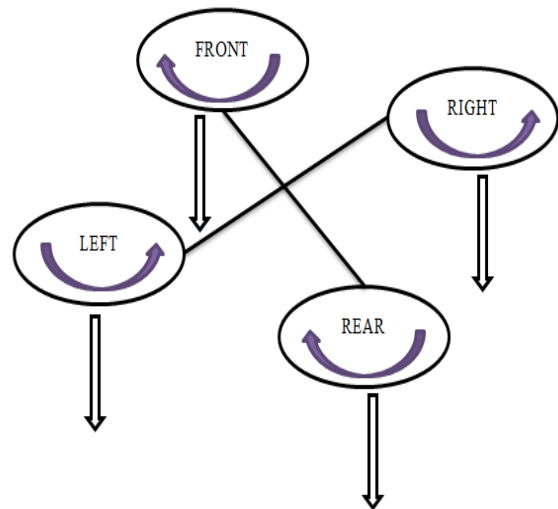


Figure 7: landing motion of Drone system.

In figure 7, landing motion is shown. By decreasing the speed of four rotors, landing motion is controlled. Front and rear rotor has clockwise motion whereas left and right rotor has counter clockwise motion.

7. CONCLUSION

The system develops a combination of wheeled robot and Drone system so that it can be used on land as well as in air. Using DTMF wheeled robot is controlled, this in turn helps in reducing the limitation of other systems. Using Telemetry module the drone is controlled. Sensors are used to measure humidity and temperature of nearby environment. The method in this system is able to perform the dual work of hovering and land rover. Considering all the disadvantages, problems

and designing issues in the traditional system, the goal to construct hybrid robot for more efficient and better use was in the mind and it's been a really fruitful moment to finally conclude that hybrid robot is ready to fly. The system is developed with much more care with proper technicality and at the same time it is efficient.

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SENTIMENT ANALYSIS ON CAR REVIEWS

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ABSTRACT

The approach for mining online user reviews to generate feature-based sentiment analysis that can guide a user in making an online buying a product. In this feature based sentiment analysis on car domain is presented. In which features are extracted using domain ontology, then by using the feature description table the features are classified into positive and negative polarity. Since the polarity of each feature is varied according to the analysis of classifier. The system gives the output according to the polarity of the reviews. This system helps user to easily evaluate the reviews of product to avoid manual efforts.

GENERAL TERMS

Design, Implementation, Testing, Security

KEYWORDS

Opinion Mining, SentiWordNet, Naïve Classifier

1. INTRODUCTION

The development of internet, there has been an exponential increase in the amount of information in online systems. These very large information are very difficult to process by individuals, leading to information overload and affecting decision-making processes in organizations. The field of Opinion Mining is recent and as a result there are still a lot of challenges to be met. The mining of forums and online discussions is a challenge on its own. It is bit difficult for average human reader to identify relevant web sites and extract features and to do polarity summarization. Therefore automated sentiment analysis systems are thus needed. Whenever we want to take a decision we want to know the existing users opinions. Individual consumers also want to know the opinions of existing users of a product before purchasing it. This system helps users to take the correct decision before purchasing any new product. This system analyze the existing similar product reviews and classify those reviews and find the proper decision for that particular product.

2. EXISTING SYSTEM

There are several existing system like our system but they have some drawbacks and issues also. Those systems are not able to give the proper result in some cases they cannot give

the accurate result. They are less friendliness to understand the users.

2.1 Problem with existing scenario

- In traditional system, there is no such mechanism that would calculate the score or review of a particular car with the help of users comment.
- No such sentiment words dictionary created to calculate the ratings or score of a particular car based on users sentiments keyword.
- There was no such latest technological tools used to rate a car.
- User need to manually rate the car based on stars or score within range of 0-5.
- Maintenance of the system is very difficult.
- There is a possibility for getting inaccurate results.
- User friendliness is very less.
- It consumes more time for processing the activities.
- If the maximum users are working on the system then system gets slow down.

3. PROPOSED METHOD

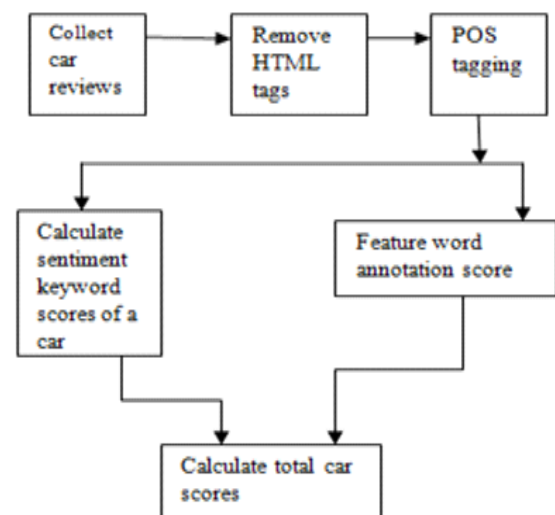


Fig 1: Proposed System of Sentiment Analysis

The System works in various ways. First it collect the reviews from the different web sites and integrate those reviews and

then sentence tagging done on it after that classifier analyze those reviews and give the output as in positive, negative polarity. In this POS (part of speech) is used to remove the html tags so the system will get the clean and structure data for summarization.

System Development Life Cycle is the process of developing the information through implementation, design, coding, testing, delivering. The steps for developing the software are as follow's Software concept, analysis of software, designing, coding, debugging, testing, deployment.

In this the web crawler collect the information from the web sites and integrate the information. Then the sentence tagging used on information i.e. it will remove the html tags from the web pages.

Next step is to calculate the keyword score. In this we are using the SentiWordNet to obtain the sentiment score each WordNet is associated to three numerical scores objective, positive and negative. If it find the uses of obtained score as the keyword's score then adds that to total sentiment score of the blog page. If the analyzer finds a degree-adverb such as "low" or "high" in front of an adjective, then it multiplies the adjectives score with the degree-adverbs score and uses the result as the keyword's score. If the analyzer finds a reversing adverb such as "not" in front of an adjective, it simply reverses the score of that adjective and uses the result as keyword's score.

3.1 Collection of reviews

In this method the product reviews are collected by using web crawler. Web crawler collect the reviews from different web sites. And integrate those reviews in structure form. In this system needs to collect the reviews from different web sites.

3.2 Sentence tagging

The data that we are collecting from various web sites are not in structured format so to convert data into a structured format sentence tagging can be performed. In this the text are analyze. First, it will select the blog pages that contain comments about a specific car. After that it will remove the HTML tags from the web pages. For example, "<head>CAR</head>" will give an output as "CAR". Then apply part of speech (POS) to each sentence which will extract the nouns, verbs, adjectives and adverbs. For e.g. "<head>Hello</head>". This is used to extract the noun, verbs & adjective.

3.3 Keyword scores

We are using the SentiWordNet to obtain the sentiment scores. The SentiwordNet is a lexical resource, where each WordNet synset is associated to three numerical scores objective, positive and negative. It will be useful for the testing the accuracy of sentiment score to avoid manual efforts. It also looks for an adverb either degree-adverbs or reversing adverbs. If the analyzer finds a degree-adverb such as "less" or "more" in front of an adjective, then it multiplies the adjectives score with the degree-adverbs score and uses the result as the keyword's score. If the analyzer finds a pre-defined keyword in a sentence of a given blog page for a specific car, it look for the sentiment words (such as an adverbs or adjectives) that may be associated with that keyword. If it found then uses the obtained score as the

keyword's score and adds that to total sentiment score of the web page.

3.4 Feature word annotation score

We first manually annotate vocabularies related to car and then build our own general feature word list. It do not include some special proper noun related to car such as names of Engine/Mileage and character names because it is not complete enough to cover all of the latest car. A Naive Bayes classifier is a very simple probabilistic model which is used to calculate the score.

3.5 Overall score

Finally, both the scores keyword score and feature word annotation score are added to get the overall score of the car which will decide that car is positive, negative and this work is presented to the end user.

4. SYSTEM ARCHITECTURE

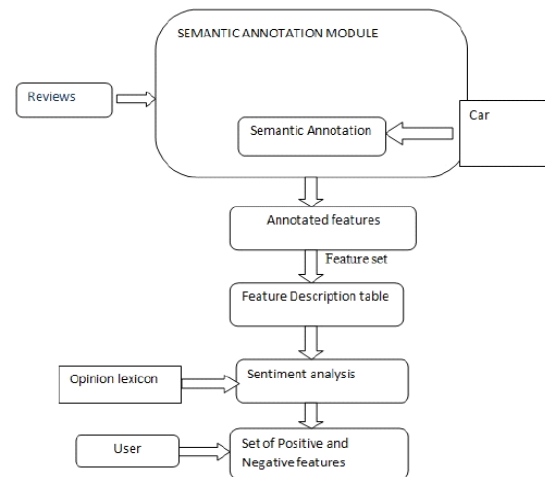


Fig 2: System Architecture for Sentiment Analysis on Car

5. EXPECTED RESULTS

Response time should not be degraded if there is congestion in network. The introduction of the newer clients should not make the server to work hap hazardously. Continuous use of the server by different clients should not result into the server getting slowed down. Response time should be unaffected irrespective of the no of users.

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RAILWAY TICKETING USING NFC

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ABSTRACT

This project is based on ticketing and identification of the passenger in the public transport. In the metropolitan city like Mumbai, Kolkata we have a severe malfunction of public transport and various security problems. Firstly, there is a lot of confusion between the passengers regarding fares which lead to corruption. Secondly due to mismanagement of public transport the passengers faces the problem of traffic jam, thirdly nowadays we have severe security problems in public transport due antisocial elements. This project suggest a user friendly automated ticketing system which will automatically deduct the passenger's fare according to the distance travelled as well as detect the passenger's identification. This could be only possible by use of NFC tickets. This project basically deals with the identification and ticketing of the passengers sitting in the bus. Development in technology bring digital world to be border-less. It's proven through a developed technology, when trade and transaction can be done not only using real money but also virtual one. Shopping process using virtual money has even more supported by existed Near Field Communication (NFC) device. This particular device works using radio frequency. In the year of 2011, Google was integrating this device into a Android-based cell phone, which made transactions using virtual money gradually developed.

E-Ticket is one of the utmost services in online trading. E-ticket is basically a paper-less electronic document, which commonly used for passenger tickets of a transportation system. One of the aims in using NFC in daily life can be implemented within public transportation application. This particular research offers a application prototype for train ticket purchasing and exterminating that use a Near Field Communication (NFC) integrated cell phone.

This train ticketing application integrated with NFC device that had been planted in an Android 4.1 Operation System based cell phone. Designed system made for passenger interface and train conductor interface. NFC technology applied within two created applications. Cell phone that is used within this research is any android enabled mobile, which has been integrated with NFC device; therefore created application can provide a circumstance where applications for passenger and conductor are able to work as a single entity of train ticketing application.

GENERAL TERMS

Hardware Specification

- NFC tags
- NFC based Android Mobile
- Intel processor IV and above
- 1 GB RAM
- 160 GB hard disk

Software Specification

- Visual Studio 2010
- MS SQL Server 2005
- Windows Operating System
- Eclipse
- SDK for Android 4.2

1. INTRODUCTION

1.1 Near Field Communication

Near Field Communication is a wireless close-range connectivity technology which allows data trade between two gadgets. NFC commonly integrated within mobile devices. This will allow the device to establish communication with sim card or other reader devices. NFC works using 13.56 MHz radio frequency. This technology optimizely works under the the space of 20 cm. Transmittable data is only less than 1Mbit. This technology developed in 2004. NTC got the transfer speed of 424 Kbps.

Nevertheless, the main reason to apply this technology is to be implemented within ticketing application, payment application and public transportation application. When a cell phone equipped with NFC devised, that particular cellphone can be used as ticket of conference or theme park and also a "mini wallet" which can be used in certain time. Moreover, the cell phone can also be used as payment tool and an automatic machine, toll payment, and some other transactions. NFC application is also can be used on a public transportation as a substitute of wallet and as a tool to ticket data writing.

Basically NFC has 2 different communications which work on different speed, consist of:

- Active NFC Mode, in this mode, initiator and target use self-established radio frequency to communicate.
- Passive NFC Mode, in passive mode, target answer command made by initiator to call modulation scheme. Initiator do the radio frequency creation.

2. RELATED WORKS

Within the development of technology, problems in banking transaction have been solved by integration among customer's bank accounts to the internet. It can be seen from the existence of e-Banking and m-Banking as main features of banking services.

The ability to establish transaction anytime and anywhere isn't only beneficial for Bank's management, but also several service

providers and sellers which also make use of banking features to cycling an amount of transactions happened. Proven by viral development of online shops that take advantages from payment feature to shop's bank account.

Technology will never stops expanding. The ability to establish quick transaction can be done almost borderless with the existence of e-Money feature or in which also known as virtual money. Take an example from a private bank in Indonesia, this particular bank has launched a card equipped with a particular device which can be detected using radio signal or commonly known as Radio Frequency

Identification (RFID) that intended to replace small denomination and boost up the speed of transaction.

This particular development of technology is not only being used by banking sector. This technology is used by Google as a form of special card launched by a bank. Google inc. in 2011, launched Google Wallet feature as the substitution of credit card which basically works as combination of credit card and a certain equipment that can be detected through radio signal located within a cell phone.

Slightly different with RFID equipped card, within the cell phone there is Near Field Communication (NFC) equipped within.

The NFC technology implementation directed for fast transaction such as supermarket payment or transportation payment. NFC implementation as transportation ticketing will be hugely beneficial for reducing queue line in counter, reducing robbery cases as well as illegal ticket trading which happens in this country. By simplifying the ticketing process and transforming ticket physical form to virtual one, then the NFC technology development will not limited only for payment transaction. This particular technology can also be implemented as one of the way to substitute current ticketing.

3. PROPOSE TECHNIQUES

As soon as the passenger reach to the station he/she have to visit ticket window. There will be a Android Mobile placed over there.

Passenger tap the NFC card. As soon as tapping, passenger id and total balance will get fetch from the NFC card.

NFC based card that will have a unique ID number. The card is rechargeable from certain electronic booths placed at certain locations of the city.

The reader will detect the tag and require certain information from the passenger.

According to the route distance between departure & destination the cost would be deducted from the NFC tag.

The cost can be deducted according to the distance travelled by the public transport vehicle.

The reader will accept the card if the card has required credit to travel that distance.

After the whole day, the individual train reader will know how much credit has been transferred to the corresponding account and also the information can be found in the main database.

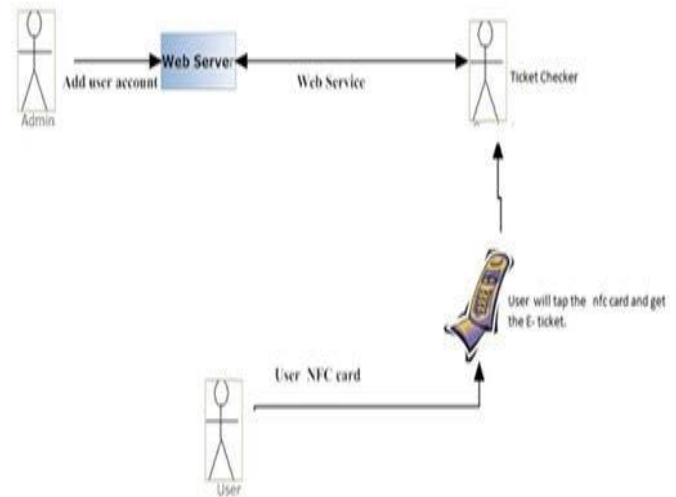


Figure 1: Block Diagram

4. RESULT ANALYSIS

Our project suggest a user friendly automated ticketing system which will automatically deduct the passenger's fare according to the distance travelled as well as detect the passenger's identification. This could be only possible by use of NFC tickets.

E-Ticket is one of the utmost services in online trading. E-ticket is basically a paper-less electronic document, which commonly used for passenger tickets of a transportation system.

E-ticket will reduce operational expenditure and improve the service quality for customer. This strategy has been ran smoothly for airline, so that it is feasible as well to be implemented within other transportation mode such as train, bus, metro etc.

To solve those problems we are developing a new system which is fully automated and paperless.

5. CONCLUSION

The system is completely automated so it reduces the human effort. The cards being reusable, they are much more convenient compared to the project based ticketing system.

Even the bill printer helps to keep the record of the entire expense of the train.

Any unwanted events can be avoided as all the person carrying NFC tickets are monitored every time they travel

6. ACKNOWLEDGMENTS

I would like to express a deep sense of gratitude towards my guide **Ms. Ashwini Save** Department of Computer Engineering for her/his/their constant encouragement and valuable suggestions. The work that I am able to present is possible because of her timely guidance.

I would like to pay gratitude to the panel of examiners **Mrs. Sunita Naik, Mr. Ram Hembade, Mr. Siddhesh Doiphode and Mr. Tatwadarshi P.N.** For their time, effort they put to evaluate our work and their valuable suggestions time to time.

I would like to thank Head of the Computer Engineering Department, **Ms. Ashwini Save** for her support and co-ordination. I am also grateful to entire Computer Engineering Department who lend their helping hands in providing continuous support..

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REAL-TIME IMAGE PROCESSING OF AERIAL IMAGES FOR TRAFFIC CONTROL

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ABSTRACT

Traffic management is becoming one of the most important issues in rapidly growing cities. Due to bad traffic management lot of man-hours are being wasted. We propose a system that will help to control traffic by image processing. The vehicles are detected by the system through image instead of using electronic sensors. The sequence of aerial images are stored in a database. Image processing is also more reliable in estimating vehicle presence because it uses actual traffic images. It function much better than those systems that rely on the detection of the vehicle's metal content. The operation that comes under image processing are image enhancement operations such as sharpening, blurring, brightening, edge enhancement. Traffic density of lanes is calculated using image processing which is done of image of lanes is captured from database. We have chosen image processing for calculation of traffic density. This project will be of great use to control and manage traffic.

Keywords

Image Processing, Aerial Images, Traffic

1. INTRODUCTION

Traffic means the movement of vehicles along a route. Congestion may result due to heavy traffic at a junction. In developing cities like Pune, Mumbai etc. traffic management is becoming important issue day by day due to rapid increase in number of vehicles. Lot of man-hours is being wasted in traveling due to bad traffic management. To avoid congestion there are so many traffic management techniques available. Traffic density of lanes is calculated using image processing which is done of images of lanes that are captured using digital camera. We have chosen image processing for calculation of traffic density as cameras are very much cheaper than other devises such as sensors. An Image is rectangular graphical object. Image processing involves issues related to image representation, compression techniques and various complex operations, which can be carried out on the image data. The operations that come under image processing are image enhancement operations such as sharpening, blurring, brightening, edge enhancement etc. Image processing is any form of signal processing for which the input is an image, such as photographs or frames of video; the output of image processing can be either an image or a set of characteristics or parameters related to the image. Image processing usually refers to digital image processing, but optical and analog image processing are also possible.

2. RELATED WORK

There are some very important concepts used in project. Those are as follows:

2.1 Image Processing

An Image is rectangular graphical object. Image processing involves issues related to image representation, compression techniques and various complex operations, which can be carried out on the image data.

2.2 Steps in Image Processing

There are various steps in image processing. Some of them are as follows:

2.2.1 Image Representation

Image representation is concerned with characterization of the quantity that each picture-element (pixel) represents. The fundamentals requirement of digital processing is that images can be sampled and quantized. Image can be represented in analog or digital form. In digital representation, image can be represented in grey-scale or color format. The grey-level images are represented as 8-bits which allow 256(0-255) possible grey color combinations.

2.2.2 Image Enhancement

In Image enhancement, the goal is to accentuate certain image features for subsequent analysis or for image display. Examples include contrast and edge enhancement is useful in feature extraction, image analysis, and visual information display. The enhancement process itself does not increase the inherent information content in the data. It simply emphasizes certain specified image characteristics.

2.2.3 Image Restoration

Image restoration refers to removal or minimization of unknown degradations in an image. This includes de blurring of images degraded by the limitation of sensor or its environment, noise filtering, and correction of geometric distortion or non- linearity's due to sensors.

2.2.4 Edge Detection

The image consists of objects of interest displayed on a contrasting background; an edge is a transition from background to object or vice versa. The total change in intensity from background to foreground is called the strength of the edge or edge detection.

3. PROPOSED SYSTEM

The research is carried out in order to reduce the traffic congestion by calculating the traffic density in a particular direction of the road by using image processing algorithms. The system starts with an image acquisition process in which the live video is processed by the stationary camera, mounted on any pole. Then one frame per second continuously extracts from the live video and processed each frame by converting it into gray scale. For the reference image an empty road image was selected, when there is no traffic on the road. The second step is the image cropping in which, the targeted area is selected, the area where the vehicles are present and filtered out unnecessary surrounding information. Next phase, determines the presence of objects in live video by taking the absolute difference of each extracted frame with the reference image. Then the presence of objects is enhanced by binarization of the difference image. Then the final step is to calculate the traffic density in the desired target area by counting the number of vehicles in that region. To perform this, first, the vehicles are marked in the targeted region by scanning all the connected objects, and filtering out smaller and overlapping objects.



Fig 1: Captured image



Fig 2: Background image

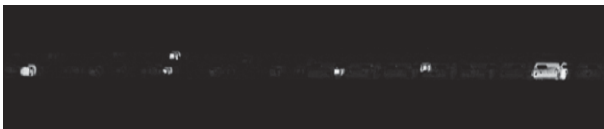


Fig 3: Difference image



Fig 4: Detected vehicles

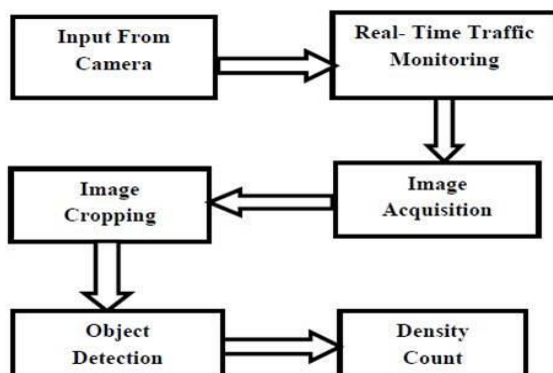


Fig 5: Flow of system

4. EXPECTED RESULT

The proposed system will reduce the traffic jam because we analysis the specific traffic signal various time in a day and make a schedule for that place and it controlled by following that schedule and also with image processing. It will reduce the number of uses traffic police because this mechanism handled the signal atomically so we need only a traffic police into each traffic place and it will also reduce the complexity of the traffic point. This mechanism will save the valuable time of the general public with its traffic jam free road and people finish their daily work with his great satisfaction. The system has a central database all of the information are stored into the database and it is all time share its data through the others nearest traffic signal. So all time one signal knowing others nearest signal situation. The real time imaging system are continuously collect images that is also supported online monitoring and maintain traffic management, vehicle tracking and collect information. It will make a good relation between traffic police and general people. If made some further changes this tool can also be used by the Railway Department. The movement of trains can be done with the help of this tool. This tool will also prevent the unwanted accidents which take place almost every day because of wrong signals given to the trains.

5. CONCLUSION

The system will be developed with much care and at the same time it will be efficient and robust. Also provision will be provided for future development in the system. The entire system will be secured.

6. ACKNOWLEDGMENTS

Our thanks to our guide Mrs. Pallavi Vartak who always motivated and helped us.

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Steganography in Audio files using Modified F5 Algorithm

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ABSTRACT

Today's large demand of internet applications requires data to be transmitted in a more secure way. The transmission of data in public communication system is not secure because of interception and improper manipulation by attacker. So the best solution for this problem is Steganography. Steganography is an effective method of hiding data that has been used throughout history. Audio steganography is the scheme of hiding the existence of secret information by suppressing it into another medium such as audio file. The first input is an audio file whose audio samples, which are used to suppress the hidden data. Whereas, the second input is a grammatically correct text. Then it encodes the location of the random audio samples in the audio file. The proposed technique of modified F5 algorithm provides a secure way for data transmission that it is difficult for unauthorized user to detect the presence of and recover the secret data.

Keywords

Steganography, Messaging, Secure communication, Audio files, Modified F5 algorithm.

1. INTRODUCTION

Steganography is an art of sending hidden data or secret messages over a public channel so that an unauthorized user cannot detect the presence of the secret messages. Steganography is method of embedding textual information in an audio file, images or in video files. The term hiding refers to the process of making information imperceptible or keeping existence of information secret.

Embedding information into 'audio' seems more secure due to less steganalysis technique for attacking to audio. Pure Steganography is defined as a steganographic system that does not require the exchange of a cipher such as a stegokey. Steganography is implemented using some of algorithms such as Least Significant Bit (LSB), Echo-hiding, Direct Sequence Spread Spectrum (DSSS), etc. Audio steganography is the scheme of hiding existence of secret information by concealing into another medium such as audio file. This paper proposes audio steganography using 'Modified F5 algorithm' which provides more secure way for data transmission and reliable as compact to other algorithms.

2. RELATED WORKS

There are many algorithm developed for image steganography. Meanwhile, the interest in using audio data as cover object in steganography is more reliable than image data. This paper describes the implementation of steganography in audio data using direct sequence spread spectrum method. Modified F5 can be applied to embed message in audio data & to send hidden message through radio waves. Spread Spectrum method is known very robust, but it is expensive, the implementation is comparatively complex and the information capacity is very limited [2].

A perfect audio steganographic techniques aim at embedding data in robust way and then extracting it by authorized people. Hence the main challenge in digital audio steganography is to obtain robust high capacity steganographic systems. In this paper, a current state of art literature in digital audio steganography is presented. The potentials and limitations have been identified to ensure secure communication [4].

Till now in steganography the hidden or secret text message is firstly stored in an image and then that image has been send to the user with the help of audio, But this process is too lengthy because there is an involvement of image and audio also. LSB is one of the most widely used algorithms for audio steganography. This method permits high embedding capacity for data and is relatively easy to implement. But this technique is characterized by low robustness to noise addition and hence it is less secure and very vulnerable even to simple attacks [11].

Later on another technique was introduced and implemented named as Echo Hiding in which data is embed into audio signal by introducing short echo to the host signal. This method still has some issues in data transmission, since there may be chances to get add additive noise [5].

Taking all those issues into consideration and to some extent solve such problems this paper presents a more secure, robust and reliable algorithm named as Modified F5. This paper is focused on working of Modified F5 algorithm and applications of this algorithm to achieve secure data transmission in audio files. Modified F5 uses matrix encoding to improve efficiency of embedding. It is a secure steganographic algorithm hides confidential messages within another carrier file. An unauthorized user should not be able to find out whether there is any secret data is embedded in the steganogram (i. e., a steganographically modified carrier file).

3. PROPOSED TECHNIQUE

3.1 Modified F5 algorithm

In 2001, the german researchers Pfitzmann and westfeld introduced the F5 algorithm. F5 algorithm is vulnerable to recompression. The detection rate is decreases as the embedding rate decreases. To solve this problem this paper proposes modification to the F5 algorithm. In Modified F5 algorithm message bits are embeds into randomly chosen DCT coefficients in audio beats. It is the first steganographic process the algorithm which uses matrix encoding algorithm to reduce the necessary number of changes required for embedding a secret message.

Steps for embedding:

1. Input one audio cover file.
2. Calculate DCT value of beat matrix.
3. Apply quantization to DCT coefficients the quality factor 'Q' is used to build quantization table.
4. Take a password from user which is served as random embedding position in a DCT blocks.
5. To hide messages, choose available coefficient.
6. Apply entropy encoding algorithm.
7. Save stego file in Wave/Mp3 format.

Steps for decoding:

1. Take input as stego file for performing steganalysis.
2. Decompress stego file.
3. Perform filtering for noise removal.
4. Recompressed the audio.
5. Count different histogram value for the stego audio and cover audio.
6. Calculate different stego audio-cover audio.

3.2 Discrete cosine transform

Sound file consists of vectors that vectors are divided into smaller frames and arrange in the matrix form. The matrix is manipulated with the DCT operation. By performing DCT operation elements are sorted in their matrix form through which components and their positions can found out. Elements are arranged in descending order and then threshold value is decided which are below the threshold values, so the compression takes place because of the reducing size of the signal. So by using reconstruction process the data is then converted into the original form. For this IDCT operation, perform on the signal then it is converted into vector form. Formula:

$$x_n = \sum_{k=1}^n y_k w(k) \cos\left(\frac{\pi(2n-1)(k-1)}{2N}\right)$$

Where

$$w(k) = \begin{cases} \frac{1}{\sqrt{N}}, & k = 1 \\ \sqrt{\frac{2}{N}}, & \text{otherwise} \end{cases}$$

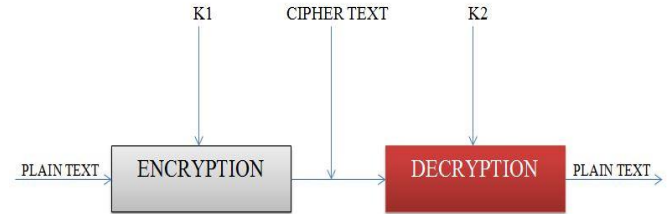


Figure 1: Basic Working

In above diagram describes the basic working of how the actual process is been takes place in application. First the plain text will be encrypted with encryption key k1. This plain text will be converted into cipher text which will go for further process that is decryption which will be done at end user side. For decryption a decryption key k2 will be use and with the help of that key the end user can get his desired output that is plain text.

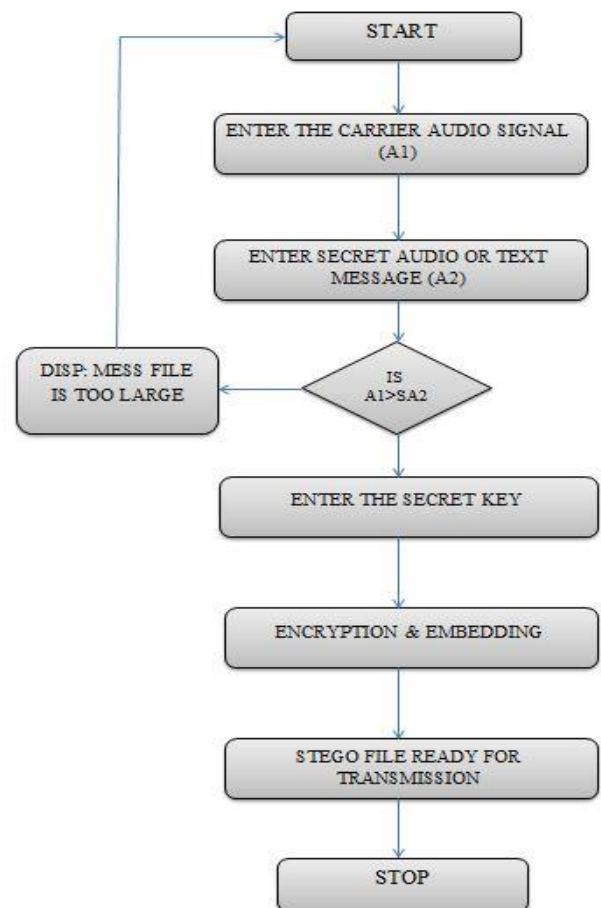


Figure 2. System flowchart

To accomplish the steganography process the following steps have to be followed:

Step 1: Take the input audio file from user and the message that he/she want to transfer.

In above step an application will receive an input file from the user which is known as cover file. Also it will accept a message or text file which user wants to send the end user.

Step 2: convert message into appropriate binary numbers.

This step converts the message or the text file into appropriate binary numbers and then it goes for further processing.

Step 3: Insert that binary numbers into audio file.

In this step the converted binary numbers are inserted into the cover file which is selected by the user.

Step 4: Performing algorithms for data hiding.

This step is the heart of the algorithm in which an appropriate binary numbers get combined with the cover file. If the data size is too large then data compression will take place using DCT algorithm. In the whole process actual working is run in the backend which will lead to message hiding and finally meet the desired goal.

Step 5: Then another user decrypt that files and get desired data. This is the final step which is performed at the receiver side. Here also the algorithm will be running in the backend and the decryption process has been done through which end user can get his/her desired data or message.

4. RESULT ANALYSIS

Modified F5 algorithm has a high steganographic capacity. The Modified F5 algorithm helps to prevents visual attacks. Also it provides more secure communication than F5 algorithm.

In following table it can be seen how modified F5 algorithm is different in terms of capacity, efficiency and robustness. The LSB and Direct spread spectrum algorithm are low and poor in capacity and efficiency respectively, where as they are low and medium in robustness. Echo hiding has medium capacity, low efficiency and medium robustness. Phase coding has medium capacity, high efficiency and low robustness where as modified F5 algorithm has high capacity, efficiency and robustness.

Table 1. Result analysis of all algorithms with modified F5

Algorithm	Capacity	Efficiency	Robustness
LSB Algo.	Low	Poor	Low
Echo hiding	Medium	Low	Medium
Direct Spread Spectrum	Low	Poor	Medium
Phase coding	Medium	Medium	Low
Modified F5 Algo.	High	High	High

In this system the user can send his message to end user through networking in a secure manner. In this system keys

have been used for encryption and decryption so that an unauthorized party cannot detect the message easily.

5. CONCLUSION

This system provides a good, efficient method for hiding the data from hackers and sent to the destination in a safe manner. This system will not change the size of the file even after encoding and also suitable for any type of audio file format. Encryption and Decryption techniques have been used to make the security system robust.

Thus this method provides a more reliable way for secure communication and help to achieve high capacity robust steganography system. The main goal of modified F5 algorithm is to provide maximum security. It reduces the number of changes which are necessary for message hiding.

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Survey paper on Salesman tracker

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ABSTRACT

Our application is basically built for live tracking of salesman and live in their schedule of work regularly. It will help regularly to co-ordinate with employee. It gives live tracking along with update admin whenever he wants to change his priority to do work with live tracking. It will help to get live update of salesman.

This app will also include features like Live tracking of salesman, Update with work status, Alarm check which is going to differentiate each company from one other and daily status of salesman's work.

Keywords

Android Application,Gps,Java.

1. INTRODUCTION

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2. RELATED WORK

Related work in this field includes fetching the salesman location and notifying to the admin also specifying daily work.

Tracking and work assignment

At this level, the location of salesman is identified using GPS system and inform to manager in this way continuous tracking of salesman is done. Then manager assign work tasks to salesman.

Daily map generation

At the end of the day map of salesman's whole day work is generated. It helps manager to calculate things like number of location visit by salesman, routes by which he travels, time spending for each work.

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3. PROPOSED METHOD

Considering the anomalies on above existing system, we have developed a convenient system with the help of latest technological tools.

In current system tracking is done manually means admin has to depend on sales representative, check in and out time is maintained from every sales representative. Also manual reports are obtain manually. Due to these performance of the

salesman cannot tracked precisely and sale of product or collection of process degrades. Our application is built for live tracking of salesman and live co-ordinate with employee as same as current system. It also gives live tracking in update in their schedule of work regularly. It help regularly to admin whenever he wants to change his priority to do work with live tracking it will help to give live update of salesman.

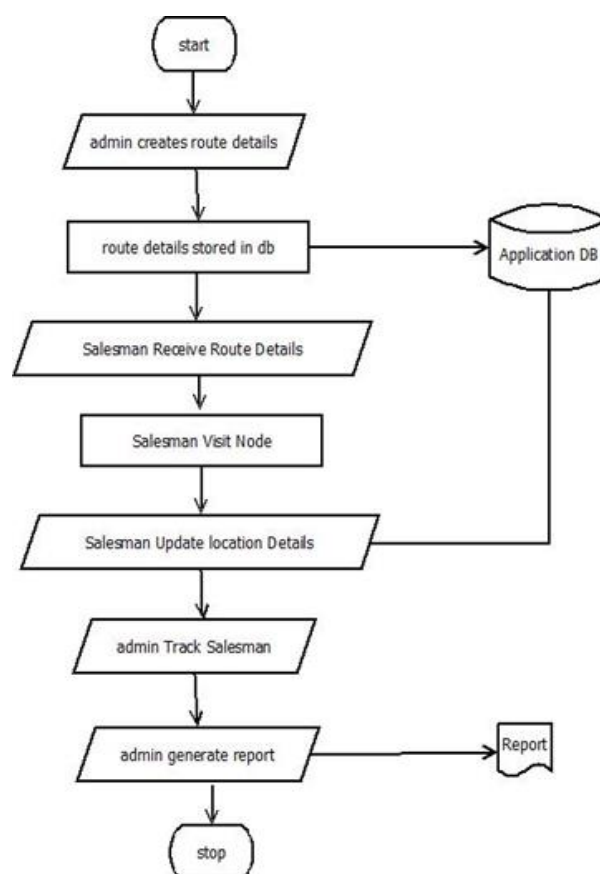


Fig 1: flowchart of system

Our system also includes new features like live tracking, update with work status, alarm check, whole daily status and few additional once. Our system is work in following manner- first admin upload route details then salesman receive it. After that salesman visit route node and he update visit details and

node details. Then admin track the salesman and in last admin generates daily report.

4. PERFORMANCE MEASURE

The goals of Salesman Tracker can be summarized as follows.

The application is scalable, admin can manage multiple salesman at a time and set work task to him. The processing speed of the application is fast so that work task notification arrived quickly. In this manner application work precisely. It consumes less internet so that battery life live long. Because of daily map it helps to admin to summarize salesman's whole day work on single screen

Table 1. Comparison with alternatives

App name	Salesman tracker	Track my work force
Ease of access	Easy to handle and user friendly.	Quite hard to handle.
Internet consumption	Less.	More.
Speed	Fast.	Slow.
Additional Features	Daily map generation.	No daily map.
Cost	Free.	Paid.

5. CONCLUSION

Using our application admin will be easily coordinate with salesman. Admin assigns tasks according to its priority to the salesman. It also easy for salesman because it easy to handle and user friendly. The processing speed of our application is fast so that new updates about work are quickly received. Also it consumes less internet so that battery life of cell live long throughout the day. This application includes generation of daily map which will gives summary of salesman's whole day work to the admin. There will be no registration cost in our application so that it will becomes more popular in public. In future updates of our application we will also include shortest path concept, which will display possible shortest path from salesman's current location to the goal (target) location. The entire system is secured. In future, more work is needed in further improving the performance measures. Since there is possibility of employing various methods and combining them to be used in single situation to achieve better and more accurate outcome and results are also demonstrate, in our future work we plan to further improve and refine existing techniques

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ONLINE EXAMINATION SYSTEM FOR SUBJECTIVE ANSWERS

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ABSTRACT

A system application performs online examination for subjective and objective question, checks and marks written answers similar to a human being. This software application is built to check subjective answers in an online examination and allocate marks to the user after verifying the answer. The system requires you to store the multiple sets of original answer for the system. The admin may insert questions and respective subjective answers in the system. When a user takes the test he is provided with questions and area to type his answers. Once the user enters his/her answers the system then compares this answer to original answer written in database and allocates marks accordingly. The system consists of in built artificial intelligence sensors that verify answers and allocate marks accordingly as good as a human being.

Keywords

Subjective Answer, Answer Checker, Marks Allocation.

1. INTRODUCTION

An automatic answer checker application, checks written answers similar to a human being. This software application is built to check subjective answers in an online examination and allocate marks to the user after verifying the answer. The system requires you to store the original answer for the system. This facility is provided to the admin. The admin may insert questions and respective subjective answers in the system. These answers are stored as notepad files. When a user takes the test he is provided with questions and area to type his answers. Once the user enters his/her answers the system then compares this answer to original answer written in database and allocates marks accordingly. The system consists of in built artificial intelligence sensors that verify answers and allocate marks accordingly as good as a human being.

2. RELATED WORKS

Online Examination system:

This system works using the data connection ie. The internet. This system checks answer automatically using internet connectivity.

Objective type:

This system is used to check answers which are of objective type. This system works well for objective answers only and therefore has less application.

Subjective type:

This system provides questions for subjective answers which are then checked manually by professors. It uses man power and is time consuming.

3. PROPOSED SYSTEM

Considering the anomalies on above existing system, we have developed a convenient system with the help of latest technological tools.

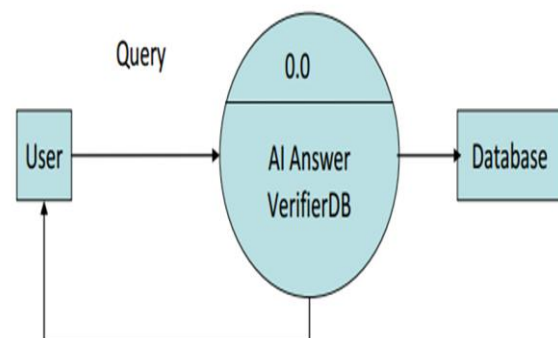


Figure 1: Database Details

In this diagram, we can see that the answer verifier takes the user entered answer and checks with the answer stored in its database.

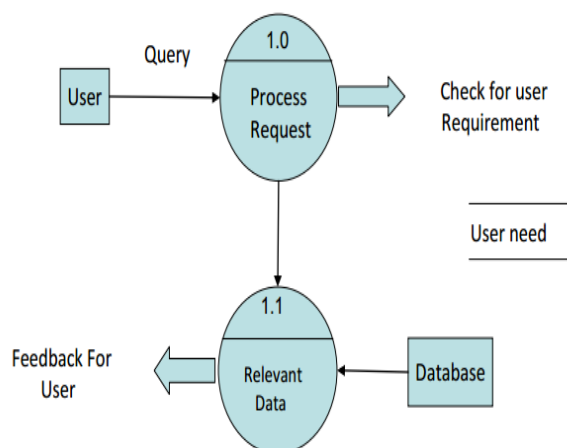


Figure 2: Level 1 DFD

In this figure we can see, that inside the answer verifier, the process request checks for the requirement needed by the user and then sends it to the relevant data. The relevant data, which is stored in the system's data is compared with the answer.

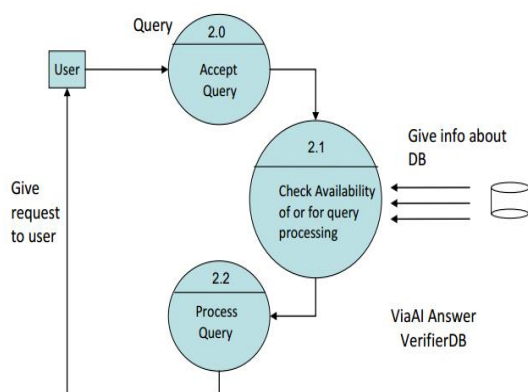


Figure 3: Level 2

In this figure, we can see that the verifier first accepts the query from the user. Then the verifier checks for the availability of the query in its database and takes all the information related to it. Once all the information is collected, it then processes the query and gives the related feedback to the user.

4. CONCLUSION

This Online Examination System developed using ASP.net, HTML and My-SQL fulfills the basic objectives of the

system for which it has been developed. The system has reached a steady state as far as the basic framework is concerned. The system is operated at a high level of efficiency and its advantage is quite understood. The important thing is that the system is robust. Also provision is provided for future developments in the system. The entire system is secured. This online system will be approved and implemented soon.

5. ACKNOWLEDGMENTS

I would like to express a deep sense of gratitude towards my guide Ms. Ashwini Save, and Co-guide Mr Ram Hembade department of Computer Engineering for his constant encouragement and valuable suggestions. The work that I am able to present is possible because of her timely guidance.

I would like to pay gratitude to the panel of examiners Mrs Sunita Naik, Mr. Ram Hembade, Mr. Siddhesh Doiphode and Mr. Tatwadharshi P.N. For their time, effort they put to evaluate our work and their valuable suggestions time to time.

I would like to thank Head of the Computer Engineering Department, Ms. Ashwini Save for her support and co-ordination.

I am also grateful to entire Computer Engineering Department who lend their helping hands in providing continuous support.

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“SMART CITY”: Reflecting Municipal Corporation Services for Human Welfare

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ABSTRACT

In day to day life municipal corporation services are provided by visiting corporation offices physically or through visiting their web sites to some extent. Various facilities such as banking, e-commerce, booking etc. are provided using mobile application.

Use of mobile applications for distinct purpose is growing rapidly. People prefer to use mobile applications to carry out various daily activities. Hence there is a need to develop a mobile application which will help to provide municipal corporation services. The previous system used to serve citizens was based on website which was not so convenient. Thus we have developed new system i.e. Mobile Applications which is more convenient and efficient than the previous system[1].

This paper presents new and efficient method to provide various corporation services through mobile application which turns to be efficient in terms of time, cost and paper work.

KEYWORDS

GCM – Google Cloud Messaging, HCI- Human Computer Interaction, TID - Transaction ID.

1. INTRODUCTION

People visit to a municipal corporation offices or visit their websites to access their services. Use of mobile has increased drastically. 91% of world population owns mobile phone, out of which 56% owns a smart phone. Mobile is the primary internet source for the 50% of the mobile users. It is also observed that user spent 80% of time inside applications [9][11].

This application resembles municipal corporation services. Various services are provided through this application. User

can access these services from anywhere & anytime through mobile[12].

Observing the above stats, user prefers mobile applications to access essential day to day services. There are numerous municipal corporation services which are used by the citizens frequently, thus accessing this services through applications will be boon to a mankind.

2. RELATED WORK

Most astronomically immense corporation are in the six metropolitan cities of India viz. Delhi, Mumbai, Kolkata, Chennai, Bangalore and Hyderabad and among these Mumbai is the most populous and most immensely colossal metropolitan city of India[10].

Today municipal corporation services are provided in corporation offices. Therefore there is much need of a common man to visit corporation offices physically. It is not feasible for every person to visit corporation offices every time. There is another option provided by some municipal corporation i.e. websites. People can access any services online through this websites, but most of the time this sites are not available or dead.

Most researchers in human computer interaction take interest in developing incipient hardware contrivances, prototyping incipient software system and exploring incipient paradigm for interaction. Design in human computer interaction aim to engender utilizer interfaces which can be operated within facileness and efficiency [3].

3. PROPOSED SYSTEM

Application is based on Common Man interaction with Computational device along with the benefits of interaction with Municipal Corporation.

This application will be truly based on HCI Key points, i.e. User Friendliness, Color Combinations, and Ease of

Language. It gives various functionalities as one touched operation for providing various facilities [6]. The Records generated will be logged in web server on the admin side. Providing TID for each operation and services available in Android based Application. Also Corporation can provide various notifications to all users regarding any required broadcast information during the time of epidemics and other various emergencies. User can also access to the municipal Services through one touch like Reporting to Fire nearest Fire station in the Corporation Boundaries. Fire Station will be reported the location of the user through Global Positioning System. Other services like Reporting Potholes, Complaints about specific departments, etc.

This Application represents customize notification according to the user given location filtered by the server admin. It will also inform user about the current corporation committee and available media and information about the historical and geographical context as an extended service.

3.1 Google Cloud Messaging for Android

Role of Google Cloud Messaging for Android (GCM) refer Fig. 1 in this application i.e. GCM Architecture is an accommodation that sanctions you to send data from your server to your users' Android-powered contrivance, and withal to receive messages from contrivances on the same connection. The GCM accommodation handles all aspects of queueing of messages and distribution to the target Android application running on the target contrivance. GCM is completely free no matter how immensely colossal your messaging needs are, and there are no quotas [14].

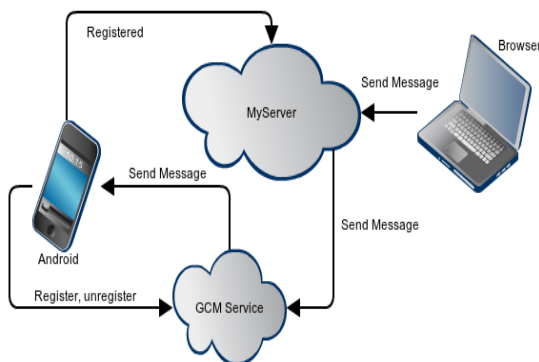


Fig 1: Working of GCM Architecture

Above figure 1. refers the working of google cloud messaging architecture by Google, used in this application. In context to this service, the web server sends the message the GCM server, which queue the message incase the registered device is not reachable or delivers the message to the registered device. Message is received in the form of Push Notification on the device.

3.2 Services offered in Application

An application offers many services. Some of the services are listed as follows:-

- Notifications
- Active Tenders
- Certificates & Online Forms
- Complaint & Feedback
- Taxes & Bills
- Emergency Toolkit
- Job Opportunity
- Elected Wing

For example Active Tenders will give information regarding all the Active Tenders that are announced by the municipal corporation.

3.3 Flow of Complaint Services in Application

There are various services available to user in application, among which one of the service is describe through a flowchart refer Fig. 2 below.

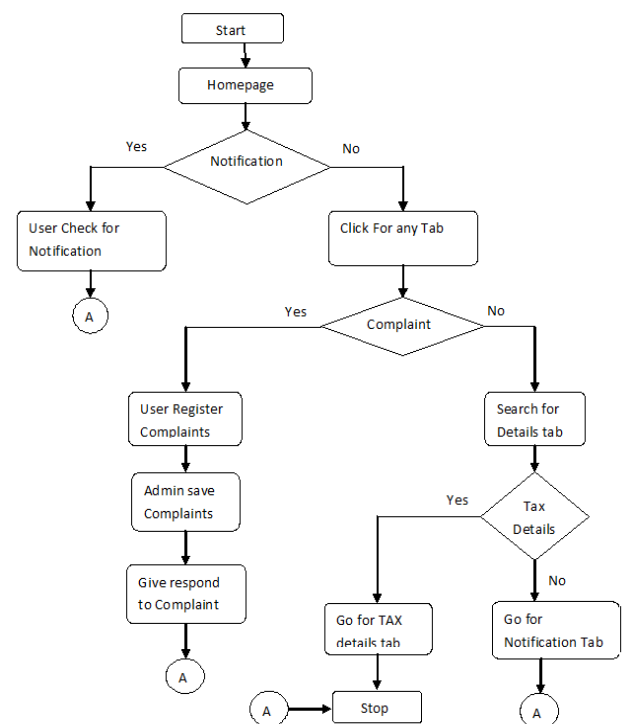


Fig 2: Flow of Complaint Services in Application

Above figure 2. shows the flow of Complaint Registration Service in our system, which refer to registration of various complaints regarding various issues of a common man in a

society within the boundary of Municipal Corporation. For example issues regarding Drainage system, Irregular Water Supply, Waste Collection, etc. One can register complaint of such issues through this application.

4. RESULT AND ANALYSIS

Current system resembles to personally visiting the corporation office or visiting their websites. Very few websites are fully functioning. Thus this increases paper work, cost and time. This application provides better and fast result than current system. It provides services such as Notifications, Active Tenders, Certificates & Online Forms, Complaint & Feedback, Taxes & Bills, Emergency Toolkit, Job Opportunity, and Elected Wing.

Some advantages are listed below:

- User Friendly Interface.
- User friendly with transaction id generation on registration of complaint and various other features.
- Ease of accessing Municipal Corporation Services by using the Application developed [3][6].

GUI of the application will look similar refer Fig. 3 as such below:



Fig 3: GUI of Smart City

Above figure shows basic or first look of GUI of the Application. It consists of various services offered by the application. It also consist of language switch key to change language of the User Interface according to user convenience..

Language switch will offer languages like Hindi, English, Marathi, etc.

5. CONCLUSION

This paper results into advantageous and beneficial context to the current system of Municipal Corporation. The system has been developed with much care that it is free of errors and at the same time it is efficient and saves time. One of the important thing is that the application is robust in terms of data. Also provision is provided for future developments in the application. The entire working of the application is secured.

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Opinion Mining for Hinglish Using Supervised Learning

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ABSTRACT

Due to the development of the web in recent years, there is a lot of user generated content available. This user generated content can be used as data sources in online systems. Opinions can be extracted from these user generated contents and be used for further analysis. This paper proposes a way, to build a classifier for detecting sentiments of Hinglish & English movie reviews, based on Naïve Bayesian Classifier. We implemented the proposed method, tested its performance and suggested directions of improvement.

Keywords

Opinion mining, Naïve Bayes, sentiment analysis, machine learning, Hinglish, Hinglish analysis.

1. INTRODUCTION

The sentiments found within comments provide useful indicators which can be used for many purposes like pattern analysis and decision making. The sentiment can be classified as positive and negative and the overall sentiment of the comment can be calculated based on the number of sentimental keywords. Sentimental analysis facilitates policies to analyse public opinions with respect to particular subject.

Large volumes of information appear on the internet. It is very difficult to be processed by individuals manually, leading to information overload, hence affecting decision making process. In India, these reviews are often in Hinglish (Hindi words typed in English). Hinglish is a language used routinely in music, movies and it is through which millions of Indians communicate. As it used so widely, people tend to use it in their comments or reviews to express their opinions. These comments and reviews when analyzed using a standard classifier, might not give desired output. In order to overcome this obstacle, this paper presents an opinion mining technique.

There is a training data set consisting of positive and negative sentimental words for Hinglish and English, the classifier

checks for keywords from this training data set to classify the respective word as positive or negative.

A large volume of information is available in the textual form. This textual information can be either Opinions or Facts. The facts are the objective expressions which describe the entities, events and properties whereas the opinion is the subjective expression which describes people's opinions, emotions and sentiments towards entities and their properties [11].

Opinion mining (also known as Sentiment analysis) indicates the use of techniques such as text analysis, natural language processing, and computational linguistics to identify and extract subjective information [1]. It is used to analyze the attitude of the writer towards the commodity or service.

2. RELATED WORK

Related work in this field includes analyzing the data or information which is available in the textual format at different levels. They are as follows: [7]

Document level: At this level, the task is to identify whether a whole document expresses a positive or negative sentiment. It classifies a whole review as positive or negative. In this level of analysis it is assumed that the opinions expressed by a document are towards a single entity only.

Sentence level: At this level, the objective is to determine whether the opinion expressed by a sentence is positive, negative or neutral. This level of analysis relates to subjectivity classification which differentiates factual information from subjective views and opinions [2].

Entity and Aspect Level: In this level, analysis is done to identify towards which entity the opinion was directed. Also called feature level, it separates an opinion into sentiment and its intended target. An opinion without its target being identified is of limited use.

The document level analysis is of limited use as the opinions expressed by the document are towards a particular entity only. Thus, this approach is not applicable to comparative reviews.

The Sentence level is based on subjectivity. It differentiates facts from opinions. It is complex to implement compared to document level, but easier than Entity & Aspect Level.

The Entity & Aspect Level is the most complex analysis. It determines the entity towards which the opinion was directed. In most cases, classifiers built based on this analysis method are of little use.

3. PROPOSED METHOD

We come across movie review websites where users are allowed to rate and add reviews about movies online. These ratings are used as input to the website. The admin then checks reviews, critic's ratings and displays an online rating for every movie. Here, the proposed online system automatically allows users to post reviews and store them. The system analyzes these comments to check for sentiments associated with each comment. The proposed system consists of a sentiment library i.e. training data consisting of positive and negative words. The system breaks user comments into tokens to check for sentiment keywords. The keywords, once found, it associates a sentiment rank to the comment. The system then amalgamates all comments for a particular movie, and then calculates an average score to rate it. For every movie in the system, this score is generated. Thus, an automated movie rating system for Hinglish as well as English comments is achieved based on sentiment analysis.

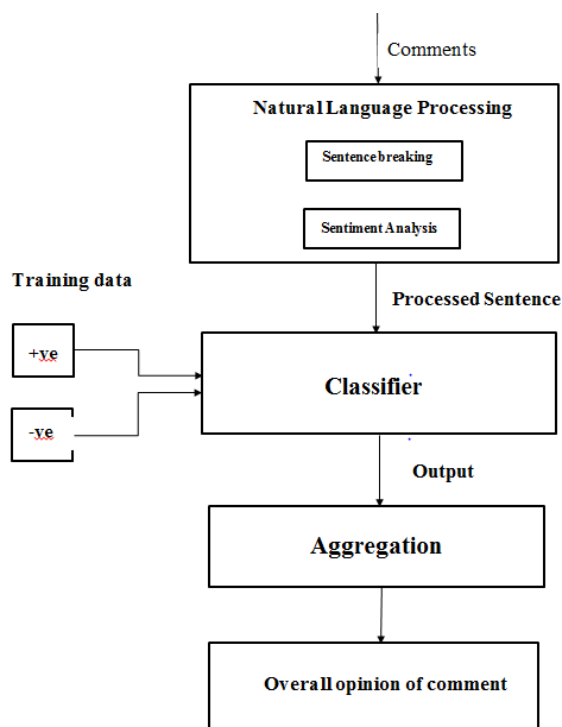


Fig 1: Flowchart of the System.

Fig 1 depicts a flowchart of the proposed system. The comment or review containing Hinglish words is fed as an input. The comments are then broken into sentences (for multi-sentence comment). These sentences are further divided into tokens. The tokens are then fed to the classifier. The classifier checks for Positive & Negative Hinglish words and assigns a word count to the particular class (positive or negative). Depending upon these words, the overall sentiment of the sentence is calculated. The same is done for each sentence. It is then aggregated to get the overall opinion of the comment.

4. PERFORMANCE MEASURE

The Naive Bayes Classifier gives an accuracy of 0.8 which is greater than most classifiers. Note that this accuracy is only for English comments. Since we are implementing classifier for Hinglish comments as well, hence the accuracy will be slightly more than that. This is due to the fact that, the proposed system will classify English as well as Hinglish comments, which will be ignored by a standard classifier. The performance can be well analyzed with the help of an example given below.

Example:

Bole toh maza ah gaya. Full paisa wasool, zara bhi pakao nahi hai. Movie is a visual masterpiece. There were some shots, which made audience go crazy. Some scenes were as epic as 2001: A Space Odyssey. Matthew McConaughey does what he is best in and supposed to. Go, sit back and enjoy. Also, make sure you go to the best theatre close to you. If you loved Donnie Darko, 2001: A Space Odyssey, this is the one for you, Get ready to get mindblown!! Interstellar Movie is EPIC in all sense!! [13].

The above example shows a movie review with Hinglish comments. The system now breaks the user comments to find out keywords that help to find out the sentiment.

Eg.

Bole toh maza ah gaya. Full paisa wasool, zara bhi pakao nahi hai. Movie is a visual masterpiece. There were some shots, which made audience go crazy. Some scenes were as epic as 2001: A Space Odyssey. Matthew McConaughey does what he is best in and supposed to. Go, sit back and enjoy. Also, make sure you go to the best theatre close to you. If you loved Donnie Darko, 2001: A Space Odyssey, this is the one for you, Get ready to get mindblown!! Interstellar Movie is EPIC in all sense!!

The words which are underlined in the above table are those words which give the sentiment of the sentence. Now these words are checked with the training data to identify the

polarity of the sentence. The training data consist of set of positive words and a set of negative words.

Table 1. Assigning polarity based on training data

maza	1
wasool	1
pakao	-1
masterpiece	1
epic	1
best	1
enjoy	1
loved	1
mindblown	1

As we can find the number of positive words is more than the number of negative words, hence the above comment is considered to be a positive comment.

The system does same for all the comments of a particular movie and generates a overall rating for the movie. This score is generated for all the movies in the system. This provides an automated movie rating system.

5. CONCLUSION

This paper provides a method in which sentimental analysis for Hinglish comments is done. The system breaks user comments to check for sentiment. The classifier has been trained with pre-defined positive and negative words. Once it analyzes the sentence, it associates a sentiment rank (positive or negative) with the comment. This system does sentimental analysis for Hinglish comments hence its accuracy is slightly greater than the previous systems. Sentiment analysis can be used in different fields when it is required for identifying the task of whether the opinion expressed in a text is positive or negative in general, or about a given topic. The important thing is that the system is robust. Also provision is provided for future developments in the system. The entire system is secured. In future, more work is needed in further improving the performance measures. Also, there is possibility of employing various methods and combining them to be used in single situation to achieve better and more accurate outcome and results.

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Text Steganography: The Mahābhārata Way

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ABSTRACT

A sentence contains at least one clause. That is, a sentence contains at least one subject and at least one predicate. To enhance the understanding of the sentence or give more information about the subject and the predicate adjectives are used in a sentence.

This paper proposes a new method at text steganography where the adjectives, which can be so easily used in an English language, are used to hide information.

Keywords

Information Hiding, Text Steganography, Mahābhārata, Adjective, Adjective Text Steganography, Mahābhārata Text Steganography.

1. INTRODUCTION

The Mahābhārata is one of the greatest and the longest epics ever written. This epic is made of one hundred thousand verses, making it an epic eight times longer than the Greek epics Iliad and Odyssey put together.

Sage Veda Vyāsa, the writer of the epic, says that the Mahābhārata is the encyclopaedia of virtues and other tenets. In fact, the Mahābhārata itself says that “whatever is spoken about virtue, wealth, pleasure, and salvation may be seen elsewhere; but whatever is not contained in this is not to be found anywhere” [1]. It also believed that it contains information that is useful even in today’s context. One such important context pertains to steganography.

Steganography is the art and science of hiding secret data in another medium. The data which has to be hidden is called secret message and the medium in which this secret message is hidden is called the cover document. The cover document containing hidden message is called the stego-document. This stego-document is sent over the unsecured channel to the intended receiver [2]. And since the eves dropper is unaware of the presence of the secret message the question of decoding minimizes.

This paper proposes a technique of hiding of the secret message or information by using an adjective or a group of adjectives that are present or can be seamlessly integrated into a grammatically correct English sentence.

2. RELATED WORK

Over the many decades now text steganography has been a very interesting field of study. And this interest has led to many new techniques being put forward by many scholars. In this section we will look at some of these methods pertaining to text steganography.

Moreland [3] put forward a technique of hiding of words in Specific Characters of Words. Here the secret word was hidden in a collection words of a paragraph, character by character. Example, first character of every paragraph.

Line Shifting method [4] text steganography. Here lines are shifted vertically by some degree. And this degree of shifting is taken as 0 and 1.

In the Random Character and Word Sequencing method [5], random sequence of words or characters are generated to hide the information.

In Word Shifting method [5] [7] the words are shifted horizontally and by changing the distance between the words the information is hidden.

Another way of hiding the information is by placing punctuation at proper places, this approach is called Syntactic method [8].

The Semantic method techniques [8] hides the message by using synonyms of some particular words, mostly nouns, adjectives, verbs and adverbs.

Feature coding technique [9] of the text steganography changes the feature or structure of the text to hide the information.

In open spaces method [11] of the text Steganography the information is hidden by adding extra white spaces between words or at the end of the paragraphs.

Also many other works have been carried out in the field of text steganography recently including applying its use in chat [13] and SMS [14].

The large number of dots in the Arabic, Persian and Urdu have prompted them being used for text steganography. The methods [9] [10] [15] exploits these dots to store information.

As far as the Mahābhārata is concerned, mattitude of research has been carried out on its linguistic properties, on its virtues, its warfare techniques but very less on the context of cryptology and steganography techniques that it uses or have been made use of in the book.

Taking a leaf out of the Mahābhārata, this paper presents a novel approach of using the adjectives to store hidden message or information.

3. PROPOSED TECHNIQUE

In the Mahābhārata at one instance Droṇācārya, the teacher, wants to communicate that Arjun, the opponent warrior, has arrived on the battlefield to his colleague Bhīṣma without others in the hearing range knowing about it. So, instead of calling the name of the person directly Droṇācārya uses many superficially unrelated adjectives. On the face of it the use of adjectives were useless. But to the receiver, in this case Bhīṣma, it contained the meaning that the person that has come in front of them is no ordinary warrior but in fact it is Arjuna the great mythological warrior [16].

Taking this idea forward the paper proposes a technique of using the adjectives to store secret message. Here an adjective or a group of adjective contain a particular secret message which will only be decoded by the intended receiver. At both the sender and the intended receiver they will have a database or a table mapping a particular adjective or a group of adjectives to a unique secret message that need to be sent over the unsecured channel.

For example,

Table 1: Adjectives assigned to each secret message

Adjective	Secret Message
Abandoned	English is a good language
Adventurous	English can be a great language

Astonishing	Hindi is a good language
Astonishing, Adventurous	Hindi can be a better language
Dependent	Hindi will be a great language
Disgusting	Hindi is a great language
Disgusting, Astonishing	USA is super power
Abandoned, Dependent	Indian is an emerging Economy
Astonishing, Adventurous, Disgusting	India will become a super power
Astonishing, Adventurous, Disgusting, Dependent	India is on its way of becoming a super power

3.1 Encoding Technique:

For encoding or converting the secret message to stego document the following process needs to be followed. The secret message that needs to be sent is searched from the table and the corresponding mapped adjectives are identified. These adjectives are used in a grammatically correct sentence. This is the stego document containing the secret message.

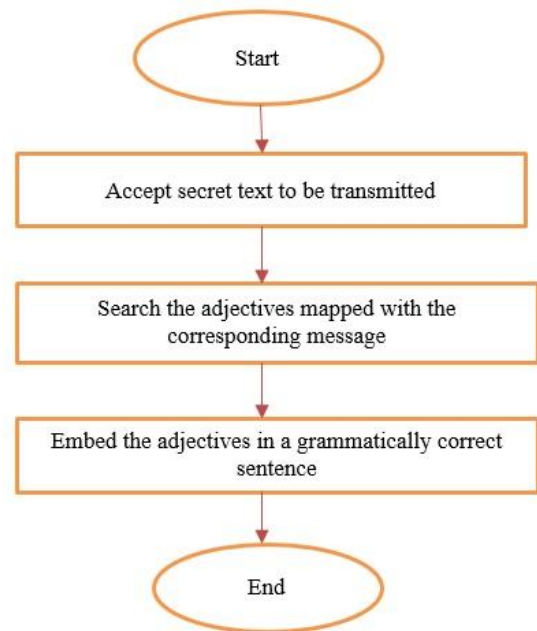


Fig 1: Flow chart for encoding the secret message

3.2 Decoding Technique:

For decoding or extracting the secret message the received message is scanned and the adjectives are tagged using natural language processing. The adjectives are extracted and mapped to the corresponding secret message associated with the concerned adjectives. This is the secret message sent by the sender in a secure manner by using the proposed technique.

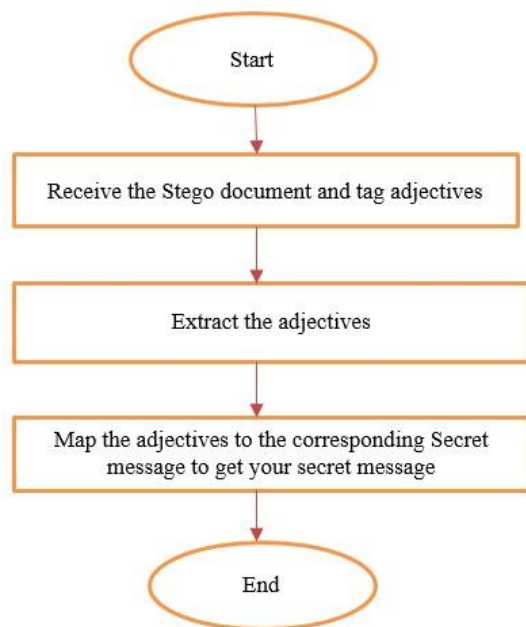


Fig 2: Flow chart for decoding the stego document

4. ANALYSIS OF ADVANTAGES AND DISADVANTAGES

- The technique is very easy to understand.
- The implementation is also relatively simple, only the introduction of Natural Language processing for tagging adjective will have to be looked into.
- Supposing that English language contains around Hundred thousand adjectives and scope of more, the secret message and the adjective pair that can be made is in the millions by just considering the possible combinations.
- If permutation and combinations are taken into consideration, with unique order of the

occurrence of the adjectives then the secret message and the adjective pairs that can be formed will be even more.

- The database can be periodically updated without any hassles.
- The ability of updating the database periodically, with ease, makes the system reliable and helps the technique be relevant for a long time.
- The same technique of using the adjectives in the sentence can also be used and integrated to support any languages.
- The drawback of the system is that the generation of the database will be a somewhat tedious task.

5. CONCLUSION

The paper proposes an easy method of hiding information making use of the adjectives, a method or a way of hiding information used in the great epic called the Mahābhārata. These adjectives carry hidden information or secret message with it, unknown to a person to whom the message is not intended.

The ease through which this technique of using the adjectives to covertly send the message, as used in the Mahābhārata, has been integrated in this paper also proves that more research into the epic might throw new techniques and methods in many different fields.

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ADVANCED RAILWAY RESEVATION SYSTEM

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ABSTRACT

In our country railways have become prominent. Our system consists of solution for reservation, planning and managing railway transportation. It includes the idea of seat selection, indirect route finding to provide convenience to the users while planning trips. Apart from this we deal to provide client side facilities using algorithms such as SHA-512 for security purpose. It may also avoiding simultaneous registration, authentication and blocking of about two or more client assessment at the same time. The front end consists of HTML web pages and Backend consist of PHP and loosely coupled with Front-End. It also includes database connectivity by using MYSQL.

1. INTRODUCTION

This project is nothing but as an advanced version of currently running Railway Reservation System used by IRCTC. The passenger can individually select his seat as per the preferred berth unlike the current system which provides seating as per the availability. The transparency in the existing system is compromised means one can illegally book the ticket and sell them at a higher price. In our system we overcome this problem by providing more security by using the cipher text for authentication purpose. This system also provides an indirect route that provides tickets even if direct route is not available between the source and destination.

2. RELATED WORK

This project enables concurrent seat allocation handling. It is done by overcoming the problem of blocking of simultaneous access of same seat.

2.1 Existing System

Current system lacks in the optimization of seat allocation and procurement of tickets.

There are several drawbacks in the existing system. They are as follows:

2.1.1 Searching

The current system show only direct trains available between the source and destination station. If a direct train is not available then the user has to make two separate bookings for both the trains. So the user has to fill the booking form twice and has to go through the payment procedure twice.

2.1.2 Booking

In the current running system, the passenger's selects his train and fills the passenger's detail form and submit it. The reservation system allots seats as per the availability of the seat. There is a no guarantee that the passenger will get the same seat as specified.

2.2 Proposed System

To avoid blocking during simultaneous access of same seat, we will use the concept of timer. This includes a time limit allotted to a passenger once he selects a particular seat. The temporary time allotted ensures that seat is reserved for other passengers; this time is provided for payment procedure. If the payment is succeeding, the seat is permanently reserved. If the passenger does not book his ticket within given time, his temporary allotment is cancelled and the seat becomes available to other passengers. We use two colors Green and Red to indicate seat availability. The Green color will represent the available seats, whereas the Red colour will represent the reserved seats. The system may also show indirect routing of locations that is, it may issue a ticket even if a direct route is unavailable between source and destination.

2.2.1 Algorithm Used

SHA512 algorithm will be used for encryption which is considered to be one of the safest methods for improving the security. Also a 512 random salt is added to the passwords for the user to further enhance the security.

The formula for finding salt is as follows

Formula

Salt =SHA512 (random number)

The formula for finding Password Hash is as follows

Formula

Password Hash= SHA512 (Password + Salt)

This Salt value and Password Hash value is then stored in DB. The system designed has certain functions present. These functions have certain requirements to execute. They also have certain constraints.

2.2.2 Inputs

The user can search trains by entering the source and destination stations. The user can directly book ticket if he knows the train number. The system displays the layout of the

'S1' coach of the selected train by default. The user can select a different coach and his seats by clicking on the available seats. The user has to fill in details (name, age, gender and quota) for each passenger. The user has to enter Bank credentials to complete payment process.

2.2.3 Outputs

The user gets the following outputs.

The system generates a ticket after the booking process completes. The user can click the 'PRINT THIS TICKET' button to print the ticket.

3. RESULT ANALYSIS

The idea of seat selection and indirect route finding is expected to provide more convenience to the user in terms of planning their trip. If it turns out as expected, then it would create a huge impact on the turnaround of passengers toward the railways, increasing their level of trust. Apart from this, the Algorithms used can be housed in many different situations of seat allocations and reservation system [3]. Addition of client side facilities is an attempt to provide rich and convenient experience to the users. We try to provide a solution which has a strong backbone of GUI, user friendliness and transparency by an extensive set of services, to make the Railways even more efficient the system that we have proposed here is extremely flexible and adaptive and thus has a very wide scope [4]. The backend PHP scripting is very loosely coupled with the front end design part. The advantage being that we could easily change the design and the look of the website without affecting the functional part. Along with that for maintaining the database MySQL will be used for efficient maintenance of user data [4].

4. CONCLUSION

The project report entitled "Advanced Railway Reservation System" has come to final stage considering all the difficulties and irregularities in the traditional system, the goal to replace it with a more efficient one was in the mind when constructing the project and it's been a really fruitful moment to finally conclude that ARRS is ready to roll. The system has been developed with much more care and at the same time it is efficient provision is provided for future developments in the systems. The entire system is secured. This project will be approved and implemented soon. The system can be made more efficient by integration of Short Message Service (SMS) API. The system will then be able to verify user authenticity via SMS and tickets can also be provided using an SMS thus totally eliminating the use of paper. Besides, user can also be sent important updates related to its ticket. Quota and concession can also be implemented without making major changes in the system, thus making the system more practical.

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RFID Embedded Mobiles for Person Tracking during Calamities

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ABSTRACT

This paper describes the design of an RFID (radio frequency identification) embedded mobiles for person tracking during Calamities. It is designed to track a Person in a wide area where a calamity has occurred using RFID technology. In a mobile device the proposed system uses hardware and software components. The hardware consists of an RFID transceiver, scanning antenna, RFID transponder. The antenna is setup around area where the calamity has occurred. The transponder in an individual's mobile is programmed with his profile. When an RFID tag is in the range of the antenna, it detects the signal from the antenna. That starts the RFID chip, and it transmits the information to microchip to be picked up by the scanning antenna.

General Terms

Embedding RFID technology

Keywords

RFID system, Hybrid mobile, Calamity management.

1. INTRODUCTION

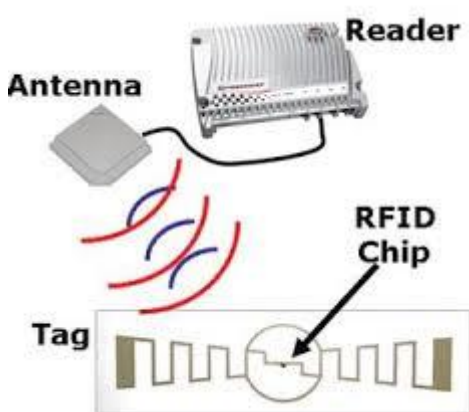


Figure 1: Simple RFID system.[13]

Information and communication technology have played a vital role in managing calamity. In recent Uttarakhand disaster, the mobile networks and connectivity was cut off and rescue operations were hindered due to this situation. The current search and rescue techniques are based on identifying

possible locations of victims, or areas of entrapment. This means the rescue people do not exactly know the exact position of victims trapped. In this paper we have proposed a system that will speed up the search and rescue operations by pinpointing the exact location of the trapped victim by using scanning antennas and RFID embedded mobile phones. This paper is structured as follows: In section 2, we describe the RFID technology briefly. Section 3 contains working of the system. Section 4 contains other applications of the proposed system and conclusion in section 5.

2. RELATED WORK

Today Radio Frequency Identification card use in many applications such as product location in big show room to protect it from the thief, in vehicle identification to check whether vehicle is of authorized user etc. It is widely use for security and authentication purpose. This card will be use in mobile phone. It will help to find people in extreme situations like disaster. It will also work if the mobile network is down.[2]

3. REVIEW OF RFID TECHNOLOGY

RFID stands for Radio-Frequency Identification. The RFID device does same purpose as a bar code or a magnetic strip on the back of a credit card or ATM card; it provides a unique identifier for that object. and magnetic strip must be scanned to get the information, the RFID device must be scanned to retrieve the identifying information. RFID systems have been widely used in many application areas, such as: inventory control, container tracking, ID badges and access control, equipment/patient tracking in hospitals, etc. A Radio-Frequency Identification system has three parts: A scanning antenna, a transceiver with a decoder to interpret the data, a transponder the RFID tag that has been programmed with information. The radiofrequency does two things: It provides a means of communicating with the transponder (the RFID tag) and it provides the RFID tag with the energy to communicate (in the case of passive RFID tags). This is an key part of the technology; RFID tags do not need to contain batteries, and can hence be usable for very long periods of time (maybe years). The scanning antennas can be permanently affixed to a surface; handheld antennas are also available.

Three frequency bands are normally being used for RFID:

Low Frequency (125/134 KHz):

Highly used for access control, and asset tracking.

High-Frequency (13.56 MHz):

Used where medium data rate and read ranges up to about 1.6 meters are acceptable. This frequency also has the advantage of not being susceptible to interference from the presence of water or metals.

Ultra High-Frequency (850 MHz to 950 MHz):

Offer the longest read ranges of up to approximately 3 meters and High reading speeds[1][5]

4. TYPES OF RFID

	Active RFID	Passive RFID
Distance	Up to 100 feet	Up to 20 feet
Power Source	Internal- Battery powered	External- Relies on a reader
Cost	Around \$20 per tag	.07 - 20 cents per tag
Data Storage	128kb large read/write data	128b small read/write data
Tag Expiration	About 5-10 years, dependant on the battery's life.	Often longer than a lifetime depending on the environment.
Size	Large enough to accommodate the battery. Usually bulky.	As small as a microchip and as large as a paperback book
Advantages	<ul style="list-style-type: none"> • Reads long distances • Highest data bandwidth • Able to initiate communications • Tag must be replaced when battery dies 	<ul style="list-style-type: none"> • Longer lasting, tag life doesn't depend on battery • Tags are inexpensive • Small tag size accommodates range of assets and is easy to conceal • Tags are more resistant to physical damage or harsh environments
Disadvantages	<ul style="list-style-type: none"> • Tags are costly • Cannot function without a battery • The tags are large in size, not suitable for smaller assets 	<ul style="list-style-type: none"> • Communication depends on the antenna size and shape • Read range is limited • Difficulty reading through metal or liquid

Figure 2: Difference between Active RFID & Passive RFID[16]

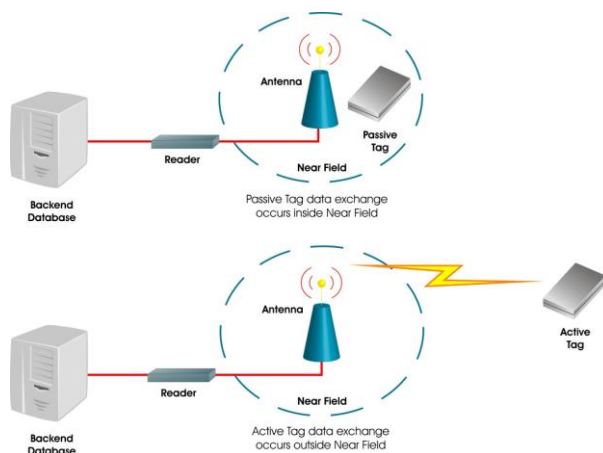


Figure 3: Range of Active & Passive RFID system.[15]

5. PROPOSED SYSTEM

In this system we are embedding two technology RFID and mobile phones, because we have seen various situations where person's location is not known in advance and therefore the rescue operations are delayed. To overcome this problem we have a solution of using UHF (RFID) with mobile phones as people carry their mobile phone everywhere they go, here we use RFID as a active device which is being used by the rescue operation team of disaster management. As during the any occurrence of any natural or man-made calamities the affected people cannot communicate with their dear ones as the network is crashed or nonfunctional, or not in a condition to speak or operate any communication , as today

the current technology to locate any person or group of person is been used by government officials by using mobile communication, (GPS) which cannot be used during calamities so here UHF(RFID) can be used instead, As a similar low range application is used in warehouse management , in large library where to keep track of each and every product and book is very difficult and to store and find its location using traditional methods is much more difficult. So we can use this technology to save people's life.

6. PERSONS LOCATION USING RFID

1.Firstly we have to a choose a very high frequency active RFID which ranges from 100 meter to 100 miles.

2. we have to select a frequency allotted by government and legalized it for only RFID tracking technology

3. we have to compulsorily fuse RFID active tags with mobile phones.

4.During calamities we have to setup an array of large power RFID receivers to triangulate the position of every person in affected areas .

5. we can also use large power receivers in flying vehicles which can fly over a large area and close to earth which can pinpoint a person or can log people's location in geographical map .

7. TRIANGULATION TECHNIQUE

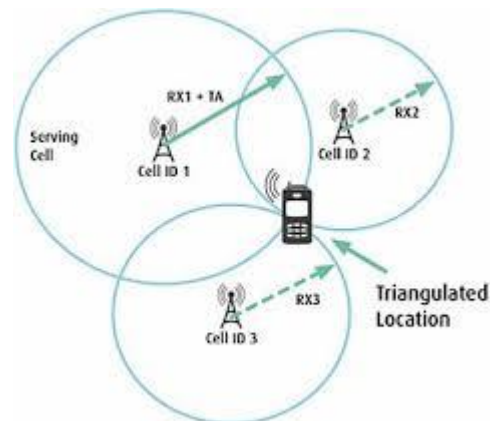


Figure 4: Three tower technique to locate person.[14]

8. APPLICATIONS

RFID is surely not able to completely substitute barcode. Rather, both technologies will exist parallel to each other in the future and will be used depending on the application.

A few areas our proposed system can be implemented are as follows:

- RTLS (Real Time Location System): In some applications, you need to track the real-time location of assets, or customers. Whether you're measuring the efficiency of worker movements, store floor plan, or tracking the location of high value resources, our proposed RFID system can be

embedded anywhere to provide visibility in any number of locations.

- IT asset tracking: IT assets such as server blades, laptops, and other peripherals are costly investments for any company, do not mention that information stored on those items could prove hazards if it falls in the wrong hands. IT asset tags give your IT team the ability to quickly do an inventory count and make sure everything is in place. Our proposed system could be used to track these peripherals by embedding an RFID chip into it.
- Attendance Tracking: If you've ever managed a large event before, you'll know that it's key to keep the flow of traffic moving at a slow pace, especially in and out of seminars. With an RFID embedded mobile attendee solution, we can eliminate the need for registration lines at entrances.

9. ADVANTAGES

There are many advantages of using RFID over conventional technology like barcodes. Following gives a list of a few advantages of using RFID based system:

- RFID Can Read Multiple Tags Simultaneously.
- RFID Does Not Require Line-of-Sight:
- RFID Improves Processes.
- Robust system
- RFID is very fast. In most cases respond in less than 100 milliseconds.
- Bidirectional communication
- Reliability in tough environments.
- Bulk detection.

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ELECTRONIC CIRCULATOR

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ABSTRACT

In this project we are about to distribute the e-book resources into a client-server architecture for effective reading purposes. The main aim of the project is to provide a platform to share documents in a small network of a small workplace, which can allow development of synchronized and well knitted workgroup. The system will include distributed objects for the books in the library as well as a user client program and a client program and a monitor program. The application will provide a login based access to the library and books will also involve authentication for added data security. It includes semantic construction of the e-resources in the database, classification and search optimization. A ramified version of ontology will be seen in the project to enhance the features. Also it will be a web-based application so that the clients can access it from any place feasible. One of the vital features of the circulation is to analyze the popularity of the file among a targeted audience. For that purpose the application will include viewers, up loader's and the admin's recommendation. The popularity count will also be an additional feature.

KEYWORDS

Library, Bookmarking, E-books.

1. INTRODUCTION

Today, internet has become the back bone of the society. The emergence of the internet and the web has led to changes in the process of scholarly publishing, communication and to find the relevant information using internet. Library is a place where in all the resources i.e. books, journals, thesis, projects,

etc. are stored. Libraries now have electronic/web resources, internet based subscribed resources, open access e-contents like e-books, e-journals and many more. A library just can't maintain a stock of the resources if it does not makes it available to the users. Until and unless, the users reach their desired information which he/she is seeking without wasting his time, the e-resources available from the library portal are of no use to him/her [2]. Management of e-resources has become more challenging and daunting task. As the library responds to the enormously increasing online resources and the users' rising demand for the resources, the acquisition, metadata organization and system management of e-resources become increasingly complicated due to more various types of publisher, and online interface provider, frequent changes in available journals and its issues within aggregated databases, and the variety in the scope of fair use for each license agreements. Thus Electronic Circulator will provide a centralized access to all the books needed at feasible location [1]. Apparently, all most all the library's databases and e-resources can be reached using the application, and library statistics show rapidly increasing use of those databases and e-resources [3]. "A great advantage is that when users work with the e-application, it makes no difference whether the resource they need is from an online journal, e-book, online database or an open access database," remarks professor of Medicine at KMC, Manipal. "Thanks to the e-interface, users can locate the huge range of available resources regardless of their origin, access them in the most efficient way possible, and benefit from additional features such as the uniform display of data records, saving useful searches, and exporting search results into literature management tools" remarks MD postgraduate student [4].

2. RELATED WORK

Related work in this field includes analyzing the data or information. At this level we are collecting and gathering the information about the different types of algorithm that were used for sharing resources platform. Here we will discuss about mainly two different algorithms. The first one is the Time Quantum Based Improved Scheduling Algorithm and other is String Matching Methodologies [6]. The First algorithm is time based whereas the String matching is based on the pattern matching.

Further determining the effect, it analyses the core ideas of these single pattern string matching algorithm and multi-pattern string matching algorithms. We compared the matching efficiencies of these algorithms by searching speed, pre-processing time, matching time and the key ideas used in these algorithms. It was observed that performance of string matching algorithm is based on selection of algorithms used and also on network bandwidth. String matching is a technique to find out pattern from given text. Let Σ be an alphabet. Element of Σ are called symbol or character. For example, if $\Sigma = \{a, b\}$, then abab is a string over Σ . The pattern is denoted by $p[1...m]$. The text is denoted by $[1...n]$. If P occurs with shift S , then we call S a valid shift; otherwise, we call S an invalid shift. The string matching problem is the problem of finding all valid shifts with which a given pattern P occurs in a given text T .

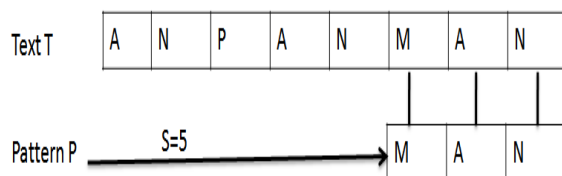


Fig 1: Example for String matching algorithm

Now when the application will be launched the first activity that will appear to the user will be a list consisting of following options – registered with ID, add notifications, modify notifications, search for the topic and books and papers. There will be an encryption technique involved to secure the user's identity and data. The User will be made to choose a User-Id and password as for authentication.

Registration for user is most important for the reviewing the data [4]. The Pop-ups related to the fondness of the book will be displayed. In short, the application is going to keep a track of the user's activity through time and then pop up a list of activities which he can choose from. Bookmarking technique for personal innovativeness, along with popularity count and recommendation will be provided. Time based relationship approach will be used to provide recommendations after working on the statistics of the user data to analyze the topic that attracts user interest [5].

3. PROPOSED METHOD

We propose to build customized software for a workplace which can also be used in the education system. The bookmarking system will be introduced for individual user for personal innovativeness [7]. Pop-ups related to the user fondness will be projected by time based algorithm. Also the searching will be easier to find a specific e-book in the Database. The authentication of every user will be crucial part of the application. Electronic circulator project provides the linking of all e-resources (e-journals, e-books and online databases) subscribed by the library as well as open access resources. In this solution A-Z listing has been done for all e-resources. Electronic Circulator is built on highly scalable and flexible technology platform [12]. This solution is backed by online help for the all users. Online help provides the complete information to use the application.

About the Bookmarking system:

All web browsers have features that help individuals organize their bookmarks. Increasingly, browsers are including features that let users assign tags, or self-selected keywords, to their bookmarks and search through their tags and associated bookmarks in ways that were not possible with older, hierarchically organized bookmark lists [9]. A bookmark can be made visible to others if a user chooses to make it public; however, the act of retrieving a bookmark in current social bookmarking systems is not visible to others at all. Social bookmarking systems, therefore, let individuals inconspicuously discover what others are reading in two ways. Major, an individual can search on a certain tag to find what bookmarks others have associated with it [8]. Second, an individual can view the complete set of tags and

bookmarks created by another person, which makes it possible to serendipitously come across information that is interesting and pertinent but which users may not have known to search for directly. Together, these are “social triangulation” where one individual’s choice of which online resources to visit is influenced by the preceding actions of others.

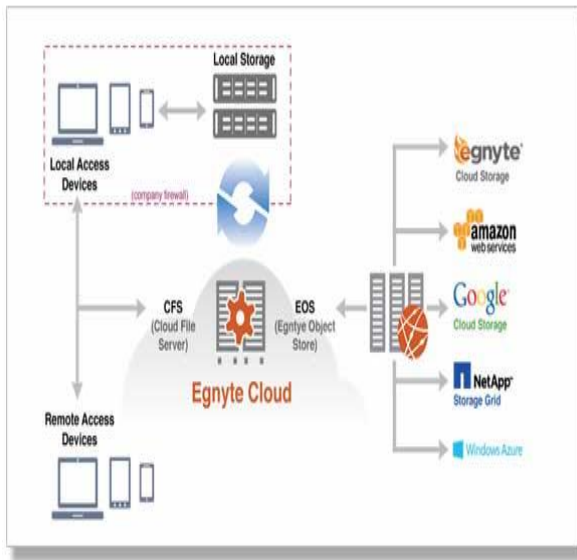


Fig 2: Execution on board [15].

4. PERFORMANCE MEASURE

The goals of Electronic Circulator can be summarized as follows.

Genericity: our first and primary goal is that our system be usable to measure a wide range of sharing platforms [10].

Scalability: the application must be ready-to deploy at a large scale, since we want to test the performance of distributed systems with a large number of “real” peers. The user’s own overhead should be low, to avoid influencing the overall performance of the system measured [14].

Modularity: Electronic Circulator must allow performing fine-grained measures of various

components of data management application. Thus, it may be interesting to grasp the performance of a sharing system’s locating function only or of its indexing component only, of its distributed query processing operations only etc. This essential feature also enables the accessibility of complex, hybrid systems, for instance XML or RDF data management layers deployed alternatively on a DHT and on an unstructured network etc [11].

We plan to demonstrate Electronic Circulator on a distributed application dedicated to the collaborative production, testing, integration and distribution of free software, inspired from google drive and drop box platforms. Many kinds of users participate in such a system. Most users are uploaders: they contribute successive versions of specific software packages and/or their documentation. Other users are testers/integrators: they need to have up-to date versions of software packages on their sites (possibly automatically pushed by the system as part of a subscription) in order to test and integrate these packages among them. A few sites have a publisher profile: periodically, they publish large-scale integrated software suits, together with their documentation etc. Other sites serve as boosters: they only replicate published suits, with the purpose of making them available faster to downloading users scattered all over the world. Finally, a large majority of participants only download software, either integrated suites or individual packages under test [13].

We have chosen this application as representative mainly due to its distributed nature, and to the dynamicity of all peers involved: an arbitrary peer can get involved in such a free software development and exploitation effort, and similarly, any peer can leave at any time. A further interesting aspect of the application is the variety of read/write profiles of the participating peers, which should allow to test the suitability of a sharing system for a large spectrum of real-life applications.

5. CONCLUSION

The ELECTRONIC CIRCULATOR is an effective management and search tool for the information seekers like faculty members, researchers and students. ELECTRONIC CIRCULATOR enables users to quickly and easily find the resource they need, whether from an e-journal or a database. Users can search and access e-resources as a stand-alone content. They can easily access e-books, e-journals and online databases combined. In a single platform they can search across the library's resources including free and paid databases such as journals and e-books and other resources.

Features such as e-mail alerts, my e-library, Feedback form, admin login, clustering, increased customization, and enabling users to choose whether to display results by relevance or chronological order will make the system even more effective for library staff and library users.

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Data Cleaning Technique for Text Data

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ABSTRACT

Today, data plays an important role in our daily activities. Today's business success is highly dependent on the data quality. Data warehouse of any organization contains large number of data entries. Incorrect data may misguide to take wrong decisions and conclusions. Monitoring and analyzing organizations data regularly is necessary. Some approaches should be there to monitor and correct the data.

Many techniques have been proposed for data cleaning. This paper is focusing on the PNRS algorithm which detects and corrects textual errors present in the dataset for improving data quality in database applications.

Keywords

Data cleaning, PNRS, Modified PNRS.

1. INTRODUCTION

Data quality is a critical factor for the success of data warehousing projects. Improving the quality of data is important in data warehouse, because it is used in the process of decision support, which requires accurate data. There are many errors and inconsistencies that occur in the data sets when brought in from several sources. Data cleaning is the process of identifying and removing or correcting errors in the data.

To build the data warehouse with clean and correct data; the cleansing process is important which detects and corrects errors in the entered data. The cleaning process includes methodology in which organizational level dictionary has been created for correct data along with the real world dictionary. All data which is incorrectly entered will be compared with the dictionary words and it will be replaced by manual intervention. Even duplication of the data has been avoided by implementing the transitive algorithm method for data cleaning process [2].

Data cleansing is the first step and most critical, in a Business Intelligence (BI) or Data Warehousing (DW) projects, yet easily the most underestimated. T. Redman suggests that the cost associated with poor quality data is about 8-12% of the revenue of a typical organization. Thus, it is very significant to perform data cleaning process for building any enterprise data warehouse [1]. After cleaning, a data set will be consistent with other similar data sets in the system. The inconsistencies detected or removed may have been originally caused by user entry errors, by corruption in transmission or

storage, or by different data dictionary definitions of similar entities in different stores.

This paper presents a modified PNRS technique which detects and corrects most of the error types and related problems in the dataset. Text data will be cleaned by PNRS algorithm. By applying this algorithm with some modified version on data sets, it will give more accurate and less number of suggested words in the suggestion list. That means it will avoid some non-relevant suggestions so that it will help user to choose the correct word easily from the suggestion list.

2. BACKGROUND

Many methods are proposed by researchers for data cleaning. Dictionary based data cleaning is widely used technique. Dictionaries used for the data cleansing process can be both real world dictionary as well as organization level dictionary.

PNRS Algorithm:

This algorithm corrects the phonetic and typo-graphical errors present in the data set using standard dictionaries. PNRS Algorithm mainly includes two types-

2.1 Near-Miss Strategy

This approach works on the technique where two words are found identical by interchanging, inserting, or by deleting two letters. If valid word is generated by applying this technique; it is added to the temporary suggestion list. This can be reviewed and corrected in the original data automatically or by some manual intervention [1].

Algorithm of Near Miss Strategy:

Input: Unclean Dataset.

Output: Replaces each incorrectly entered data in dataset by suggesting list of correct words.

1. Create an organization level dictionary.
2. Determine incorrectly entered data.
3. Find two words that are considered "near" if they can be made identical by any of following three interventions.
 - i. By inserting a blank space.
 - ii. By interchanging 2 letters.
 - iii. By changing/adding/deleting a letter.

4. If a valid word is generated using this technique, it is added to temporary suggestion list.

The valid word can be reviewed and corrected in the original data with some manual intervention [1].

For example: If the entry of attribute Religion is incorrectly entered as 'Jian' then applying near miss strategy two nearer letters 'i' and 'a' will be interchanged and the word will be corrected as 'Jain'.

2.2 Phonetic Algorithm

When the word is truly miss-spelled, Near-Miss doesn't work efficiently as it's unable to give best list of suggestions. In this technique phonetic code is calculated for Miss-Spelled words which have to be compared with the phonetic codes of the word list in dictionary. When it gets matched the word is added to the temporary suggestion list and which can be reviewed and corrected in the original data automatically or by some manual intervention.

Phonetic Algorithm [5]:

Input: Unclean Dataset.

Output: Replaces each incorrectly entered data in dataset by suggesting list of correct words.

1. Create an organization level dictionary.
2. Determine incorrect entered data.
3. Find Two words which are considered identical by applying phonetic code technique as :
 - i. Capitalize all letters in the word and drop all punctuation marks. Pad the word with rightmost blanks as needed during each procedure step.
 - ii. Retain the first letter of the word.
 - iii. Change all occurrences of the following letters to '0' (zero): 'A', 'E', 'T', 'O', 'U', 'H', 'W', 'Y'.
 - iv. Change letters from the following sets into the digit given:
 - 1 = 'B', 'F', 'P', 'V';
 - 2 = 'C', 'G', 'J', 'K', 'Q', 'S', 'X', 'Z';
 - 3 = 'D', 'T';
 - 4 = 'L';
 - 5 = 'M', 'N';
 - 6 = 'R'
 - v. Remove all pairs of digits which occur beside each other from the string that resulted after step (iv).
 - vi. Remove all zeros from the string that results from step 5.0 (placed there in step 3).
 - vii. Pad the string that resulted from step (vi) with trailing zeros and return only the first four positions, which will be of the form <uppercase letter><digit><digit><digit>.
4. This compares the phonetic code of the miss-spelled word to all the words in the word list.
5. If a valid word is generated using this technique, it is added to temporary suggestion list.
6. The valid word can be reviewed and corrected in the original data with some manual intervention.

For example : If the entry of attribute occupation is incorrectly entered as 'Teachee' whose phonetic code is T-200 then it will be

match with dictionary phonetic code T-260 then the word will be corrected as 'Teacher'.

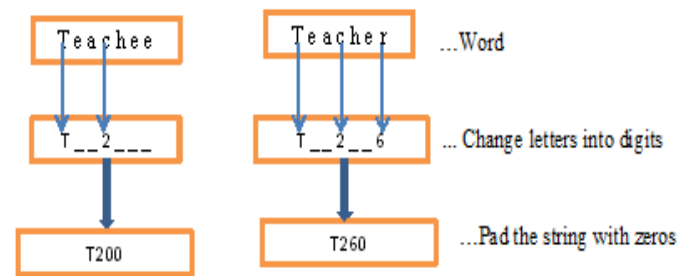


Fig 1: Working of phonetic technique

In the PNRS Algorithm, An organization specific dictionary is used along with the standard dictionary for checking the spelling mistakes.

3. PROPOSED DATACLEANING TECHNIQUE

Modified PNRS:

The modification done in the PNRS Algorithm in this paper is, Using some predefined characteristics on some attributes; so that, it will give more accurate and less number of suggested words in the suggestion list. That means it will avoid some non-relevant suggestions so that it will help user to choose the correct word easily from the suggestion list.

For example, if we will apply this modified version of Near-Miss Strategy in PNRS algorithm on the 'NAME' attribute; and if we have specified characteristic of 'MADHUR' as 'MALE' and 'MADAHURA' AS 'FEMALE' in the dictionary itself; then while correcting the incorrectly entered word say 'MADHU' whose Gender attribute is having value as MALE; will get 'MADHUR' as a suggestion in the list it will simply avoid 'MADHURA' suggestion in the list even though it is present in the dictionary.

Taking another example, if we apply this modified version of Phonetic Algorithm in PNRS algorithm on the 'CITY' attribute; and if we have specified characteristic of 'AHMEDABAD' as 'GUJRATH' and 'AHMEDNAGAR' as 'MAHARASHTRA' in the dictionary itself; then while correcting the incorrectly entered word say 'AHAMED' whose State attribute is having value as GUJRATH; will get 'AHMEDABAD' as a suggestion in the list it will simply avoid 'AHMEDNAGAR' suggestion in the list even though it is present in the dictionary.

4. CONCLUSION

PNRS technique detects and corrects most of the error types and related problems in the dataset. Text data will be cleaned by PNRS algorithm. The modification done in the PNRS Algorithm in this paper is, Using some predefined characteristics on some attributes; so that, it will give more accurate and less number of suggested words in the suggestion list. That means it will avoid some non-relevant

suggestions so that it will help user to choose the correct word easily from the suggestion list.

So by applying this algorithm with modified version on data sets, the accuracy level of the dataset will get increased.

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Implementation & Discrimination of Smoke & Fire in Fire Forest Area using Wavelet Decomposition.

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ABSTRACT

For fire alert system, the most important problem is how quick the existence of fire is detection. The other sensing devices such as a gas sensor become high– cost and cannot set them in some places. Some methods of detecting a fire or flame directly are proposed, however, they have some difficulties to catch fire with cameras depending on the relation of places between a camera position and a fire generating place.

KEYWORDS

Local Binary Patterns (LBP), Wavelet Method.

1. INTRODUCTION

There are some computer vision based methods for smoke detection which use the edge or color information based technique. They have difficulties in treating characteristic properties of smoke and needing high-cost computations to detect smoke whole of wide-view images or image sequences. There are other approaches which combine texture features and its time–series properties.

Therefore, the Video-based detection technology has been applied to the forest fire. Its current performance is superior to those of traditional particle-sampling based detectors in terms of detection rate. But, when it comes to false alarm rate, it is still needs to be improved. The traditional image processing method to detect the forest fire is based on analyzing the color of the smoke in the picture through RGB algorithm, which can detect the changes of the pixels in the target areas. Whereas if some substances with the same color as smokes, such as clouds and fog, appear in the scenes, the RGB algorithm cannot distinguish them from smokes and this has lead to relatively high false alarm rate.

2. Local Binary Patterns (LBP) :

In this study, we adopt a simple texture feature named Local Binary Patterns (LBP). LBP is defined as a simple texture operator computed using the center pixel value and its neighbourhood pixel values. As it is considering the result as a binary number, LBP is robust against the illumination change. Therefore, it can be suitable for our purpose of this study.

The Algorithm is as follows

The LBP feature vector, in its simplest form, is created in the following manner:

Divide the examined window into cells (e.g. 16x16 pixels for each cell).

For each pixel in a cell, compare the pixel to each of its 8 neighbors (on its left-top, left-middle, left-bottom, right-top, etc.). Follow the pixels along a circle, i.e. clockwise or counter-clockwise.

Where the center pixel's value is greater than the neighbor's value, write "1". Otherwise, write "0". This gives an 8-digit binary number (which is usually converted to decimal for convenience).

Compute the histogram, over the cell, of the frequency of each "number" occurring (i.e., each combination of which pixels are smaller and which are greater than the center).

Optionally normalize the histogram.

Concatenate (normalized) histograms of all cells. This gives the feature vector for the window.

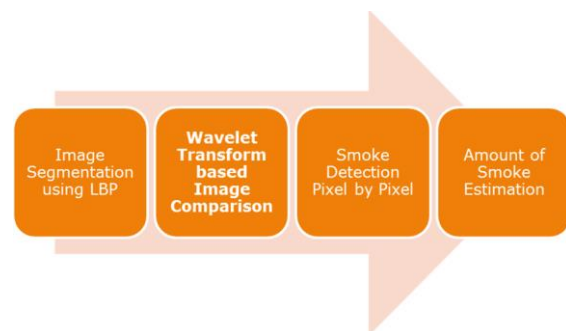


Fig. 1.1 Proposed Flowchart

WAVELET METHOD :

Additionally, we also adopt wavelet method to improve the accuracy of detection results. When we prepare a training set, we need to consider that the image information of smoke is strongly affected from its background. That is, we have difficulties to gather smoke images and non–smoke images in

a wide range of variations. wavelet is one of the widely used learning method to classify the complicated data in real world. We consider smoke detection as a two-class problem in the context of learning problem. In such situation, we adopt wavelet to our method to improve the accuracy as it is suitable our purpose. We examine our presented method with real world data. Results of experiments show that the presented method can provide accurate results of smoke detection against the various conditions of real scenes.

A method for smoke detection in video/audio is proposed. It is assumed the camera monitoring / satellites captured imaged, the scene is stationary. Since the smoke is semi-transparent, edges of image frames start loosing their sharpness and this leads to a decrease in the high frequency content of the image. To determine the smoke in the field of view of the camera, the background of the scene is estimated and decrease of high frequency energy of the scene is monitored using the spatial wavelet transforms of the current and the background images. Edges of the scene are especially important because they produce local extrema in the wavelet domain. A decrease in values of local extrema is also an indicator of smoke. In addition, scene becomes grayish when there is smoke and this leads to a decrease in chrominance values of pixels. Periodic behavior in smoke boundaries and convexity of smoke regions are also analyzed. All of these clues are combined to reach a final decision.

MATERIAL & METHODOLOGY :

a. PREPROCESSING :

1. Take input image

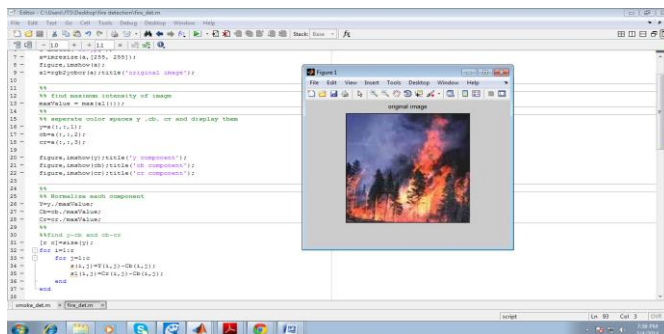


Fig. 1.2. Input Image

2. Convert into ycbcr color space.
3. Display each color space.

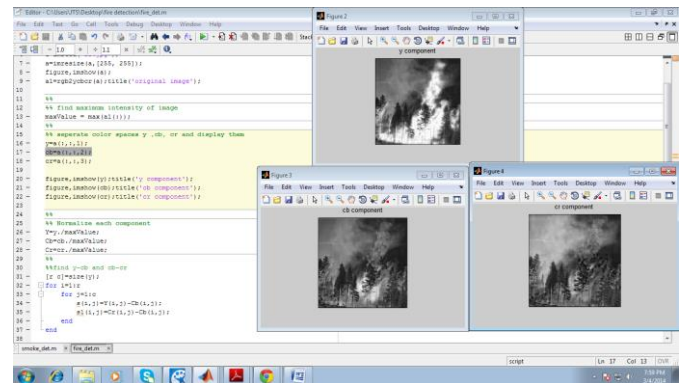


Fig. 1.3 Different color spaces

4. Normalize each color space component.

b. IMAGE COMPARISON USING WAVELET:

Wavelet Based image Comparison

1. Read 1st image
2. Resize it
3. Then decompose image using 2-D DWT
4. Read 2nd image
5. Resize to same dimensions as 1st image
6. Then decompose using 2-D DWT.
7. Compare sub bands of both images pixel by pixel.
8. If sub bands are equal then images are same else - different.



Fig. 1.4. output of wavelet based image comparison

IV. CONCLUSION

Smoke detection method based on local binary patterns. In smoke detection, LBP is not only a simple operator but also effective to illumination variations, which can contribute to obtain accurate results. We also combine with wavelet, which is one of the machine learning techniques, to improve the accuracy of detection results.

As the pre-processing, we extracted the moving objects as candidate smoke regions in images. From the subtracted images, we computed LBP values and LBP histograms from the image blocks. Using LBP histograms as the input vector of AdaBoost, we detect whether the image blocks are smoke or non-smoke.

ACKNOWLEDGEMENT

Thanks to my honourable Guide Ms. Varsha Bhosale, Lecturer in vidyalankar, Wadala for giving me valuable guidance.

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E-MAIL FLYER: An Easy Marketing Technology

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ABSTRACT

Due to the development of the web in recent years, there is a lot of user generated content available. This user generated content can be used as data sources in online systems. E-mail Flyer is a scholarly online, open access, peer-reviewed, interdisciplinary, bimonthly, and fully refereed journal focusing on advances in the field of Engineering and Technology. The journal covers all areas of engineering and Technology. Journal publishes original research articles, review articles, new concepts, literature surveys, state of the art, research implementations, simulation/practical experiments, applications of engineering and technology, industrial case studies and technical notes. Email Flyer is an online marketing system. It promote advertise and sell products through internet mailing. Send e-mail with the purpose of acquiring new customers or convincing old customers to buy something immediately. Money simply travels up the chain some levels of users get commission. Those who want to market the product either a Company or Individual will contact the Administrator for marketing. The administrator will register the client with the details given by them. Once the client is registered, the product can be registered based on the client request. Only after launching the product which is registered, it will be available for email marketing. The product details are send to different users in random. The users will get the product details in mail they can buy the product if they are interested or can either forward the product to other users, but only after being a member of Email Flyer.

Keywords

Email flyer, online marketing system, E- flyer images, flyer Wikipedia.

1. INTRODUCTION

Email Flyer is an online marketing system. In earlier days, organizations were independent for marketing, they are earning profit and loss independently. By using E-flyer Portal, user will get centralized information of all marketing organization including their new articles, new researches, surveys, research implementations, experiments etc. launched by all included company in Email flyer. This portal is user friendly, flexible to use, free of cost available on internet globally. Email flyer are rapidly replacing paper flyers, as businesses all around the world begin to locate the broad variety of benefits that email flyers can offer them . this articles highlights several important advantages that email flyers offer, which are allowing businesses larger output and a better returns on investment [10].

An email marketing campaign is same as any other marketing campaign be flyers, mailshots or networking. These activities are part of your larger networking strategy. The internet has developed significantly in the last decade. E-mail marketing is a form of direct marketing which uses electronic mail as a means of communicating commercial or fund raising messages to different users. In its broadest sense, every e-mail send to a potential or current customer could be considered e-mail marketing. However, the term is usually used to refer to:

- a) Sending e-mails with the purpose of enhancing the relationship of a merchant with its current or old customers and to encourage customer loyalty and repeat business.

- b) Sending e-mails with the purpose of acquiring new customers or convincing old customers to buy something immediately.
- c) Adding advertisements in e-mails sent by other companies to their customers.
- d) Emails that are being sent on the Internet [8].

2. RELATED WORK

Related work in this field includes analyzing the data or information which is available in the textual format at different levels. They are as follows:

2.1 Information sharing level :

At this level, our objective is to try to spread more information about different products, latest technologies, latest affairs, so that user will gain more knowledge about the things happening around the world. The user not only will be provided with its required information but along with that he will be provided with other researches too. Many consumers use the Internet as a source of product information before they buy, even if they don't actually make a purchase on the Internet. The Internet provides retailers with a low-cost distribution channel for disseminating all types of business information. As a result, Internet consumers are often able to access information that would not otherwise be available to them.

2.2 Entity and Aspect Level:

In this level, analysis is done towards entity so that, they get more and more information.

2.3 Interactive level:

This level creates interaction between different organizations. Sending e-mails with the purpose of enhancing the relationship of a merchant with its current or old customers and to encourage customer loyalty and repeat business.

2.4 Fun level:

In a recent survey of consumers who have made a purchase using the Internet, 25% stated that they purchase on the Internet because it is more fun than traditional shopping. This ranked as the fourth most popular reason, behind convenience,

selection, and price. In addition, the use of multimedia technology, and the novelty of discovering a new way of doing things are unique qualities that make shopping on the Internet a unique experience.

2.5 Customer-Service-Level:

The Internet serves as a communication tool between consumers and retailers, through the use of e-mail, or other online feedback mechanisms. With Internet retailing this dialogue does not need to stop at the end of the transaction or even at the time of product delivery. These feedback mechanisms allow a retailer to maintain an ongoing dialogue with consumers in order, among other things, to ensure that they are fully satisfied with their purchase [9].

3. EMAIL MARKETING

3.1 Reduced Time & Effort

Take a moment to think about the time and effort involved in structuring a direct-to-consumer or direct business-to-business campaign using one of the two most common offline direct marketing communications techniques:

3.1.1 Print Postal Mailings: You'll need to allow time for a designer to create the mailing, typically through several lengthy revisions. Then you'll need to allow time for the print mailing to be printed, cut and, if necessary, stuffed into envelopes. There will be time while the marketing collateral is being transported via the postal system and then time while you wait for the consumer to retrieve it from the mail box.

3.1.2 Telesales Campaigns: In addition to having to construct a telesales script, you'll have to wait the time out while your sales agents dial through cycled call attempts to all of the sales leads or customers on your target list.

With email marketing, however, you can turn a marketing communications piece out in typically less than two hours.

3.2 Real-Time Messages

As we talked about above, with a print mailer or telesales campaign, you'll need to select marketing campaigns and specials that have a "long tail" because of the extended period of time between campaign development and implementation. Because a marketing email can be completed in just a few hours, you can literally send "day-of" messages to help reduce stock or promote a limited time special as needed. You can even send unique real-time messages to customers that arrive on their birthdays or anniversaries. With email marketing, short time frames are your friend, not your enemy [2].

3.3 Personalize Advertisement

Because print mail campaigns, telesales campaigns and even print, television and radio advertising campaigns must be done in a mostly "one-size-fits-all" format, it's difficult for you to speak directly to your consumer in a personalized way. However, email marketing presents many dynamic opportunities. Not only can you send personalized email with your user's name or login name, but many email marketing solutions offer the ability to feed in personalized information such as sales or purchase history [1].

3.4 Customer Database Information and multiple user

As noted above, because you can segment your database of customers or users with email, you can send extremely targeted marketing campaigns that will result in increased sales conversions simply because they are so specific. For example, if you sell flowers, you can find everybody in your database who ever bought daffodils and then send them an email in April when the first daffodil shipments come in. You're then using your customer database to put the most relevant message in front of the customers who are most likely to respond to it, and that's what good marketing is all about.

3.5 Spread all types of information

When was the last time that you saw a customer hand over a postal mailing that they'd received to a friend who might be interested? Or have you have seen somebody clip an ad from

a magazine and send it to a family member who may want that product or service? However, forwarding an email with an enticing or useful offer or piece of information only takes seconds and many users will do it. That means that your marketing effort has not only a wider reach but also a networked reach with people who, by forwarding the email, are now acting as your brand advocates.

3.6 Reduce Overhead Costs

Email marketing can be done at a very low overhead cost! You don't need a ton of employees, designers, or marketing analysts. You don't need to pay for printing, postal mailing costs, phone lines, or advertising rates. In fact, there are services, such as Comm100 Email Marketing, that allow you to host your email marketing using professionally-designed templates that you can then just alter to your own needs. An effective email marketing program only needs a great email marketing platform or service and a good marketer who knows how to put the right offers and the right copy and graphics in front of the right portion of your user or customer list. There is no marketing channel in which you'll spend less to get greater returns on your investment than email marketing.

3.7 Email –Marketing Supports and Saves environment

It may seem like a minor part of the big picture, but we're all trying to be more environmentally friendly these days! When you optimize email marketing as your primary customer communication and direct-to-consumer or direct business-to-business marketing method, you'll help save the planet by reducing the number of trees killed for print marketing pieces. We all want to help save the planet, and making a responsible decision about your marketing tools can help you to do just that while also improving your business's success.

Those are a lot of measurable benefits of email marketing over other marketing channels! [6]

4. PROPOSED SYSTEM

Compared to other media investments such as direct mail or printed newsletters, it is less expensive. Return on investment

has proven to be high when done properly and e-mail marketing is often reported as second only to search marketing as the most effective online marketing tactic. It is instant, as opposed to a mailed advertisement; an e-mail arrives in a few seconds or minutes. It lets the advertiser "push" the message to its audience, as opposed to a website that waits for customers to come in. It is easy to track. An advertiser can track users via web bugs, bounce messages, un-subscribes, read-receipts, click-through, etc. These can be used to measure open rates, positive or negative responses, correlate sales with marketing. Advertisers can reach substantial numbers of e-mail subscribers who have opted in (consented) to receive e-mail communications on subjects of interest to them. Over half of Internet users check or send e-mail on a typical day. Specific types of interaction with messages can trigger other messages to be automatically delivered. First thing is, constant flyer programs are very highly profitable, advantageous and operate at comparably low cost. This marketing technology at every bit has an positive revenue. And also they haven't damaged relationship with other companies and member in the process. sure this technology would continue grousing about award availability[12].

4.1 System Specification

The hardware and software requirements for the development phase of our project are:

4.1.1 Software Requirements:

- a) OPERATING SYSTEM : WINDOWS 7, WINDOWS XP,
- b) ENVIRONMENT : MICROSOFT .NET FRAME WORK
- c) FRONT END : ASP .NET
- d) SERVER SIDE SCRIPTING : VB.NET
- e) CLIENT SIDE SCRIPTING : JAVASCRIPT

- f) BACKEND : My SQL SERVER 2008 R2
- g) BROWSER : INTERNET EXPLORER 7.0

4.1.2 Hardware Requirements:

- a) PROCESSOR : PENTIUM IV :500 MHZ
- b) SYSTEM BUS : 32 Bit / 64 Bit
- c) RAM : 512 MB
- d) HDD : Minimum 40 GB
- e) MONITOR : SVGA COLOR
- f) KEY BOARD : 108 KEYS
- g) MOUSE : LOGITECH
- h) FDD : 1.44 MB

5. Results and Analysis

5.1 Results:



Fig.1 GUI showing e-mail portal to multiple user

Figure 1 shows a GUI, which represents a discount advertise of a company through an e-mail flyer. This advertisement is sent to each and every company those are in contact with e-flyers.



Fig.2 An Advertisement of party at some venue.

Figure 2 represents an advertisement of an Opening Night party providing all information about the party including Venue, Timings, Guests, Day, Dressing style, Contact ,Email id, etc.

5.2 Analysis:

Additional advantages of Proposed System

As it will work as a portal, all users will get all the above benefits of email flyers as mentioned above .But additional to it, they also get some additional advantages through the proposed system as:

5.2.1 Provides Convenience

The ability to purchase products and services over the Internet provides an attractive alternative to conventional shopping practices. Internet shoppers can research and buy products and services online according to their individual schedules. The Internet offers consumers the convenience of being able to shop 24 hours a day, seven days a week, and in the privacy of

their own homes, for products and services from around the world.

5.2.2 User can have advantage of Price-Competition

The Internet puts comparison shopping at a consumer's fingertips. Studies have demonstrated that products in certain retail categories, especially mid-to-high-priced commodity-oriented items, sell for lower prices online than in traditional stores.

5.2.3 Multiple Selection at a time

Purchasing products and services over the Internet offers consumers the opportunity to find a much broader and deeper selection of items.

5.2.4 User Customization service

Purchasing on the Internet provides consumers with the opportunity to customize products to their individual needs or desires. A good example is the Dell Computer Internet site that allows shoppers to custom build their own computer hardware and software configurations. In addition to consumers being able to select exactly what they want, retailers also benefit by custom building or ordering products, thus optimizing their inventory management practices.

6. CONCLUSION AND HIGHLIGHTS OF THE PROJECT

Work on project is on. The project will be successfully completed within the time span allotted. Every effort has been made to present the system in more user friendly manner. All the activities provide a feeling like an easy walk over to the user who is interfacing with the system. All the disadvantages of the existing system have been overcome using the present system of "Email Flyer" which will be successfully implemented at clients' location. A trial run of the system has been made and is giving good results. The system has been developed in an attractive dialogues fashion and the entire user

interface is attractive and user friendly and suits all the necessities laid down by the clients initially. So user with minimum knowledge about the computers and the system can easily work with the system.

7. ACKNOWLEDGMENTS

Our thanks to the H.O.D of our Computer Department Mrs. Ashwini Save and staff member Miss Akshata Patil who, have contributed their opinions and helped us in every part whenever we needed them. towards development of the template [4].

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A Mobile Application Which Suggest Medicine to Patient

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ABSTRACT

Lack of doctors is the major problem in many countries. So the idea is to make a mobile application based on platform such as android and windows which will contain some basic multiple choice questions related to health same as that the doctors generally ask to the patient and similarly suggest the medicine, preventive measures as well as Ayurvedic way to cure the disease.

The application will help patients to know about the disease or the problems he/she is suffering from. The patient has to give the symptoms he/she has and answer few questions asked in application in order to get the prescription.

The mobile application will also provide the emergency medical help techniques which are critical to save the life of a patient till the ambulance or doctor arrives.

All of these features will be made available offline so the users don't have to depend on internet connection in emergency situations.

Keywords

'medicine to patients', Emergency medical help techniques, Ayurvedic, symptom, Reminder facility, automated medical systems,

1. INTRODUCTION

The idea is to provide services like a doctor for those who cannot reach a doctor on time or lives far away from a hospital. The application proposed in this paper will help the patient to get the general idea of disease even if users choose not to use the suggested medicine. The application will also contain many different emergency medical help technique videos, such as how to give CPR etc. The main intention is to create a basic android application which will store the medicinal data in its database and as per the symptoms given by the patient. On the basis of those symptoms the mobile application will suggest the medicines and also give the details of the condition from which the patient is suffering.

The medicine to patient application will also be provided with a reminder facility in case the user forgot to take the pills on time this facility will remind the user to take the pills. It will be providing features such as online medicine ordering and suggesting the various effects and side-effects of medicines in possible cases. There are already applications available which provide effects and side effects of medicines but the idea of suggesting medicine on the basis of symptoms of patient is something new [12].

2. RELATED WORK

There are many websites which provides information about the disease and medicine by knowing the symptoms [6]. There are also many Android based application which serve as a dictionary for different medicines [8]. There also exists reminder facility in the applications which reminds the user to take medicines on time [10].

But medicine to patient application is different from them.

The online websites are not very convenient and portable to use without Internet services whereas 'medicine to patients' application will provide and detect basic or common diseases and provide cure offline so users don't have to be connected to Internet or walk to clinics.

'Medicine to patient's' application will serve as an all in one solution to the above different applications which are available online but lacks all the features combined. Other application serves as a guide whereas medicine to patient's application will serve as a doctor.

3. PROPOSED METHOD

We want to provide medical services to those who cannot reach to the hospitals or doctors. In many countries doctors are not available in such abundance. In country named Chad there is 1 doctor for 20,000 people, in Ethiopia there is 1 doctor for 36,407 people [1]. In today's world everyone has a mobile phone so this application will help people to overcome this problem of fewer doctors per person. This application will not replace the doctors but serve as a subordinate to doctors. The patients will still need to go to doctors for more serious illness. This application will only cover general medicines and more common aspects of general fever which everyone has like cold fever, diarrhea, jaundice etc.

3.1 Help patients with general diseases

Many general diseases such as diarrhea can be very deadly. A report by WHO estimates that around 90,000 to 1.5 lakh children's die from diarrhea. The medicine to patient's application might not be able to completely eliminate these deaths but it is a step forward towards automated medical system. This app will suggest a medicine commonly used and also the life style pattern which the patient has to follow in order to get cured. As already said this application is only subordinate to doctors the patient will always be suggested to see a doctor if possible.

3.2 Provide knowledge of medical emergency techniques

There are many emergency techniques which a person generally should know in order to provide temporary relief to the patient. These methods generally save the lives of patient but very few of us know them [5]. In India we can really benefit from this feature of the application. Many of such techniques include treating serious burn, perform CPR [3], treating puncture wound, treating concussion, treating a broken bone, treating severe bleeding [4].

Table 1. Deaths due to diarrhea in the world, 2004 [2]

Country	Deaths in thousand
India	535
Pakistan	77
China	74
Bangladesh	69
Uganda	28

3.3 FLOWCHART AND BLOCK DIAGRAM

In this flowchart the general algorithm of the application is explained in detail but many future aspects are still not added in this flow cart and block diagram.

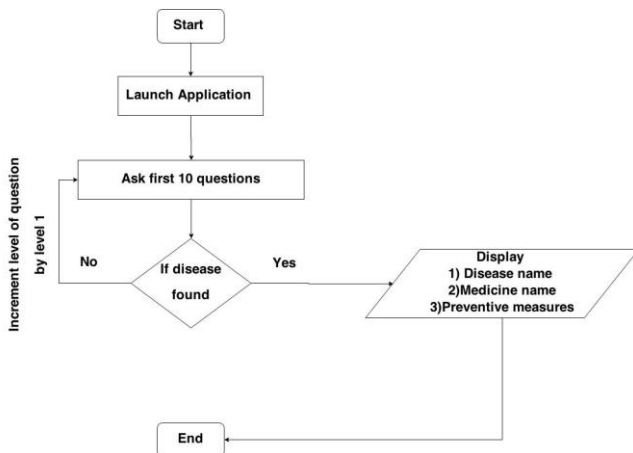


Fig 1: Flow chart for basic functions in application

The flow chart explains how launching the application ‘medicine to patients’, will prompt a set of ten questions and if disease is found, the application will display the disease name, medicine name and preventive measures. In case if the disease is not recognized then another set of ten questions will be prompted.

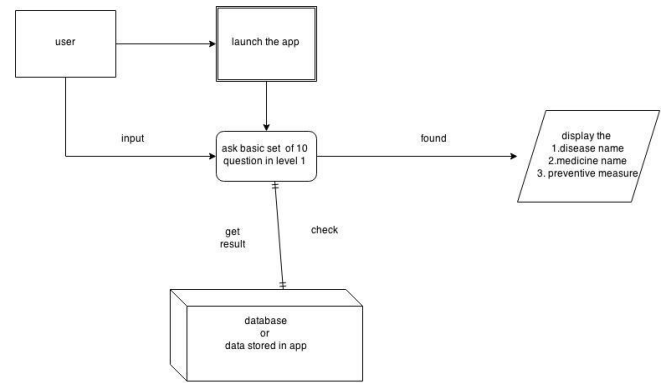


Fig 2: Block diagram for different controls in application

The block diagram shows the control of application which will help application to predict the disease accurately and provide the correct disease name, preventive measures and medicine name.

4. IMPLEMENTATION

The Application ‘medicine to patients’ is partially implemented; the feature of emergency help technique is yet to be added in the application [7]. We have for now implemented this application for few diseases only. The application is currently being developed to detect and give results of a range of different diseases accurately [11]. Main aim is to make the application available offline and by doing so the size of final application should be in an appropriate range for users to download. The development of application also focuses on security of medical records [9].

5. CONCLUSION

The main motive of the application is to reduce the mortality rate of children’s in India due to diseases which are mainly common and can be easily cured if provided with proper medicinal routine at a proper time. The application will also be of immense use during emergencies since most of its contents will be available offline so the users don’t have to care about the internet connection while they are in a emergency situation.

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Hybrid Honeypot – Network Security by Detection, Deflection and Counteraction: Comparative Analysis

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ABSTRACT

In the fields such as forensics, medical imaging, e-commerce, and industrial photography, authenticity and integrity of digital images is essential. Digital images being a major part of the digital world it becomes a prime focus of work for the researchers. Typical image forensics includes source device identification, source device linking, classification of images taken by unknown cameras, integrity verification, authentication, etc. Source camera identification provides different techniques to identify the characteristics of the digital devices used. Our proposed system consists of a novel technique used for extracting sensor noise from the database images, and then the feature extraction method is applied to extract the features.

1. INTRODUCTION

A large number of new users are connecting to the Internet to access online resources and communicate with the rest of the world. Maintaining security of this interconnected network is costly and requires constant monitoring. The security of most networks is managed by utilizing Firewalls, Intrusion Detection Systems (IDS) and Honey pots. Firewalls are the first measure of protection and highly effective in managing access in and out of a network. Intrusion detection systems are alternatively able to monitor connections, inspect packets and match them against database of known attacks or examine them for anomalies. Intrusion detection systems were once thought as the "one answer for all" security tool. They produce a large set of logs that need to be analyzed and require constant monitoring and administrative attendance. Anomaly based intrusion detection systems are also prone to false positive and false negatives which cause denial of service and attack detection failure respectively. Tremendous increase in the speed of the data communication and the growth of the networks requires significant processing powers to allow intrusion detection systems to perform Deep Packet Inspection (DPI). The biggest challenge facing intrusion detection system however comes from utilization of IPv6 protocol for online communication. IPv6 utilizes IPSec as encryption mechanism which allows hosts to encrypt packets before transmission thus making deploying IDS impractical, as they rely on packet content inspection to detect threats. Honey pots were developed to solve these issues.

Honey pots have various security applications and are flexible security tool, capable of detecting variety of attacks. They are capable of detecting encrypted attacks, diverting attention away from production hosts and servers and averting adversaries away to dummy systems which may or may not exist.

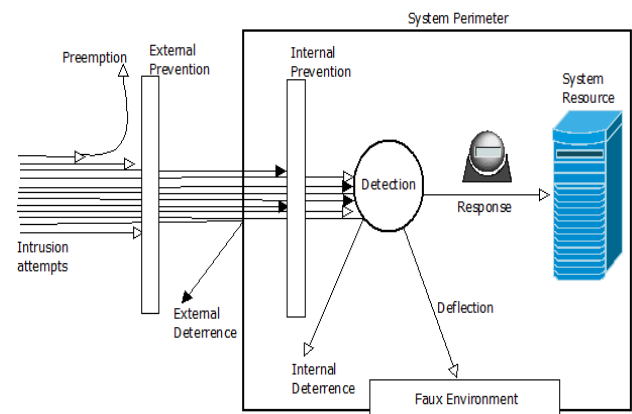


Figure 1: Methods of Defense [17]

A honeypot firstly allows providing a controlled environment consisting of interesting data and resources to adversaries to intrigue them to attack and obtain them. Secondly, a honeypot allows collection of information about attackers on multiple layers and based on different interaction levels. Finally, a honeypot can serve as a deterrent against future attacks by inspecting how an attack was performed and securing the operational systems accordingly, as shown in figure 1.

Honey pot may be categorized according to several aspects and parameters. Basic division includes the area of deployment (purpose Honey pots) and level of interaction; one is production honeypots and second is research honeypots. Production honeypots are valuable to the organization especially commercial, as they help to reduce the risk that a specific organization faces. They secure the organization by policing its IT environment to identify attacks. These honeypots are useful in catching hackers with criminal intentions. The implementation and deployment of these honeypots are relatively easier than research honeypots. As a result, they also provide less evidence about hacker's attack patterns and motives. Research honeypots are complex. They are designed to collect as much information as possible about the hackers and their activities. Their primary mission is to research the threats organization may face, such as who the attackers are, how they are organized, what kind of tools they use to attack other systems, and where they obtained those tools.

Two Honey pots subtypes depending on the level of interaction: Low interaction, High-interaction. Low-interaction Honey pot does not contain OS. All its tools are dedicated for emulation of OS and simulating its services what cannot be used for gaining full access to Honey pot – feature that slows down attack. Low-interaction Honey pot are

characterized by easy deployment and maintenance. An example of low-interaction Honeypot is Honeyd [18].

Honeyd with high-level of interaction is the most advanced decoy type, but it is a solution with the most complex and time-consuming design. The risk of threat in high-interaction Honeyd is the highest, because it contains its own OS. Under this system nothing is emulated, simulated or limited. An example of use is HoneyNet [19], which is a combination of several decoys, with different interaction level, working as one.

In this report, Section II gives brief idea of Literature Survey. Different applications of hybrid honeypots are discussed in Section III. Section IV gives explanations of Hybrid Honeyd Designs. Section V gives Comparative Analysis; finally conclusion is discussed in Section VI.

2. LITERATURE SURVEY

The architecture [3] used sophisticated hybrid Honeyd with an autonomous feature as an IDS detection mechanism. Solution for minimizing failures in the detection process and collection of important data based on Honeyd consists of a combination of security tools: Snort IDS, Sebek and Dionaea. Tools were selected based on their properties analyzed above. The detection mechanism based on a sophisticated hybrid Honeyd integrated in the client-server architecture consisting of centralized main server and multiple client stations. Client workstations serve to capture suspicious activity or directly record the malicious code which is then send to server for processing. Server analyzes received data, decides to issue or not to issue a security warning and displays cumulative information through a web interface. This proposal aims to provide a solution of early warning against any attack on the computer system.

In this paper [4], the system was proposed to integrate the active property of client honeypots into server honeypots to overcome their passiveness. The system utilized modules that interact with web servers to increase exposure of its vulnerable services by letting the IP and host information of the honeypot be recorded by websites that are suspected to be operated by hackers or organizations that participate in malicious activities. This exposure increased honeypots online fingerprint and results in a higher number of captured attacks. Interaction with web servers through integrated client honeypot module also created traffic which decreases the probability of detection through detecting of lack of traffic in and out of a honeypot.

A hybrid design of low and high interaction client honeypot was depicted in paper [5] a collection of website URLs are first visited by a high interaction client honeypot to provide higher detection speed. The websites marked as benign are passed to low interaction client honeypot for further analysis. The low interaction client honeypots are generally known for their higher speed while high interaction honeypots for their detection rate. The reverse scenario in [5] was a property of the unique design that relies on multiple antivirus engines for detection, hence slower performance speed.

To optimize speed as well as detection accuracy, they proposed to explore a hybrid client honeypot system that utilizes the strengths of both technologies [6]. The main purpose of research [7] was to combine the strong points of low and high-interaction honeypots to mitigate the drawbacks of each type. A large number of low interaction server honeypots were deployed to increase exposure of vulnerable services and act as a gateway to high interaction server honeypots. In this system, low-interaction honeypot Honeyd acts as lightweight proxy that exposes vulnerable services and listens on open ports. If an attack is determined to be a port

scan, it is ignored and dropped. However, once a real attack has been detected with finalized three way handshaking, the connection is transferred to a high interaction honeypot without attacker's notice.

Honeybrid [9], the hybrid honeypot that employ low interaction honeypot to increase exposure of vulnerable server side services. Low interaction honeypot act as front-end role, responsible for filtering the traffic. If an attack is classified as interesting, it is transparently redirected to a high interaction honeypot to provide full interaction and collect detailed information. Attack redirection is not a new concept and has been previously implemented on Intrusion Detection Systems. Bait and Switch Honeyd [10] is an example of a system that redirects suspicious connections to a honeypot if traffic matches a Snort signature Rule.

3. APPLICATION

With respect to application of honeypot paper [11], this acts as malicious web servers that attack web browsers. Attacks on web browsers by malicious web servers seem to be the most prominent client-side attack type today, but they are still not well understood. The goal was to assess the threat to web browser client applications from malicious web servers with a high interaction client honeypot. High interaction client honeypot is chosen, because it allows obtaining information about attacks that are unknown or obfuscated in a way that low interaction client honeypots could not detect. We obtain and present information on malicious web servers, evaluate several defense mechanisms, and make recommendations on how to protect systems against these malicious web servers.

In this paper [12], the authors discuss that there are a variety of honeypot options, each having different value to organizations. Productions honeypots help reduce risk in an organization. While they do little for prevention, they can greatly contribute to detection or reaction. Research honeypots are different in that they are not used to protect a specific organization. Instead they are used as a research tool to study and identify the threats in the Internet community. Regardless of what type of honeypot you use, keep in mind the 'level of interaction'. This means that the more your honeypot can do and the more you can learn from it, the more risk that potentially exists. Honeypots will not solve an organization's security problems. Only best practices can do that. However, honeypots may be a tool to help contribute to those best practices. This paper [13] is an application of honeypot in network forensics analysis network forensics system can prove valuable investigative tools on malware attacking information collection. They use the malware collection as a network forensics strategy. This technique analyzed the logs that are cause by the malware attacking. By combining it with Capture - HPC program, the system even checks out the traverse websites in search of client - side malware. Network forensics investigation utilizes the collected information as the evidences in court. Additionally, the system also provides four kinds of tools, Ping, NMAP, NSLookup, and Trace route for network forensics investigators to apply into the evidences Investigation Honeypots were used to lure and trick attackers using network deception, by making possible security vulnerabilities and has very good commonage place. A prototype system was developed to collect the network logs using honeypot infrastructure and analyze all the logged traffic, which are highly malicious in nature with large volume of attacker's information. The end result of the system was to collect network data which were highly malicious in nature and were used for further investigation to get the intelligent information about the attackers as evidence for Network Forensics [14].

Honeypot technology made network security shift from passive to active defense, tracking of the intruder Undeniable. Compared to other security mechanisms, honeypot easy to use, flexible configuration, occupies less resources can be effective in a complex work environment, collecting data and information relevant of a good value. With the intrusion type of diversification, the honeypot must also be a variety of interpretations; otherwise it will not be able to face the ravages of the invaders [15]. From the general emphasis on prevention and detection of network attacks as in primitive network security model, the network forensics focuses on the collection, observation and preservation of network data so as to analyze and organize traffic data using clustering or various other data mining techniques for data verification [16].

4. RELATED WORK

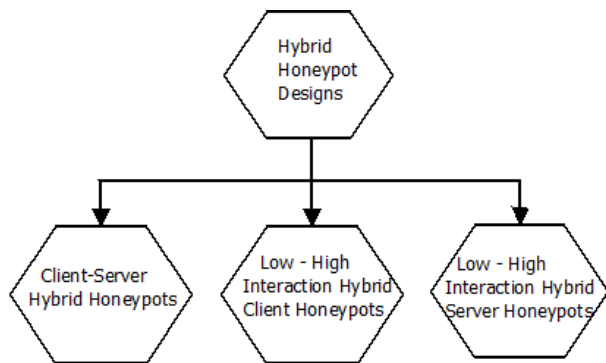


Figure 2: Hybrid Honeypots' Classification

In this study, the working principle of three different types of hybrid honeypot systems will be done. These hybrid honeypot systems will be analyzed with respect to their security features supported. The aim of this study is to illustrate the different designs of honeypots, their components and provide a brief analysis of their security features as shown in the above figure 2.

4.1 Client-Server Hybrid Honeypots

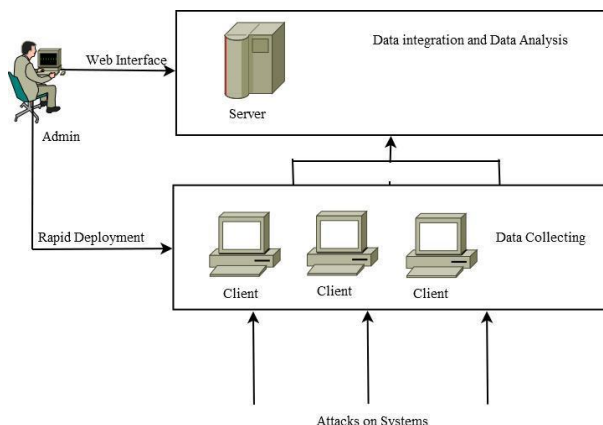


Figure 3: Client-Server Hybrid Honeypot

The proposed architecture shown in figure 3 uses a sophisticated hybrid Honeypot with an autonomous feature as an IDS detection mechanism. Combination of security tools: Snort IDS, Sebek and Dionaea. Tools were selected based on their properties for minimizing failures in the detection

process and collection of important data based on Honeypot. Client workstations serve to capture suspicious activity or directly record the malicious code which is then send to server for processing. Server analyzes received data, decides to issue or not to issue a security warning and displays cumulative information through a web interface. The apport of this work is improving the IDS detection mechanism and minimizing the number of generated false positives and also false negatives using advanced technology.

4.2 Low and High Interaction Client Honeypots

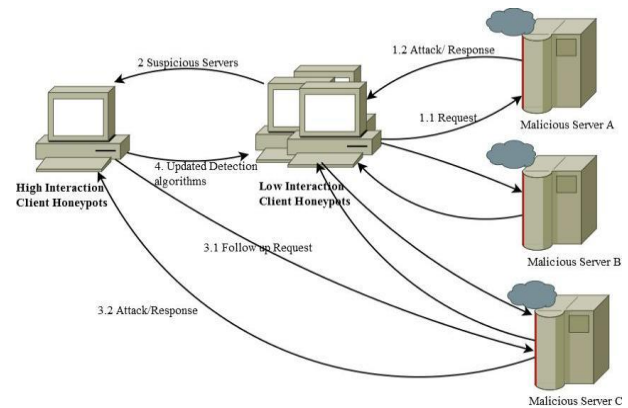


Figure 4: Client Hybrid Honeypot

The design of figure 4 proposed to combine the low and high interaction client honeypots into a hybrid client honeypot system to optimize speed as well as detection accuracy. It utilizes the strengths of both technologies, the favorable detection speed of the low interaction client honeypot and the detection accuracy of the high interaction client honeypot. The low interaction client honeypot crawls the network at high speed and make an initial classification. Once a positive classification has been made, the responses are forwarded to the high interaction client honeypot to confirm the initial classification; the hybrid system will be able to utilize favorable detection accuracy at high crawling speeds.

4.3 Low and High Interaction Server Honeypots

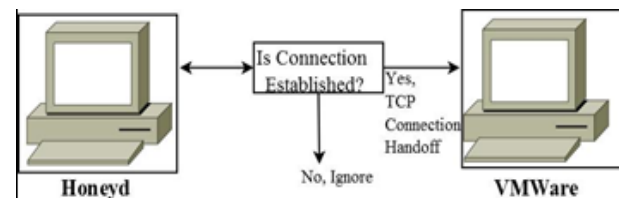


Figure 5: Server Hybrid Honeypot

Same as figure 5 a large number of low interaction server honeypots can be deployed to increase exposure of vulnerable services and act as a gateway to high interaction server honeypots. A small number of high interaction honeypots need to be deployed to maintain connection and gather information on limited number of attacks that are more sophisticated and involve a human attacker. In this system, low-interaction honeypot Honeyd acts as lightweight proxy that exposes vulnerable services and listens on open ports. If

an attack is determined to be a port scan, it is ignored and dropped. However, once a real attack has been detected with finalized three way handshaking, the connection is transferred to a high interaction honeypot without attacker's notice. Consequent activities take place between the attacker and the high interaction honeypot.

5. COMPARATIVE ANALYSIS

Table 1 below gives the comparative analysis of various Hybrid Honeypot Design based on various parameters as shown below.

Table 1. Table captions should be placed above the table

Parameters	Client Server Hybrid Honeypot	Hybrid Client Honeypot	Hybrid Server Honeypot
Server	Yes	No	Yes
Client	Yes	Yes	No
Low Interaction	Can be used	Yes	Yes
High Interaction	Can be used	Yes	Yes
Real Time Monitoring	Yes	Yes	Yes
Log Support	Yes	No	Yes
Output	Increasing exposure of Server Honeypots	Improving Detection	Increase exposure vulnerable services
	Avoid Detection of Honeypot	Improving Speed and Accuracy	Capture detailed information
Effectiveness	Less false positives and false negatives	Identifies malicious servers	Captures larger set of data for analysis
Efficiency	Fast	Fast Comparative	Fast
Supported Services	Passive fingerprint	User agent string	Light weight proxy
Maintenance	Difficult to setup and maintain	Easy to setup and maintain	Difficult to setup and maintain
Level of Risk	Relatively High	Relatively Low	Relatively High

6. CONCLUSION

Honeypots have been combined in a hybrid system to detect intrusions faster or more accurately. Besides improving detection accuracy, combining systems in a hybrid system can be driven by other concerns, such as operational costs. Instead of combining honeypots with traditional intrusion detection systems, there have been approaches to combine honeypots based on interaction level. Interaction level specifies the level of functional interaction that is possible with the honeypot. Possible values of the interaction level are high and low. The high interaction level denotes that the honeypot system allows for full functional interaction, a rather expensive component. A low interaction level signifies that the functionality is

limited, for example by using emulated services, which can be implemented with cheap, lightweight technology.

In order to overcome the drawbacks of a certain system, components from a different system can be integrated to create a hybrid design. Studies on hybrid honeypot designs indicate that integration of different types of honeypots is a modest approach to increase their functionalities. These include, increasing their exposure thus attracting more attacks, easier management, fewer required resources and collection of larger sets of data for analysis.

Comparative Analysis indicates that each design has its advantages and drawbacks. So combination of Client or Server and Design with respect to interaction level has to be chosen based on the application level.

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Size Optimization of Cantilever Beam using Taguchi Method and Utility Concept, validation by FEA

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ABSTRACT

Cantilever beam is one of the most important structures in engineering applications. An attempt has been made to give a generalized optimized solution for size of cantilever beam. In this study, optimization of cantilever beam has been carried out. Experiments were designed using Taguchi's L9 orthogonal array. Considering different geometrical parameters, finite element analysis of cantilever beam is carried out for stress and deflection. These results are analysed using Taguchi method and Utility concept. Thus, optimized beam is further validated with finite element analyses results and found to be in closer match. The commercial packages used are MINITAB 15 and ANSYS 11.

Keywords

Optimization, Taguchi method, Utility concept, Finite element analysis, Signal to noise ratio.

1. INTRODUCTION

Optimum, the word derived from Ops, the name of the Sabine goddess of fertility and agricultural abundance, was first used by Leibniz in the 18th century, to mean the best of all possible. Optimization may be defined as the process of maximizing or minimizing a desired objective function while satisfying the prevailing constraints. Depending on the type of design variables optimization may be classified as parameter or size, shape and topology optimization. In parameter or size optimization the objective functions typically the weight of the structure, and constraints reflecting limits on stress and displacement. Optimization of cantilever beam is one of the most important examples used in any engineering systems. The objective of this optimization is to reduce weight of beam. Thus, changing parameters of the beam such as height, width, length satisfying constraints stress induced and deflection of beam. For this optimization Taguchi method and Utility concept is used. Use of such methods to optimize cantilever beam is rare. Shape optimisation of cantilever beams has been studied by S. Yadav, et al. [1]. Artificial neural network is used to analyse the results obtained by finite element analysis. S. Darshan, et al. [2] focused on reduction of mass to strengthen the beam using traditional method, Johnson's method for fatigue strength of material. Shape optimization of connecting rod using FEM and

Taguchi method is done by Md. Israr Equbal, et al. [3]. Objective is to obtain optimal perform shape in the consideration of the influence of the metal flow deformation in closed die forging process. The goal of the simulation and optimization process is to minimize the forging load and produce defect-free forgings. While Dheeraj Gunwant &

Anadi Misra [4] performs topology optimization of continuum structures using optimality criterion approach in ANSYS. P. Sivanagendra, G. K. Anathasuresh did size optimization of cantilever beam considering application to Wheat stalks, under deformation loads [5].

The objective is to optimize a cantilever beam having dimensions of height D , width B and length L . The load acting is to be considered as point load of magnitude P . The material of the beam is SS with allowable stress and deflection as 75 GPa and 7 mm respectively. The dimensions considered during study are all in SI unit.

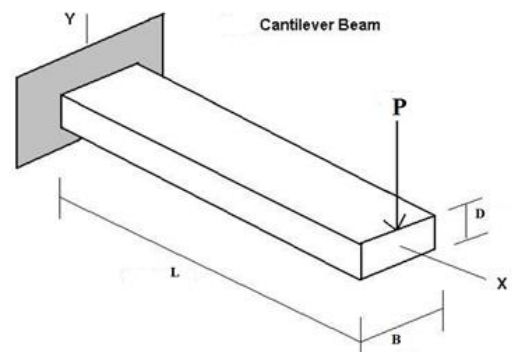


Figure 1: Cantilever beam

2. DESIGN OF EXPERIMENT

2.1 Selection of Orthogonal Array

The experimental design is done based on the Taguchi Method. Genichi Taguchi a Japanese scientist developed a technique based on Orthogonal Array of experiments. This technique has been widely used in different fields of engineering to optimize the process parameters. The control parameters considered for the study are height ' D ', width ' B ' and length ' L '. Three levels for each control factor are used. Based on number of control parameters and their levels, L9 Orthogonal Array (OA) is selected. Table-1 represents various levels of control parameters and Table-2 represents experimental plan with assigned values of control parameters.

Table 1. Levels of Various Control Parameters

	Level1	Level2	Level3
B	B0	B1	B2
D	D0	D1	D2

L	L0	L1	L2
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Table 2. L9 OA with Assigned values of Control Parameters

Exp. No	B	D	L
1	B0	D0	L0
2	B1	D1	L0
3	B2	D2	L0
4	B0	D1	L1
5	B1	D2	L1
6	B2	D0	L1
7	B0	D2	L2
8	B1	D0	L2
9	B2	D1	L2

2.2 Taguchi Method

Taguchi technique uses S/N ratio as a performance measure to choose control levels. The S/N ratio considers both the mean and the variability. In the present work, a multi- response methodology based on Taguchi technique and Utility concept is used for optimizing the multi-responses (Stress and Deflection). Taguchi proposed many different possible S/N ratios to obtain the optimum parameters setting. Nominal is the better criteria is selected for the present work.

$$[\eta_1] = 10 * \log_{10} \left[\frac{\text{Stress}^2}{S^2} \right] \quad 1$$

$$[\eta_2] = 10 * \log_{10} \left[\frac{\text{Deflection}^2}{S^2} \right] \quad 2$$

2.3 Utility Concept

To improve the rational decision making, the evaluations of various attributes should be combined to give a composite index. Such a composite index is known as utility of a product. It is difficult to obtain the best combination of process parameters, when there are multiple responses to be optimized as optimum solution for one response may result in non-optimum solution of another one. The adoption of weights in the utility concept helps in these difficult situations by differentiating the relative importance of various responses. If x_i represents the measure of effectiveness of i^{th} process response characteristic and n represents no. of responses, then the overall utility function can be written as [6]

$$U(x_1, x_2 \dots x_n) = f[U_1(x_1), U_2(x_2), \dots U_n(x_n)] \quad 3$$

Where $U(x_1, x_2 \dots x_n)$ is the overall utility of n process response characteristics and $U_i(x_i)$ is utility of i^{th} response characteristic. Assignment of weights is based on the requirements and priorities among the various responses. Therefore the general form or weighted from of equation can be expressed as

$$U(x_1, x_2 \dots x_n) = \sum_{i=1}^n W_i * U_i(x_i) \quad 4$$

Where,
 $\sum_{i=1}^n W_i = 1$

Where W_i is the weight assigned to the i^{th} response characteristic

$$\eta_{Obs} = \eta_1 W_1 + \eta_2 W_2 \quad 5$$

Where W_1 & W_2 are the weights assigned to the Stress and Deflection respectively. Assignment of weights to the performance characteristics are based on experience of engineers.

3. RESULT AND ANALYSIS

Simulations were run as per Taguchi's experiment plan based on the experimental layout depicted in Table 2, and respective values of stress and deflection for each simulation run are converted into their respective S/N ratios as per equation 1, 2 and are given in Table 3 and Table 4.

Table 3. Experimental Result for Stress along with S/N ratio

Stress_1	Stress_2	Stress_3	η_1
78.7	35	105	6.28
67.81	30	92	6.13
58.85	26	78	6.29
70.64	32	98	6.09
61.2	30	84	6.67
72.65	33	101	6.09
63.75	30	90	6.18
75.56	35	106	6.14
65.2	31	92	6.24

Table 4. Experimental Result for Deflection along with S/N ratio

Deflection_1	Deflection_2	Deflection_3	η_2
6.32	6.28	5.59	23.38
5.16	5	4.5	23.05
4.25	4.14	3.68	22.45
5.86	5.69	5.06	22.38
4.82	4.67	4.16	22.36
6.36	6.26	5.57	22.98
5.53	5.29	4.7	21.69
7.28	6.99	6.21	21.83
5.95	5.85	5.2	22.87

3.1 Single Response Optimization

The optimal settings and the predicted optimal values for stress and deflection are determined individually by Taguchi's approach. Then, overall mean for S/N ratios Stress and deflection are calculated as average of all treatment responses for each level (Table-5 and Table-6). The graphical representation of the effect of the three control parameters on

stress and deflection is shown in Figure 2 and Figure 3 respectively.

Table 5. Response table for Stress

Level	B	D	L
1	6.19	6.17	6.24
2	6.31	6.15	6.28
3	6.21	6.38	6.19
Delta	0.12	0.22	0.10
Rank	2	1	3

Table 6. Response table for Deflection

Level	B	D	L
1	22.48	22.73	22.96
2	22.41	22.76	22.57
3	22.76	22.16	22.13
Delta	0.35	0.60	0.83
Rank	3	2	1

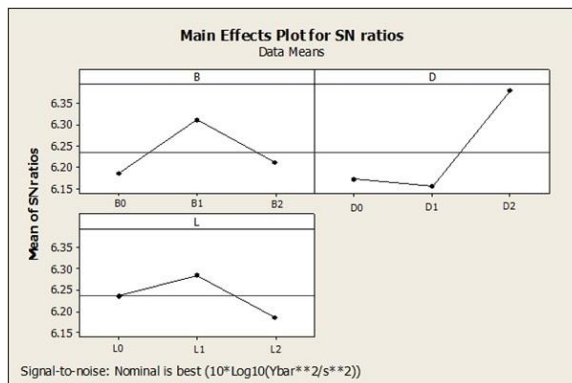


Figure.2 Graphs for Stress

Figure.3 Graphs for Deflection

3.2 Multi Response Optimization

The optimal combination of process parameters for simultaneous optimization of stress and deflection is obtained by the mean values of the multi-response S/N ratio of the overall utility value. Table-7 and Table-8 shows the values of S/N ratio for the individual response and the S/N ratio for the overall utility. The graphical representation of effect of three control parameters is represented by Figure 4.

In the present work equal importance is given for both stress and deflection. Therefore $W1$ & $W2 = 0.5$. The analysis is done using the software specifically used for design of experiment applications known as MINITAB 15.

Table 7. L9 OA with Multi-Response S/N Ratios

Exp. No	η_1	η_2	η_{obs}
1	6.28	23.38	14.834
2	6.13	23.05	14.587
3	6.29	22.45	14.370
4	6.09	22.38	14.237
5	6.67	22.36	14.513
6	6.09	22.98	14.536
7	6.18	21.69	13.932
8	6.14	21.83	13.984
9	6.24	22.87	14.554

Table 8. Response Table for Multi Objective Optimization

Level	B	D	L
1	14.33	14.45	14.60
2	14.36	14.46	14.43
3	14.49	14.27	14.16
Delta	0.15	0.19	0.44
Rank	3	2	1

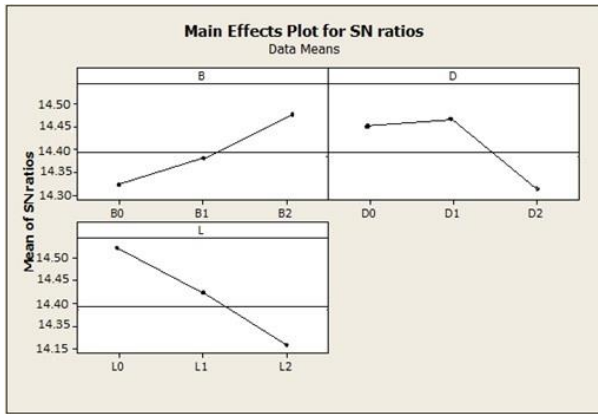


Figure.4 Graph for multi-objective optimization

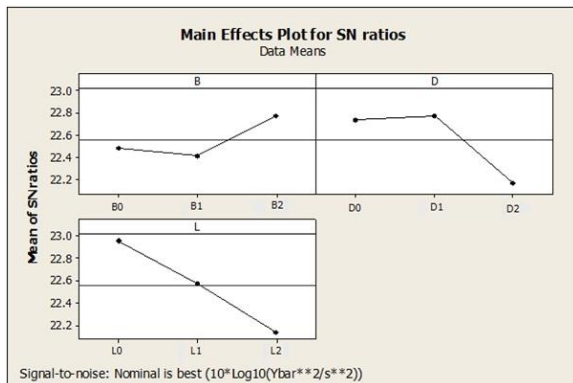
4. EXPERIMENTAL VALIDATION USING FEA

Results obtained are validated with the help of commercial FEA package ANSYS11 for modeling, meshing and analysis. Material used is SS A36 as 200GPa Young's modulus and Poisson's ratio 0.3. Element type used is Solid Tet10node92. Meshing done is fine meshing for better results. After analysis the stress and deflection observed are reduced by 11% than original, which are considered as safe for cantilever beam.

Table 9. Experimental Validation for Result

5. DISCUSSION

From mean of S/N ratios (Table-5) for stress, it is found that depth has highest rank '1'. Therefore, it has most significant effect on stress while length has the least effect. The optimal combination of control parameters for optimum stress is found to be: B2D3L2, the symbols B, D, L represents control parameters: width, depth and length respectively and numbers represent their levels. Also, from mean of S/N ratios (Table-



6) for deflection, it is observed that, the length has highest rank '1' and therefore, it affects deflection significantly while the width has least effect on deflection. The optimal combination of control parameters for optimum deflection is found to be: B3D2L1, the symbols B, D, L represents control parameters: width, depth and length respectively and numbers represent their respective levels.

From Table-7 optimal combination of control parameter for simultaneous optimization to obtain optimum stress and deflection is found to be B3D2L1. The symbols B, D, L represents control parameters: width, depth and length respectively and numbers represent their respective levels.

Experimental validation shows that volume is reduced by 11% and thus the weight of beam is also reduced by same, without compromising stress and deflection values.

6. CONCLUSION

Geometrical parameters are important for any type of beam such as length, height and width to prevent failure due to stress, deflection, etc. when subjected to point load. In this study we have considered case of cantilever beam. As explained in this study determination of geometrical parameter leads to optimal combination for same. The results of this optimization are confirmed with simulated results by FEA commercial software package ANSYS11.00. Thus attempt is made to propose a generalized optimal solution for size of beam. However, one can go for shape and/ or topology optimization with quantitative comparison with experimental data for the same.

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Combinations	Stress		Deflection		Volume
	Act.	Exp.	Act.	Exp.	
B2D3L2	61.2	56-84	4.82	4.68	30875
B3D2L1	65.2	57-85	4.96	4.9	29640
B3D2L1	65.2	57-85	4.96	4.9	29640

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WORLD CLASS MANUFACTURING

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ABSTRACT

In a manufacturing sector nowadays there is very tough competition at world level for providing better product as well as services at minimum cost and on just time. As a result of literature review shows that there are many different methods and techniques which support manufacturing processes to achieve world class level. This study shows that managers use these tools extensively. The number of management-supporting tools is increasing. A major advantage of this topic is to show the complexity of production system management. Different pillars of the World Class Manufacturing model show the diversity of model, tools and techniques.

Keywords: World Class Manufacturing, WCM Pillars, Obstacles in implementing WCM.

1. INTRODUCTION

Rapid changes in the competitive environment over the past few decades have made competition much more complex. The ability of companies to change and innovate is becoming more and more important for their survival. This is especially true today, with the current economic crisis forcing world economic growth in a downward, recessionary spiral.

Is it important for companies to belong to the leaders in their line of business? Definitely yes, but nowadays many enterprises are managed intuitively, without clear rules and principles. If the company wants to be successful and be among the first, it must continuously improve all processes and find optimal solutions for increasing both the efficiency and effectiveness. This path is not easy. At the beginning, there must be a desire to become that leader. Also important is the courage to learn and to try new things, perseverance and the ability to deal with the details and correctly convert ideas into solutions.

2. DEFINITION

The term 'World Class Manufacturing' was first used by Hayes and Wheelwright in 1984. Hayes and Wheelwright described world class manufacturing as a set of practices, implying that the use of best practices would lead to superior performance. The term "World-Class Manufacturing" was first used by Hayes and Wheelwright to describe organizations which achieved a global competitive advantage through use of their manufacturing capabilities as a strategic weapon. They cite a number of critical practices, including

development of the workforce, developing a technically competent management group, competing through quality, stimulating worker participation and investing in state-of-the art equipment and facilities.

3. WORLD CLASS MANUFACTURING

World Class Manufacturing represents a synthesis of various concepts, principles, policies and techniques for the management and operation of companies engaged in production. It's guided by the results of which enabled the revival of Japanese manufacturing after World War II and adapted the ideas that were used in the Japanese automotive, electronics and black industry, in order to achieve competitive advantage. The primary goals are to continually improve the quality, cost, production time, flexibility and

customer service. World Class Manufacturing is not a cure and should not be accepted as a religion. This is an operating strategy that if it is properly applied, gives a new dimension of production which corresponds to rapid inclusion of new high quality products, faster decisions and increased productivity products. WCM system is based on systematic reduction of all types of costs and losses from the contribution of all employees and the precise use of methods, standards and tools required by world class production. The picture below shows the functioning of WCM methodology, Where it is clear that the main goal of this system will reach zero in the waste, defects, faults and stocks, and values of this system are greater involvement of people, creating better values and more satisfied customers.

WCM department addresses and aligns three areas: People, Process and Production (or Production Flow):

3.1. Area: People

Teams and individuals in the company work in a safe environment to achieve the objectives set by management of this enterprise and at the same time to satisfy the customer needs. Great emphasis is placed on health, safety, environmental thinking and behavior. Among the important points in this area are that management considers also an education and training of people, then leading people to teamwork, leading people to focus on analyzing the causes of the problem, building customer thinking and leading the leaders to the proper valuation of the of people's benefits and teams to achieve corporate goals.

3.2. Area: Processes

Company that is the subject of this case study defines the process as "a series of individual actions performed in a specific sequence that create value." It is important that

processes must be standardized, must be capable, that is, to give a consistent output over time and that the maintenance of processes and equipment must proceed well.

3.3. Area: Production (Production Flow)

Flow is the rhythmic and continuous transmission of the right material and accurate information within the manufacturing operations at the right time, in the right quantity and in the right way. The key is then the continuity of this transfer. The objective of flow production is to reduce product throughput time and human effort through a series of appropriate actions [6]. Achievement of strategic objectives and performance measurement in the company is based on "Industrial Performance Indicators" (IPI) – indicators of the company performance. IPI are the target data, which quantify or demonstrate results. They are oriented towards activities leading to productivity increment. In theory, there is a rule: "what is not measured, it cannot be managed nor being improved" [4]. IPI indicators are divided into:

4. WORLD CLASS MANUFACTURING PILLARS

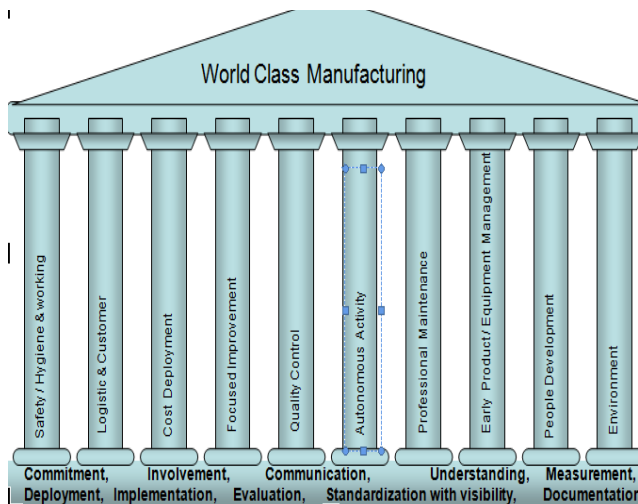


Figure 1: WCM PILLARS

Safety: It is a technical pillar that involves continuous improvement of working environment and reduction of factors generating accidents and dangerous occurrences. The aim of SAFETY pillar is to eliminate accidents.

Logistic & Customer Service: Large stocks or a necessity to reschedule production due to raw material shortages are usually the reason for performing tasks being a part of this element of WCM concepts. The aim is to create favorable conditions for the flow of materials within the company and between the suppliers and the plant, reduce inventory level, minimize the amount of displacement, and reduce the number of kilometers and transit time inside the company and from direct suppliers, integrated purchase, production and sales network.

Cost Deployment: Manufacturer, as part of COST DEPLOYMENT pillar, for company's management analysis/audit has to introduce an effective plan of waste

reduction where such activities can bring substantial benefits. It is necessary to develop an improvement program that will lead to a reduction of waste.

Focused Improvement: The purpose of this pillar is to eliminate major waste identified previously within the Cost Deployment pillar. These way organizations do not exploit resources for problematic issues of minor priority. Corrective actions are targeted and have to lead to a final problem solving and restore or introduce a new, specific standard. This work should be carried out periodically because of its unique nature.

Quality Control: Despite many preventive measures taken there are always situations when customers are not satisfied with our products or services. This reflects the importance of this pillar. Defects are found and the cost of rejected products becomes a considerable expense for the company.

Autonomous Maintenance: As machinery and equipment often operate in poor conditions and never work at full capacity this pillar becomes really important.

Professional Maintenance: Scope of activities associated with this pillar is a result of the number of failures that occur in many systems, lack of systematic preventive measures and poor co-operation between machine operators and the maintenance service staff. Main activities under this pillar focus on: control and failure cause analysis, further qualifications of maintenance service staff.

Early Equipment Management: Activities being a part of this pillar are usually undertaken if the start-up time of new equipment exceeds the initial settlements. Efficient implementation of this kind of work allows for cost optimization and loss elimination resulting from inactivity period.

People Development: Activities within this pillar are to ensure, through a structured system of training, appropriate skills and qualifications for every job position. In addition, maintenance service staff and technicians are prepared to train later other employees. There should be also knowledge and operational skills documentation system in place.

Environment: The tenth pillar is used to meet the environmental management requirements (compliance with the requirements and standards of the environmental management), continuous improvement of the working environment, etc. The main activities include: periodic internal audits verifying the impact of the plant on the surrounding environment, risk identification and prevention, use of ISO 14000 standard and a variety of technical improvements such as production site improvements.

5. MANAGEMENT RESPONSIBILITIES

- 1) **Commitment** – If the board members are not aware of or does not support the management in their objective of achieving world class levels of performance, the company is doomed to fail.
- 2) **Involvement** – All the people are not only aware of the goals and objectives of the business but they are a part of achieving them.

- 3) **Communication** – Before people can commit to a concept or an ideal they need to be told about it. They need to understand the ‘how’s and the ‘why’s of a decision and an objective. It is important for people to know how well they are performing against their objectives and also how the overall business is progressing towards its goals.
- 4) **Understanding** – Understanding what and where problems are is the starting point for making improvements.
- 5) **Measurement** – Measurement is key to quantify problems and prioritize them and to determine the effectiveness of improvement activities. It is necessary to measure performance before and after implementation to determine if and to what extent the changes have improved performance.
- 6) **Deployment** – Deployment relates to how objectives are translated into action.
- 7) **Implementation** – Implementation of right solutions with rigor by right people to identified problems is central to success. People can also learn things better by doing them and grow.
- 8) **Evaluation** – Evaluation needs to be an integral part of the improving process to see whether the identified problems have been solved.
- 9) **Standardization** – Once the evaluation cycle is completed, it is time to standardize the method to manage the process to sustain the result after solving the problem and not to have the same problem again.
- 10) **Documentation** – Documentation is to accumulate created know how to prevail and use it in other area and in the future.

The 7 steps of WCM way:

1. Identify problems that need to be addressed
2. Detect where they are
3. Prioritize them based on cost deployment
4. Analyze them and choose Right methods
5. Estimate how much they cost to be solved
6. Implement solutions with rigor

7. Evaluate the achieved results against the original objective
To solve problems we can use WCM tools which can be split into three groups: tools for the description of the problem (eg. 5W +1 H, 5G), to find the root cause (4M, 5Why's) and to standardize the results (eg. OPL, GAV). When problem arise it needs to be described with the use of appropriate tools. Tools 5W +1H we can describe deeply the problem by completing a standardized form with questions. After detailed problem description we can start to search for the root cause of the problem with the tools 4M (Men, Machine, Material, Method), which uses a fish bone diagram for describing all possible root causes of the problem, which can be caused by man, machines, methods or materials. After generating all possible root causes they needs to be analyzed one by one in order to eliminate ones that are not really root cause. In the end, the remaining possible root causes are analyzed into the depth of the problem using the tool 5Why's. By asking ourselves 'Why', at least five times, we can determine the actual root cause of the problem. The above tools are tested and they can help in faster and easier problem implementation with removing possibility of arising again. At the end of

successful problem elimination, solution of the problem is accepted as a standard and helps to eliminate future same or similar problems. As all the WCM pillars, and implementation of WCM approach has 7 steps. Those steps are presented on Figure 3, with all the major activities that are necessary to be completed in order to finish full implementation.

Step 1 deals with safety and environment – These are fundamental issues for a manufacturing company to be responsible for the safety of the people who work there and for being a respectable existence for the community surrounding it.

Step 2 relates to reliability and availability – These require developing the skills, capabilities and experience of operators under the heading of “Autonomous Maintenance” and to involve the maintenance crew in doing work to ensure that plant and equipment do not break down during required production periods. The maintenance crew needs to develop a deep understanding of the plant and equipment under their care. This process needs to be carefully managed to balance the cost-benefit relationship between maintenance costs and delivered performance improvements.

Step 3 seeks to build on the quality and the yields being achieved from processes – The focus is on building-in quality at the process, and maximizing yields, looking for ways to minimize waste and losses by the use of the tools of quality and especially Total Quality Control.

Step 4 brings the full focus on to performance – By this time; the company and its people understand their operations and processes in a very deep way. Planned daily production output must be achieved and plant performance will be at its highest level. Achievements being made at steps 1, 2 and 3 enable the improvements at Step 4.

Step 5 moves towards the use of the tools and techniques of Total Industrial Engineering – The focus is on rationalization in both the areas of logistics (production and service delivery). Efforts must be made to reduce the logistics burden both internally and externally. Step 5 is also meant to introduce LCA and labour saving devices.

Step 6 looks at completing synchronization between the sales and manufacturing areas. Efforts must be used in order to look at the full supply chain and to identify and remove waste and losses throughout the system. Companies focus their attention on the advanced use of Just in Time techniques, using their responsiveness to meet market needs rather than relying on large inventories of either finished goods or raw materials. It is important to realize that Step 6 looks at waste along the full supply chain. This chain stretches from the raw material suppliers', right through to the consumer.

Step 7 is the point where businesses are fully aligned with market requirements. Automated and automated plants and machines are producing at world class levels in terms of both internal and delivered Quality, where product, warranty and full life Costs are at the highest levels, where Deliveries are made as and when the customers require, each and every time and where the workforce can operate in a safe and healthy environment. The best way to achieve good results in WCM

implementation is to apply Kaizen methodology. shown

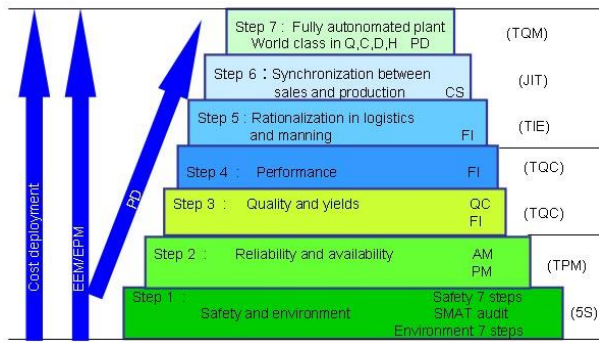


Figure 2: Seven Steps of WCM approach

6. WCM system implementation obstacles

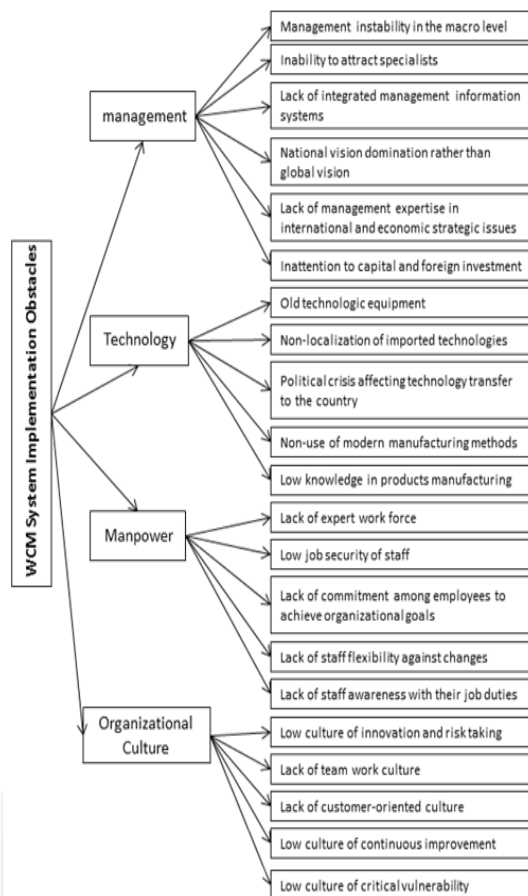


Figure 3: WCM System Implementation Obstacles

7. CASE STUDY

In this case study observations are done on fiat group of company .Before introducing world class manufacturing in any industry, it is necessary to decide critically that which area is to be focused for improvement in manufacturing sectors. WCM was developed by Fiat and partnering firms in 2005, The Chrysler Group joined the WCM when Fiat acquired majority shares in 2009

WCM is the “concept of zero”. The target of WCM is zero waste, zero defects, zero breakdowns and zero inventories. The model areas should prove achievement of zero for several

weeks before solutions are spread. Another key characteristic of the WCM concept is that change always starts with a model area. The model areas are pilots for the implementation of the principles. For example, the plant typically chooses the worst performing machine as a model machine for the Autonomous Maintenance pillar. The success of WCM is highly dependent on the participation of employees, who are periodically involved in targeted training programs. All Group plant employees worldwide are encouraged to make suggestions, each of which is assessed for potential application to be transformed in a project. In 2013, Fiat Group’s plant employees submitted a total of 1.3 million proposals for improving processes, representing an average of 15 suggestions per employee. In 2013, about 2,400 specific energy projects were implemented, resulting in approx. 180,000 fewer tons of CO2 emissions. The total number of roughly 3,000 environmental projects started during the year resulted in cost savings of €70 million. To manage and minimize environmental and safety risks, a preventive and proactive approach is employed. In the event of an accident, WCM calls for a rigorous analysis of the causes and application of the most appropriate procedures to reduce the risk of recurrence. The projects developed within WCM are designed to achieve the broadest engagement of employees and to systematically reduce losses and waste, ultimately reaching zero accidents, zero waste, zero breakdowns and zero inventories will be added when the publications are assembled.

8. CONCLUSION

From all above discussion it is clear that, the increased level of globalization and competition is forcing the Indian firms to gain competitiveness, this ‘improved competitiveness’ in its broadest context is referred as manufacturing excellence. To compete successfully with World-Class Manufacturers in this dynamically changing environment, firms must adopt World-Class Manufacturing Practices. As the world is becoming ‘global market’ the standards applied to ‘World-Class performance’ are becoming increasingly expected by customers and buyers. But this requires a systematic analysis and formulation and implementation of strategies to become World-Class Manufacturer. And doing this only will help the Indian Manufacturing organizations to endure in the new millennium What are different advantages of WCM and how to implement WCM in any industry and which area is to be focused should be well known otherwise it will be just waste of time and money. It is required to create a progress function within the organization to focus on higher level projects using Focused Improvement.

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POWDER MIXED ELECTRO-CHEMICALDISCHARGE MACHINING

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1.INTRODUCTION

Powder mixed electrochemical discharge machining (PMECDM) is an extension of the ECDM process. It is advanced hybrid machining process comprising the techniques of electrochemical machining (ECM) and electro discharge machining (EDM). The process is also referred as electrochemical spark machining (ECSM) process. The process is important since it can support a variety of materials including metals, ceramics, composites, alumina, glass, etc. The glass or quartz is usually bonded with the semi-conductive material due to their transparency, chemical-resistant properties and so on. Likewise, the engineering ceramics is also used more and more often in the high-tech apparatus. But it becomes more difficult to be further machined once they are highly sintered. The machining by means of grinding results in many micro-cracks owing to the direct-contact force. The crack propagation causes difficulty in realizing the fine structures on a ceramic base. Anode(work piece) and cathode (tool) are separated by an powder mixed electrolyte. Graphite powder is used as abrasive material which has good thermal and electrical conductivity. The material removal takes place due to chemical reaction and spark generation. The electrochemical discharge machining (ECDM) has been proved to be a potential process for the machining of high-strength non-conductive materials. Electrochemical spark micromachining process (ECSMM) is a process suitable for micromachining of electrically non-conducting materials. ECDM uses strong electric fields and chemical reactions to etch glass substrates. A DC voltage is applied between the tool and counter electrode with the tool located a few micrometers above the target etch site. Explore a new method of micro- machining, electro-chemical discharge machining (ECDM) to create robust and inexpensive micro-scale fluidic channels for bio-analytical devices.

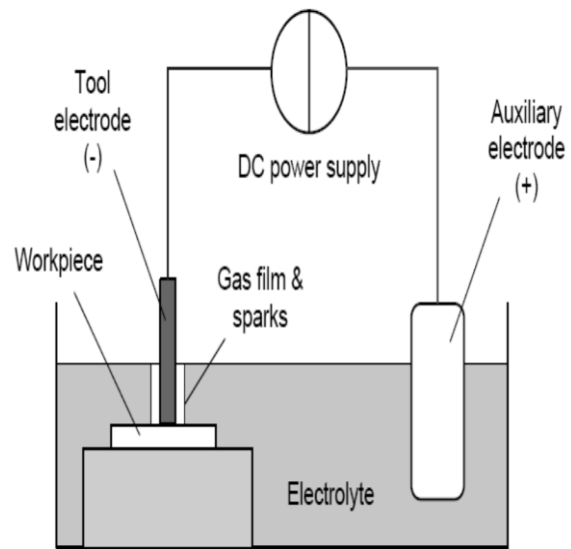


Fig 1.0(a) Powder mixed electrochemical discharge machining

2. LITERATURE REVIEW

A study of literature shows that Powder Mixed electrochemical discharge machining can support variety of materials for micromachining including metals, ceramics, glass, and alumina. Various researcher presented research paper this topic such as, (H. KuraFuji et al, 1968), MRR increases with voltage and concentration but at higher concentration over cut is also increased hence for accuracy purpose lower concentration is preferred.(J. Kozak et al, 1989), Tool shape is also a prominent factor, Rotation of tool improves performance in machining, Flat end is most effective.(Gautam, Naveen and Jain V.K 1998), Rotation of tool improves performance but max depth attained is at lower RPM.(B. Doloi, B. Bhattacharyya and S. K. Sorkhel. August 1999), MRR increases with voltage and concentration but at higher concentration over cut is also increased hence for accuracy purpose lower concentration is preferred; Tool shape is also a prominent factor. Flat end is most effective. Improvement in machining accuracy can be achieved by

modifying electrolyte flow distribution, Need of fresh electrolyte; Tool material should have good electrical conductivity. (A.V. Kulkarni 2000), A mechanism for physical operation of ECDM based on the observations of time-varying current measurements is proposed. When an isolating film of hydrogen gas bubbles covers the cathode tip portion in the electrolyte, a large dynamic resistance is present and the current through the circuit becomes almost zero. A high electric field of the order of 107 V/m gets generated across the cathode tip and isolated electrolyte causing an arc discharge within the gas layers covering the tip. The electrons flow towards the workpiece kept near the cathode tip. This flow of electron is seen as a current spike of about 20 A or more for a short duration of a few milliseconds. This bombardment of electrons raises the temperature of the workpiece momentarily and then the temperature decreases due to quenching. Synchronized study of the process revealed that the discharge temperature rise is due to the bombardment of the electrons generated during the discharge process. Geometry of the discharge-striking zone, and hence, the machining can be performed in the micron region using this process. The dimensions can be further reduced by reducing the geometry of the cathode tip, and by careful design of the process and its parameters. Close-loop control of the process can be achieved. (R. Wuthrich et al, 2003), M.R.R increase with electrolyte concentration and voltage, Feeding mechanism can influence the machining performance. (C.T. Yang et al, 2005), Adding abrasive to the electrolyte increases critical voltage and reduces slit expansion, Surface roughness gets reduced, MRR increases with increase in abrasive concentration. (Min Seop Han et al, 2011), Surface roughness reduces and geometrical accuracy increases as smooth surface can be produced, Use of 0.5-1.0 wt.% graphite powder is preferred as micro cracks on glass are significantly reduced (Y.S. Liao et al, 2013), It is verified that the ECDM can be applied for slicing meso-size non-conductive brittle materials of several millimeters thick. The electrolyte supply is investigated for more stable and stronger spark release.

3. POWDER MIXED ECDM

3.1 INTRODUCTION

PMECDM is an extension of the ECDM process. The electrolyte cell is similar to that used in ECM. In ECDM,

anode is made up of inert material while cathode normally is made of copper. Dilute hydrochloric acid (HCl) or NaOH is generally used as the electrolyte. When a voltage is applied to the cell in proper polarity, i.e., positive terminal to anode and negative terminal to cathode, reduction of electrolyte with liberation of hydrogen gas takes place at the cathode tip. This is similar to the ECM process. When the applied voltage is increased beyond a threshold value, hydrogen gas bubbles evolve in large number at the tip of the cathode and grow in size. Discharge occurs at the tip of the cathode. Machining takes place on the work piece surface kept near the cathode tip where discharge occurs.

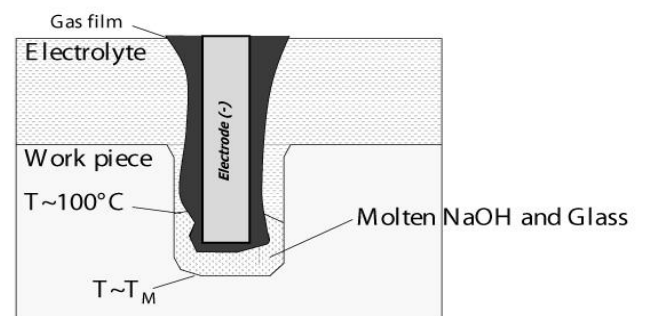


Fig 3.0(a) Glass machining using PMECDM

3.2 ROTARY POWDER MIXED ECDM

One of the effective means of improving machining accuracy and smoothing is to impart a rotating movement to the electrode. Rotation of tool improves performance but max depth attained is at lower RPM.

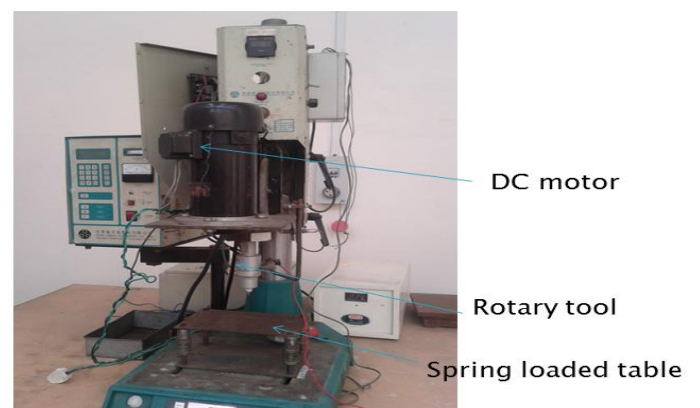


Fig 3.1(a) Rotary powder mixed ECDM

3.3 MACHINING IN POWDER MIXED ECDM

The scheme of rotary PMECDM is shown in Figure 3.2-(a). The rotating tool-electrode (TE) is connected to the negative polarity, while the workpiece (WP) is connected to the positive polarity of a pulse generator or continuous power supply of direct current. There is a gap between the electrodes through which electrolyte flow. During machining, the rotating tool-electrode is set at the depth of cut g_0 , while the workpiece (or tool) moves with a feed rate V_f fig 3.1 (b). In RECDM process, the machining region is established in two zones: EC with electrochemical dissolution and electrical discharge zone ED. Electrical discharges in ED zone can be created by electrical breakdown of the vapor- gas layer as well as by instantaneous short-circuits between the electrodes. In both cases, the deciding factor is the appearance of vapor-gas layers resulting mainly by heating of the electrolyte to the boiling point. In reality, the dimensions of both zones EC and ED fluctuate. It is so because, during the electrical discharges, the hydrodynamic conditions in these zones are changing, and also, local gaps are periodically changing with time. Due to the effect of electrical erosions on the machining surface, a large number of craters are formed in ED zone. These surface irregularities are subject of electrochemical smoothing by dissolution in the EC zone and roughness is reduced. Therefore better quality of machined surface and simultaneously larger MRR in RECDM than in ECM or EDM.

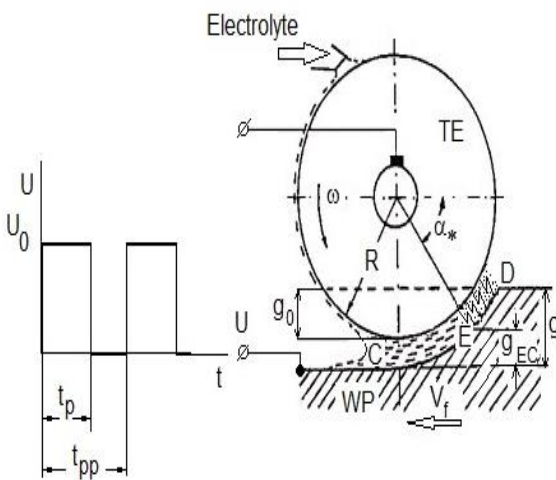


Fig 3.2(a) Machining in Rotary PMECDM.

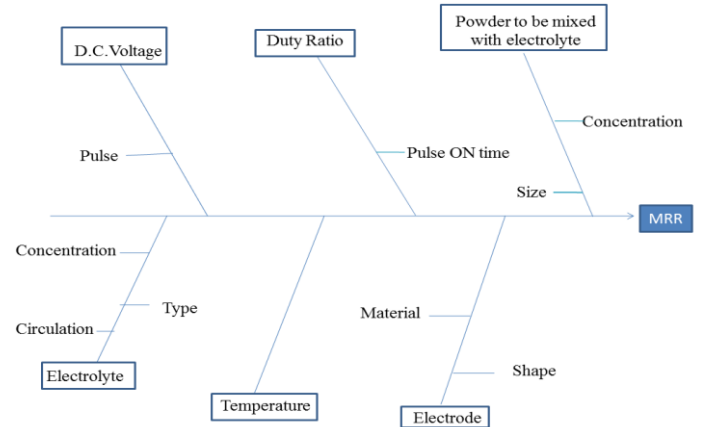


Fig 3.2(b) Cause and Effect diagram for MRR

- M.R.R increase with electrolyte concentration and voltage
- MRR increases with increase in abrasive concentration.
- With higher voltage and higher duty factor, the MRR is greater but micro cracks and other defects are generated, also glass cracks.
- Voltage applied has the largest influence on the MRR.
- Tool shape is also a prominent factor. Flat end is most effective.
- Tool material should have good electrical conductivity.
- Improvement in machining accuracy can be achieved by modifying electrolyte flow distribution

3.4 APPLICATIONS

- To create robust and inexpensive micro-scale fluidic channels for bio-analytical devices.
- Micro-seam welding of copper plates and foils
- Fabrication of miniature components
- Heat treatment
- the ideal technology for the processing of metal bonded grinding wheels and hence for the grinding of modern cutting materials

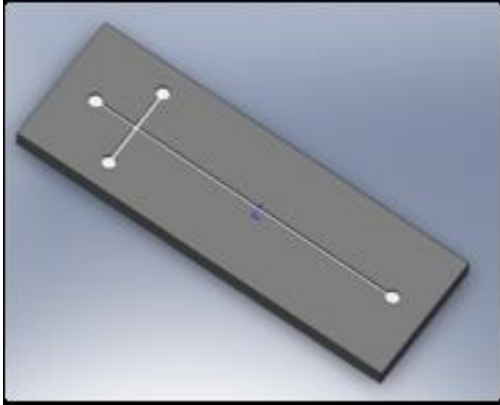


Fig 4.0(a) Glass Wafer

3.5 CASE STUDY

Objective of case study is to find out the effect of powder mixed electrolyte on MRR (material removal rate and depth of cut (DOC) in ECDM process. This case study is carried out in CiDRA® Precision Services, LLC is an industry leading supplier of precision machining services for glass, Alumina, ceramic, sapphire, and hard metal materials. They also provide drilling, milling, grinding, and polishing facilities with highest quality to the customer. For glass applications requiring special features, CiDRA® Precision Services, LLC offer polishing, coatings, glass strengthening and glass forming. They also have the micron level inspection tools necessary to guarantee dimensional requirements of customer.

Work Piece Material	Alumina(50x 50 x 5mm)
Tool Materials	Copper, Stainless Steel, Tungsten-Copper
Electrolyte	Sodium Hydroxide (NaOH)
Reference Electrode material	Copper
Tool Feed Method	Gravity Feed
Abrasive powder	Graphite powder

Factors	Applied Voltage(V)	Duty Cycle	Concentration(%)	Pulse on Time (ms)	Coding
H	65	0.80	50	1500	+1
M	60	0.72	40	1000	0
L	55	0.64	30	500	-1

Table 3 Input Parameters- Levels and coding

Gravity feed experimental set up

In gravity feed experimental set up micro drilling operation is performed by providing gravity feed motion to the tool. It consists of auxiliary electrode (Anode), Tool (Cathode), electrolyte tank. When the voltage is applied to the electrochemical cell, electrochemical spark generated between the electrolyte and tool which results in material removal from the work piece.

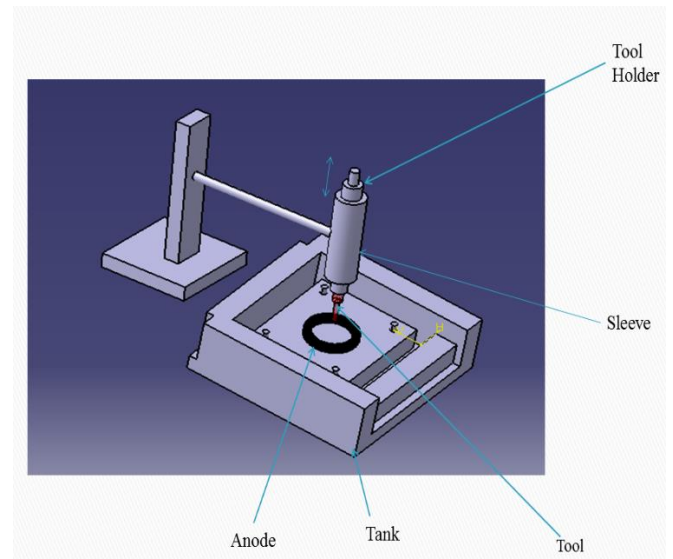


Fig5.0 (a) Gravity feed Experimental Set Up

Run	Voltage (Volt)	Duty (%)	Pulse time	Conc ⁿ	Voltage V	Duty Factor (%)	Pulse micro sec	Conc ⁿ %	Measured MRR (mg/min)	Measured DOC (mm)
1	60	72	1500	30	0	0	+1	-1	0.75	0.663
2	60	80	500	40	0	+1	-1	0	0.4	0.748
3	55	80	1000	30	-1	+1	0	-1	0.25	0.403
4	55	64	1500	40	-1	-1	+1	0	0.29	0.441
5	65	64	500	30	+1	-1	-1	-1	0.5	0.971
6	55	72	500	50	-1	0	-1	+1	0.35	0.481
7	65	80	1500	50	+1	+1	+1	+1	0.75	0.992
8	65	72	1000	40	+1	0	0	0	0.4	0.989
9	60	64	1000	50	0	-1	0	+1	0.3	0.781

Table 4 Observation data for copper tool

1: MRR calculated by measuring the difference in weight of work piece before and after machining and drilling time required to drill The through hole.

2: DOC is measure using profile projector.

DOC= Maximum Diameter of circle having all profile points of drilled hole – Tool diameter

Run	Voltage (Volt)	Duty (%)	Pulse time	Conc ^a	Voltage V	Duty Factor (%)	Pulse micro sec	Conc ^b %	Measured DOC (mm)
1	60	72	1500	30	0	0	+1	-1	0.473
2	60	80	500	40	0	+1	-1	0	0.609
3	55	80	1000	30	-1	+1	0	-1	0.399
4	55	64	1500	40	-1	-1	+1	0	0.367
5	65	64	500	30	+1	-1	-1	-1	0.878
6	55	72	500	50	-1	0	-1	+1	0.478
7	65	80	1500	50	+1	+1	+1	+1	0.886
8	65	72	1000	40	+1	0	0	0	0.859
9	60	64	1000	50	0	-1	0	+1	0.669

Table 5 Observational data for stainless steel tool

From the above experiment and calculations it is clear that with the use of powder mixed electrolyte, Surface roughness gets reduced and MRR increases with increase in abrasive concentration.

4. CONCLUSION

The following conclusions are drawn from this study. Powder mixed electrochemical discharge machining is best method for processing of high strength non conducting material. It combines both the advantages of EDM and ECM. Abrasive powder mixed with electrolyte improve material removal rate(MRR) and dimensional accuracy of workpiece. The input parameters like electrolyte concentration, D.C voltage, pulse ON time have more influence on MRR.

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The Theory of Constraints as a manufacturing strategy

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ABSTRACT

The Theory of Constraints (TOC) takes a scientific approach to improvement in manufacturing. TOC does not treat organization as a collection of independent processes, but rather as an integrated system. In the business environment, constraints on a firm's production chain have serious consequences. The TOC is a methodology for identifying the constraints that stands in the way of achieving a goal and then systematically improving that constraint until it is no longer the limiting factor. The contribution of this paper is to provide elements and conditions for manufacturing firms to use the TOC as a tool to reduce cost and improve performance as a strategy.

Keywords

Theory of Constraints, Productivity, Cost reduction, Performance improvement, Integrated manufacturing system, Manufacturing technology.

1. INTRODUCTION

Competing situations in today's manufacturing environment force organizations to adopt a new Production Management System (PMS). In the last three decades, different PMS systems have been developed: MRP II, JIT, and TOC.

The traditional approach, MRP, is "passive" in that it plans and controls a production system that it assumes rates and times are fixed. These include, but are not limited to, setup times, processing times, move and queue times, breakdown rates, repair times, and scrap rates. Within the constraints of this fixed environment, it tries to maximize the production output.

JIT, on the other hand, is 'active'. It reduces inventory levels, making production plans difficult to execute unless improvements are made in the production system. Typical improvements include reducing setup times, move and queue times, breakdown rates, repair times and scrap rates. JIT tries to achieve two equally important goals— maximize production and make improvements.

Both MRP II and JIT have their own weaknesses to deal with in different conditions. MRP ignores improvement of the production system. To be successfully implemented, JIT needs very rigid and restricted conditions.

Goldratt provided a new approach for production planning, done with software called Optimized Production Time Table or OPT. Dr. Eliyahu Goldratt conceived the Theory of Constraints (TOC), and introduced it to a wide audience through his bestselling 1984 novel, "The Goal". Since then, TOC has continued to evolve and develop, and today it is a significant factor within the world of management best practices.

One of the appealing characteristics of the Theory of Constraints is that it inherently prioritizes improvement

activities. The top priority is always the current constraint. In environments where there is an urgent need to improve, TOC offers a highly focused methodology for creating rapid improvement.

A successful Theory of Constraints implementation will have the following benefits:

- Increased profit (the primary goal of TOC for most companies)
- Fast improvement (a result of focusing all attention on one critical area – the system constraint)
- Improved capacity (optimizing the constraint enables more product to be manufactured)
- Reduced lead times (optimizing the constraint results in smoother and faster product flow)
- Reduced inventory (eliminating bottlenecks means there will be less work-in-process)

2. THEORY OF CONSTRAINTS

The Theory of Constraints is a methodology for identifying the most important limiting factor (i.e. constraint) that stands in the way of achieving a goal and then systematically improving that constraint until it is no longer the limiting factor. In manufacturing, the constraint is often referred to as a bottleneck.

The Theory of Constraints takes a scientific approach to improvement. It hypothesizes that every complex system, including manufacturing processes, consists of multiple linked activities, one of which acts as a constraint upon the entire system (i.e. the constraint activity is the "weakest link in the chain").

So what is the ultimate goal of most manufacturing companies? To make a profit – both in the short term and in the long term. The Theory of Constraints provides a powerful set of tools for helping to achieve that goal, including:

- The Five Focusing Steps (a methodology for identifying and eliminating constraints)
- The Thinking Processes (tools for analyzing and resolving problems)
- Throughput accounting (a method for measuring performance and guiding management decisions)

2.1 Core Concept of TOC

The core concept of the Theory of Constraints is that every process has a single constraint and that total process throughput can only be improved when the constraint is improved. A very important corollary to this is that spending time optimizing non-constraints will not provide significant benefits; only improvements to the constraint will further the goal (achieving more profit).

Thus, TOC seeks to provide precise and sustained focus on improving the current constraint until it no longer limits throughput, at which point the focus moves to the next

constraint. The underlying power of TOC flows from its ability to generate a tremendously strong focus towards a single goal (profit) and to removing the principal impediment (the constraint) to achieving more of that goal. In fact, Goldratt considers focus to be the essence of TOC.

2.2 Five focusing steps

The Theory of Constraints provides a specific methodology for identifying and eliminating constraints, referred to as the Five Focusing Steps. As shown in the following diagram, it is a cyclical process.

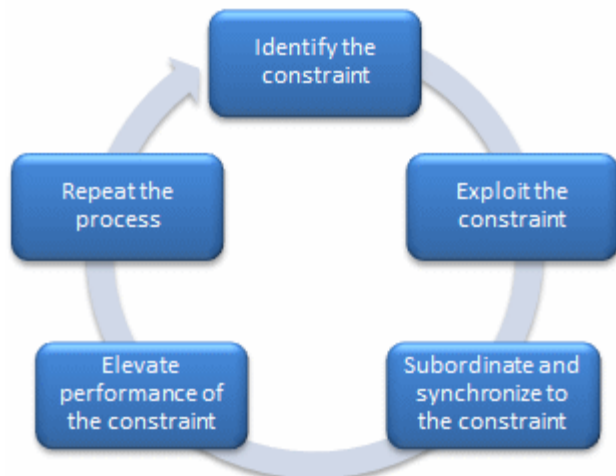


Fig 1: Five Focusing Steps, a cyclical process

Table 1: Five Focusing Steps to identify and eliminate constraints (i.e. bottlenecks).

Identify	Identify the current constraint (the single part of the process that limits the rate at which the goal is achieved).
Exploit	Make quick improvements to the throughput of the constraint using existing resources (i.e. make the most of what you have).
Subordinate	Review all other activities in the process to ensure that they are aligned with and truly support the needs of the constraint.
Elevate	If the constraint still exists (i.e. it has not moved), consider what further actions can be taken to eliminate it from being the constraint. Normally, actions are continued at this step until the constraint has been “broken” (until it has moved somewhere else). In some cases, capital investment may be required.
Repeat	The Five Focusing Steps are a continuous improvement cycle. Therefore, once a constraint is resolved the next constraint should immediately be addressed. This step is a reminder to never become complacent – aggressively improve the current constraint...and then immediately move on to the next constraint.

2.3 The thinking process

The Theory of Constraints includes a sophisticated problem solving methodology called the Thinking Processes. The Thinking Processes are optimized for complex systems with

many interdependencies (e.g. manufacturing lines). They are designed as scientific “cause and effect” tools, which strive to first identify the root causes of undesirable effects (referred to as UDEs), and then remove the UDEs without creating new ones.

The Thinking Processes are used to answer the following three questions, which are essential to TOC:

- What needs to be changed?
- What should it be changed to?
- What actions will cause the change?

2.4 Throughput Accounting

Throughput Accounting is an alternative accounting methodology that attempts to eliminate harmful distortions introduced from traditional accounting practices – distortions that promote behaviors contrary to the goal of increasing profit in the long term.

In traditional accounting, inventory is an asset (in theory, it can be converted to cash by selling it). This often drives undesirable behavior at companies – manufacturing items that are not truly needed. Accumulating inventory inflates assets and generates a “paper profit” based on inventory that may or may not ever be sold (e.g. due to obsolescence) and that incurs cost as it sits in storage. The Theory of Constraints, on the other hand, considers inventory to be a liability – inventory ties up cash that could be used more productively elsewhere.

In traditional accounting, there is also a very strong emphasis on cutting expenses. The Theory of Constraints, on the other hand, considers cutting expenses to be of much less importance than increasing throughput. Cutting expenses is limited by reaching zero expenses, whereas increasing throughput has no such limitations.

These and other conflicts result in the Theory of Constraints emphasizing Throughput Accounting, which uses as its core measures: Throughput, Investment, and Operating Expense.

Table 2: Core measures of throughput accounting

Core Measures	Definition
Throughput	The rate at which customer sales are generated less truly variable costs (typically raw materials, sales commissions, and freight). Labor is not considered a truly variable cost unless pay is 100% tied to pieces produced.
Investment	Money that is tied up in physical things: product inventory, machinery and equipment, real estate, etc. Formerly referred to in TOC as Inventory.
Operating Expense	Money spent to create throughput, other than truly variable costs (e.g. payroll, utilities, taxes, etc.). The cost of maintaining a given level of capacity.

In general, management decisions are guided by their effect on achieving the following improvements (in order of priority):

- Will Throughput be increased?
- Will Investment be reduced?
- Will Operating Expenses be reduced?

The strongest emphasis (by far) is on increasing Throughput. In essence, TOC is saying to focus less on cutting expenses (Investment and Operating Expenses) and focus more on building sales (Throughput).

3. THE NATURE OF CONSTRAINTS

Constraints are anything that prevents the organization from making progress towards its goal. In manufacturing processes, constraints are often referred to as bottlenecks. Interestingly, constraints can take many forms other than equipment. There are differing opinions on how to best categorize constraints; a common approach is shown in the following table.

Table 3: Types of constraints

Constraint	Description
Physical	Typically equipment, but can also be other tangible items, such as material shortages, lack of people, or lack of space.
Policy	Required or recommended ways of working. May be informal (e.g. described to new employees as “how things are done here”). Examples include company procedures (e.g. how lot sizes are calculated, bonus plans, overtime policy), union contracts (e.g. a contract that prohibits cross-training), or government regulations (e.g. mandated breaks).
Paradigm	Deeply engrained beliefs or habits. For example, the belief that “we must always keep our equipment running to lower the manufacturing cost per piece”. A close relative of the policy constraint.
Market	Occurs when production capacity exceeds sales (the external marketplace is constraining throughput). If there is an effective ongoing application of the Theory of Constraints, eventually the constraint is likely to move to the marketplace.

There are also differing opinions on whether a system can have more than one constraint. The conventional wisdom is that most systems have one constraint, and occasionally a system may have two or three constraints.

In manufacturing plants where a mix of products is produced, it is possible for each product to take a unique manufacturing path and the constraint may “move” depending on the path taken. This environment can be modeled as multiple systems – one for each unique manufacturing path.

4. IMPLEMENTING TOC

An excellent way to deepen understanding of the Theory of Constraints is to walk through a simple implementation example. In this example, the Five Focusing Steps are used to identify and eliminate an equipment constraint (i.e. bottleneck) in the manufacturing process.

4.1 Step One – Identify the Constraint

In this step, the manufacturing process is reviewed to identify the constraint. A simple but often effective technique is to literally walk through the manufacturing process looking for indications of the constraint.

Look for large accumulations of work-in-process on the plant floor. Inventory often accumulates immediately before the constraint.

Look for areas where process expeditors are frequently involved. Special attention and handholding are often needed at the constraint to ensure that critical orders are completed on time.

Review equipment performance data to determine which equipment has the longest average cycle time. Adjust out time

where the equipment is not operating due to external factors, such as being starved by an upstream process or blocked by a downstream process. Although such time affects throughput, the time loss is usually not caused or controlled by the starved/blocked equipment.

Ask operators where they think equipment is not keeping up with demand. Pay close attention to these areas, but also look for other supporting indicators.

The deliverable for this step is the identification of the single piece of equipment that is constraining process throughput.

4.2 Step Two – Exploit the Constraint

In this step, the objective is to make the most of what you have – maximize throughput of the constraint using currently available resources. The line between exploiting the constraint (this step) and elevating the constraint (the fourth step) is not always clear. This step focuses on quick wins and rapid relief; leaving more complex and substantive changes for later.

Create a suitably sized inventory buffer immediately in front of the constraint to ensure that it can keep operating even if an upstream process stops.

Check quality immediately before the constraint so only known good parts are processed by the constraint.

Ensure that the constraint is continuously scheduled for operation (e.g. operate the constraint during breaks, approve overtime, schedule fewer changeovers, cross-train employees to ensure there are always skilled employees available for operating the constraint).

Move routine maintenance activities outside of constraint production time (e.g. during changeovers).

Offload some constraint work to other machines. Even if they are less efficient, the improved system throughput is likely to improve overall profitability.

Offload some work to other companies. This should be a last resort if other techniques are not sufficient to relieve the constraint.

The deliverable for this step is improved utilization of the constraint, which in turn will result in improved throughput for the process. If the actions taken in this step “break” the constraint (i.e. the constraint moves) jump ahead to Step Five. Otherwise, continue to Step Three.

4.3 Step Three – Subordinate and Synchronize to the Constraint

In this step, the focus is on non-constraint equipment. The primary objective is to support the needs of the constraint (i.e. subordinate to the constraint). Efficiency of non-constraint equipment is a secondary concern as long as constraint operation is not adversely impacted.

By definition, all non-constraint equipment has some degree of excess capacity. This excess capacity is a virtue, as it enables smoother operation of the constraint. The manufacturing process is purposely unbalanced:

Upstream equipment has excess capacity that ensures that the constraint buffer is continuously filled (but not overfilled) so that the constraint is never “starved” by the upstream process.

Downstream equipment has excess capacity that ensures that material from the constraint is continually processed so the constraint is never “blocked” by the downstream process.

Some useful techniques for this step include:

Implement DBR (Drum-Buffer-Rope) on the constraint as a way of synchronizing the manufacturing process to the needs of the constraint.

Subordinate maintenance to the constraint by ensuring that the constraint is always the highest priority for maintenance calls.

Add sprint capacity to non-constraint equipment to ensure that interruptions to their operation (e.g. breakdowns or material

changes) can quickly be offset by faster operation and additional output.

Operate non-constraint equipment at a steady pace to minimize stops. Frequent inertial changes (i.e. stops and speed changes) can increase wear and result in breakdowns.

The deliverable for this step is fewer instances of constraint operation being stopped by upstream or downstream equipment, which in turn results in improved throughput for the process. If the actions taken in this step “break” the constraint (i.e. the constraint moves) jump ahead to Step Five. Otherwise, continue to Step Four.

4.4 Step Four – Elevate Performance of the Constraint

In this step, more substantive changes are implemented to “break” the constraint. These changes may necessitate a significant investment of time and/or money (e.g. adding equipment or hiring more staff). The key is to ensure that all such investments are evaluated for effectiveness (preferably using Throughput Accounting metrics).

Use performance data (e.g. Overall Equipment Effectiveness metrics plus down time analytics) to identify the largest sources of lost productive time at the constraint.

Target the largest sources of lost productive time, one-by-one, with cross-functional teams.

Implement ongoing plant floor reviews within shifts (a technique called Short Interval Control) to identify tactical actions that will improve constraint performance.

Implement a setup reduction program to reduce the amount of productive time lost to changeovers.

Evaluate the constraint for potential design updates and/or component upgrades.

Purchase additional equipment to supplement the constraint (a last resort).

The deliverable for this step is a significant enough performance improvement to break the constraint (i.e. move the constraint elsewhere).

4.5 Step Five – Repeat the Process

In this step, the objective is to ensure that the Five Focusing Steps are not implemented as a one-off improvement project. Instead, they should be implemented as a continuous improvement process.

If the constraint has been broken (the normal case), recognize that there is a new constraint. Finding and eliminating the new constraint is the new priority (restart at Step One).

If the constraint has not been broken, recognize that more work is required, and a fresh look needs to be taken, including verifying that the constraint has been correctly identified (restart at Step One).

5. CASE STUDY

5.1 Application of TOC in small scale industry.

In this study, the small metallurgical plant introduced TOC as a work philosophy and successfully applied theory's principle to its manufacturing process. Using the efficiency of the TOC, it was noticed how its directors decided how and where they should invest its money. TOC specially helps small manufacturing firms in reducing lead time and stock levels. Based on survey among firms that use this theory as well as on the results obtained from the small manufacturing, it was concluded that results of this theory reported reduction in the lead time of their processes of the order of 30 to 45 % and in relation to their stocks decreases between 50 and 75 %.

5.2 Application of TOC to increase control in complex manufacturing environment.

The goal of this study was to analyse a case example of a complex manufacturing setup and introduce more control into this setup using the techniques suggested by the Theory of constraints (TOC). The techniques would be simple enough to implement without major investments and they should increase the throughput of the manufacturing setup.

The process analysed was the manufacturing process of mixed-component candy bags at a factory owned by the case company, Candy Co. Increased throughput would aid the factory in its problem of high inventory levels and would increase the capacity to produce mixed component bags, a category which has shown strong growth within the candy bag market over the past ten years.

To gain deeper insight into the challenges the factory was facing before delving more deeply on the numbers and analysis, the complexity of the production setup and the manufacturing process of mixed bags as well as the throughput speed of the bottleneck was first looked upon. Analysis on the size of the inventory and production planning was done, which gave answer to the first research question:

1. How is the manufacturing process organized? What are the preceding and following steps for the bottleneck resource?

There are four main types of components that are inputs in the mixed bags: molded, caramel, granulated and liquorice components. Within each main type there are several different specific components. A component is defined as a candy which has the same basic recipe, i.e. it can be manufactured at the same time and in the same production run. The same components can have different colours and shapes, since the machines can produce components with varied colour and shape at the same time.

Three of the main types are manufactured from scratch: molded, caramel and liquorice. Granulated components are components that are manufactured initially in one of these three departments and then coated in granulation drums to create a different surface texture and flavour to the original components. The time it takes for a component to become ready to be put into a bag from raw materials can be vastly varied, from a few days for some components to a few weeks for some.

From these four departments the components are brought into the WIP inventory space for the packaging area, where the mixing/packaging process happens. However, sometimes the components are brought into the mixing/packaging area straight from the manufacturing departments, either due to the components getting finished in the nick of time or due to the space running out in the WIP inventory space. The components are then brought into the mixing area, where the mix is created and the components are packaged into bags. The mixing and packaging phases are inseparable in this setup, thus the phase is called the mixing/packaging phase. This phase is the bottleneck in the process, initially determined by the large queue in front of the process and later confirmed by my analysis which showed that the annual throughput of the mixing/packaging phase is less than the amount of components manufactured during this time period. The throughput speed of the bottleneck based on annual data is approximately ~1 900 kg/h. From the mixing/packaging phase the candy bags are moved to the finished goods inventory, where they are shipped to customers later on. The factory runs on make-to-stock production, so the production schedule is devised based on demand estimates.

With all the variables in the production process of mixed bags, it can safely be concluded that the environment meets the standards for a complex system. The factory does an excellent job at managing this complexity. Production planning is quite accurate: while studying a week of production, it was observed that actual production in kilograms was only a few per cent lower than the planned production, even though the production schedule had to be changed on the fly. Having praised production planning, one must also note that they are planning with an expected utilization rate of around 50% of calendar time (60% of available time), so there is definitely room for improvement. Inventory is very large at the factory. It would take roughly six days to package the entire WIP inventory. After analyzing the initial situation, analysis on components were. This analysis answered second research question:

2. What types of components flow through the bottleneck? Can some load be taken off the bottleneck through reorganizing or investments? What is the potential effect on throughput?

The types of components that flow through the bottleneck were analyzed. This analysis revealed that 14% of the products that are packaged by the bottleneck are single-component products, which do not require mixing at all. Using the average annual throughput rate, this means that 850 hours of the bottleneck's time was used to package goods that do not require mixing. There is also free capacity in the factory to shift the 1-component products to other packaging machines, especially if a third shift is added to one of the machines.

Additionally, 18% are 2-component products, which only require limited mixing capabilities. If the factory is unable to shift some of the 1-component products away from the bottleneck, 2-component products can be shifted instead. In fact, this is already done in the factory sometimes.

3. If the bottleneck resource is ever idle, what are the reasons behind that? Can the reasons be divided into different categories?

After analysing the offloading possibilities, analysis of the idle time at the bottleneck was done: whether there is any and if there is, what are the reasons. This phase combined data analysis with interviews to determine the root causes for idle time.

Looking at the bottleneck statistics, it was seen that the bottleneck is idle for almost half of the year. The bottleneck is active for 52% of the year. The largest category for idle time is waiting time, which takes up 22% of the year. Waiting time is further divided into separate reasons for the wait, the biggest of which are component and personnel shortages. On an annual level, component shortages represent roughly 5% of time, while personnel shortages represent roughly 7% of time. Together, they contribute to over half of the waiting time, possibly even more (the data was unfortunately not accurate enough to form a more precise estimate).

The main causes for component shortages are machine- or process-related, either resulting from machine or human error. However, some of the component shortages can be prevented by smart investments. For example, the factory lacks a modern inventory management system and the components are not tracked in a systematic way. Investing in new IT systems would bring transparency to the process and prevent components from being misplaced.

The main causes for personnel shortages are more easily identified: they are caused by employees taking breaks at the same time and by employees being absent due to sick leave.

In theory, the employees are instructed not to take breaks at the same time; however it does not work in practice. Also, it was suggested that employees in the packaging area are on sick leave more often than in other departments.

4. What are the implications of these findings and what actions could be undertaken to improve performance at the bottleneck resource?

What the analysis suggests is that there are two different main issues that affect the throughput of mixed bags: the types of bags packaged by the bottleneck and the utilization rate of the bottleneck. The bottleneck can produce more mixed bags, if one-component products are packaged elsewhere. Likewise, the bottleneck can increase throughput by reducing the idle time in the bottleneck resource.

Reducing idle time might seem simple, however it is not. We need to identify the causes for idle time and address those causes, which impact the idle time the most. Ideally, we would like to implement cheap solutions, however it is not always possible. Together with CandyCo's staffs, improvement ideas were generated to decrease idle time. The ideas addressed either component or personnel shortages.

The two best ideas to decrease component shortages were investing in a new IT system and investing in new production machinery. Investing in a new IT system would increase the transparency in the manufacturing process and enable employees to track the components in the factory. Additionally, the IT system would need to integrate the various systems that the factory uses, so that production planning has an overview of what is being produced, where certain components are located, what the expected time of various components to become ready for packaging is, what components are in the WIP inventory and if there are errors somewhere, where are they. Renewing old production machinery would decrease the number of errors in component manufacturing and produce more steady quality. The two best ideas to reduce personnel shortages were work-time arrangements and staff training. Together, these two methods would ensure that the bottleneck is never idle due to lack of staff. The idea is to organize work in the factory in such a way, that there is always someone available to cover for the packaging machines. Of course, this will require that employees are trained to operate the packaging machines, so that the breaks can be covered.

Together these improvement suggestions could decrease inventories in the factory, which at their current state not only require a lot of space but they tie a lot of capital as well.

Additionally, the bottleneck's throughput would be increased and capacity for mixed bag manufacturing would increase, should the factory need extra capacity. Based on current market trends, it can be expected that the demand for mixed bag products will continue to increase in the future.

5.3 Application of TOC in scheduling.

The Drum-Buffer-Rope principle (DBR) is scheduling technique of TOC that can visualise the systems constraints (Fig. 2). Every production system needs some control points or points to control the flow of product through the system. The Theory of Constraints argues that the best place for control is at the bottleneck. This control point is called the drum. A buffer can be used in front of the bottleneck, to make sure the bottleneck always has something to work on. Because it is a bottleneck, its output determines the throughput of the system. Communicating back upstream to A, what D has

produced so that A provides only that amount, is called the rope. It keeps inventory from building up.

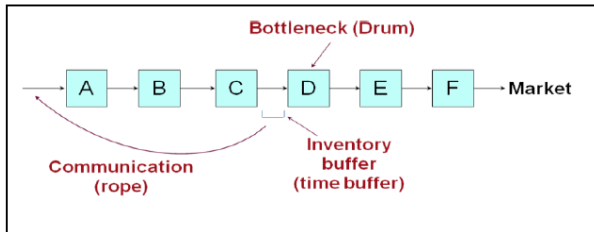


Fig 2: Drum-Buffer-Rope principle

Inventories are used to give the impression of good control and maximum equipment utilization but much were inventories same times accumulates more investment of the organisation and this concept keeping inventory was traditionally used in proven new industry. DBR scheduling proves the above traditional logic wrong. The DBR scheduling provides reduction in average WIP inventory, increasing in percentage of on time delivers, reducing in average overtime and reducing in average raw material inventory. Also because of DBR scheduling reduce WIP and raw material inventory were space availability in the store as well as production shop and improving the quality of product due to better control over operation of constraint resources. The ideal time of non-constraint resources are utilized by other purposes e.g. developments work.

6. CONCLUSION

The implication of the study is that using Theory of Constraints technique, factory throughput can be increased using small investments and changes in the way things are done instead of resorting to heavy investments in machinery in small scale industries as well as in complex manufacturing environment. By applying some changes even in scheduling of activities may result in reduction in average WIP inventory and better control over operation of constraint resources. Also, TOC when compared with other methods of production management emphasis more on increasing throughput rather than cutting expenses. Cutting expenses is limited by reaching zero expenses, whereas increasing throughput has no such limitation. Hence the scope of improvement by TOC is always greater than any other production management system

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DOUBLE ACTING SHAPER MACHINE

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ABSTRACT:

To survive in the globalized world, everybody have to think over the new things which are useful to speed up the production with low cost and better quality. In to-days world, one is always trying to co-ordinate the cost with quality. World required speed on each and every field.

Hence rapidness and quick working is the most important. Now a days for achieving rapidness, various machines and the equipments are manufactured by the man.

The engineer is constantly conformed with the challenges of bringing ideas and design in to reality new machine and techniques are being developed continuously to manufacture various products at the cheaper rates and high quality.

General terms: quick return, double acting, shearing.

Key words: quick return, double acting, shearing.

1.INTRODUCTION: Today the whole world due to globalization is turning towards more and more productivity to earn more with less profit margin and more volume of sale. Hence the productivity has been distributed among small scale industries rather than an branded large scale industry. By taking this moto we are also going to manufacture such type of low cost shaper with increased productivity and reduced weight.

A shaping machine is used to machine surfaces. It can cut curves, angles and many other shapes. It is a popular machine in a workshop because its movement is very simple although it can produce a variety of work.

The tool feed handle can be turned to slowly feed the cutting tool into the material as the 'ram' moves forwards and backwards. The strong machine vice holds the material securely. A small vice would not be suitable as the work could quite easily be pulled out of position and be damaged. The vice rests on a steel table which can be adjusted so that it can be moved up and down and then locked in position. Pulling back on the clutch handle starts the 'ram' moving forwards and backwards.

The tool post and the tool slide can be angled as seen below. This allows the shaper to be used for different types of work.

QUICK RETURN CRANK MECHANISM

The shaping machine is used to machine flat metal surfaces especially where a large amount of metal has to be removed. Other machines such as milling machines are much more expensive and are more suited to removing smaller amounts of metal, very accurately.

The reciprocating motion of the mechanism inside the shaping machine can be seen in the diagram. As the disc rotates the top of the machine moves forwards and backwards, pushing a cutting tool. The cutting tool removes the metal from work which is carefully bolted down.

Ratchet mechanism: A ratchet mechanism is based on a wheel that has teeth cut out of it and a pawl that follows as the wheel turns. Studying the diagram you will see that as the ratchet wheel turns and the pawl falls into the 'dip' between the teeth. The ratchet wheel can only turn in one direction - in this case anticlockwise.

The water well seen opposite has a ratchet mechanism that allows the person to rotate the handle in an anticlockwise direction. The bucket of water is heavy and so the person can rest by taking his/her hands away from the handle. This is because the pawl has fallen into the 'dip' between the teeth and so the bucket cannot fall back into the well.

Ratchet mechanisms are very useful devices for example, they are used in mechanical clocks. They are also very useful when using a system, such as the one seen opposite, to lift heavy weights.

2.Proposed technique:

2.1 Construction: The Double acting Shaper machine is completely fabricated type. While constructing the machine we have considered the following mechanical engineering problems to achieve the rigidity:-

1. Minimum vibrations with the maximum shaping operation so as to get maximum rigidity of machine.

2. Design should be such that it is easy for manufacturing and maintenance.

3. Fabrication technique should be such that it is economical to manufacture.

1. Frame:- It is manufactured from the Mild steel C-channel 70 x 40 x 4.6mm size and 40/40 angle. The channel and angle is cut as per the drawing and then welded to form a robust frame base. The base holds vertical channel frame post to hold the job holding device. The base plate is installed at the bottom of the frame by welding process. The main shaft (arbor) is installed on the top side of frame using the plummer blocks. It is provided with the anti rest coating to prevent it from environmental wear and tear.

2. Main Shaft : It is installed on the frame using plummer blocks. The Over hanging end of the shafts is linked to the eccentric wheel and link strip using 200 x 20Φ shaft through the guide bush along with the connecting strip of 25 x 5 x 60 section made from mild steel.

3. Plummer blocks : It is the cast metal bearing holder used to hold the bearing firmly and to hold the shaft and provided rotational motion. It is installed on the main frame using nut and bolts. Its size is 47Φ x 60 x 100 to hold 47Φ x 20Φ x 15 no 6204 SKF bearing

4. Motor (prime mover):- It is the second important component of the machine. It is either an electric motor or internal combustion engine.

Here the machine, which we are going to manufacture for the cottage industry, is portable with electric motor with the following specifications:-

H.P. ----- 0.5

R.P.M.---- 1440

Volt ----- 250V A.C. and Amp- 5A.

Rating---- continuous

Cooling -----air (fan and finned)

Phase ----- Single phase.

Bearing --- Ball bearing

5. Drive:- It is operated by the belt and pulley type power transmission system.

Here we are using the v-grooved cast iron pulley with B-type V-belt made of synthetic rubber and resin. The belt drive is safe drive because when the load comes on the cutter the belt slips instead of having back torque on the motor causing the damage to the motor.

6. Connecting rod : It is used to transfer the motion of the eccentric crank wheel to the container wire mesh frame . It is used to transfer the power and motion through right angle. It is manufactured from cast steel

providing with the internal tapping to hold the M12 bolt. This bolt is welded to the link strip the rotation of bolt in the connecting link is for adjusting its length due to internal tapping. It is just like the turnbuckle with the ball and socket joint at the end to link with the eccentric wheel.

7. Job holder holder:- It is installed at the end of the connecting strip using strip holder which forms a turning pair. It reciprocates to and fro due to the eccentric mechanism and whatever tool hold with it reciprocates against the fixed job, from which the material is to be removed. Material particles, which are removed with out aid of a person. Double acting shaper machine works with the maximum output yielding capacity. Hence the machine called as ‘ Dual side shaping machine’. According to the type of surface finish required the shaping tools can be adjusted from the tool holders.

8. Guide way:- Here the m.s. angle frame is so manufactured that it itself forms the guide track for the reciprocating ram along with the shaper tool to and fro, which is installed on the robust saddle on the frame. To reduce the friction and noise it is well lubricated periodically.

2.2 PRINCIPAL PARTS OF A SHAPER:-

Base : The base is a heavy cast iron body. It acts as a support for all the fixed and operating parts of the machine which are mounted on it. The base is made of cast iron to resist vibration and take up high compressive load.

Column : The column is a box like casting mounted on the base. It encloses the ram driving mechanism. The ram reciprocates on the guide ways provided on the guide ways provided on the top of the column. On the front of the column vertical ways are provided on which the cross rail can be moved upwards and downwards.

On the left hand side of the column a lid is provided for inspection and oiling of the internal mechanism. For operating the machine levers and handles are provided on the other side of the column.

Cross rail: The cross rail is a heavy box like structure, mounted on the front vertical guide ways of the column. The table cross feed screw and cross rail elevating screw are housed inside it. By rotating the cross rail elevating screw the cross rail and hence the table mounted on it can be moved upwards or downwards.

Saddle : The saddle is mounted on the cross rail. By rotating the cross feed screw by hand or by power the saddle moves in a cross-wise direction.

Table : The table is a box like casting having T-slots on its top and sides. It is bolted to the saddle. The job is supported on the table with the help of a vice. The table receives the vertical movement from the cross rail and

cross wise movement from the saddle. In a universal shaper the table may be swiveled on a horizontal axis.

Ram: The ram is reciprocating member of a shaper. It is semi-cylindrical in form and carries the tool head in its front. The ram slides on the accurately machined guide ways provided on the top of the column. It houses a screwed shaft to change its position relative to the job. The ram is driven by a quick return mechanism contained within the column.

Tool head : The tool head is clamped firmly to the front of the ram. It consists of a vertical tool slide and an apron. The vertical slide has a swivel base graduated in degrees, and can be set to any desired angle with the work surface. By rotating the down feed screw handle the tool can be fed in a vertical or angular direction.

Apron : The apron is clamped to the vertical slide by a vertical slide by a clamping screw. The apron can be swiveled either towards the left or right with respect to the vertical slide.

It consists of a clapper box, clapper block and a tool post. The clapper block is connected to the clapper box by means of a hinge-pin. The tool post is mounted upon the clapper block. During the forward cutting stroke of ram the clapper block is rigidly supported in the clapper box and

on the return stroke the block hinges outwards swinging on the hinge pin. This keeps the cutting edge of the tool clear of the work during the idle stroke, and prevents severe rubbing, dragging and spoiling of the cutting edge and retains the cutting efficiency.

2.3 Working:

SHAPER (OUR UNIT):- shaper is a reciprocating type of machine tool. Where a to and fro reciprocating job is fed against a stationary job.

FUNCTION:- the main function of a shaper is the production of flat surfaces, which may be vertical horizontal or inclined. It can also be used for machining convex and concave surfaces, for key way cutting slotting, grooving etc. in addition to this it can be adopted for cutting spur and bevel gears; using a single point cutting tool ground to a correct profile. A shaper is used for machining small jobs that may be held in its vice.

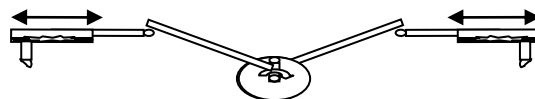
Working principle:- following fig shows the working of shaper. The work piece is secured firmly either in a vice or bolted directly to the table. The cutting tool mounted in a tool head in front of the reciprocating ram moves forward and backward and removes the metal from the work piece, while the work is fed the

small distance each time in a direction perpendicular to the line of tool motion. The machining is performed

during the forward as well as return stroke in case of our manufactured shaper.

The shaping machine is compact; easy to operate and economical in use for machining small jobs. The work and tool can be set quickly and easily and the job can be machined easily with the good standard of accuracy.

Operating Principle:- The working principle of the shivering machine is the rapid conversion rotational motion into reciprocating motion using the crank mechanism. Here rapid reversal of direction of motion of the screening frame takes place causing severe vibration.



Crank mechanism:- The crank mechanism consists of the crank wheel installed on the crank shaft. The crank wheel is rotated using electric drive. The eccentric pin installed eccentrically on the crank wheel is coupled to the polishing brush shaft using the connecting rod. The crank-shaft and the crank wheel forms the single pair which acts as a single rotating link. Also the crank-pin and the connecting rod forms a turning pair. The shaft along with the brush forms a sliding pair with respect to the shoe.

Operating procedure:-

When we start the motor rotational speed is fed to the eccentric plate or driving plate through the speed reducing pulleys. For reducing the speed, speed pulley and belt arrangement is used. When the eccentric plate rotates and the rod mounted on shivering tray pushes and pulls the tray by reversing its direction.

3. Advantages:

For the same power input it gives double work output. It requires low floor space area for its installation.

Low power consumption and is operated using single-phase electric power supply i.e. 250 V A.C. input.

It is convenient to convey it from one place to another place, due to its compact size and being installed on the single frame.

It is easy for the maintenance. It requires very less skill for its operation.

It is multipurpose and can be used for screening different particles.

It requires less power for its operation.

Specific Applications:-

For filing the metal surface.

For slotting operation

For grinding the slots.

4. Conclusion:

This project gives rise to various conclusion which are as follows :

- 1.This DOUBLE ACTING SHAPER machine is capable of removing extra material from required job or machine part such as casting of different parts, etc.
- 2.This DOUBLE ACTING SHAPER machine is helpful for mass production , it also helpful for those parts whose extra material can not be removed by grinding .
- 3.We can have many operation on this machine simply by changing the tool i.e. replacing file by slotting tool or by piercing tool.
- 4.We further conclude that the workability of small workshop has been increased due to the involvement of this machine.

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ABSTRACT

This is basically an industrial project which is presented & appreciated by “PARLE ELIZABETH TOOLS PVT.LTD” which is on the process improvement of the working system. We have tried to make few changes in the automatic keyway milling fixture and made brush polishing system semi-automatic which was earlier conventional. So that it will give better output or efficiency and reduce the human error. Thus in case of milling machine the basic problem is related to angle alignment which is previously done by worker manually and in case of brush polishing the work piece is polish manually. This generates error and thus the work piece is rejected. So for milling machine we are using universal dividing plate with angular graduation and for brush polishing turn plate mechanism is been used.

Keywords

Process improvement, keyway milling, automatic brush polishing, Turn plate, Universal Dividing Head.

1. INTRODUCTION

1.1 What is milling machine?



Fig.1 Vertical Milling Machine

- A milling machine is machine tool that removes metals as the work piece is fed against a rotating multipoint cutter.
- The cutter rotates at a high speed and because of the multiple cutting edges it removes metal at fast rate.
- The first milling machine came into existence in about 1770 and was French origin. The milling cutter was first developed by Jacques de vaucanson in 1782.

1.2 Types of milling machine:

1.column and knee type:

- Hand milling machine
- plane milling machine
- universal milling machine
- vertical milling machine

2.Manufacturing or fix bed type:

- simplex milling machine
- Duplex milling machine
- Triplex milling machine

3. speed type:

- Rotating table milling machine
- Drum milling machine
- Planetary milling machine



Fig.2 Job mounted on fixture

4. Planer type.

Since our area of interest is a AUTOMATIC VERTICAL MILLING.

1.3 Automatic keyway milling

- Key-way machine is specially designed for making keyway on punch.
- The punch is clamped on both the side using a fixture.
- The punch on which this key way milling operation is performed is mainly used in pharmaceutical industries for punching alpha-numeric data on medicines.

- To avoid deviation one technique can be used is first the position of Harbor and Hob is interchanged.
- Then a circular turn plate with angular graduation is done in the increment of 5 degree.
- A hole is punched on every 5 degree of increment.
- Then by a gear mechanism is situated inside the Harbor which is connected to L shaped arm. The arm consist of pins which in y axis which is hold inside the hole which is punched.
- Now the arm cannot move. so the tool also cannot move since it is in line with magnetic chuck.
- Thus this way the system becomes foolproof and deviation of angle is prohibited.

2. PROBLEM STATEMENT

The job (punch) is fixed between two jaws of fixture with the help of hob (which can be set in any degree between 0 to 360) so that the punch is set in desired angle position as mentioned. All this setting is done manually.

While doing so, the error in setting of degrees occurs which leads to deflection in actually angle by certain degrees. This is undesirable and the job is rejected.

3. PROPOSED SOLUTION

We found the solution to the above mentioned problem as stated below:

- To avoid deviation one technique can be used is first the position of Harbor and Hob is interchanged.
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- A hole is punched on every 5 degree of increment.
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- Now the arm cannot move.so the tool also cannot move since it is in line with magnetic chuck.
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4. Automatic Brush polishing

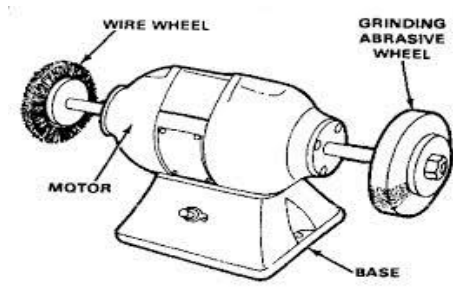


fig.3 brush polishing machine

Polishing and buffing are finishing processes for smoothing a work piece's surface using an abrasive and a work wheel or a lathe strop. Technically polishing refers to processes that use an abrasive that is glued to the work wheel, while buffing uses a loose abrasive applied to the work wheel. Polishing is a more aggressive process while buffing is less harsh, which leads to a smoother, brighter finish. A common misconception is that a polished surface has a mirror bright finish, however most mirror bright finishes are actually buffed.

Polishing is often used to enhance the looks of an item, prevent contamination of instruments, remove oxidation, create a reflective surface, or prevent corrosion in pipes.

Each punch tip is formed to a very high degree of accuracy and a slight wear and tear can result in production of excessively dull or collared tablet. Polishing of punch cavity is an important exercise to ensure reliability of the tooling process. They use different types of brushes for different cavities and different types of pastes for varied application

5. PROBLEM STATEMENT



Fig.4 Conventional Brush Polishing

Polishing is done to revive the original cavity finish and not to remove material. Care should be taken so as not to do excessive or unsatisfactory polishing.

The 4 most common errors in punch cavity polishing are:

- 'Rounding' of the outside diameter of the tip
- 'Rounding' of the edges of the tip face
- 'Distortion' of embossed details
- 'Distortion' of the tip face



Fig.5 Finished workpiece

DESIGN AND MANUFACTURING OF ARDENT

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ABSTRACT

In this paper we describe about the designing and making of an off-road/on-road compact 4 wheeler which can be used for local travelling .

And most important is its specialty is mileage that is 30 kmpl as it has a 100cc 4stroke motor bike engine .Very easy to ride as it is auto clutch with three transmission . ARDENT is suitable for both kids and adults (only criteria is their weight should not exceed 120 kilograms and height should be between 4'5" and 6'10") Few amongst many features include separating rod which separates the vehicle in two , foldable steering .

It is very cheap than a commercial scooter (Vespa ,Activa) yet it provides much more safety advantages .Including another point, people (aged) who are not able to balance two wheelers can very easily ride ARDENT ,also people who cannot control huge SUVs ,sedans ,hatchbacks etc. can easily drive it.

Keywords:

Automobile Engineering , Automotive Assembly , fuel efficient vehicle, compact , Ergonomically versatile vehicle.

1. INTRODUCTION

What is off-road vehicle? Vehicles that thread on off-road terrains including sand ,pebbles , mountains etc. our aim was to build a vehicle which is compact, fuel efficient , multi-terrain moving ability, ergonomically fluent, with very less investment and most importantly safe for a wide range ages. what we have made is an off-road, on-road compact vehicle which can be separated in to two integral parts.

it just weighs 90kg. it can run on multi-terrain like sand, gravel . it is extremely easy to ride it as it has auto clutch mechanism which allows u to shift gears without any separate clutch mechanism, it took 32,680INR for getting the working model ready .and it is much more safer than a scooter or bike as there is no stress to balance it .

It mainly consist of two separable parts body/casing and engine carriage.

The casing consists of seating arrangement ,gear leverage system, steering system, self-start switch ,kill switch ,acceleration and braking pedals, steering mechanism ,front axle and the casing

Whereas ,the engine carriage consists of the rear wheel assembly, brake disc, rear shock absorbers, battery, wiring system and the engine.

2. LITERATURE REVIEW

These types of kart can be found in ample amount on internet, where many home-projects , workshop projects have made such kart . But our projects includes many additional points over them.

2.1 STEERING SYSTEM

The steering system used here is a simple Ackerman steering with pitman arm at an angle of 108 degrees ,and knuckle type is simple Elliot , the castor angle maintained at 20 and camber maintained at 5 degrees respectively. Wheel hub is mounted on a custom made knuckle which is mated to pitman arm with the help of a knuckle joint.



Fig.1 Steering knuckle rod

3. FRONT AXLE

The knuckle joint consists of a GCI pipe of O.D 3/4 inches and thickness 2.5mm. the outer casing has a brass bushing press fitted on it which has an internal diameter of 6mm .this cylinder is to be holded by a metal C section of dimension as 3 inches base and 2 inches of projected ears. The projected ears are drilled with a 6mm drill so as to tight fit the metal rod which meshes the cylinder and the outer 'C'.

Calculation of stresses at Fork / 'C'

Material Grey cast Iron -15

$$\sigma_t = 190 \text{ N/mm}^2$$

$$\sigma_{cr} = 0.6 \times \sigma_t$$

$$\sigma_{cr} = 95 \text{ N/mm}^2$$

$$\text{Load } P_{\text{design}} = (3.14851/4) \times D^2 \times \sigma_{cr}$$

$$= 10 \text{ KN}$$

Calculating load that design can sustain

$$\sum M_c = 0$$

Therefore,

$$0 = 2 \times 0.1 + 0.2 \times 0.6 - (P) \times 0.7$$

$$(P) = 2 \text{ KN}$$

$$(P) < P_{\text{design}}$$

Therefore Design is Safe.



Picture showing tie rods and pitman arm

These together form the front axle knuckle . on the cylindrical front surface the pitman arm and the wheel hub has been mounted the . GCI pipe of O.D 3/4 inches is welded at an angle of 5 degrees to the cylinder; this is done to attain the camber angle. The projected pipe encloses a solid metal rod which holds the outer surface of the hub very firmly with the help of ball bearing, the bearing size used is 12mm I.D 30mm O.D. and the 'C' section of both sides are welded together on a single pipe of size 3/4 inches and wall thickness 2mm. both the 'C' sections are welded at an angle 5 degree facing oppositely (to even out the camber angle)

3.1 TIE ROD AND LINKAGES

The steering rod is a 3/4 inch pipe of same wall thickness 2mm 30 inch long which is mounted on a bearing with the means of a center rod. The steering rod has a loop on chassis for additional support to avoiding sagging while in motion .the

front end of steering rod is welded to the center of a flat metal plate which has symmetrical face including two welded bolts. These welded bolts will hold the tie rods of each wheel connected to the steering rod.

The tie rod has a semi section with one section of solid rod of O.D 6mm for length of 8 inches and threaded rod of length 8 inches for rest of section .the solid section has a welded ear for linking with the pitman arm , the threaded section has a variable ear to link with the steering linkage. the main purpose of threaded rod is for giving the vehicle a wide range of toeing in and out. Which is necessary for gripping and others factors.

MECHANISM

The pitman arm is rotated at a limited angle of 40degrees on both the wheels. The steering rod rotates the linkage which in turn transmits rotational motion in form of linear displacement to shift the tie rod that results in rotation of pitman arm i.e. rotation of wheel in either direction.

3.2 REAR AXLE

We are using live axle here, mounted on two P204 plumer-block bearings .both the bearings are rigidly mounted on the chassis by welding operation. For rear live axle ,a single piece solid rod of O.D 15mm is used and it is enclosed by GCI tubing which is tight fitted on it the shaft assembly is turned on lathe for passing the shaft through bearings. This operation is necessary as the I.D of bearing is such that the size of rod suitable for it will be mismatching the size of connector which spline meshes with the rear wheels. [2]

3.3 SPROCKET

Sprocket used is a Hero Honda made 42 teethed 7 inch diameter wheel. It is rigidly mounted to the axle with the help of a hub.



Sprocket ,engine ,disc brake

3.4 BRAKE (DISC)

The disc used is Honda Aviator scooter disc of 10 inch diameter. The disc is bolted on a custom made hub of material iron, and the hub is rigidly welded on the left side extension of shaft from chassis.

The caliper is mounted on the same side by bolting it to ears and welding them on the body. The caliper is AJP make single piston clamper.

4. ENGINE

Coming to most important part of “Ardent”, its engine. We came to an optimum conclusion of selecting a 4stroke 100cc, air cooled Hero Honda street engine which will give both the mileage and quench the thirst for requirement of enough torque and speed. It has a sprocket of 2.5 inch hence giving a reduction ratio of 1: 2.8. It also has a starter motor for button start provision.

5. TRANSMISSION

It has a auto clutch mechanism inside the engine casing, where before shifting from one gear to other, the motion of gear lever is used to engage and dis-engage the clutch. The gear shifting lever is placed on the left side of the seat, the lever is 8 inch long and is connected to the gearbox through hollow S.S pipe of diameter ½ inch

6. SHOCK ABSORBERS

Here we have used a pair of spring damper shock absorber that connect to rear carriage and rest wall of seat, this helps in reduction of vibration drastically. The Shocks are at an angle of 40 degree.

These shocks are manufactured by Hero Honda for the vehicle named Splendor, its length is 14 inches, it compresses upto 10 inches. These are mounted with the help of nut bolts on the ears welded on chassis



7. CHASSIS

Our aim was to design a chassis which would favor following conditions

1. Light weight
2. High durability
3. low cost of fabrication
4. Rust free

So we designed the chassis base with round hollow bar of ¾ inch O.D and 2mm thickness, and the top frame with square section pipe of same size. fabrication was done by self so there was very less fabrication cost. all the material used was galvanized iron so it was rust free



Fig. 2 Chassis, shock absorber

8. WHEELS AND TYRES

Wheels we have used are TVS factory make, of the model ‘Scooty ES’. It is a 8” wheel, and the tyre width is 3 inches. The main reason behind using this wheel is weight reduction, and since it has a hub, it is very quick to change another wheel.

9. FUEL RESERVIOR

The fuel reservoir is from the same vehicle which stores up to 4 liters of fuel at a time.

Following are cost of few important parts contributing its making (few parts are second handed)

• Engine	– 6000
• 4 set of wheels	– 2600
• Metal pipes/ rods / sheets	– 3700
• Shock abs	– 1000
• Disc and caliper	- 3500
• Silencer	- 5500
• Battery	- 1300
• Starter kit	- 3500
• Wiring parts with labour	- 5000
• Welding rods	- 450
• Nut bolts and washers etc	- 130

10. ACKNOWLEDGMENTS

Our thanks to the experts who have contributed towards guidance and development of the paper. and special thanks to my team for bringing ‘ARDENT’ to life.

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Purchasing technique to manage Indian Organisation.

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ABSTRACT

Traditionally in every companies the procedural function of purchasing is quite narrow. The key responsibility for purchasing usually is buying the parts that operator is needed on lowest possible cost, as such purchasing is most often a sub department of manufacturing and operations. However In present scenario purchasing plays a very important role from the usual shorter and opportunistic to integrated holistic and long term goals, further more purchasing strategy is no longer derivative from the operation strategy but is aligned to the business strategy.

The result tested below a hypothesis on the strategic purchasing. The hypothesis tested with a survey of purchasing executives and the result were analysed using a null hypothesis.

1. INTRODUCTION

Every Organisation looking and grabbing various purchasing technique to gain cash flow. Purchasing department needs to stay alert to minimise loss technique like changing nature of demand, seeking joint advantage with supplier, manage spend.

The usage of various technique required knowledge about vendors, value about commodity for which organisations have experts. The drastic changes in market conditions also has high impact on the prices of the commodities. Purchase without any technique include risk, arises due to ignorance towards factors that are internal or external.

For any organisation it is difficult to handle such critical situation to overcome this condition they needs not only experts but also strong purchasing techniques with proper explanation.

But such technique are popular in western countries however it attract Indian industries after 2000 because arrival of company ARIBA in India. The various other companies like Accenture, zycus also provides such services to other organisation. But each organisation

should understand how these works how it helps to save money and increase the cash flow.

2. LITERATURE REVIEW

Purchasing:

Purchasing may be defined as the function of acquiring goods from internal and external vendors to an Organisation, One of the important entity involved is purchasing department, Purchasing management can be defined as the concept of managing purchasing and related aspects in the organisation because of industries purchase presently 70% of their turnover, the purchasing management department ensures that all goods, supplies and inventory needed to operate are kept in stock. It is also responsible for controlling the cost of goods ordered, controlling inventory level and building strong relationship with customers. While supply chain was gaining attention in both practice and the academic literature, the concept of strategic purchasing has also been emerging. Just recently a definition of strategic purchasing was developed by Carr and Smeltzer (1997). By means of a literature review and empirical research, they found three factors to be indicators of strategic purchasing: (1) the purchasing function has a formally written long range plan, (2) purchasing operation long-range plan is reviewed and adjusted to match changes in the company (3) purchasing operation long-range plan includes the kinds of materials or services to be purchased. From this definition, it may be said that the purpose of strategic purchasing is to direct all purchasing activities toward opportunities consistent with the firms capabilities to achieve its long-term goals. This perspective on strategic purchasing is consistent with the general strategy literature. In one of the more popular definitions of strategy, Quinn (1980) states that strategy is the plan that integrates an organizations major goals, policies, and action sequences into a cohesive whole. As Certo and Peter (1994) state, strategy is the attempt to direct the firms activities toward a long-term goal. The idea of

strategic purchasing began to emerge in the **1980s**. But historically top management tended to view purchasing as having a passive role in the business organization (Ammer, **1989**). But during the 1980s, purchasing began to hear that it was important to become involved in the corporate strategic planning process (Spekman and Hill, **1980**). By the 1990s, both academics and managers were giving much more attention to strategic purchasing. Articles were written that indicated how the purchasing process could be linked to corporate strategic planning (Watts et al., **1992**). A thorough review of the articles published on strategic purchasing was conducted by Ellram and Carr (**1994**). Based on the literature, a clear distinction between a strategic purchasing function and a clerical purchasing function was identified. Purchasing activities can be viewed along a spectrum which ranges from clerical to strategic. Pearson et al. (**1996**) indicate that at the clerical level the purchasing function will have low visibility, with a lengthy reporting relationship to top management. Thus, purchasing decisions are routine in nature. The clerical level includes basic purchasing activities such as order processing, expediting orders, following-up on orders, and selecting suppliers based on price. At this end of the spectrum, purchasing performance is based efficiency measures (Reck and Long, **1988**). Little interfunctional communication takes place because of purchasing operation low visibility. Purchasing operation job is to keep the factory running and the buyer often has no relevant professional qualification (Keough, **1994**). Freeman and Cavinato (**1990**) classify this level as basic financial planning. At the strategic level, purchasing activities are integrative. Pearson et al. (**1996**) state that strategic purchasing has a proactive, long-term focus. According to Reck and Long (**1988**), the cross functional training of purchasing professionals occurs. Permanent lines of communication are established with other functional areas. Professional development focuses on strategic elements of the competitive strategy. Purchasing performance is measured in terms of contributions to the firms success. At this level, supplier management is critical (Keough, **1994**). Purchasing operations selects the right type of relationship with its suppliers and supplier relationships are strategically managed. While there was agreement on what constitutes strategic purchasing, Ellram and Carr (**1994**) concluded that the body of literature primarily consists of conceptual frameworks and exploratory findings based on empirical research. And, few of these articles attempt to link purchasing to the strategic management process. Although few articles linked purchasing to strategic planning, a general theme seemed to be developing that purchasing was becoming more strategic. As a result of a comprehensive study on the future of purchasing, Carter

and Narasimhan (**1996**) concluded that purchasing operation ability to impact strategic planning has increased in a number of firms. Spekman et al. (**1994**) recently noted that purchasing professionals have new opportunities to become strategic due to the rapidly changing competitive environment. The conclusion can be made that purchasing as a strategic function has gained in importance.

GENERAL PURCHASING CYCLE:

Goods and service cannot be received without the liability being recorded, if this is possible then the liabilities could be understated along with the expenses. Moreover only authorised goods and service are made. If this is not the case then the company would suffer from paying of unauthorised purchases and expenses will be overstated only authorised goods are expected on delivery this means there must be check to the purchase order for agreement of quantities to be delivered, and only authorised payment to the supplier is possible if this is not the case then the company would end up paying for unauthorised purchase and understatement of the bank would result. All goods return to the supplier must be approximately would be dealt with.

PURCHASING PRINCIPLE AND TECHNIQUE.

All procurement function essentially have the same goal:

Obtaining maximum savings. In procurement professional attempts to obtain the goods and services at the lowest price and at the necessary quantity level, he/ she strives to fulfil certain objectives in the day to day endeavour related to purchasing functions. What then objective in purchasing, the national institute of public purchasing maintains that the objective of purchasing are :

To obtain the right material or services meeting quality requirement in the rigid quantity for delivering at the right time to the right place from the right source with the right service at right price.

To supply end user with an uninterrupted flow of goods and services.

To purchase competitively.

To laid emphasis on quality and best values.

THREE PURCHASING TECHNIQUE:

CHANGE NATURE OF DEMAND:

The nature of demand does not remain same throughout the year, there are some other things like re specification,

blanket po can be used in this technique which are as follows:

Re specification is used when organisation not able to make saving if hard try so they need to go back to their requirement and needs to check about each specification that the particular things really required or not. Blanket po is the method when the organisation confirm about there future demand particularly commodity so they can directly raise po for entire rather raising several po for same commodity and ask for discount for supplier. With this strategy organisation can purchase the raw material, semi finished goods finished goods as per season of products with respect to quality and quantity.

SEEK JOINT ADVANTAGE WITH SUPPLIER:

Where there is both high supply power and high demand power, the strategy aims at searching jointly with the supplier for advantages. The different variants of this basic strategy depends upon the scope and intensity of the partnership. Value partnership where goal is optimize growth and share business risk which leads win win situation for both the parties. Integrated operation planning where both party need to show trust on each other related to the operation and production. Meanwhile the intensity can range from project based sharing of costs to the sharing of financial success and risk.

MANAGE SPEND:

Spend means expenditure for organisation, manage spend in the case of low supply and demand power basic technique involves professional steering of demand. Manage spend of all requires detailed knowledge of who is buying what from which supplier. Based on this one can then consider the possibility of offsetting low demand power by building demand, either within the company or across company boundaries, these consideration should be backed by an uncompromising analysis of whether the demand in question is really justified. The approaches for cutting costs and adding value within this basic strategy are demand management where organisation can analysis their requirement from particular vendor and procure only quantity which is exactly required, volume bundling is the concept which is similar to the economy of scale where organization can save the money by producing the products in bulk for there customer and commercial data mining which includes the keeping the records of previous purchase which help in future purchase.

FUNDAMENTAL CONCEPT RELATED TO THE TOPIC

PURCHASE ORDER:

A Purchase Order Is Commercial Document and first official offer issued by a buyer to a seller, indicating

types, quantities, and agreed price for products and services, acceptance of a purchase order by a seller forms a contract between the buyer and seller, so no contract exist until the purchase order is accepted. It is used to control the purchasing of products and services from external supplier.

BLANKET PO

A blanket order is the purchase order the customer makes with its suppliers which contains multiple delivery date over a period of time, Often negotiated to take advantage of predetermined pricing. It is normally used when there is a recurring need for expendable goods, blanket orders are often used when a customer buys large quantities and has obtained special discounts.

Having a blanket order prevents the customer from having to hold greater than necessary amounts of stock and avoids the administrative expenses of processing frequent purchase orders, while favouring discount pricing through volume commitments or price breaks.

A blanket order is set at fixed price contract for a period of time. The buyer looks for the best pricing among competitor supply bid, after the best one is chosen the price of goods are fixed and also quantities of each product given to the supplier to prepare stocks for on request delivery.

Forecasted quantity is provided by the buyer as full usage quantity recorded historically few years or as needed for quantitative analysis. The supplier may give a condition of quantity to supply for this contract which may be done one or two years.

The blanket order will charge the delay delivery if the supplier could not supply the products in the contract on time. Anyway since the suppliers has already kept the stock for ready delivery for the first year or agreed period, if the buyer could not fulfil the contracts. Conditions such as must buy 80% of forecast quantity within a year the contract may be extended, or the delay charge could be no more, or no other charges requested by the buyer.

The blanket order is very useful for the buyer. The most difficult part of having a contract is determining the forecast quantity arranged by the user of the product. As a forecast quantity can be difficult to get, the supplier must be aware of the quantity to keep in stock. An easy way to do this is to discuss with the buyer what quantity to keep in stock. For example, they might keep only 20% in stock in the first six months so that the supplier and the buyer are able to review the quantity and adjust it appropriately, this reduces

the stock burden of the supplier during the contract period and might help the buyer at the end of the contract if the stock doesn't move as quickly as anticipated, the contract may be extended year after year but it can be adjusted each time as more relevant forecasting history will predicate the needs to decrease or increase stock requirements, alternatively some companies may utilize forecasted information via mrp system to determine appropriate stock quantities throughout the product life cycle

VALUE PARTNERSHIP:

For organisation looking to build a new business or expand an existing one, a strong partner can be key. For a company such as consumer product business seeking to launch products into new industry sector, partnering with the company already integrated into that sectors channels of distribution can make market entry easier and more realistic to achieve.

It is concept where two parties working together for developing and refining the business concept and crafting the business plan. But both parties might not be a partners but simply working together.

Overtime, sucessfull value partnership confirmed that parties skill complemented each others well and specific contribution towards getting the business get funded.

INTEGRATED OPERATIONS;

To produce product from raw materials, it needs to move out from various processes where various operations gets perform on it. However in integration operations the operation gets divided between two parties based on each other competencies also each party knows about processes done in each other production house but they not disclose out to anyone thus integrated operation totally based on trust on each other.

VOLUME BUNDLING

This concept is similar to economies of scale, economies of scale are the cost advantages that enterprise obtain due to size, output or scale of operation, with the cost per unit of output generally decreasing with increasing scale as fixed cost are spread out over more units of output. Often operational efficiency is also grater with increasing scale, leading to lower variable cost as well. Economies of scale apply to a variety of organisation and business enterprise. For example, a large manufacturing facility would be experted to have lower cost per unit of output than a smaller facility all the factors being equal, while a

company with many facilities should have a cost advantage over a competitor with fewer.

Some economies of scale, such as capital cost of manufacturing facilities and friction loss of transportation and industrial equipments, have a physical oe engineering basis. The economics concept dates back to adam smith and the of obtaining large production returns through the use of division of labours. Diseconomies of scale are the opposite. Economies of scale often have limits, such as passing the optimum design point where cost per additional unit begin to increase. Common limits include exceeding the nearby raw material supply, such as wood in the lumber, pulp and paper industry. A common unit for low cost per unit weight commodities is saturating the regional markets, thus having to ship product un economical distance. Other limits include using energy less efficient or having a higher defect rate. Large producers are usually efficient at long runs of a product grade and find it costly to switch grade frequently. They will therefore avoid speciality grades even though they have higher margins, often smalles manufacturing facilities remain viable by changing from commodity grade production to speciality products

DATA MINING:

Data mining is used to understand previous purchase patterns, materials, customer record setting up computational process of discovering patterns in large data sets involving methods at the intersection of artificial intelligence, machine leanring, statics and data base system. The overall goal of the data mining process is to extract information from a data set and transform it into an understandable structures, visualization and online updating.

The term is the buzz word and is frequently misused to mean any form of large scale data or information processing (collection, extraction, ware housing analysis and statictics) but is also generalised to any kind of computer decision support system, including artificial intelligence. In the proper use of the word the key term is discovery commonly defined as detecting something new often the more general terms (large scale) data analysis or when referring to actual methods, artificial intelligence and machine learning are more appropriate.

The actual data mining task is the automatic or semi automatic analysis of large quantities of data to extract previously unknown interesting patterns such as group of data records (cluster analysis) unusual records (anomaly detection) and dependencies (association rule mining), this usually involves data base techniques such as spatial indices. These patterns can then be seen as a kind of summary of the input data, and may be used in further analysis or for example, in machine learning and predictive analytics, for example data mining set up might identify few multiple groups in the data, which can then be used to obtain more accurate prediction results by a decision support system.

The related term data fishing and data snooping refers to the use of data mining methods to sample parts of a larger population data set that are too small for reliable statistical inferences to be made about the validity of any patterns discovered. These methods can, however be used in creating new hypothesis to test against larger data population.

Various ERP system such as SAP, SAS, Oracle databases can be used for such techniques.

RESEARCH DESIGN AND HYPOTHESIS

To carry out the research effectively the understated research methodology shall be adopted for the purpose.

Preliminary investigation

All old literature, studies, website books used to get acquainted with the topic of study.

The hypothesis of the study shall be as under.

H₀: Null Hypothesis- purchasing technique performing lower than traditional purchasing. The sampling technique to be used for the proposed study shall be judgemental sampling. Primary data will be collected from the interview of people coming to purchasing department, secondary data shall be used for the proposed study.

TOOLS AND TECHNIQUE ANALYSIS:

The organisation purchasing tool or database (purchasing) records can be used to compare the performance

STATISTICAL ANALYSIS:

Statistical analysis method to evaluate the drastic change. Through above information null hypothesis can be tested by using **F test**

F TEST

An F Test is an statistical test in which the test statistic has an f distribution under the null hypothesis. It is most often used when comparing statistical model that have been fitted to a data set, in order to identify the model that best fits the population from which the data were sampled. Exact f test mainly arise when the models have been fitted to the data using least squares. The name was coined by George W.S. Nelder in honour of Sir Ronald A. Fisher. Fisher initially developed the statistic as the variance ratio in the 1920s.

In F TEST

$$F = \sigma_{s1}^2 / \sigma_{s2}^2$$

Where σ_{s1}^2 and σ_{s2}^2 represents the variance of two normal population.

$$\sigma_{s1}^2 = \frac{\sum (x_{1i} - \bar{x}_1)^2}{(n_1 - 1)}$$

$$\sigma_{s2}^2 = \frac{\sum (x_{2i} - \bar{x}_2)^2}{(n_2 - 1)}$$

x_{1i} = frequencies of first sample

x_{2i} = frequencies of second stage

\bar{x}_1 = mean of first sample

\bar{x}_2 = mean of second sample

n_1 = number of frequencies of first sample

n_2 = number of frequencies of second sample.

Where

The calculated value of F is smaller than in table below. We conclude that F ratio is not significant.

If F ratio is considered non significant, we accept the null hypothesis, but if F ratio is considered significant we then readjust H₀.

When we use F test we presume that

1. the population is normal,
2. samples have been drawn randomly
3. observations are independent
4. there is no measurement error.

The object of f test is to test the hypothesis whether the two samples are from the same normal population with equal variance or from two normal populations

with equal variances. f test was initially used to verify the hypothesis of equality between two variances, but is now mostly used in the context of analysis of variance. the following example illustrates the use of f test for testing the equality of variance of two normal populations.

Judgemental sampling:

Judgemental sampling is non probability sample technique where the researchers selects units to be sampled based on their knowledge and professional judgement. This type of sampling technique is also known as purposive sampling and authoritative sampling.

Purposive sampling is used in cases where an authority can select a more representative sample that can bring more accurate results than by using other probability sampling technique. The process involves nothing but purposely handpicking individuals from the population based on the authority or the researchers knowledge and judgement.

When to do judgemental sampling:

Judgemental sampling design is usually used when a limited number of individuals possess the trait of interest. It is only viable sampling technique in obtaining information from a very specific group of people. It is also possible to use judgemental sampling if the researchers know a reliable professional or authority that he thinks is capable of assembling a representative sample.

Setback for judgemental sampling:

The two main weaknesses of authoritative samplings are with the authority and in the sampling process both of which pertain to the reliability and the bias that accompanies the sampling technique.

Since it comes to the sampling process it is usually biased since no randomization was used in obtaining the sample. It is also worth noting that the members of the population did not have equal chances of being selected. The consequences of this is the misinterpretation of the entire population which will then limit generalization of the results of the study.

METHOD OF DATA COMPLETION, TABULATION AND GRAPHICAL PRESENTATIONS.

Data collection is an important aspect of any type of research study. Inaccurate data collection can impact the result of a study and ultimately leads to an invalid result.

Data collection methods for impact evaluation vary along a continuum. At one end of this continuum are quantitative methods and at the other end of the continuum are qualitative methods for data collection.

Out of the various methods researchers have used interview as a data collecting method which comes under qualitative method.

The purpose of research interview:

The purpose of research interview is to explore the views, experiences, beliefs and motivation of individuals on specific matters, qualitative methods such as interview are believed to provide deeper understanding of social phenomena than would be obtained from purely quantitative methods, such as questionnaires. Interviews are therefore most appropriate where little is already known about the study phenomena or where detailed insights are required from individual participation. They are also particularly appropriate for exploring sensitive topics, where a participant may not want to talk about such issues in a group environment.

Process followed for interview:

Researchers designed some questions related to purchasing technique asked same to employees of the firm who were closely related to purchasing related activity by visiting the company.

SCALE:

Arbitrary Scale to measure the result. Arbitrary scales are developed on an ad hoc basis and are designed largely through the researchers' own subjective selection of items. The researchers first collect few statements or items which he believes are unambiguous and appropriate to a given topic. Some of these are selected for inclusion in the measuring instrument and then people are asked to check in a list the statement with which they agree.

The scale which is used in this project to prove hypothesis is as follows

Answers	Rating
Not know	1
No	2

Occasionally	3
Yes	4

3	11
4	12
5	11
6	13
7	11
8	11
9	11

CASE STUDY:

Objective of Case Study : To verify whether the relationship established is valid through the responses from the industries. The major aim of the case study is to provide a practical example of performance improvement of the Indian manufacturing COMPANIES. One of the objectives of case study was to assess the STRATEGIC PURCHASING implementation practices and performance improvement of the organization. The case study helps in evaluating the company's overall business performance.

Following questionnaire researchers used

1. Have you ever used blanket order concept?

a) Not known b) No c) Occasionally d) Yes

2. Does concept of respecification worked/ working for you?

a) Not known b) No c) Occasionally d) Yes

3. Does value partnership working for you?

a) Not known b) No c) Occasionally d) Yes

4. Is integrated operation doing better?

a) Not known b) No c) Occasionally d) Yes

5. By equalising the credit policies is cash policies is cash flow goes up?

a) Not known b) No c) Occasionally d) Yes

6. Is volume bundling helping you?

a) Not known b) No c) Occasionally d) Yes

7. Is data mining tool used?

a) Not known b) No c) Occasionally d) Yes

Mathematical and statistical analysis and interpretations.

Obtained frequencies after asking question for traditional purchasing

Sr no	A1
1	11
2	12

Obtained frequencies after asking question from new purchasing technique

SR NO	A2
1	27
2	27
3	25
4	28
5	26
6	26
7	24
8	27

CALCULATIONS:

					W	Z		
SR NO	E1	E2	ẽ1	ẽ2	E1-ẽ1	E2-ẽ2	W*W	Z*Z
1	11	27	13.33	25.79	-2.33	1.21	5.43	1.47
2	12	27	13.33	25.79	-1.33	1.21	1.77	1.47
3	11	25	13.33	25.79	-2.33	-.79	5.43	.62
4	12	28	13.33	25.79	-1.33	2.21	1.77	4.90
5	11	26	13.33	25.79	-2.33	.21	5.43	.05
6	13	25	13.33	25.79	-.33	-.79	.11	.62
7	11	26	13.33	25.79	-2.33	.21	5.43	.05
8	11	24	13.33	25.79	-2.33	-1.79	5.43	.62
9	11	26	13.33	25.79	-2.33	.21	5.43	.05
10		26		25.79		.21		3.19
11		26		25.79		.21		.05
12		26		25.79		.21		.05

13		24		25.79		-1.79	from suppliers, data mining where all previous purchase can be saved and reviewed for future purchase. There are other good purchasing techniques available for purchasing over traditional purchasing.
SUM	103.0	336.0				SUM	36.22

Traditional purchasing is weaker compare to various purchasing technique like change in demand, joint venture with suppliers, managing spend in terms of cost

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$$N1=9, N2=13$$

$$\sigma_{s1}^2 = 36.22/8 = 4.52$$

$$\sigma_{s2}^2 = 15.74/12 = 1.21$$

$$F = \sigma_{s1}^2 / \sigma_{s2}^2$$

$$\sigma_{s1}^2 = 36.22/8 = 4.52$$

$$\sigma_{s2}^2 = 15.74/12 = 1.21$$

$$F = 4.52/1.21$$

$$F = 3.74 \text{ (CALCULATED)}$$

$$\text{BUT } F = 3.28 \text{ (TABULAR)}$$

As calculated value is greater than the tabular value so reject null hypothesis and accept alternative,.

CONCLUSION:

From study it is clear that purchasing is important activity at organization and it needs to be done carefully and logically.

It is obvious that quantity of raw material will be differ month by month hence to achieve maximum profit for bulk order company goes for concept called blanket po so it is confirmed that change nature of demand is technique where organization can change their demand of raw material with respect to the demand.

Joint venture advantage with supplier is again helps organization to save their spend, venture with local vendors helps to reduce transportation cost, trust between both party leads excellent operation planning and joint venture helps to share the risk for Organization. Manage spend is the technique of includes economy of scale where organisation can produce the products in bulk so that they can benefit

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