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Science & Technology”*



Sandip Institute of Engineering and Management
Department of Computer Engineering

2nd National Conference on
“Recent Innovations in Engineering, Science & Technology”

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Exploring Techniques for Converting Handwritten Mathematical Expression

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Abstract—Digitizing mathematical expression while submitting a problem is very necessary, but at many times recognition systems fails to accurately convert the special symbols such as Phi or Psi as they are not used frequently in natural language documents. Also, natural text converters fails to while handling complicated mathematical structures and grouping between the symbols. For writing problem sets and research papers, lot of people first write a draft and then they later type it manually. It takes a brief time to learn LaTeX and it takes a brief time for typing up mathematical documents. This project will find different approaches to create a system which will convert handwritten mathematical expressions into digital counterparts, which further could be used in near future for converting expression in real time. The input of the system are the handwritten expression. And use of a Support Vector Machine for segmenting expression traces into required mathematical characters along with Neural Network for recognizing characters. The output is the expression in LaTeX.

Keywords—Support Vector Machine, Neural Network, Digitizing, LaTeX, Character Recognition.

I. INTRODUCTION

The LaTeX holds an important ability to automate work and enhances users efficiency. As when we type a formulae and scientific syntax the person who types even more than two expressions in a report should consider using LaTeX. As the learning curve for using LaTeX at it's full efficiency is undoubtedly high. And for learning how to use mathematical expression into LaTeX requires a brief time to get a grip onto LaTeX syntax [11].

Recently there has been an increase in usage of the digital documents in academia. There is already some work done in this area but it cannot produce accurate results. For writing a research paper or any official document first people write the expression onto a paper and then they convert it into LaTeX syntax. Many applications are developed in the field of recognizing pattern such as face, character and speech recognition. The motive for the research is for finding an efficient method for character recognition. It is a complex task to develop a system which can

convert any type of document character's into machine readable form. Whereas recognition of handwritten character is always a fascinating topic for the researchers all around the world. As every person have different way of writing they are differentiated by different characteristics such as speed, style, size, positions of characters which results in many different variations for the same word. Even the same person cannot write the same sentence as it is because it depends onto the different situations different tools used and so on. To overcome these set of challenges many researchers provided different solution to make the results more accurate [12].

II. RELATED WORK

This section explores the various techniques for recognition of 'Handwritten Mathematical Expression'.

Chang, Joseph et al.[1] proposed a technique for converting handwritten and electronic documents into LaTeX source code, using Optical Character Recognition along with Machine Learning. For applying the methods they divided the task into subtasks with the techniques such as using Character Segmentation(CSeg),Character Recognition(OCR), Structural Analysis (SA), lexing and Parsing. Dataset used for training was the data crawled using python scripts. Using the above method the result for the CSeg provided with 92% accuracy. OCR was trained by partitioning the data for training, validation and testing by percentage of 60%, 20%, 20% respectively. OCR represents error percentage of 8.817%. The confusion between 1 and l, 0 and o is hard to be classified via OCR. Overall the system provides operational using RPCC, SVM and grammar focused approach.

Richard Zannibi and James R. Cordy [2] proposed a technique for recognizing mathematical expression using Tree Transformation. The system uses three successive passes. The first pass is 'Layout Pass' which builds a Baseline Structure Tree which describes the two-dimensional position of input symbols. Reading the order of operator and it's precedence both are used for allowing efficient recognition of the symbol layout even when the symbols changes greatly from their required positions. And then the 'Lexical Pass' produces a lexed Baseline Structure Tree (BST) from the first BST by creating a group of tokens with multiple input symbols, these

have function names, decimal numbers, with symbols consisting of non-overlapping primitives similar to "=". Lexical Pass labels vertical structures present such as fractions. This Lexed BST is now converted into LaTeX. The BST after lexing BST is transformed into an 'Operator Tree', which later explains the scope with order of operations present in the expression given as input. The tree changing that is manipulation used in every pass are represented in compact form using tree transformations. The system architecture is compiler like which allows efficient handling of unexpected input, increasing the scalability of system, along with providing the groundwork to handle the mathematical notations.

Masakazu Suzuki, et al.[3] proposed an OCR system for recognizing mathematical documents, called INFITY. INFITY uses four ways to perform, which are character recognition, layout analysis, and structural analysis of mathematical expressions, and manual error correction. In all these procedures, many techniques are used for efficient recognition. Results gained are on 500 pages of mathematical documents which acquired high recognition of character percentage on mathematical expressions as well as on simple texts, and sufficient performance output on the structure analysis of the mathematical symbols and expressions. The result achieved onto 476 pages of documents with the recognition rates up to 98.51% and 89.6% of mathematical expressions are perfectly analyzed with no error.

Christopher Malon, et al.[4] proposed solution for challenges in recognition of Mathematical formulas with an OCR system with a variety of similar looking symbols whose bold, calligraphic varieties must be recognized differently for each one of them, though the fonts that are present in an article are not known previously. The solution for that this paper describes the use of a support vector machines (SVM) to learn and then predict about 300 classes of symbols and styled characters. The base of this solution is for avoiding the confusion of the letters such as 1 and l. They used Naive classifier, Linear SVM and then Gaussian SVM for better classification of the data. It is concluded that even the simplest kernel, the support vector method is strong enough to achieve better accuracy result which overcomes the difficulty for simpler classification used in an OCR system.

In the review paper, Masayuki Okamoto and Bin Miao[5] focused on layout structures of symbol without parsing them. As parsing methods require the precise syntax definitions of expressions which can be difficult for a wide variety of expressions. This method finds an expression structure from the two-dimensional relative positions of symbol within the expression. The basic principle used here is partitioning the given expression into components by recursive horizontal and vertical cutting. Text recognition and Documents are understood by using the partitioning of the expressions into components. The processing speed achieved by this method is higher than that of the traditional methods.

Yassine Charjri, et al.[6] the author describes all the details concerning the necessary steps of recognition approach for handwritten mathematical expressions recognition. There are two large sets present in the era of document recognition: text analysis and graphical components analysis. The system begins by a set of pre-processing techniques in order to ameliorate the quality of the image and then making the features extraction efficient. The next step in the system process is expression segmentation into individual symbols based totally on the connected component algorithm. To extract the features, Here they applied the 'Radon Transform' for exploiting its ability to

extract lines from the images. With symbols classification by using Support Vector Machines (SVM). For pre-processing they used techniques as Normalization, Filtering, Binarization, and Skew Detection and Correction. Recognition rate achieved were: Mathematical logic with 90%, mathematical analysis 68%, mathematical algebra 82% and mathematical probability of 72%.

Richard Zannibbi and Dorothon Blostein[7] proposed surveys in the different recognition and conversion of mathematical expressions, which revolves around four key problems in math recognition as query construction, indexing, normalization and relevance feedback, and four problems present in the math recognition that is detecting the expressions, detecting and classifying different symbols, analyzing the layout of symbol, and then constructing a representation of meaning. Via optimizing the component algorithms in a mathematical expression recognition system, and with creation of effective indexing, relevance and retrieval feedback algorithms for math retrieval. And as described another important problem is for developing user interfaces which efficiently integrate recognition and retrieval.

Michael Shilman, et al.[8] proposed step by step means to recognizing graphics and textual data. This gives us augmentation of a sketched shape along with the symbolic meaning, enabling various different features. This spatial recognition method acquires a search-based optimization on a large space of possible groupings from parallel groups and recognized sketches of the given shapes. The optimization uses a classifier which gives a class label to a collection of strokes which are similar in context. The overall grouping optimization without a proof assumes the properties of the classifier so that if the classifier is scale and rotation invariant the optimization will be as well. The present invention uses a variant of AdaBoost to facilitate in recognizing or classifying symbols. It also facilitates dynamic programming and A-star search for optimization. The proposed technique presented applies to both shape sketches made by hand and printed handwritten text, and even heterogeneous mixtures of the two.

Bluche and Théodore[9] proposed a system using different machine learning techniques, using neural networks and fuzzy logic. A binary image which represents a mathematical expression is segmented, and the recognition is carried out using the symbol bounding boxes. An iterative algorithm with use of a multi-classifier system finds and recognizes the structure and via finding structure classifies the symbols as their categories. The results of the proposed techniques proved that the context of a symbol, when used can help to classify the symbol. The structure recognition along with the use of a non-recursive algorithm with very few backtracking gave good results. This survey proved that the symbols identity is not required for the structure analysis. But, the structure recognition gives very useful but very little information for classification of symbol. The machine learning approach produced a flexible system, able to adapt to not known symbols and vivid writing styles.

Martin Thoma, et al.[10] proposed a thesis in which they used multiple systems that used information and order of strokes and pen trajectory to classify the handwritten symbols. Five pre processing steps, one data augmentation algorithm, five features and five variants for multilayer Perceptron training were processed using 166898 recordings which were collected with two crowd sourcing projects. The evaluation created the result of all these 21 experiments were used for the creation of an optimized recognizer which has a TOP-1 error that is less than 17.5% and then a TOP-3 error of 4.0%. This is an improvement of 18.5% for the TOP1 error and 29.7% for the TOP-3 error.

III. DISCUSSION

TABLE 1 – Comparative analysis for character recognition systems.

Authors	Approach / Techniques	Features	Pros	Cons
Chang Joseph et. Al.[1]	Optical Character Recognition along with Machine Learning.	Electronics documents can directly be converted to LaTeX source code.	-Operation level accuracy. -Converts documents directly to LaTeX syntax.	-Error prone to handwritten symbols. -Ambiguity between characters is not resolved with leads to error in conversion.
Richard Zannibi and James R. Cordy [2]	Mathematical expression recognition using 'Tree Transformation'.	Successive passes like a compiler. - Layout pass. -Lexical pass. -Tree transformation.	-Due to compiler like design system is robust to unexpected input. -Robustness increases scalability of the system.	-Overfitting
Masakazu Suzuki, et al. [3]	Optical Character Recognition system for mathematical documents using procedures such as Layout analysis, structural analysis and Character recognition.	-Simultaneous character recognition. -Separation of mathematical expression.	-Faster computation time from the traditional OCR systems.	-Manual error correction is required for result with an error.
Christopher Malon, et al. [4]	Support Vector Machine for recognition of mathematical symbols.	-Use of kernel functions for classification of data.	-Simple SVM can produces strong generalization accuracy.	-Confusion between similar looking characters is possible which leads to error prone results.
Masayuki Okamoto and Bin Miao[5]	Mathematical expression recognition by partitioning the given expression into components by recursive horizontal and vertical cutting.	-Less complicated to apply.	-Does not require precise syntax for parsing the symbols. -Recognizes almost all the mathematical symbols correctly.	-Fails to recognize some symbols such as 'limits'. -Not all the expressions can be recognized by the system.
Bluche and Théodore[9]	Machine Learning Techniques	-Robust -Intelligent system with self learning ability	-System can correct itself using the answers from the quiz. -Use of fuzzy logic improves the results.	-Symbols with less context for recognition are hard to classify.
Martin Thoma, et al. [10]	Online Recognition via recording strokes of the letters.	-Real time -Simple to use	-Real time conversion of handwritten expression using the information of strokes and trajectory.	-Due to less no of training example system fails to recognize some symbols.

Character Recognition system can be implemented in 2 ways as Offline and Online Recognition system and they have different approaches for implementing such systems proposed by Yassine Charjri, et al.[6]. Offline OCR system along with Machine learning is proposed by Chang, Joseph et al.[1], is used to convert physical and handwritten documents into a digital form. But it is more effective for the printed documents as there is ambiguity and problems with the grouping of characters. These challenges are discussed by Christopher Malon, et al.[4] providing different approaches for dealing and improving results. The OCR systems can be improved by using machine learning effectively using methodologies such as reinforcement learning and optimizing the recognition algorithm as proposed by Richard Zannibbi and Dorothon Blostein[7]. Use of syntactic means for recognizing text and graphic was proposed by Michael Shilman, et al.[8] using the information of strokes and grouping of characters the system assigns the class labels for the strokes. This approach can be applied for handwritten as well as printed documents. But with use of fuzzy logic using the machine learning algorithm we achieve

better results proposed by Bluche and Théodore[9]. A more generic model was proposed by Martin Thoma, et al.[10], where they used pen trajectories for classification of handwritten symbols with pre processing techniques for character recognition.

IV. CONCLUSION

Much research has been done on character recognition systems. Most systems use OCR and Machine Learning, few systems use both techniques combined and some use different optimization techniques for better results. Machine Learning has been used effectively in various systems to improve the performance of the system and to achieve better results in character recognition systems. As any recognition system has two approaches as offline and online recognition the effective and correct results are achieved by using online recognition as it records the trajectory, pressure and strokes of writing to recognize symbols.

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Physician Recommendation System Using Preference Learning Algorithm

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Abstract— Web-based appointment system are emerging in health care industry providing with convenient and diversified services, among physician recommendation becoming more and more popular to make assignment. Currently patients with heterogeneous illness conditions, and then patients could select one physician for appointment according to their preferences capturing patient preferences is essential for physician recommendation delivery; however it is also challenging due to lack of data on patient preferences. In this review paper we studied physician recommendation problem by preference learning algorithm that will optimized the recommendation and learn.

Keywords—Distributed System – Client Server Physician Recommendation System – Patient – Physician

I. INTRODUCTION

Now day's health is the most important assets in life and whenever we fall illness patient need to get good treatment by physician. Currently whenever patient comes to general practitioner, he/she suggest physician manually to patient that can be harmful to patient. We are come with solution when patient goes to general practitioner, practitioner will upload symptoms three physician. To suggest physician we are using preference learning algorithm. This algorithm suggest physician on the basis of physician experience and patient information.

III. MATHEMATICAL MODEL

MATH OR EQUATION

- Input: patient information and symptoms
- Output: recommended list of physicians

II. HISTORY & BACKGROUND

There is no doubt that we live in a technology-obsessed world, with our reliance on the Internet, tablets and computers, the newest smartphones, and other gadgets that promise to make our lives easier, let us have a little more fun, or even help us get more organized. From our personal lives to professional lives and everywhere in between, technology has established its place in society and continues to evolve faster than most of us can even believe.

There are a lot of different industries where technology is paramount, like in manufacturing, electronics, and education, but there are some industries where technology is responsible for improving and saving lives.

In the medical world, our habituation on technology is as important as ever, and thanks to its ever-evolving advancements, healthcare practitioners can continue to find ways to better diagnose diseases, perform complicated surgeries with laser-like precision, and improve patient care more than ever before. The impact of medical technology on the world of healthcare will continue to greatly influence the lives of people around the world.

By Implementing the substantial algorithms we are trying to overcome the difficulties which can occur in day to day lives of people.

– Let S is the system for Doctors

$S=(I,D,F,O)$

I = set off INPUTS
D = Database

F = Process on data and give o/p using preference learning algorithm

O = Set of OUTPUTS

I = (i1)

I1 = Upload Patient Information

D = d1,d2

d1 = Physician location.

d2 = Physician Experience.

O = Three Physician List.

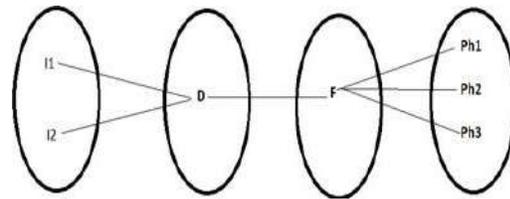


Fig: venn diagram

Formula:-

Dp= Distance Percentage.

Ep= Experience Percentage.

Xi= Physician Distance.

Yi= Physician Experience.

$$dp = (xi / \sum xi) \times 100$$

$$ep = (yi / \sum yi) \times 100$$

$$Rank = (dp + ep) / 2$$

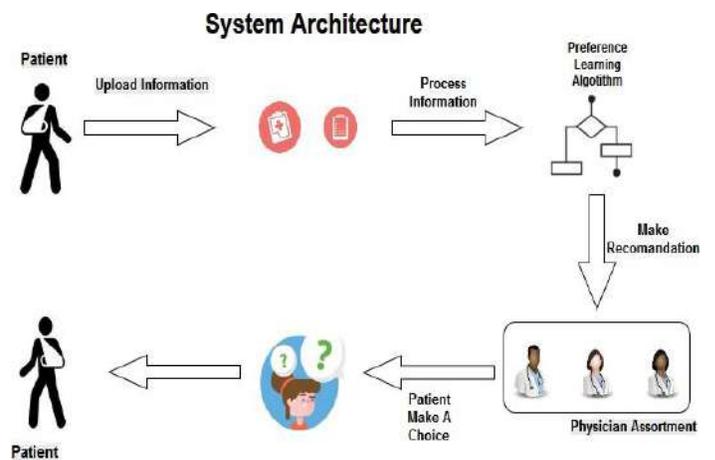


Fig. 3. A (Architecture diagram).

Patient will open the application and create the account after creating account patient will upload basic information and upload symptoms and after uploading symptoms preference learning algorithm process that symptoms and will suggest a physician and will give physician list.

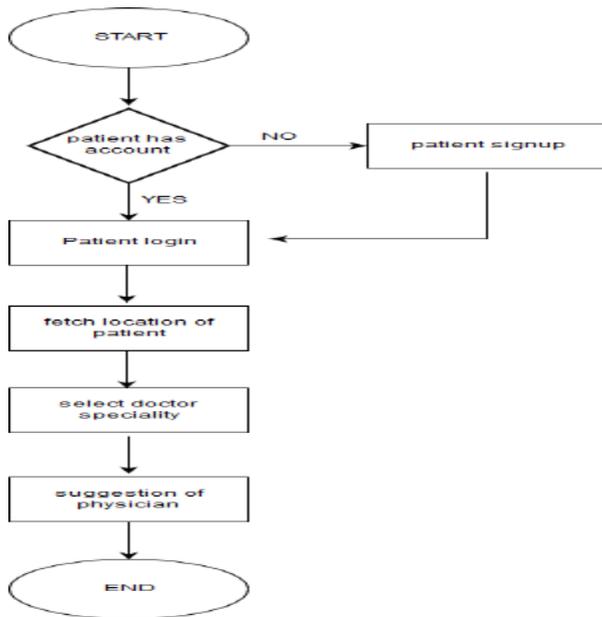


Fig. Flow Chart

IV. RESULT AND ANALYSIS

Analysis is the process of considering something carefully or using statistical methods in order to understanding it or explain it so in Following table and line graph contains the physician Experience and location information (latitude and longitude) From this latitude and longitude we are generating the line graph.

experience	latitude	longitude
13	19.969235	73.84946
15	20.004917	73.73387
8	19.938235	73.58148
9	19.969592	73.84946
10	19.964602	73.76503
6	19.951212	73.76494

Fig: Table

V. CONCLUSION

A system is implemented using preference learning algorithm, .By using these algorithm application can suggest appropriate physician to patient by analyzing symptoms uploaded by patient. It will save the time of patient in

choosing physician.

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An Urban Renewal and Retrofitting approach to Smart Cities

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Abstract— This system takes one step forward towards the smart city. It offers a view of the city where service providers use information technologies to engage with the citizens to create more effective urban organizations and systems that can improve the quality of life. Integrated cloud-oriented architecture of networks, software, sensors, human interfaces, and data analytics are essential for value creation. In this system mainly focuses on roadways, bus stations, parking systems, signal stations and a smart way of electricity generation.

Keywords— *Software Prototyping, Microcontroller, Display unit, Pollution detection, Green electricity generation on road, Automatic parking system.*

I. INTRODUCTION

The smart city system concept represents a compelling platform for IT-enabled service innovation. The emerging Internet of Things (IoT) model is foundational to the development of smart cities. IoT smart-connected products and the services they provision will become essential for the future development of smart cities. This system will explore the smart city concept and propose a strategy development model for the implementation of IoT systems in the smart city context.

In this system manually turning on of street light is converted into automatic street light being turned on. If there is darkness in the atmosphere then only the street light will be turned on and also these lights will turn on up to 30 percent of brightness only if there is no vehicle or person. If there is any vehicle or person present on the road, then the brightness of street light will automatically be 100 percent.

Using a pollution detection sensors, we detect pollution rate. These sensors are placed near the signal or bus stations and the pollution rate is displayed on the display board. On this

display boards there will also be some other social updates or articles those are helpful to the people.

Intelligent parking systems are there to detect the number of vehicles and display the count on the display boards. Electrical energy generation from the vehicles is also going to implemented in the same. To stop the vehicles when it is red signal, there will be a mechanical rod which will automatically appear on red signal, which is mounted inside of road in the upside direction and whenever there is green signal, rod will be go downside so that vehicles can go easily.

II. HISTORY & BACKGROUND

The smart city concept started appearing in time with different terms and perspectives as a means to define urban technological evolution. More specifically, smart city was not the initial term that was used by scholars. Instead, scholars in late 1990s started discussing about city from different perspectives and with the use of different terms, in their attempts to describe the project initiation within the urban space or the utilization of the to treat local needs. First evidence regarding smart city appears in literature in 1997 (Graham and Aurigi 1997), where it is claimed that over 2000 virtual cities and urban web pages existed in 1997, which introduced the term web or virtual city in an attempt to describe local network initiatives, which enabled the development of local cyber-based (virtual) communities (decentralized, interactive, one-to-one and one-to-many media networks). Virtual cities were based on the World Wide Web (WWW) and they operated as electronic analogies for the real, material, urban areas that host them. The promise of virtual cities was to develop new interactive "public-arenas", especially in cities where the lack of public space, the growing

violence, fear alienation and the reduction in civic associations do not enable public interaction, but instead they enhance "urban privatism". Web or Virtual cities drew smart city conceptual system. The Rise of the Smart City together all web activities in a city or simulated a city on the web and they were configured as little more than urban databases that provided public information for the municipal authorities to even transport and leisure data, cultural events and tourist guides. Virtual cities concerned the first attempt that utilized the potential of the Internet for supporting local democracy and enabled urban marketing, new types of electronic municipal service delivery, local inter-firm networking, and social and community development within cities. However, an absence of citizens was documented, whose feedback was supposed to be necessary to establish.

III. MATHEMATICAL MODEL

Input: Collecting input from various sensors and generate electricity using rollers.

Output: Show collected information on display screen, count the percentage of pollution, use of generated electricity for various domain e.g

Smart bus stop, signal station etc.

Functions :Verification of collected data with the help of database.

System=(Sa,Sb,Sr)

Where ,

S=system

Sa=system records/application

Sb=smart bus stop

Sr=smart roadways

Sa=fPs,lcd,ps,rs,cdg

Where,

ps= Pollution Sensor

lcd=Liquid Crystal Display

ps=power supply

rs=RFID system

cd=cloud data

Sb=fIm,ps,ws,cdg

Where,

Im=LCD module

ps=Power supply/electricity

ws=wi_ stationcd= cloud

data Sr=fps,pd,cdg Where,

cd =cloud data

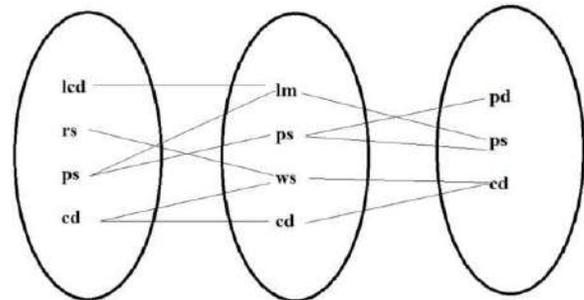


Fig: Venn Diagram

IV. SYSTEM ARCHITECTURE

ps =sensors for pollution detection

pd =power distribution

We are using IR sensors (or Ultrasonic sensor) for detection of High density traffic and then convert it to normal density traffic. IR sensors are mounted on the road facing in upside direction to collect reading of vehicles. If IR sensors get the continuous reading of vehicles for 20 seconds on a particular lane then that lane switched to green signal for 10 seconds and remaining lanes switched to red signal. Due to this the high density traffic at that lane is reduced to normal density. After the completion of 10 seconds, regular execution of signal is resumed. For Emergency vehicle detection, we are using two RFID readers (RC 522), one is mounted at the traffic signal and another is mounted at some distance from the signal to detect the Emergency vehicles arrival.

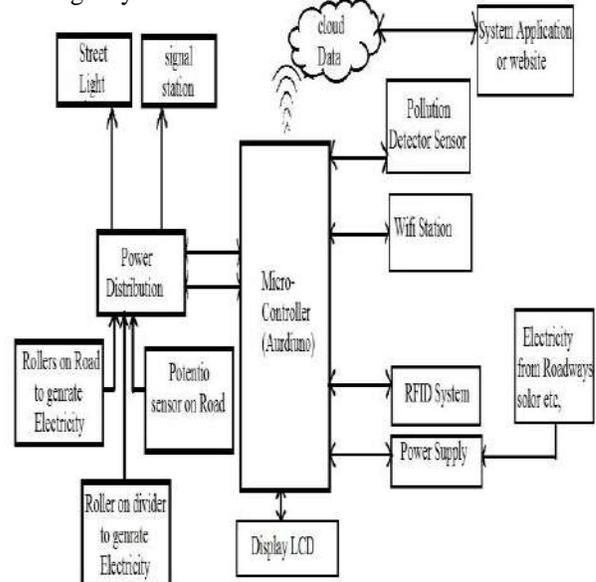
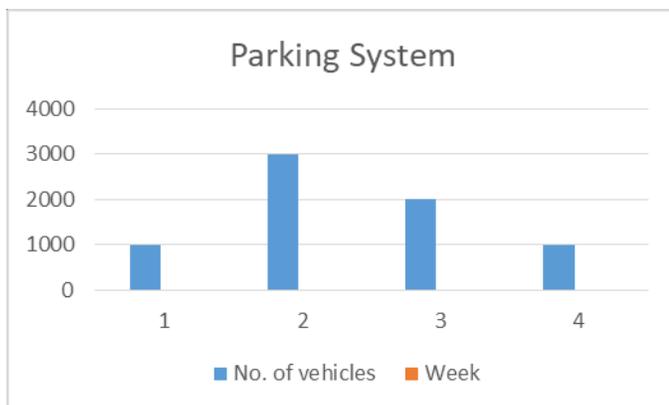


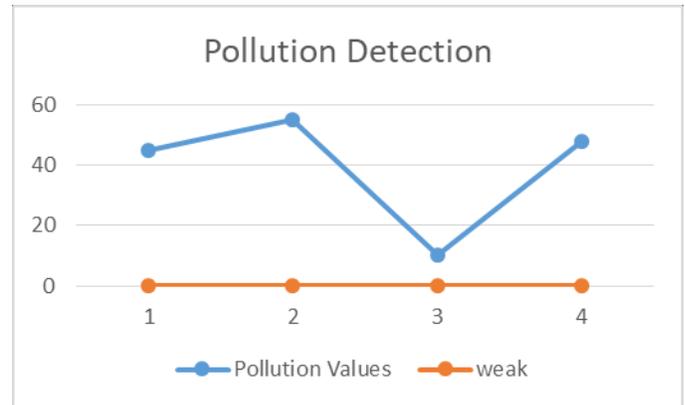
Fig. System Architecture for the Smart city model

There is a RFID Tag (Passive RFID tag) with unique ID tached to every Emergency vehicle and this ID is stored is database. When any Emergency vehicle that is arrived at particular lane then RFID reader will detect the RFID tag and it will matched the data stored in that RFID tag. If data is matched with stored data then the signal for that lane is switched to green and other lanes get red signal. Because of this the traffic at the signal is removed before the arrival of Emergency vehicle. After that, the Emergency vehicle crosses the signal rapidly and safely. Emergency vehicle is again detected by RFID reader which is mounted at signal and after that detection regular execution of traffic signal is resumed. One RFID Reader is mounted at the signal to detect any vehicle which is crossing the red signal. The RFID tag of every vehicle contains information of vehicle including vehicle number. When RFID reader detect the RFID tag of particular vehicle crossing red signal, it sends the information of vehicle to the traffic control system and then respective action will be taken by Department of R.T.O. This system will work on microcontroller board like arduino, raspberry pi, etc. The programming for overall system is developed with the help of Arduino software which is based on C/C++ language.

V. RESULT AND ANALYSIS



The above graph represents a weekly count of the cars coming in the parking area. By examining this chart we can decide on the average count of cars present in the parking area. We can also decide on the several changes that need to be made according to the count of cars.



The above graph shows the weekly pollution levels for four weeks. Here the pollution threshold value is considered as 30, all the pollution values above 30 will be considered as pollution detected. They will be displayed on the display boards provided on various locations such as bus stations. The values which are below threshold value will be taken as no pollution detected.

VI. CONCLUSION

As we move into the future and technology becomes even more advanced, the majority of capital cities will become 'smart cities'. Smart technologies can provide solutions for cities by helping them save money, reduce carbon emissions and manage traffic flows. A smart city uses the internet of things (IoT), data, and technology to streamline services to make a city more connected, efficient, manageable, and cost effective. Smart cities drive innovation, have connected residents, optimise governance, and make better use of precious resources.

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Cancer Detection Application By Using GLCM Algorithm

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Abstract- Now a days android service technology is widely used to integrate heterogeneous system and develop new applications. Our application highlights some of the limitation of medical system. Our purpose arisen regarding tumor detection using Biomedical image processing which is growing and demanding field . It comprises many different type of imaging method like CT-scan , X-ray & MRI . Several simultaneous local features extraction for modalities of cancer images, which required and expertise that is not widespread in clinical practice. Our project is going to use pre-processing, segmentation, optimization and feature extraction. Our project having trained data in which system trains the CT-scan image and MRI image from cancer specialist doctors . Our system is useful to expert doctors, beginner doctor and normal user . User can also get symptoms and precautions of particular cancer . Cancer detection is generally carried out manually by trained professionals. Manual technique are majorly helpful in the advanced stage detection . It also involves very tedious procedure which highly dependent on given information. Manual technique introduces the high possibility of human error in the detection process. This system successfully overcomes the drawbacks in earlier cancer detection system . This system increases speed of the services. Implementing this system gives detection of cancer through automated process to minimize human errors.

Keyword :-Biomedical Image Processing, Heterogeneous system, Segmentation, Feature extraction.

I .INTRODUCTION

Cancer is group disease involving abnormal cell growth with the potential to attach or spread other parts of the body. In all type of cancer division of cells in the body are nonstopable and rapidly spread to tissue around it. Our human body is compound of trillion of cells. When Cells are grow old or become damaged ,they die and new cells are form to perform their role.

Cancer cell are different from normal cells in many ways. So that they grow out of control and become attacking. Cancer cells are matured in various uncontrolled function where normal cells grows in specific function. Cancer cells are ignored the signals which is giving them to stop their division. Cancer cells may be able to affect normal cells molecule and blood vessels that surround feed tumor. This area is called as microenvironment . Cancer cells may forced to other normal cells around it to form blood vessels that provide oxygen and nutrient to it that cancerous cells.

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Cancer cells are able to avoid the immune system ,a network of organs ,tissues and specialized cells. These all parts are used to protected our body from infection and other damages. Immune system also removes damaged and unwanted cells from our body. But some cancerous cells has the ability to hide themselves from immunity system. 22% of cancer death having the cause as tobacco. Another 10% are due to obesity, poor diet, lack of physical activity ,or exercise drinking of alcohol. Cancer causing cell called as malignant tumor and non-cancerous cell are called as benign tumor.

In our paper we are studying about lung cancer and brain cancer detection by using an application which we are going to made. Generally cancer tumor is detected by using magnetic resonance imaging (MRI) and computed tomography . But first let study about these both types.

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In our paper we are studying about lung cancer and brain cancer detection by using an application which we are going to made. Generally cancer tumor is

C Lung cancer

Lung cancer is also called lung carcinoma . It is a cancerous lung tumor . The cancer which started in lung are called as lung carcinoma. There are having two types of lung cancer. Small cell lung carcinoma (SCLC)and non-small cell lung carcinoma (NSCLC)[4]. Lung cancer is leading cause of cancer all over the world [3].Lung cancer next spread to breast cancer in woman and prostate cancer in men. About 80% of lung cancer patient observed having advanced stage disease and are

1.2 Brain Cancer

The brain tumor occurs when occurs when abnormal cells forms within the brain [5].

Cancerous tumor is divided in to primary tumor which start within the brain and secondary tumor which have spread from elsewhere known as brain metastasis tumor [6]. The symptoms of brain tumor are depend on, which part is included in that tumor. The symptoms may be headaches(Pain anywhere in the region of the head and neck), seizures(Is a period of symptoms due to abnormally excessive or synchronous neuronal activity in the brain problem with vision, vomiting and mental changes[7].

Other symptoms may include difficult walking, speaking or with sensation. As the disease advances, unconsciousness may occur. The cause of most brain tumor is not known. Uncommon risk factors in includes inherited neurofibromatosis(Is a group of three condition in which tumor grow in the neuron system),exposure to vinyl chloride ,Epstein-Barr virus &Ionizing radiation(Is radiation that carries enough energy to detach electrons form atoms molecules, thereby ionizing them.)

MRI

It is non-invasive and painless procedure. Raymond Damadianorganize the first MRI full body scanner which he

II. .LITERATURE SURVEY

Brain tumour is the main cause of brain cancer. A tumour can be defined as any mass caused by abnormal or uncontrolled growth of cells. This mass of tumour increases within the skull, due to which normal brain activity is hampered. Which is if not detected in earlier stage, can take away the person's life. Hence, it is very essential to detect the brain tumour as early as possible. To detect the brain tumour, first we have to read the MRI image of brain and then we can apply segmentation on the image

detected by using magnetic resonance imaging (MRI) and computed tomography . But first let study about these both types. not able to operate due to loco regional tumor extension , e extra thoracic spread or poor physical condition at the time of diagnosis[2].

Automatic process of tumor detection would assist the physician to detect tumor very quickly[4]. However automating the process is challenging due to high diversity in appearance of tumor tissue among different patients and in many cases , similarity between tumours and normal tissue because of the low contrast in CT scan images[1]. According to this 80 % cancer are NSCLC and 15% are SCLC[4].

detachelectrons form atoms molecules, thereby ionizing them.).

Ionizing radiation is made up of aggressive subatomic particles, ions or atoms moving at high speed and electromagnetic waves on the high energy end of the electromagnetic spectrum. The most common type of primary tumours in adult are meningiomas(its typically slow growing tumor that design from the meninges the membranous layers surrounding the brain and spinal cord)and astrocytomas(is a type of cancer which originate in the particular glial cell ,star shaped brain cell in the cerebrum called astrocytes).

In children most common type is a malignant medulloblastoma is a most common type of malignant primary tumor originating in the part of the brain that is towards the back and the bottom on the floor of skull,in the cerebellum. The sign and symptoms of brain tumor are broad.

Let's study about MRI and CT scan.

MRI is called as magnetic resonance imaging and CT scan is called as computed tomography

uses large magnet radio waves and a computer to create a detailed cross sectional image of internal organs and structures. The scanner itself typically resembles a large tube with a table in the middle ,allowing the patient to slide in [9]

. But in the MRI brain image, some confidential information of patients is always there. To apply segmentation, this irrelevant information has to be removed, as it can be considered as noise.

Here we present an adequate method for removing noise from the MRI image of brain using Region Filling method Firstly, they started with image acquisition, and then noise is removed from the noisy image. 1. According to them, noise means in MRI images there will be some information regarding the institute etc.,

2. So all that unnecessary information which is treated as noise will be removed. 3. Then they converted RGB to Grey scale image. 4. After this, they started to apply region filling, means they selected some particular region of interest, then they filled that area. 5. Finally applied some low range filters. To modify an image in some way which includes blurring, de-blurring, locating certain features within an image is used.

weighted and T1 FLAIR images. This approach is very simple, more accurate and less time consuming than current methods. This method is tested by fifty patients of different tumor types, shapes, image intensities, sizes and produced

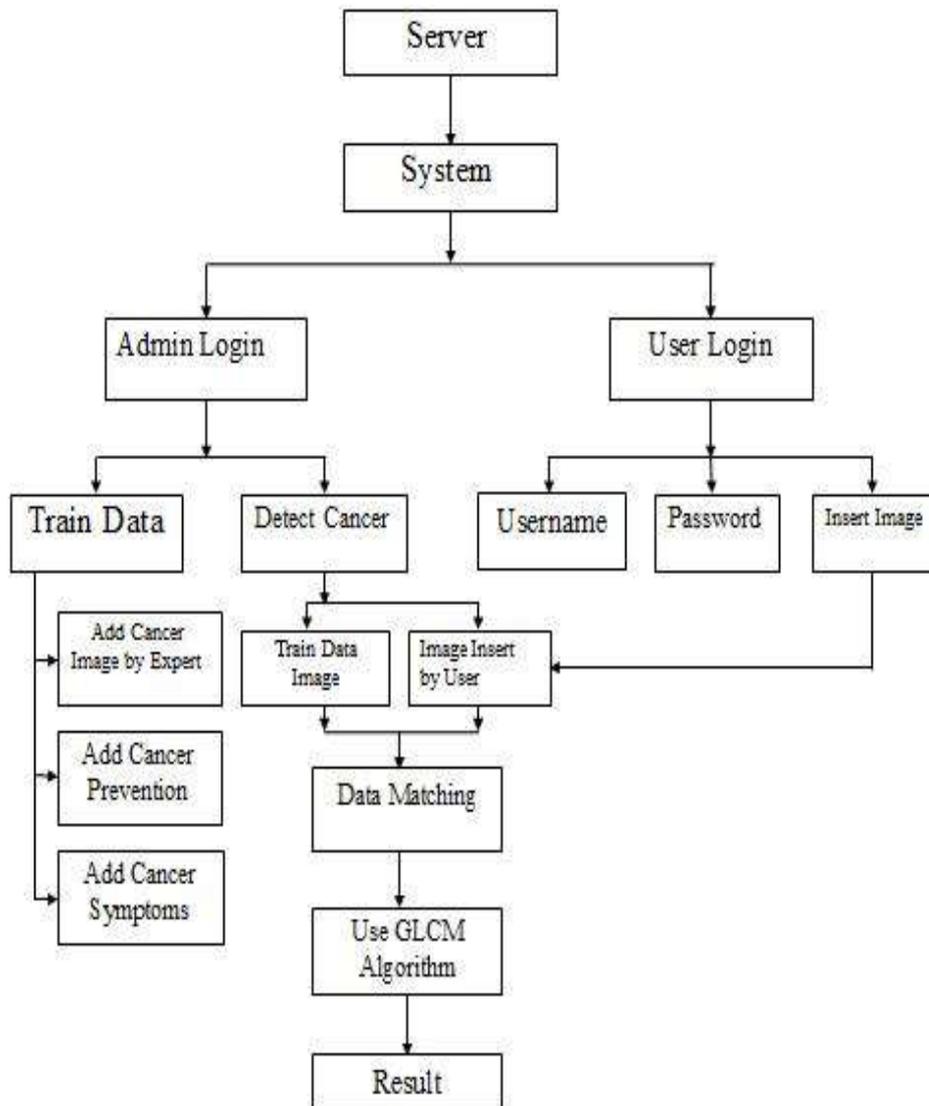
better results. The results were validated withground truth images by the radiologist. Segmentation of the tumor and boundary detection is important because it can be used for surgical planning, treatment planning, textural analysis, 3- Dimensional modelling and volumetric analysis Used a weighted algorithm. 1. Firstly to the image identified, the intensity is adjusted. 2. Then they performed Morphological Erosion Morphological dilation. 3. This process is further followed by Image subtraction, then they found the threshold value by making use of some histogram techniques. 4. Thus they performed Binary thresholding continued by morphological labelling. 5. Finally the segmented tumor is processed or known clearly by image masking.

A Survey on Brain Tumor Detection Using Image Processing
TechniquesAuthor:LuxitKapoor ,Sanjeev

Automatic Segmentation framework for primary tumours from Brain

MRIs using Morphological Filtering techniques
Author: Ananda Resmi S.,Tessamman Thomas
YEAR:2012
This paper describes a novel framework for automatic segmentation of primary tumours and itsboundary from brain MRIs using morphological filtering techniques. This method uses T2

Thakur Year:2017
Interpretation of bio-medical image contents is one of the most challenging field in computer vision for medical diagnosis. In context to that it has received much awareness of researchers to meet the challenges. The purpose of Image segmentation is to partition an image into meaningful regions with respect to a particular application. Edge is a basic as well as an important feature of an image. For further processing, detecting edges is one of the most important aspects in image segmentation. It is a process of identifying and locating sharp discontinuities in an image. In this paper, the brain image is considered for analysis and detection. Initially the region of interest is found, that helps to detect the particular content of the image and set the boundary of it.Basic morphological operations is used for edge detection. For this purpose the thresholding using histogram is done. The result obtained using Gaussian filter shows better performance than other methods. Comparison measure shows for MSE, PSNR SSIM Three major phases, namely, 1. Pre-processing, (includes steps like converting it to grey from a colour image followed by type-casting the image) 2. Image segmentation, (followed the concept of Thresholding technique and edge.



4.1.1 Trained Data :

It is the data which is stored in database by admin which is collected from user .

- **Add cancer image ():** Through this function admin can insert the images as reference of different type of cancer.
- **Add prevention ():** With the help of this function expert going to add prevention for cancer
- **Add Symptoms():**This function is used to insert symptoms of the that related cancer. So that user can specify that it, are they really having cancer or not.

4.1.2 Detect cancer :

In this part we are going to match the trained cancer image with image inserted by user. Here some processing is done on the image in which segmentation, filtering , & post-processing will be done on image. In this , that data matching is performed by GLCM algorithm. This algorithm will going to study in next section as Image Processing. That matched or not matched result will be generated and store on server and send message to user as any cancer detected there or not.

4.2User:

This is the another major component of our system. Through this user can insert their MRI report .In our project also providing username and password to the user.

Now let's see what is Image Processing

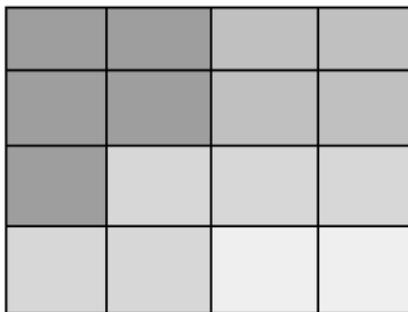
GLCM Algorithm

Gray-Level Co-occurrence Matrices (GLCMs)

Consider image given below, if we use position operator one pixel to the right and pixel to the down then we get the grey level co-concurrence matrix.

To understand this concept,consider 2 bit data .the lower the GL (digital no.) the darker the image appears.

Consider the image given below:



Example of GLCM Algorithm:

```

0 0 1 1
0 0 1 1
0 2 2 2
2 2 3 3
    
```

In GLCM algorithm three texture calculations are use :

- 1)first order
- 2)second order
- 3)third order

Here we are using second order texture calculated series for GLCM

First order:

It is an statisticalcalculations from original image value, like variance and do not consider pixel neighbour relationship.

Second order:

It consider relationship between to neighbour two pixel group in the original image.

Third order:

It is complicated order because it cannot commonly implemented and it takes too much time for calculation .

Framework for the GLCM :

Let us study about the point which are consider in framework.

- 1. Special relationship between two pixel:

GLCM takes in consideration the relation between two pixels that arereference and neighbour pixel. In the below explanation, it states that how neighbour pixel is chosen to be the one of the east (right) of the each reference pixel.They can be expressed as (1,0) relation.

The reference pixel can be made as the upper left corner and proceeding to the lower right. The pixel which are at the right edge have no right hand neighbour,so they are not used for this count.

- 2. Separation between two pixel :

In above example it uses 1 pixel offset. Large offset is possible if the size of window is large enough. In thenumber of pixel combination will just be smaller for a given window size.

This is the only time that the labels in the top row and left column will be shown .

How to read matrix framework?

The top left cell having count of the combination of (0,0) occurs, i.e. , how many time within the image neighbour pixel (gray level 0) and reference pixel(gray level 0) is occurs.

Neighbour PixelValue-> Reference pixel	0	1	2	3
0	0,0	0,1	0,2	0,3
1	1,0	1,1	1,2	1,3
2	2,0	2,1	2,2	2,3
3	3,0	3,1	3,2	3,3

Properties of GLCM Algorithm:

Correlation: It passes the calculation of the interrelationship of a pixel and its neighbour over the whole image means it figures out the linear need of gray levels of each other on those of neighbouring pixels.

Energy:

Sinceenergy is used for doing work that is arrangements.It makes useof the texture that calculates orders in an image.It delivers the sum of square elements in GLCM. It isfullyoffbeat from entropy.When the window is trainedorderly,energy value is high.

Contrast:

It's epitome is CON.It can also called as 'Sum of Square Variance'.It extends the calculation of the intensity contrast associating pixel and its neighbour over the gross image. An unbroken image contrast value is 0. In contrast measure, weight increases exponentially(0,1,4,9) as pursues from the diagonal.

Homogeneity:In short term it is going by the name of HOM.It passes the value that calculates the closeness of dissemination of the elements in the GLCM to the GLCM diagonal. For diagonal GLCM its value is 1 and its scope is [0,1]. Contrast weight and homogeneity weight values are both completely different, with weight shrinks

exponentially loose from the diagonal.

III. CONCLUSION:

We have studied our problem statement. For its solution we have also studied references given below. So observation and overall study says that to detect cancerous tumor through an application by using GLCM algorithm is useful. There are many algorithm are available for feature extraction but we are preferring this because this algorithm helps us to convert colour image into gray level image matrix. We don't have to take separately. By using it's properties, it's easy to extract features of the image.

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HOME INTERIOR DESIGNING

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Abstract— Home Interior Designing is a system proposed for better analysis of articles to be pasted in various organizations, institutes, resorts or residences. Up till now, there is no such system particularly for interior decoration articles like blind, flooring, wallpaper or film. So, the proposed system captures image of the room/area where the item is to be applied and will process the image of which it will display a virtual layout after applying the selected item, which gives a clear idea of the room/area according to the exact requirement of the user/customer.

Keywords— Image Processing, Edge Detection

I. INTRODUCTION

Home Interior Designing is a project to be developed for the ease of the customer to choose an appropriate interior decoration article. It isn't necessary that always the product chosen by the customer would match with other articles in his room such as the furniture or colors of the wall. And as it's not possible for everyone to replace it or purchase new article again. Thus, this system will help the customer to avoid such problems while selecting articles for customer's interior

It gives the customer a proper illustration of the room with the selected article placed in it. Thus, it becomes less troublesome for the customer to decide what and how or which is the most appropriate article to be picked at its own satisfactory level.

With the help of image processing techniques, the portion where the article is to be placed will be selected and the desired article from the palette, handpicked by the customer will be pasted in the selected area. In this way, the customer can get a clear idea of the article to be selected undoubtedly and can make a perfect decision with minimum efforts.

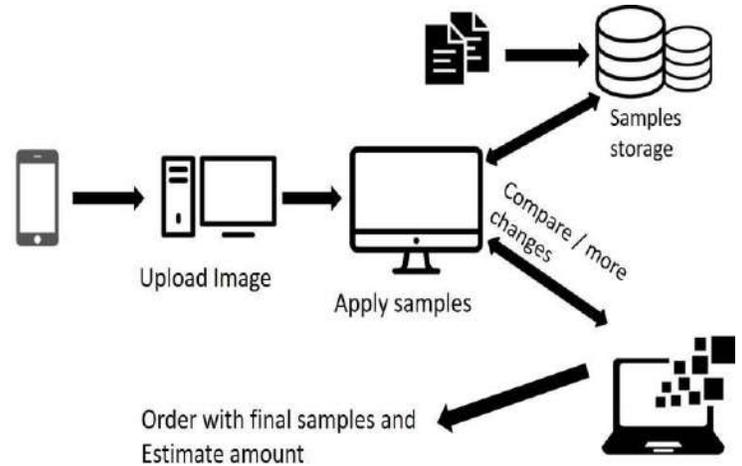


Fig. System Architecture

II. RELATED WORK

Diamond International, Asian Paints, Dulux are some of the applications that presently have the same idea implemented for their product like for paints, cornices and moldings. The number of product available for comparison are only few that are related for the interior decoration.

MATHEMATICAL MODEL

$$S = (I, FN, SE, O)$$

Where,

S = system,

I = input = {image of room, image of wall, image of floor,
image of window},

FN = function = { wallpaper (), paints (), flooring (), blinds (), films () },

SE = server = { sample details, admin_details },

O = output = { image of room with applied samples, estimate amount }.

III. PROPOSED SYSTEM

An interior design tells client the origin of design and demonstrates ability to create a symbiotic relationship between physical elements. Each designer has their own way of composing and formatting an interior design. Rêve Intérieurs is going to be an application for the customers of interior shops providing various options for decorating the house. Initially the application is going to work on 2D images and later 3D images processing will also be implemented.

Selecting your patterns in one step and next step is deciding how they will be used in your room, is the biggest question in front of the customer. Importance of texture, everything from fabrics and furniture to decorative accessories bring different textures into a space. Texture can be used to enhance a room's features or provide added dimensions. It will impart a reflective, smooth finish color is a key element of interior design.

Users only need to take a picture of the room/space and upload it onto the system. Now user can select a portion of the room like wall, window, flooring, etc. for the selected portion user will choose the item from the available list and apply it on the picture. Thus, user can easily make a choice about the most suitable item for the portion of the room. This will help users to decorate their dream house. On the admin side there will be an authentication process for the owners of the shop. Admins will be able to add, remove, and modify the list of items according to the availability.

IV. MODULE SPECIFICATION

AUTHENTICATION

Login for admin: The admin authentication process will be for owners of the shop. Admins will be able to add, edit, and remove the list of items according to the availability.

Login for user: Users can upload the picture and use the system to check for the visualization of the products.

FILE UPLOAD

The users need to upload the picture of the space/area/room to process it and add elements to it for the composition of room with new articles.

VIEW

It is to view the image which the user is uploaded.

SELECT A PORTION/SECTION FROM IMAGE

Select the area/portion/section in the room/hall/space where the article is to be applied.

Select an item from shop.

Select the desired type of item.

APPLY SELECTED ITEM TO SELECTED PORTION

Apply the item you selected from the shop in the selected area for illustration of the space/area/room.

V. PLAN OF PROJECT EXECUTION

As an implementation of the proposed system we are going to develop an application which will help the customer to get review of the room which can be easier for selection of perfect sample. So, in order to finalize the product first of all the dealer will upload the sample from its log in and feed the prices. The below steps will be required to perform to design the desired room.

Following steps are performed by the customer

Step 1: UPLOAD the IMAGE of room
 Step 2: SELECT PRODUCT to buy
 Step 3: SELECT SAMPLE of product to apply
 Step 4: Wait for it to get created.
 Step 5: APPLY and COMPARE with more samples
 Step 6: Get ESTIMATE AMOUNT
 Step 7: SAVE IMAGE

Following steps are performed by dealer

Step 1: LOG IN to Dealer ACCOUNT
 Step 2: UPLOAD NEW samples
 Step 3: SAVE AMOUNT of updated sample
 Step 4: DELETE OLD samples

VI. CONCLUSION AND FUTURE SCOPE

CONCLUSION

This software will help to efficiently convey the customer's imagination and vision for their room's interior. And there would be a psychological level of perfect product selection.

FUTURE SCOPE

Adding more items like furniture.
3D image and VR view.

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IoT Based Smart Vehicle for Fuel Consumption

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Abstract— In today's world, actual record of fuel filled and fuel consumption in vehicles is not maintained. It results in a financial loss. To avoid this we are implementing for sensing the amount of fuel filled in the vehicle. So as soon as agent starts filling petrol in your bike/car, using the Loadcell. The basic Objective of this project is to know exact amount of the petrol remaining in the fuel tank and how much distance it can travel. Also we can find near by petrol pumps and also it will indicate that the petrol pumps are out of petrol or not. The graphical display will show how much fuel is there and how much was added as well and total amount of fuel in the fuel tank this will be evidence of any kind of cheating is done by the ones fillings the fuel. this will nearly eradicate any kind of tricks pulled off by the petrol pumps. This flow sensor will be active till flow ends. Once flow ends it will calculate the amount of fuel filled and directly notify on your Dashboard an IOT fuel monitoring system and the Many a times while travelling, people get stuck in the middle of nowhere due to an empty fuel tank. Our project aims at eliminating this problem by searching and showing the nearest petrol pump to the user. We have developed an android application will notify us whenever petrol will go lower than particular level that the vehicle can travel how much km or distance in that petrol and it will also indicate the nearby petrol pumps and the petrol pumps are out of petrol or not. previously the vehicles have traditional fuel indicator meter that show the petrol level but the accuracy was not there so this system will give us the accuracy. To stop the frauds at the petrol pumps. To improve the accuracy in the petrol measurement. To reduce the amount of time to for finding the nearby petrol pumps. **Keywords**— *Sensors and Actuator, location based Services, software prototyping, database web servers.*

I. INTRODUCTION

The Equipment, such as cars, motorcycles, trucks, generators, and compressors, which is powered by internal combustion engine needs a means of refueling so that it can run for as long and efficiently as possible. The problems associated with this equipment are to know how to contain fuel, to know how much fuel is left, and to know how best the fuel should be stored for users' safety, security, and benefits. Presently most of the motor vehicles display the amount of fuel in the fuel tank with the help of some or the other kind of indication showing the E (empty), H (half) and F(full) indicators. The manufacturer provides the specification that E, H and F bar maps corresponding to the liters of fuel approximately. In daily life we might have experienced the problem of improper measurements of the fuel level in the tank with the existing system. Today in this digitized world if the analog fuel indicators in the vehicles are replaced by a digital system then it will help us to know the exact

amount of fuel present in the tank. Currently the fuel indicator system for the most of the vehicles are analog and they do not show the exact amount of fuel present in the tank. So this problem is taken into consideration in this work for developing the digital fuel indicator system for two Wheeler's which shows exact amount of fuel in terms of milliliter. All internal combustion engines running on liquid fuel have to be very fuel efficient from economic point of view. All these engines are equipped with most advanced automated fuel indication devices. These are system built devices. There should be some provision at the user level to know the quantity of fuel at all times. The safety and security of fuel is of utmost importance. In the recent years, escalating oil demands and costs of fuel are increasing. This indirectly increases the overheads of many businesses and those with large vehicle fleets. Global oil supply and demand forecasts for 2015 have changed significantly recently, but these changes have largely cancelled each other out. The outlook is still one of a market roughly in balance. However, it is at times of rapid market change that forecasting becomes most difficult. In July of 2014, before crude prices collapsed, forecasts from the International Energy Agency, US Energy Information Administration and OPEC suggested that world oil demand would rise by about 1.35 million b/d in 2015 and that the global supply/demand balance would be very slightly positive. To cater the needs of fuel savings due to one of the few above mentioned problems, the SIM 900 GSM module is used over a Global System for Mobile Communications (GSM) effective remote fuel-level monitoring system.

II. HISTORY & BACKGROUND

With rising prices of oil, fuel theft has become a very common incidence. From economic point of view a system is devised that will take care of these practices. This system makes use of smart fuel theft detection with GSM alert and GPS tracking system. Using the ARM7 microcontroller, the real time position of vehicle and its fuel content is sent to owners mobile in case of intrusion. The system includes GPS module, Microcontroller, GSM module, LCD and a keypad. The GPS module transmits coordinates to the microcontroller that converts the data which is sent to the user in text format. This text message contains longitude and latitude of the location. This smart system gives 24x7 access to fuel consumption, alerts when fuel drains and storage tank leaks immediately identified. The user can access the quantity of fuel in the tank through this GSM and GPS technology. The keypad is unlocked using the secret password. A signal is sent for fuel verification. If fuel is beyond the range of the sensor the buzzer will go "on" for two minutes and simultaneously a

text message is sent to the owner. The intruder can't stop the buzzer and if the buzzer is not stopped within two minutes then it will be treated as a theft of fuel and vehicle and a message is sent to the police station and to previously stored numbers with co-ordinates of that location. [1] The utilization of vehicles is rapidly increasing now

a days and it leads to a huge problem of fuel availability. Often humans forgot to check the fuel level before taking vehicles and it will run out of fuel in half a way. All petrol and diesel filling bunkshave digital displays to indicate the amount of fuel added. The users don't know whether it is showing the accurate value or not. To overcome this problem, this paper suggests a load cell based fuel measurement which gives exact level of fuel while fuel filling process and also in the travelling time. Nonstop monitoring of fuel level is attained by attaching the load cell below the fuel tank with the use of Arduino Uno and display unit fixed with dash board. The current speed of vehicle is indicated by the speedometer which is arranged with Arduino and it also calculates the mileage which helps the vehicle user to know about the remaining kilometres of vehicle will pass through based on current speed with the available fuel. The measured fuel levels can be sent through GSM module to the owners of the hiring vehicles by messages through electronic gadgets for their verification purposes. By interfacing GPS module with Arduino board it can show the vehicle's position with help of satellites. The proposed idea of fuel measurement using load cell with Arduino is very cost efficient and easy to use. It may be enhanced with any microcontrollers and can be implemented in all types of vehicles. By using this method petrol bunk frauds can be avoided. This project can be enhanced by interfacing GPS with arduino to track vehicle's location in case of any emergency situations.[5] The increasing corruption in fuel filling process, as well as the increasing vehicle theft, has become a big deal to the society. Thus, this paper has proposed a product that serves beneficiary to both these issues. The corruption in fuel filling process is rectified through fuel level measurement using a load cell. Though there are numerous methods to measure the fuel level including those like mechanical float, optical sensors, ultrasonic etc., the accuracy in measurement is met by the use of load cell involving Arduino Uno microcontroller. Here the precision in measurement is made even in a millilitre of added fuel. The measured output is sent via the global system for mobile communication (GSM) technology to the user mobile so that verifiable record can be created. Thus, a permanent record of filled fuel can be maintained. This would help the owners of transportation network companies to maintain an individual record of their vehicles that are run by their paid drivers. Apart from the level measurement, vehicle theft is overcome by the Global positioning system (GPS) technology. The GPS system fitted to the vehicle would share the accurate location of the vehicle to the registered user. In case of theft, the location of the filling station along with the measured fuel is sent to the registered network through the GSM technology. Thus the paper produces a complete design of the fuel cell that is implemented in a GPS and GSM enabled vehicle. Thus, the proposed systems measures the fuel level added in the petrol bunk and sends the measured value to the display unit on the dashboard and also send an SMS alert to the owner about how much level of fuel is added along with the location. From this design, corruption in the petrol bunk is avoided and owner is alerted with SMS. We implemented this design in real time and it was a success. [11]

III. PROPOSED SYSTEM

Presently most of the motor vehicles display the amount of fuel in the fuel tank with the help of traditional meter In daily life we might have experienced the problem of improper measurements of the fuel level in the tank with the existing system Currently the fuel indicator system for the most of the vehicles are analog and they do not show the exact amount of fuel present in the tank. So this problem is taken into consideration in this work for developing the digital fuel indicator system for vehicles which shows exact amount of fuel. The proposed method is a best alternative to fuel measurement techniques to help the users with low cost and

requirements. It is an efficient one and also applicable in all types of vehicles. This system can overcome the demerits of existed system and give accurate values to the users. Instead of using fuel sensors to detect the fuel level, here

load cell is used. The load cell is attached with base of fuel tank and measures the weight of tank. These values are given to Arduino and it converts weight values into litres. The respective fuel added at petrol bunk and remaining fuel will be displayed in display unit. The vehicle user can get correct quantity of fuel for their paid amount. The LCD display is interfaced with the microcontroller in such a way that when the microcontroller is switched on the current value of fuel is displayed. The microcontroller then checks for the quantity of fuel in the tank and accordingly asks the user to enter the quantity of fuel to be filled. The user can then enter the quantity of fuel to be filled through the keypad which is also interfaced to the microcontroller. After the user gives input time delay is given for the filling of fuel in the tank. After the tank is filled the microcontroller checks for the quantity of fuel and if the volume of fuel is not filled properly as specified then the microcontroller is programmed in such a way that the remaining amount of fuel to be filled is displayed in the LCD. The process ends when the volume of fuel filled is as per specifications of the user. The LCD display will show us the remaining amount of fuel and the amount of distance it can travel and the Android App will show us the nearby petrol pumps and they are out of petrol or not.

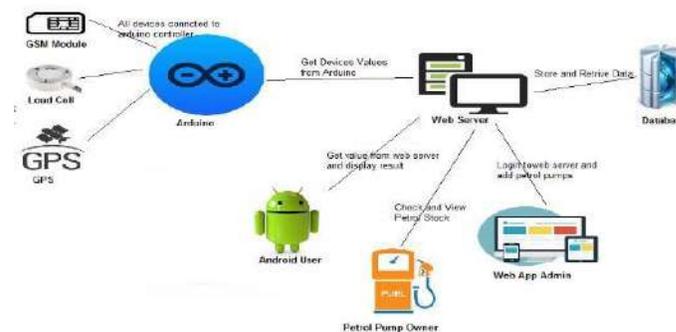


Figure 1. System Architecture

Whenever the fuel will pour in the tank the loadcell will calculate the total amount of the fuel in the tank this will be the analog value and this will be converted in the digital one with the help of HX711 converter then it will send to the Arduino board and the GSM and GPS will also used the Tx pin will connect to the Rx pin of android and the Rx pin will connect to Tx pin of the Arduino and same with the GPS and the Android application will use the GPS and GSM to locate the user and to find the nearby petrol pumps the GSM will send the message to that will be simple message and it will use the latitude and longitude that is values of petrol and distance it can travel and the app will show us the Map and the user location and the nearby petrol pumps and the petrol pump are out of petrol or not.

IV. RESULT AND ANALYSIS



Fig. 2. Screenshot of Admin Login

The above Fig.2 display a the Admin login page.

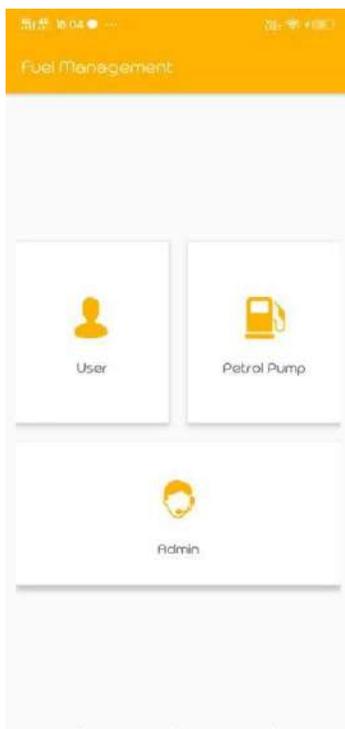


Fig. 3. Screenshot of login page

The above Fig.3 display a login page for the admin, user or for the petrol pump owner.



Fig. 4. Screenshot of user login

The above Fig.4 display a login page for the user login.

V. CONCLUSION

The System will indicate the fuel level and at the accuracy will be better than the existing systems also how much distance it can travel With the help of the Android Application person will know the nearby petrol pump and the availability of petrol whenever the petrol will get lower than particular level. The measurements are taken so the accuracy level is of percent 95 to 98. Thus it is an efficient device made by keeping in mind the petroleum thefts at the various petrol pumps at the time of filling of tanks. The existing traditional and the micro controller based float type measurement techniques are far from exact and are on the conservative. A more efficient and reliable sensing technology is the ultrasonic range sensing system with a micro controller which has corrective action code inbuilt that is applied to the fuel sensor signal based on measurements to provide highly accurate measurement of the level of fuel in tank.

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Privacy and Protecting Content for Social Sites

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Abstract— Study and investigate the role of social context, image content and metadata. We will propose two-level frameworks which according to the available history on the site. Base on the history it allots the best privacy and policies available for the user's image being uploaded. Our system relies on image classification framework for image categories which may be related with similar policies on site and on a policy predication algorithm through which automatic policy will be generated for newly uploaded images. Also sometime user social feature are also used.

Keywords—Privacy, Policies, Protection, Social Context, Image Content and Metadata.

I. INTRODUCTION

Most social content sharing sites allow users to enter their privacy preferences. Unfortunately, recent studies give result as that users struggle to set up and maintain such privacy settings.

Shared information in this process can be slow and error-prone. Therefore, there is need of policy recommendation systems which can help users to easily assign and properly configure privacy settings.

We propose an Interchangeable Privacy Policy Prediction (I3P) system which aims to provide users problem free privacy settings experience by automatically generating personalized policies. The I3P system handles user uploaded images, and factors in the following criteria that is useful for one's privacy settings of images:

Example: Photo clicked on beach

User uploads an image and it is handled as an input image. The properties of the newly uploaded image is compared with the properties of images in the current image database. To find the class of the uploaded image, first find the p closest matches. Then the class of the uploaded image is calculated as the class to which majority of the p images belong. If no primary class is found, a new primary class is created for the image. Later on, if the predicted policy for this new image turns out correct, the image will be inserted into the image category in the image database, to help refine future policy prediction.

1) The impact of social environment and personal characteristics.

User's profile information and relationships with others may provide useful information regarding user's privacy preferences i.e the social context.

For example: Users interested in photography may share their photos with other photographers.

One may upload several photos of his kids and specify privacy that only his family members are allowed to see these photos.

2) The role of images content and metadata.

Similar images often sustain similar privacy preferences, mainly when people appear in the images.

II. HISTORY & BACKGROUND

According to the history of our project some of the authors tried to explained the system they developed but there are some disadvantages which we have overcome in our project.

A. Recommendation System

From the previous studies according to J.yu,et.al.,(2009) [1] developed three features to characterized image in social media, image content, user tagging activity and user communication activity. Thus they explained their system by giving the example of Flickr group.

According to K. Lerman, et.al., [2] proposed two methods for personalizing results of images search in Flickr .The two methods were ,First improve the search precision by filtering the tags by user's contact. And in Second method described the probabilistic model. Both methods depends on metadata users create through everyday activities on Flickr.

According to D. Liu,et.al., [3] described the retagging scheme that improves the quality of tags associated with social images. Thus described the consistency between "visual similarity" and "semantic similarity" in social images.

According to P. Klemperer,et.al.,[4] explained the example of Flickr in which a photographer uploads his clicked images on his site and thus share with others. Only Sharing images doesn't make any social interaction it is important get critical feedbacks. For positive feedbacks it is important to choose correct community. So this paper explains the criteria of selecting Community or groups. Hence forth this is a study of

comprehensive evaluation of CF (collaborative Filtering) algorithm for Flickr group recommendation.

B. Privacy Configuration System

According to M. D. Choudhury, et.al., [5] will provide the particular "suites" for the uploaded images. These suites are predefined preferences and that can be selected by others i.e either by friends or trusted experts and also can be given by users if he wish to modify them.

According to J. Bonneau, et.al., [6] which proposed a technique called "Social Circles Finder" for generating social circles list automatically. For Particular circles fixed privacy are allotted. If any changes made it will be assign to whole group. According to A. Kapadia, et.al., [7] worked on the tagged images of users by checking their keywords and captions and thus which can be easily used by users for creating and maintaining access control policies. It mainly focuses on Tag-based access control.

III. DESIGN ISSUES

MATHEMATICAL MODEL

Using Graphical, numerical, symbolic and verbal techniques to describe and explore real-world data and phenomena of the proposed system.

Where,

S= System I=Input P=Processing O= output

I={UP, DS} Where,

UP= Upload Image DS= Old Dataset

P={IC, PM, PP, AC, SG} Where

IC= Image Classification PM= Policy Mining PP=Policy Prediction

AC= Analyze Social Context SG= Social Group

O={SP, AR} Where,

SP= Suggested Policy AR= Accept/ Reject Policy

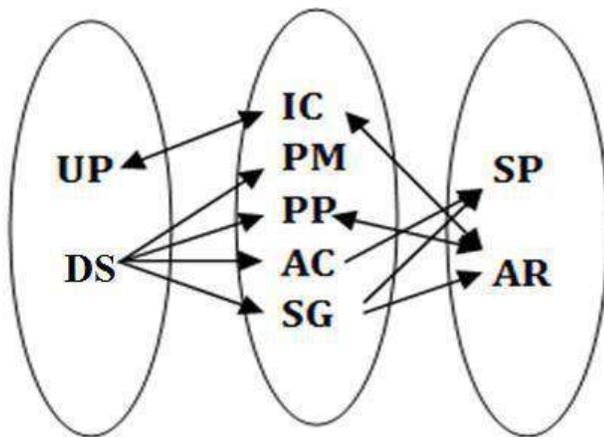


Fig.III.1 Mathematical Model

IV. SYSTEM ARCHITECTURE

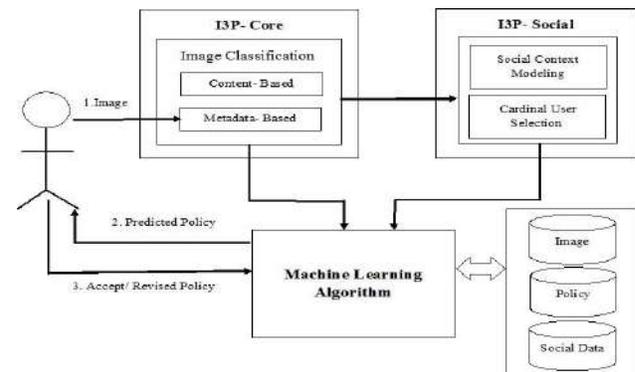


Fig.IV.1 System Architecture

A. System Construction Module

The I3P system consists of two main components: I3P-core and I3P-social. The overall data flow is the following.

When a user uploads an image, the image will be first sent to the component I3P-core. The I3P-core then classifies the image and determines whether there is a need to invoke the I3P-social or not. In most cases, the I3P-core predicts policies for the users directly based on their historical behavior/past used policies.

If one of the following two cases is true, I3P-core will invoke I3Psocial:

- 1) The user do not have enough data to predict the policy for uploaded image;
- 2) The I3P-core detects the recent changes among the users community about their privacy practices along with users increase of social networking activities i.e addition of new friends, new posts on one's profile etc.

B. Content-Based Classification: To obtain groups of images that do not have metadata will be grouped only by content. It is based on hierarchical classification that gives a higher priority to image content and minimizes the influence of missing tags.

It is also possible that some images are included in multiple categories as long as they contain the typical content features or metadata of those categories.

C. Metadata-Based Classification: In metadata-based classification groups images into subcategories. The process consists of three main steps.

I) Extract the keywords from the metadata associated with an image. The metadata considered in our project are tags, captions, and comments. Classify this metadata in noun, verb and adjectives.

II) Derive a representative hypernym (denoted as h) from each metadata vector.

III) Find a subcategory that an image belongs to. This is an incremental procedure.

At the beginning, the first image forms a subcategory as itself and the representative hypernyms i.e make subcategories of

subcategories based on the similarity and non-similarities. If new value of noun comes so check the closest threshold value and add in that subcategory.

ACTIVITY DIAGRAM:

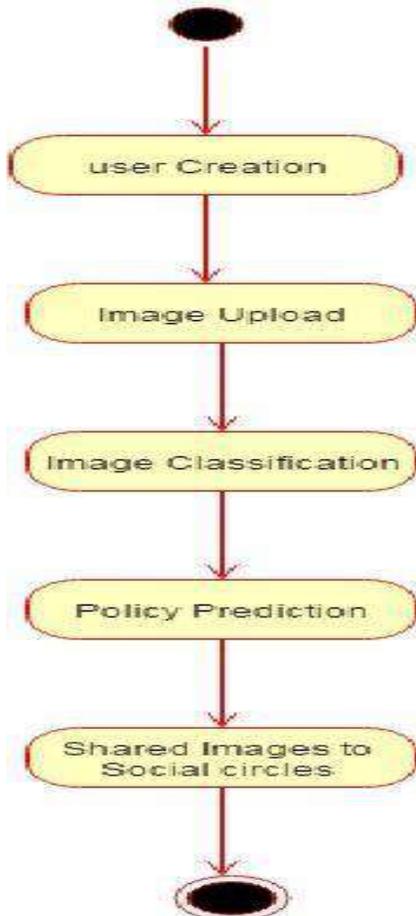


Fig.IV.2 Activity Diagram

V. RESULT AND ANALYSIS



Fig.V.1 Home page

Fig.V.1 shows that introductory page of the website. This page is set as a default or startup page on a browser.



Fig.V.2 Registration page

Fig.V.2 shows the registration form contains a list of fields that the user will input data into and submit the details for future login purpose.



Fig.V.3 Login page

Fig.V.3 shows the Login page, In order to access the system the respected user has to login by providing username and password



Fig.V.4 Login Success page

Fig.V.4 shows that the login will be successful only when the user enters the valid username and password which he/she entered at the time of registration.



Fig.V.5 Login Failure Page

Fig.V.5 shows that the login will be failed when the user enters the invalid username and password.

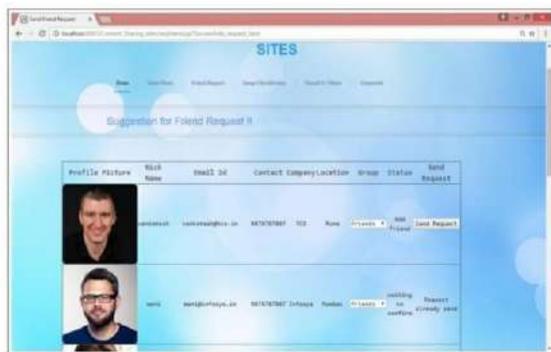


Fig.V.6 Friend Request Page

Fig.V.6 shows that a request is send to a person on a social media or social networking website to be their friend.



Fig.V.7 Share Photo

Fig.V.7 shows that a website used to store and share photo. Users upload their pictures to the site, which are stored on the server and made available to friends and family via personal Web pages.

VI. CONCLUSION

Thus we have projected an Interchangeable Privacy Policy Prediction (I3P) scheme that helps users computerize the privacy policy settings for their uploaded images. The I3P structure provides a structure that will provide privacy preferences based on the in order available for a given user.

Automatic Image illustration helps to overcome the issue of metadata information of images being uploaded.

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SMART STUDENT CARD

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Abstract— The project that we are going to make is to help the college to avoid maintaining the registry book. This project uses a barcode scanner. We use Barcode scanner to retrieve the documents of students which they want as per their uses. Each student's ID card will have a barcode at the back side of it. This barcode contains unique data of the student such as collage id no., roll number, branch and year. Etc. The display screen will show the documents of the respective student after scanning the barcode. For more Security we have provided Face Recognition System so that student can't proxy their Identification. Teachers and administrator will only have access to the system with their respective login ID's and passwords

Keywords— Barcode/Orcodes, Face Recognition.

I. INTRODUCTION

Barcode is a visual representation of information in the form of bars and spaces on a surface. The bars and spaces are designed with different widths and consist of numbers, characters and symbols such as dot, colon and others. Different combinations of these alphanumeric characters are used to represent information. There are various types of barcodes in use today. The successful of barcode technology has been constantly improving in order to accommodate more information in the minimum possible space.

Today barcodes are widely used on books and at retail stores in order to keep track of the products available and easy checkout of the products. In facilitating numerous identification processes Barcodes have played a great role since their invention in 1952. In fact for machine readable digital data storing on product packages or paper, barcode is a cost-effective and simple method. Even faster data transfer as pressing needs and there have been many improvements with high reliability have emerged on the original barcode design that was made.

For these cost-effective codes as well as their application opened a new front by invention of HC2D barcodes in scenarios like storing contact information which transfer more complex data, URLs among other things, there have become increasingly popular in which QR codes.

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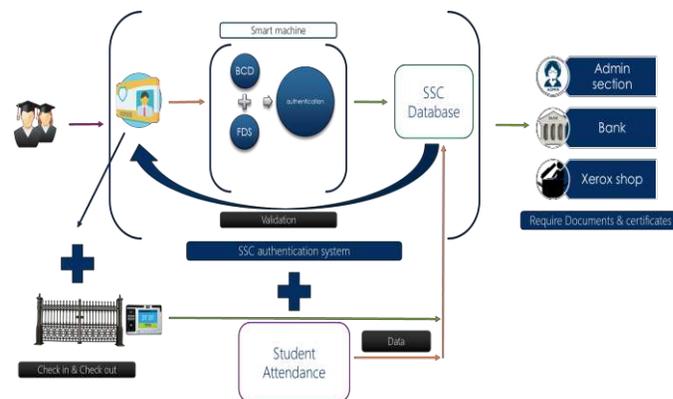


Fig. System Architecture

II. LITERATURE SURVEY

Smart Card use the concept of DigiLocker which already been implemented by various companies like BHIM (Bharat Interface for Money), CBECGST etc. DigiLocker is a "digital locker" service operated by the Government of India that enables Indian citizens to store certain official documents on the cloud. The service is aimed towards reducing the need to carry physical documents, and is part of the government's Digital India initiative.

Hence our idea of creating Smart Card is influenced by DigiLocker in which we are enhancing the DigiLocker by adding a barcode or QR code with Facial Recognition. Facial Recognition will provide the security and barcode or QR code will act as key for our digital data storage

MATHEMATICAL MODEL

$S=(I,O,F)$.

Where s : System.

$I=\{D\}$ are set of inputs ,

Where,

D : Data from Camera Module and Barcode scanner.

$F=\{MD,UD\}$ are set of functions.

MD : Matching Data. UD :

Unmatched Data. $O=\{AG,AD\}$

are set of outputs. AG : Access

Granted.

AD : Access Denied.

III. PROPOSED SYSTEM

QR Code Detection:

Through creation of links between Internet resources and physical objects, there enable rich context interaction by applications of Quick Response (QR) codes. There are this kind of barcode applications are not common in spite of the widespread use for people and robots which are visually impaired because during image acquisition that the symbol is properly by existing decoders framed are assumed. To perform accurate detection of QR code symbols a two-stage component-based approach proposed by this work in arbitrarily acquired images. With the help of the framework which detect the objects proposed by Viola-Jones to detect parts of the symbol is trained, a cascade classifier in the first stage. In the second stage, in order to evaluate the detected patterns are aggregated if they are spatially arranged with the components of a QR code symbol in a way that is geometrically consistent. With the help of the framework which detect the objects proposed by Viola-Jones to detect parts of the symbol is trained, a cascade classifier in the first stage. In the second stage, in order to evaluate the detected patterns are aggregated if they are spatially arranged with the components of a QR code symbol in a way that is geometrically consistent.

There was performed an extensive study of both stages parameter variation and in terms of computational efficiency, recall and precision the results were analysed. With precision of 76: 8% there achieved average recall of 91: 7% by the proposed QR code detector while at 22 fps being capable of processing a 640 by 480 pixels video stream.

IV. MODULE SPECIFICATION

AUTHENTICATION

Login for admin: The admin authentication process will be for respective to institute/organization. Admins will be able to add, edit, and remove the list of items according to the availability.

Login for user: Users can upload the picture ,there documents ,any important papers i.e results etc.

FILE UPLOAD

The users need to upload the documents to the database with user friendly user interface.

VIEW

Can view their documents as there folders kept .

V .PLAN OF PROJECT EXECUTION

As the implementation of the proposed system we have developed application which will help us to store the documents of the student in the database which can be access by them anytime and anywhere from the database according to their login ids. So in order to identify whether student is there in the database or not first of all we have to enrol the student in the database of our system. So when the student is going to enrol in the database our system will perform sum number of enrolment steps which are mentioned below.

Following steps are performed in order to register in the database

Step 1: GET THER USER NAME AND PASSWORD

Step 2: CREATE A NEW ROW IN DATABASE

Step 3: CHECK IF USERNAME IS ALREADY PRESENT IF YES GO TO STEP 8.

Step 4: REGESTER THE USERNAME AND PASSWORD IN DATABASE .

Step 5: PRATICULAR SPACE ALLOCATED TO THAT USER.

Step 6: USERNAME EXISTS GO TO STEP 2 .

Step 7: SAVE TO DATABASE.

Following steps are performed by users

Step 1: LOG IN TO STUDENT

Step 2: UPLOAD NEW DOCUMENTS

Step 3: SAVE DOCUMENTS TO DATABASE

Step 4: DELETE IF YOU WANT FROM THE DATABASE

VI. CONCLUSION AND FUTURE CONCLUSION

Smart Student Card (SSC) simplifies the work of college system as well as student. SSC provides simpler way to maintain the documents of the student. Smart Student Card (SSC) can also be used as student attendance system. It helps in making paper less transaction. It's a step towards Digital India.

FUTURE SCOPE

Adding otp and some more verification secure system

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SMART SYSTEM FOR BLIND PEOPLE

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Abstract— Visually impaired persons have difficulty to interact and feel their environment. The blind people's life and activity is greatly restricted by loss of their eyesight. So because of this we have developed a system in which we have done image processing ,which will identify the objects in front of blind person.To do so we have used Deep Learning, CIFAR10 Library and the concept of Convolutional Neural Network.

Keywords—Image Processing, Deep Learning, CIFAR10 Library , Convolution Neural Network, CUDA, Raspberry PI 3 Model B, Supervised Learning

I. INTRODUCTION

Blind people face several problems in their life, one of these problems that is the most important one is detection the obstacles when they are walking. In this research, we suggest a system where a camera is placed on the person's glasses and their duty is to take images from the surrounding. This image is passed to our trained model. In our trained model we are using CIFAR10 dataset which consists of 10 classes, 50,000 training images and 10,000 testing images. Also we use Convolutional Neural Network which is concept of Deep Learning for the prediction of the images using Supervised Learning. For the optimization of the algorithm we have used back propagation.

Firstly, we capture an image using the raspberry pi 3 model B camera module. Now using python we save the captured image in the database and that image is passed to our trained model. That image is now converted into pixels matrix which uses 3 channels RGB. Then this matrix is multiplied by weight function to calculate the score for the prediction

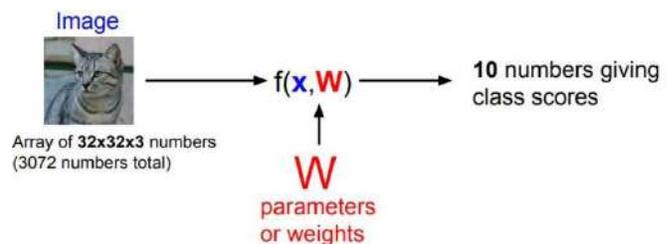


Fig 1: Parametric Approach

II. HISTORY & BACKGROUND

According to the history of our project some of the authors tried to explained the system they have developed for blind person in their published papers. But there were some disadvantages in the developed systems which we have overcome in our project. The paper [1] published in May, 2015 presents a Smart system for visually impaired, that make use of ultrasonic sensor and RF transceiver as assistive devices. This system is based on embedded technology. It makes use of ultrasonic sensor and RF transceiver simulator. The paper [2] published in 2016 describes about the Visually impaired to find their navigation as they often lack the needed information for by passing obstacles and hazards. Electronic Travel Aids (ETAs) are devices that use sensor technology to assist and improve the blind user's mobility in terms of safety and speed. The paper [3] published in September, 2016 focuses mainly in the development of the computer vision module of the Smart Vision system. The main component of this system is the infrared sensor which is used to scan a predetermined area around blind by emitting-reflecting waves path. They are using buzzer and vibrator, two output modes to user. The paper [4] published in 2017 in which the project that they have designed has a new system consisting of a camera attached to the micro controller. This camera has to be placed over the book and it will read the pages and information's will be given by the loud speaker. This project makes the use of

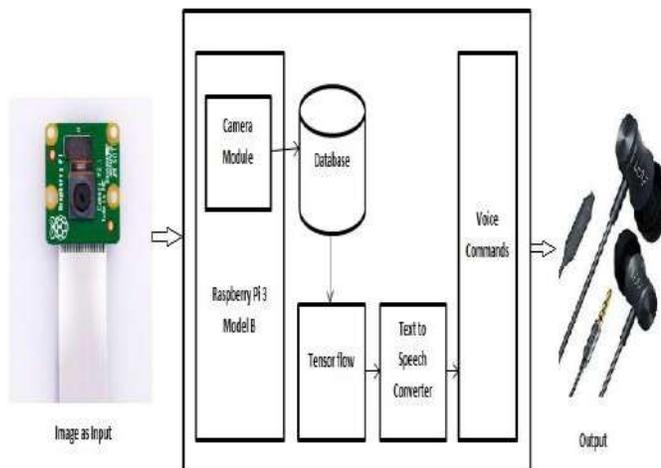
Arduino UNO, Web Cam, Optical character recognition, Text to Speech Engine, Audio amplifier. The paper named as [5] explains about Active Noise Cancellation (ANC) is a classical area where noise in the environment is canceled by producing anti-noise signals near the human ears. This paper brings IoT to active noise cancellation by combining wireless communication with acoustics. Some of the keywords are Noise Cancellation, Acoustics, Internet of Things, Wearable, Edge Computing, Adaptive Filter, Smart Home, and Earphone. In paper [6] designed a project in which the circuit takes in an ambient noise signal through a microphone, is processed by our circuit's filter system, inverted, and finally added with an incoming audio signal and sent to the headphones. The results indicate the possibility for complete functionality. However, this design is a prototype and does not meet the original goal of an in-ear device.

III. DESIGN ISSUES

- 1) Network Connection : If there is no proper internet connection then the system would not work.
- 2) CIFAR10: CIFAR10 library consists only 10 classes whereas CIFAR100 consists of 100 classes but it requires high computation GPU which is more costly.
- 3) Our system recognizes image of only one class at a time which reduces its accuracy.
- 4) The image captured by the camera must be clear as a blur image will result in wrong output.

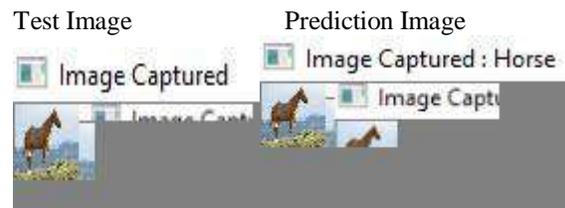
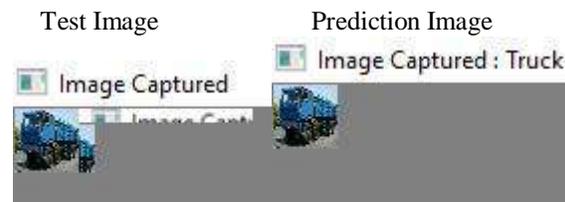
FIGURE AND TABLE

The system architecture of our model is as below



IV. RESULT AND ANALYSIS

the incorrect predictions look very close to what they model thought it is.



Now that we have a trained neural network, we can use it! We then made the model interpret 50000 unknown images of 10 classes and got an accuracy of 95%. It's also interesting that

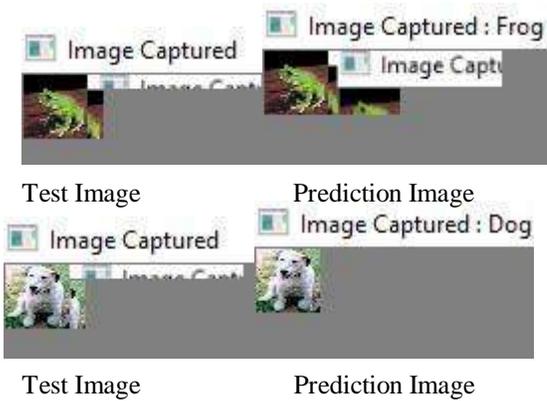


Fig 2: Sample of correct predictions

V. CONCLUSION

Hence, we are able to capture images from the raspberry pi camera and then our trained system process the captured image using deep learning and supervised learning. Henceforth our system achieve 95% accuracy using convolutional neural network.

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V2V and V2I Communication for Prevention of Road Accidents

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Abstract— The number of accidents in India are highest in the world. The actual number of accident number may be higher than documented. One person dies in every 4 min. In India now-a-days safety on roads has become a serious issue as well as all over in the world. At some places accidents occur like crossings, diversions on highways, sharp Turn. The accidents on highways can be prevented by providing the notification of infrastructure to the driver before they arrive. It is a project with innovative ideas for safety on roads and highways. An Internet of Things (IOT) with sensors is used to transmit the entire data collected by sensors communicate through wireless protocol. In this Project we are presenting an electronic system which is based on embedded and Internet of Things (IoT).

Keywords— Wireless Communication, WSN, RF433MHz, vehicle, road, Infra-structure

I. INTRODUCTION

The presence of devices in an automobile that connect the device to other device within the vehicle or devices networks and services outside the car including other car, home, office or infrastructure. Connected vehicles safety applications are designed to increase situation awareness for accidents through vehicle to vehicle (V2V) and Vehicle to Infrastructure (V2I) communications. This project has idea of prevention of accidents. In this Project all this communication is done with IOT (Internet of things)[1]. The IOT Technology can be used for providing communication & Interaction among vehicles & Infrastructure along the road side. By connecting vehicles & road side Infrastructure to the Internet real time communication, monitoring, controlling & notifications (early warning system) can be achieved.

Due to road accidents many people loss there life in the world in every year, and much more people have been injuring and maiming. The main reason of these accidents is a limitation in view of roadway emergency events that can be due to the distances, darkness, and existence of an inhibitor in the road. Road and traffic safety can be improved is drivers have the ability to hear further outside the road and Know if a collision has occurred. This can become possible if the drivers and vehicles communicate with each other. If Infrastructures information was provided to drivers the road would be safer and travelling on them would become more efficient. We are proposing the V2V and V2I communication link to prevent

the road accidents. There are some issue regarding to current system so we are developing this Iterative system for Preventing Road Accident.

Here Communication is established between vehicle to vehicle and vehicle to infrastructure so that driver will able to drive more easily. Radio Frequency is used for Communication between vehicle to vehicle and vehicle to Infrastructure. We are using IOT sensor such as Ultrasonic, Proximity, and DHT11 for sensing data and some of the data is send on cloud. This project has idea of prevention of accidents. In this Project all this communication is done with IOT (Internet of things). The IOT Technology can be used for providing communication & Interaction among vehicles & Infrastructure along the road side[6]. By connecting vehicles & road side Infrastructure to the Internet real time communication, monitoring, controlling & notifications (early warning system) can be achieved.

The purpose of this system is to assess the readiness for application of vehicle-to-vehicle (V2V) communications, a system designed to transmit basic safety information between vehicles to facilitate warnings to drivers concerning impending crashes.

Objective of our project are 1. Early warning regarding any vehicle coming from left or right on the cross road where visibility is poor due to the presence of buildings or other infra-structure along the cross road. 2. Information regarding approaching on vehicle in the fog & heavy rain. 3. Information regarding any obstacle lying on the road during night. 3. Early warning regarding bridge & other structure during night.

II. HISTORY & BACKGROUND

^[2]Swati B. Raut developed a VANET to reduce the collision of the vehicles and congestion control in the intersection of the roads efficient monitoring of vehicles is need of time for smooth traffic flow. It uses Intelligent Control Unit (ICU) and Vehicle to Vehicle communication to predict the collision probability at highway intersection. The scheme is implemented at open street map, on location of interest and makes use of warning system based on collision probabilities. Simulation results show the collision probability for near crash, no crash and crash.

In VANET, Problems are Analysis of the existing VANET protocols [11]-[13], [16], [18, 19] demonstrated that most of them result in performance bottleneck during high

traffic conditions. The main problem with these protocols is the large packet size, that results in increased cryptographic and communication overheads. The above situation motivated this research to look for a reliable solution to support both V2I and V2V communications, yet by reducing the above said overheads that are not properly addressed by other studies. The main concern of this research is, to propose an efficient protocol that can satisfy the scalability requirements and lower the message loss.

[3]GOH CHIA CHIEH proposes a novel Vehicle to Vehicle (V2V) communication system for collision avoidance which merges four different wireless devices (GPS, Wi-Fi, Zigbee and 3G) with a low power embedded Single Board Computer (SBC) in order to increase processing speed while maintaining a low cost. Collision avoidance data processing includes processing data for vehicles on express ways, roads, tunnels, traffic jams and indoor V2V communication such as required in car parks.

Wi-Fi Based System: - In Wi-Fi based system there is limitations of user in high traffic conditions. Wi-Fi hotspot only communicate with 10 users at a time. In Wi-Fi based system at first time user have to manually connect with hotspot for communication. In High Traffic condition there is chance of delay in notification and collapse of network.

a. *Survey of Country:*

A serious road accident in the country occurs every minute and 16 dies in Indian roads every hour. 1214 road crashes occur every day in India. Two wheelers account for 25% total road accident deaths. 20 children under the age of 14 die every day due to road crashes in the country[4]. 377 people die every day, equivalent to a jumbo jet crashing every day.

b. *Survey of Maharashtra:*

Every day, on an average, as many as 115 road accidents take place in Maharashtra and 37 people die in these mishaps, reveals the annual crime report released by the Crime Investigation Department. Pune, on an average, witness's four accidents per day and three deaths every 48 hours, states the report. The maximum number of road accidents 3,123 took place in Aurangabad in 2017, followed by Mumbai (2,551) and Navi Mumbai (2,223). Mumbai tops the list of road accident deaths 611 followed by Pune, which saw 543 such deaths. In 2017, Maharashtra witnessed 42,250 accidents, in which 13,685 people died and 39,301 were injured[5]. In 2016, the state saw 44,382 road accidents, in which 13,529 persons were killed and 43,668 injured. While the number of accidents fell by 4.8%, the number of accident-related deaths increased by 1.15 %.

According to World Health Organizations (WHO), road accidents annually cause approximately 1.2 million deaths worldwide. Also, about 50 million persons are injured in traffic accidents. Western Europe a mere 5 km/h decrease in average vehicle speeds could result in 25% decrease in deaths.

The National Highway Traffic Safety Administration helps to reduce deaths, injuries, and economic losses resulting from motor vehicle crashes by

setting and enforcing safety performance standards for motor vehicles and motor vehicle equipment. Vehicle manufacturers respond to NHTSA's standards by building safer vehicles. Combined with State and local government efforts, market effects, and driver behaviour improvements, NHTSA's standards have contributed to a significant reduction in annual highway fatalities and injuries, from 52,627 fatalities in 1970, to 32,479 fatalities in 2011. Safety technology has developed rapidly since NHTSA began regulating the auto industry – vehicles protect occupants much better in the event of a crash due to advanced structural techniques propagated by more stringent crashworthiness standards, and some crash avoidance technologies are now standard equipment. Between existing crashworthiness and required standard crash avoidance technologies, motor vehicles are safer now than they have ever been.

However, a significant number of annual crashes remains that could potentially be addressed through expanded use of more advanced crash avoidance technologies. The agency estimates there are approximately five million annual vehicle crashes, with attendant property damage, injuries, and fatalities. While it may seem obvious, if technology can help drivers avoid crashes, the damage due to crashes simply never occurs[7]. The agency's push thus far for adoption of crash avoidance technologies, like electronic stability control, has helped vehicles react to crash-imminent situations, but has not yet been able to help the driver react ahead of time.

Before Intelligent Transportation Systems (ITS), the United States developed, planned, and built the interstate highway system. The interstate highway system has provided a high level of mobility for citizens as well as the efficient movement of goods. From the 1950s through the 1980s, the vision of highway transportation was focused on building roads. Yet issues began to emerge as the interstate system was being built: about traffic congestion, especially in our urban centers; about highway-related fatalities and injuries due to crashes; and about the impacts on energy consumption and air quality. The discussions culminated in a workshop held in Dallas, Texas, in 1990. During the workshop, participants invented the Intelligent Vehicle Highway Systems (IVHS) concept, which was later renamed to ITS. The overall precept was that new transportation efficiencies could be found if current infrastructure could be married with advanced technology. New developments in computing, sensors, information systems, and advanced mathematical methods could be used to increase the operational capacity of the system, and achieve better overall transportation network operations.

The ITS concept became an integral part of the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA). The Act allocated \$660 million of funds for ITS research, development, and operational tests over six years. In addition, just before the Act was adopted, the Intelligent Vehicle Highway Society of America advisory organization was established; later renamed Intelligent Transportation Society of America. This advisory organization developed the first strategic plan for ITS in 1992. The plan called for the integrated operation of the system using technology to bring together information about modes and current conditions,

and discussed how institutions can be organized to operate the total transportation network.

V2V communications research initially began under the Vehicle Infrastructure Integration Initiative in 2003, but its origins date back to the Automated Highway System (AHS) research of the 1990s. The actual initiation of advanced technology research was mandated by the ISTEA[8]. The Act called for the development of an automated intelligent vehicle highway prototype that would use technology to make highway driving efficient, safe, and predictable.

The vision of this system is to test V2V safety applications in real-world driving scenarios to support estimation of their effectiveness at reducing crashes, and to ensure that the devices are safe and do not unnecessarily distract motorists or cause unintended consequences. The Model Deployment is evaluating everyday drivers' reactions, both in a controlled environment through driver clinics, and on actual roadways with other vehicles through the real-world model deployment.

As this paper focuses on the basis and potential of applying V2V technology to light vehicles, it important to note the agency is also heavily involved in V2V research related to heavy vehicles, pedestrians, and motorcycles.

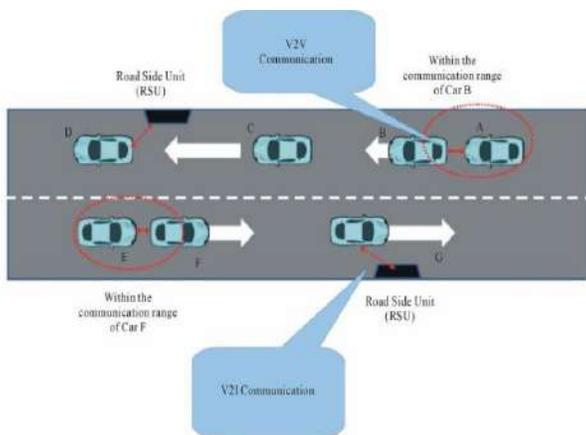


Fig. 1. Existing System

III. DESIGN ISSUES

Mathematical Model:

$$S = (V, C, M, X)$$

Where

S: system

$$V = \{As, Us, G\}$$

are set of service of vehicles

where

As: audio system

Us: ultra-service

G: gateway

$$C = \{VI, MI, XI\}$$

are set of Database Information

where

VI: vehicle service

MI: module service

XI: Sensor Service

$$M = \{T, B, F, O, Ts, v\}$$

are set of modules

Where

T: turn

B: bridge

F: fog

O: obstacle

Ts: traffic signal

V: vehicle

$$X = \{U, P\}$$

Are set of Sensors

Where

U: Ultrasonic Sensor

P: Proximity Sensor

MODEL

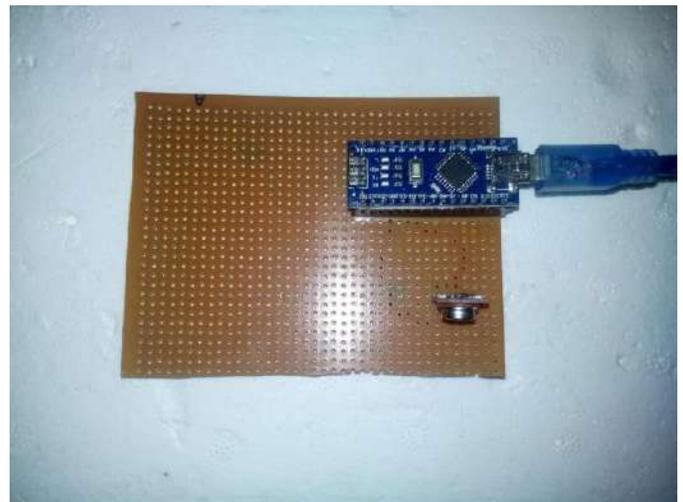


Fig. 2. Transmitter Model

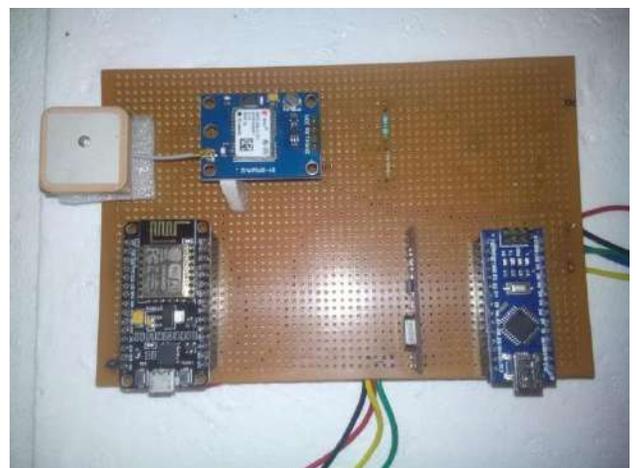


Fig. 3. Receiver Model



Fig. 4. Audio Notification System

IV. RESULT AND ANALYSIS

Results:

- Sharp Turn Guidance: System Provide Sharp Turn Notification.
- Infrastructure Warning: System Provide Notification about Near by Infrastructure.
- Slow / Stopped Vehicle Warning: System Provide Notification about Near by No horn zone or Speed Breaker.
- Blind-spotWarning: Sometimes in Fog situation where visibility is poor then our system gave the notification of nearby vehicles.

Below Graph Shows No of Accidents Prevented By Our System:

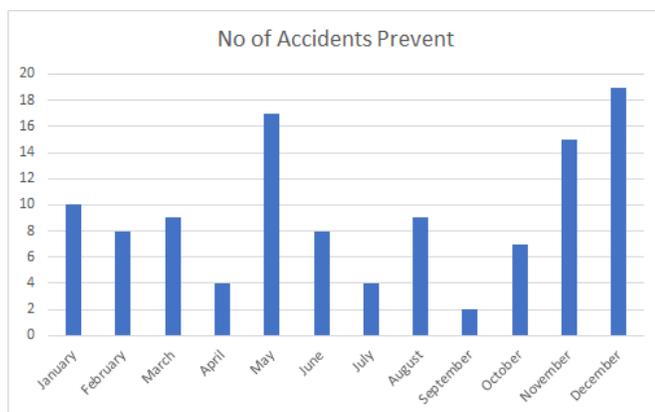


Fig. 5. Graph

V. CONCLUSION

In this project smart system has been implemented for the vehicle which uses concept of IOT. This project includes use of various sensors like ultrasonic sensor that detects rear and front vehicle during Fog and Night. A novel idea is proposed for monitoring the road side infrastructure and the sharp turns on roads. Using wireless communication medium the message will be sent in vehicle and some data is displayed on Cloud server. Thus here by we conclude that the proposed system remove some drawbacks of existing system and enhanced with the IoT system for V2V and V2I system.

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Android Application for Disaster Recovery

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Abstract— We design how to use networks with smart phones for providing communications in disaster recovery. By lessening the communication gap among different kinds of wireless networks, we have designed and implemented a system, which provides Android phones the capabilities on communications in disaster helper. Application consists of two components: a messaging system between rescue worker and the victim and a self-rescue system. The messaging system between rescue worker and victim integrates cellular networking enables proper communication. The self-rescue system finds different communication network ways for trapped survivors. Such a group of Android phones can cooperatively get a notification and send out emergency messages in an energy-efficient manner with their location and position information so as to help rescue operations. We have implemented application as a prototype application on the Android platform and deployed it on all types of smartphones. We are creating application with a centralized server for communication. First for the admin who will monitor victim and rescue worker and other two for rescue worker and disaster victim.

Keywords— Smartphones, Routing, Disaster Recover, Wi-Fi, Bluetooth.

I. INTRODUCTION

Today mobile and mobile based applications have become an integral part of our day to day life. With the revolution in mobile computing, many great features were added to the field and the mobiles got smaller, faster and better as the decade passed. It gave rise to the introduction of new mobile-based operating systems where the programmers were presented with an open source operating system named “ANDROID”. With the introduction of android, the programmers were free to program freely and with the much-awaited programming language as the programmers did not have to learn anything new. The android was a handsome mixture of java and mobile computing Thus a model integration of ANDROID platform with a desktop application can be utilized for disaster management applications and disaster management which can be of many types varying from natural disaster, accident, fire, theft. So we are thinking of in cooperating various constraints in our application like, Injuries due to accidents are among the leading causes of hospitalization in elderly persons, often resulting in a rapid decline in functionality and death. The fast and unique response can improve the victim's outcome, but this is often lacking when the injured person lives alone and the nature of the injury is so bad to call for help.

The lack of efficient disaster management system that will help in times of need. One common scenario during disasters is that the activity of rescue and relief is not well-coordinated. This increases a need for a well-coordinated disaster management system that can be coordinated by a central entity such as administrator. Since the use of

Android smartphones has attracted millions of people, the disaster management system was implemented as a smartphone application using Google's Android operating system. The disaster management system monitor both victim and rescue worker. It finds out the rescue worker which is nearest to the victim and sends him an alert to help the victim.

II. HISTORY & BACKGROUND

Considering worldwide systems for emergency reporting regardless of their communication method where it's wired or wireless, majorly we studied some unique parameters of the systems which will help us to define the strong objectives about our proposed systems. Below listed generation wise systems gives us the fair idea about the survey we had done.

A. Closed-Circuit Television (CCTV)

Closed-circuit television (CCTV) is the use of cameras and its wired or wireless network to transmit a signal to its DVR. It can be deployed as a point to point or point to multipoint links between camera and monitor [6]. These are mainly used in surveillance areas where they are needed from shops to airports etc. In mechanical and production plants, these video cameras are used to monitor and take decisions accordingly while at one room only [2]. Some places like the heavy heat generated while molding metal or another area where worker can't sustain that environment that time such CCTV are more useful and most suited one. Depends upon the requirement these CCTV operate continuously or time being to a monitor [1]. Now a day we have advanced Digital Video Recorders (DVRs), which records 24 hours for many years. It can continuously run and record it in some storage like disk or tape [4]. Also, these CCTV supports IP based monitoring and centralized network-based storage such as cloud [6].

Advantage and disadvantage:

- 1] It can work and may be placed anywhere.
- 2] DVR should always be on.

B. Smoke Detectors

Smoke detector systems are Emergency detection system in case of fire which generates smoke first. Such detectors are widely used in areas where there are big facilities like factories and hotels [1]. These systems report the issue to some kind of audible alarm to alert public around it [3]. Older smoke detectors were using the physical process of ionization whereas latest technology enables us to use the photoelectric diode sense the smoke in the air and send an alarm after it [9]. In large areas like factories, it runs mainly on the power supply and not on batteries [10].

Advantage and disadvantage:

- 1] It can detect fire easily and accurately.
- 2] It can do it only once not repeatedly.

C. Natural Disaster Monitor App (Developed by Dominic925)

This smartphone-based app gives you real-time updates on any global natural calamities like earthquake, tsunami, cyclone, floods, and volcano eruptions on the backdrop of a Google earth map [13]. The app makes use of the alerts published by the Global Disaster Alert and Coordination System (GDACS) [9,6]. The app shows icons on the map with colours- green, orange, and red etc [11]. each indicating the severity of the natural calamity. On clicking the respective icons, the list shows date and time, region, disaster type and other related details of the calamity [14].

Advantage and disadvantage:

- 1) It shows disasters on Google maps.
- 2) It cannot help and coordinate and help victims.

D. Tsunami Alert (Developed Palta Software)

This application is capable and built to help people living along the coastal lines across Pacific and the Indian Ocean, who witnessed the large-scale devastation by the 2004 Tsunami [15]. The main feature of the application is that a user will get real-time updates from US government owned NOAA in every five minutes. It will also give details about the area affected, the location of the earthquake and also provide with tips on how to react to it [20]. In Tsunami Alert app, the user will have the option to select 5 main regions- one US and Canada, Pacific, Hawaii, Indian Ocean and the Caribbean Sea.

Advantage and disadvantage:

- 1) It gives perfect Tsunami alert.
- 2) It cannot help and coordinate and help victims.

E. Help Me

Another very important mobile app which deals with disaster environment is called HelpMe. It introduces a new approach to building the ad-hoc network using Wi-Fi to enable Android-based smartphones to communicate during disaster time [18]. It works without the help of any GSM operator, and smartly forwards the message on the hop-to-hop basis. It has centralized HelpMe server to keep a log of all happening about an emergency, once service is restored [2]. This information from a cell phone in knowing whereabouts of the missing person.

Advantage and disadvantage:

- 1) It helps using the AdHoc network.
- 2) It cannot use any other network.

III. DESIGN ISSUES

MATH OR EQUATION

$$S=(I,D,S)$$

$$I=(I1,I2,I3)$$

Where I1=Trapped survivor

I2=Survivor

I3=Rescue worker

$$D=(PI,PL,ACK)$$

IV. Where PI=Personal Info

PL=Person's Location

ACK=Acknowledgement

$$S=(TS,S,RW)$$

Where TS=Trapped Survivor

S=Survivor

RW=Rescue Worker

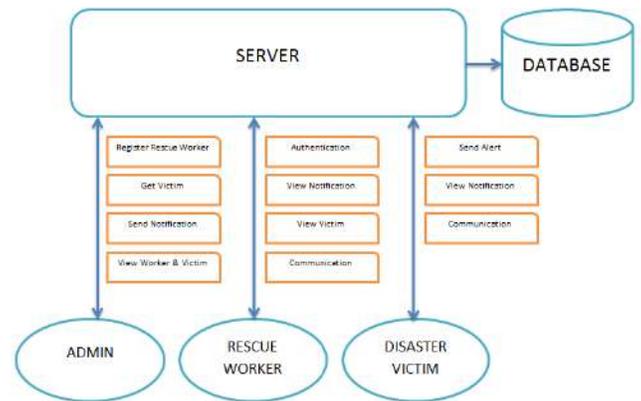
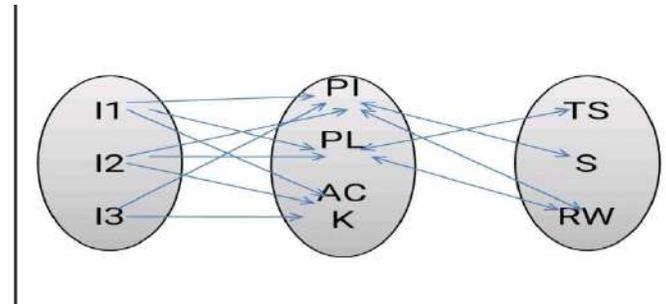


Fig. System architecture

1. Survivor:

1.1 Registration:

In this module a survivor will send name and location to admin using smartphone.

1.2 GPS:

In this module, if GPS is on the correct latitude and longitude will be given to admin.

1.3 Rescue worker:

In this module, the admin will find the nearest rescue worker and notify him the location of the survivor for help.

1.4 AES:

In this module, the data on the server will be secured using AES (Advanced Encryption Standard) algorithm.

2. Rescue worker:

2.1 Registration:

In this module a rescue worker will register to admin for helping the survivors.

2.2 GPS:

In this module, if GPS is on the correct latitude and longitude will be given to admin..

2.3 Map:

In this module, the rescue worker can see the survivor on his app and get the correct distance from him and survivor..

2.4 Notifications:

In this module, the admin will send notifications to rescue worker for further help.

2.5 AES:

In this module, the data on the server will be secured using AES (Advanced Encryption Standard) algorithm.

3. Admin:

3.1 Survivor Monitoring:

In this module the admin will continue monitor survivor where abouts on his app.

3.2 Rescue Worker Monitoring:

In this module, the admin will continue monitor rescue worker and see if he is really near the survivor.

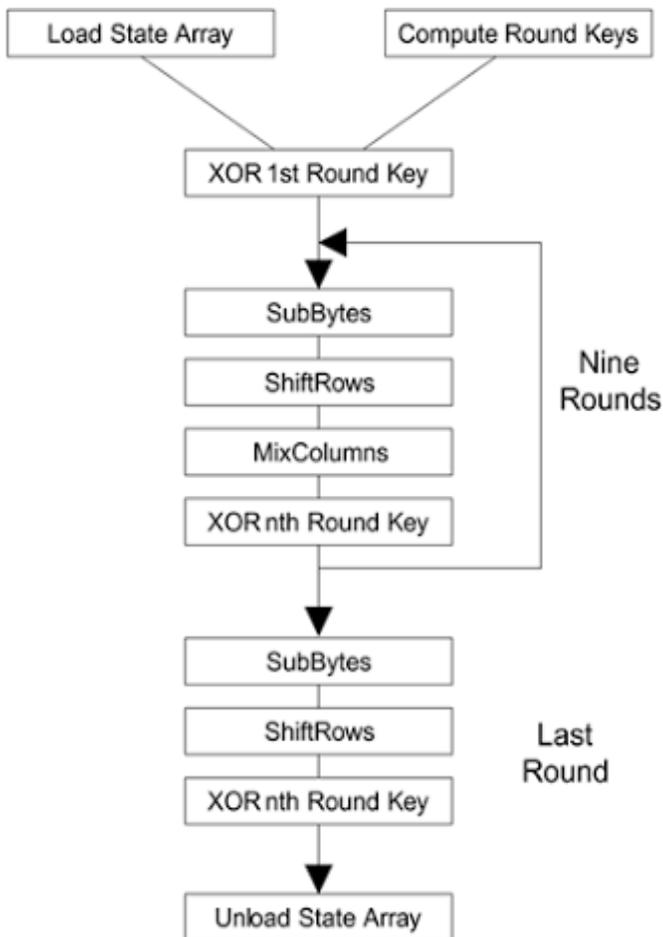
3.3 Notifications:

In this module, the admin will find the nearest rescue worker and send him to the survivor by sending notifications about the location of survivor and alert the survivor that help is coming.

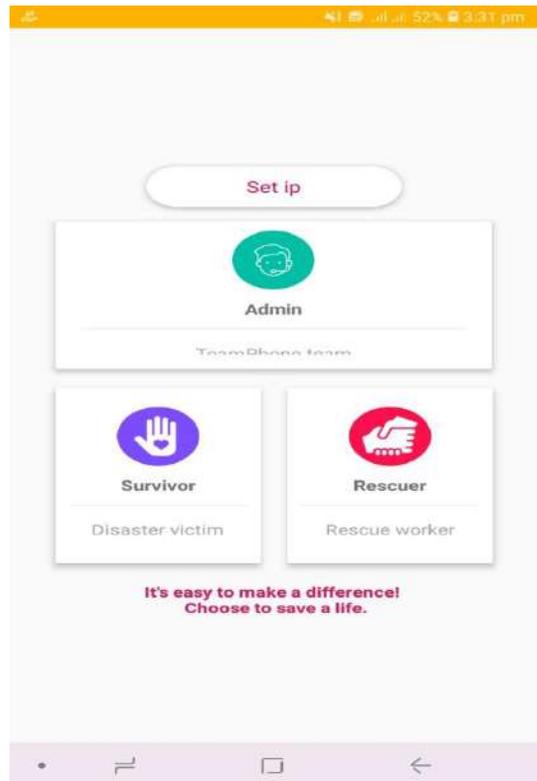
3.4 AES:

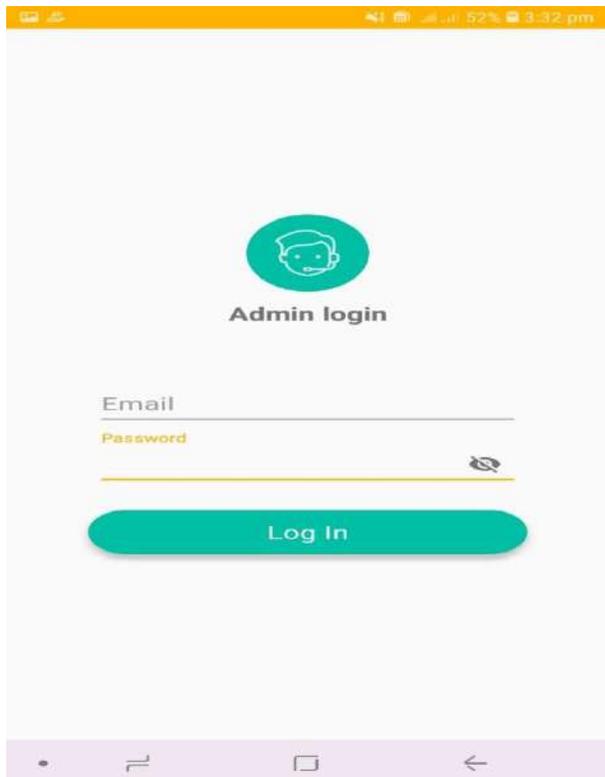
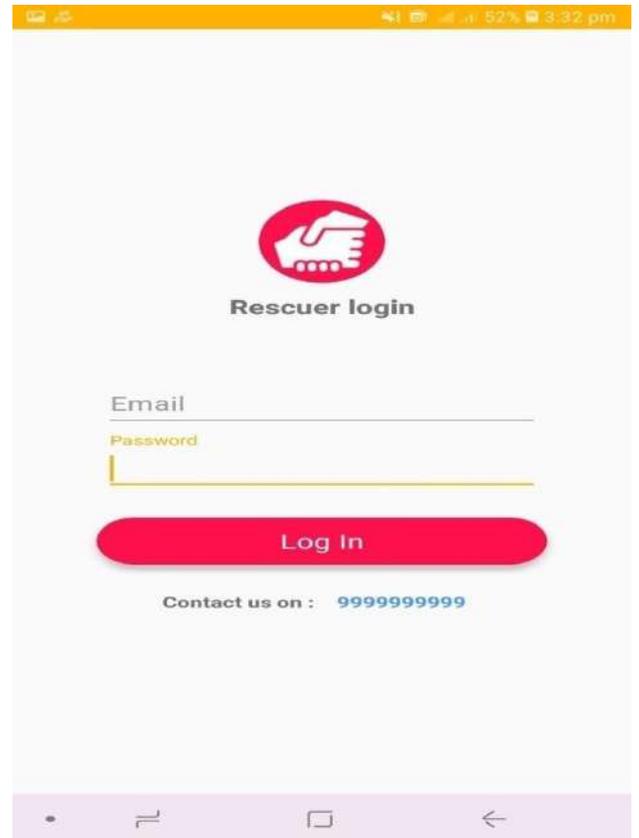
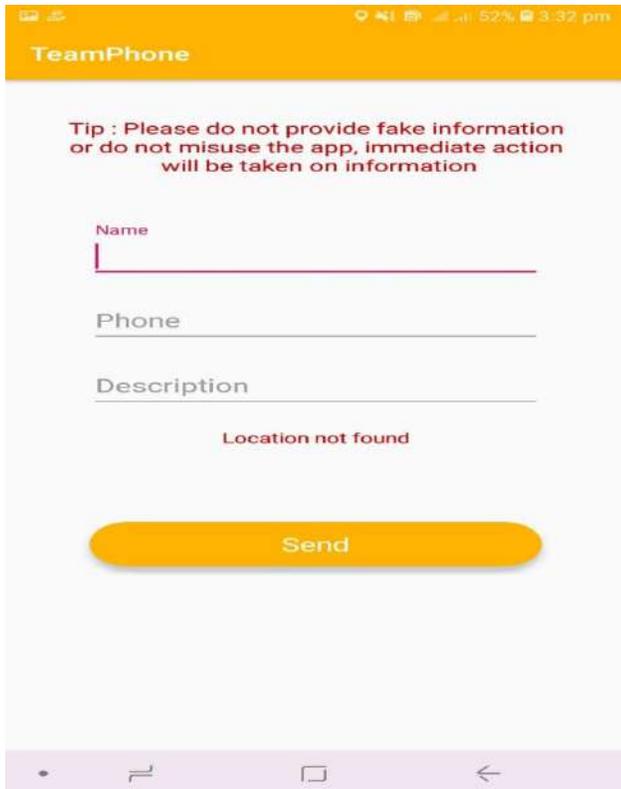
In this module, AES algorithm will be used to handle encryption and decryption of data from the server.

4. Algorithm



RESULT AND ANALYSIS





CONCLUSION

In this paper, we propose android app, which is designed to network smartphones in disaster recovery. App is implemented as a prototype application on the Android platform using the WiFi interface and cellular interface to provide several ways of communications. App can accomplish various message transmissions with affordable power consumption and delay, and greatly reduce the energy consumption of sending out emergency messages by grouping and wake-up schedule. In our project, we have developed an android based smartphone application for use in post disaster relief work. Our application works on wireless technology Wi-fi Hotspot or routing, which do not depend on any fixed infrastructure but on device's network. This application is of great utility for sending messages & enabling communication in disaster affected areas, but it also involves various security issues. Security issues are arising in such communication need to be taken care of in future. One more vital issue is smart phone battery. As these technology consumes much power & in disaster affected area there may be no power supply, the application remains of no use if battery goes down. So, we need to find ways to minimize energy requirement for communication in such environments. Also, this whole system can be implemented by using lock button of smartphones.

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Review: Water Quality Monitoring System Using IOT

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Abstract—Water is a most essential element required for humans to survive and therefore there must be some mechanisms put in place to test the quality of drinking water in real time. This paper proposes a system for water quality monitoring system using IOT. The system consists of various physiochemical sensors which can measure the physical and chemical parameters of the water such as Temperature, Turbidity, pH and Flow. By these sensors, water contaminants are detected. The sensor values processed by Raspberry pi and send to the cloud. The sensed data is visible on the cloud using cloud computing and the flow of the water in the pipeline is controlled through IoT.

Keywords—Water quality monitoring and controlling; IoT; Physiochemical sensors; Cloud; Cloud Computing.

I. INTRODUCTION

The most valuable resource for human is clean drinking water. Compromising with water quality would lead to seriously affect the health condition of humans. These days drinking water utilities are facing various challenges in real time due to limited water resources, global warming, growing population and pollution. Hence, there is need of better methodologies for real time water quality monitoring. Conventional method of water quality monitoring involves the manual collection of the water at different areas and this water is tested in laboratory. This approach takes long time and high cost. Although the current methodologies have so many drawbacks: viz a) Laborious b) absence of water quality information in real time c) poor spatial coverage d) lack of controlling unit to control the flow of the water in pipeline for safe supply of the drinking water. The online water monitoring technologies have made a significant progress for source water surveillance and water plant operation. The use of their technologies having high cost associated with installation and calibration of a large distributed array of monitoring sensors. The algorithm proposed on the new technology must be suitable for particular area and for large system is not suitable. By concentrating on the above issues, this paper designed and developed low cost system for real time water quality monitoring and controlling using IoT. In our design, physical and chemical parameters of the water are measured by physiochemical sensors. The sensed values are processed by core controller. ESP32 is used as core controller for this design. The IoT module access processed

data from the core controller to internet. The sensed data can be observed in the internet browser with special IoT account. Water flow in the pipeline is controlled depending on quality of the water through IoT. In addition to that the controlling and monitoring is observed through mobile by using Wi-Fi provided by IoT module.

II. LITERATURE SURVEY

The Internet of Things (IoT), is a concept that describes how objects that we are used in daily life will interact and negotiate with other objects over the internet [1]. This paper deals with real time water quality assurance with the perspective of IoT. This section reviews some relevant research works. Li Zhenan et.al [2], introduced an intelligent water quality and control system based on wireless sensor networks to measure the quality of water. This system used the mobile wireless sensors to monitor water quality in a remote fashion and can detect pollutant location. Wireless controlled UAVs are integrated for the marking, separation and removal of pollutant. The technical challenges such as sensor selection and wireless control are addressed with customized novel algorithms. But UAV control algorithm is not efficient method for control wireless systems. Mithila Barabdel et.al [3] proposed new system for water quality assurance. This system is based on wireless sensor network (WSN) which makes use of ZigBee. Another important fact of this system is the easy installation of the system that is the base station can be placed at the local residence close to the target area and the monitoring task can be done by any person with very less training at the beginning of the system installation. One important aspect is the system should work in different environment in more effective way, but using this system it is difficult to get reliable results in every situation. A. Fredrick et.al [4], developed new prototype based on IEEE 802.15.2.4 and solar energy for water quality monitoring is described. The prototype used ECHERP routing protocol for energy conservation purposes and solar panels are used instead of batteries to ensure the system will last in a long period of time. But evidently solar energy technologies remain to be very costly alternative. The fabrication of solar modules and their installation entail large amount of resources. Main drawbacks of this system are costly and difficult to deploy the system. Akila U et.al [5], presented a water quality monitoring system based on wireless sensor network.

presented in this work. Thamarai Selvi D et.al [6], presented a design of real time monitoring of drinking water quality system at consumer sites. The proposed system consist of several in-pipe water quality sensors. These are low power, lightweight and capable to process of data. The System is validated to enable these sensor nodes to make decisions and trigger alarms when anomalies are detected. This automated water utility billing system will overcome the difficulties in existing Water distribution system. The total costing of the meters is supposed to reduce so as the system will be economical along with power consumption reduction will be achieved by programming. Proposed system as per user requirement that is for monthly billing cycle it will be in active mode once in a month and rest of the time it will be sleep mode. But these systems are bulky and remain cost prohibitive for large scale deployments such systems can take frequent samples of the water quality at a very limited number of locations. Amruta Boyne et.al [7], did the detailed study of embedded PLC and its pros and cons. Later, they developed a new system to measure the quality of water. Extra hardwares like camera, LCD, SD card, Ethernet, LAN with many allied techniques were used in that system. The sensors pH and TDS (Total Dissolved Salt) will be kept in the river water surface and the data captured by the sensor will be given to Arm cortex M3 - Microcontroller and then data is captured and transmitted to an authentic source. After calculating the vital inference from the sensed data its analyzed. But microcontroller is specific to particular application and also this system has more complex architecture than the system which is developed using Raspberry Pi 2. From the survey, following are the drawbacks identified in the existing systems: Investment for the system is high. Size of the system is large The control system is not user friendly The systems are not real time and not able to measure the quality of water efficiently To overcome these drawbacks, our system uses simple devices that are small in size. The investment for the system is comparatively very less. The mechanism we implemented is too simple and effective. This system works with an internet connection. The system will measure the temperature, pH and turbidity of water in real time. This system is user friendly which sends text messages for registered user if predefined values of water exceeded.

III. SYSTEM ARCHITECTURE

The water quality measurement system uses pH, turbidity and TDS sensors to measure the standard of water. These sensors measure the corresponding values in the water. These

- **O = (o1, o2)**
o1 = Show data on
Display o2 = Send
data on cloud
- **F = (f1, f2)**

three sensors are connected to Raspberry Pi. The Measured information send to Raspberry Pi. the output of the pH sensor is analogue in nature, so, it is converted in to digital using ADC (analog to digital converter). System uses wireless network for communication with the control centre. It's a real time system and it doesn't required any man machine interaction. The systematic arrangements of the components are shown in the Fig 1. The Raspberry Pi is a small sized single-board computer. All Raspberry Pis included the same Video Core IV GPU and either a single core ARMv6-compatible CPU or an ARMv7-compatible quad-core one. Pi is also included the 1 GB of RAM or a Micro SDHC one for boot media. In this work Raspberry Pi 2 model is used. The pH sensor, Temperature

sensor and Turbidity sensor are connected to Raspberry Pi as shown in the Figure 1. Python programming language is used to connect various sensors. PHP and html languages are used for Graphical User Interface. For information storage and retrieval MySQL is used. The pH Electrode BNC is used to measure the pH value of the water. It is a gel-filled combination pH electrode designed to make measurements in the pH range of 0 to 14. The body that extends below the glass sensing bulb of the electrode makes this probe ideal for making measurements in the environment.

IV. MATHEMATICAL MODEL

- **S = I, O, F, Success, Failure**
I = Set of INPUTS

O = Set of OUTPUTS

F = Set of FUNCTIONS

Success = Success case

Failure = Failure case
- **I = (i1, i2, i3, i4, i5)**
i1 = Ph sensor data

i2 = Turbidity sensor data

i3 = Flow sensor data

i4 = Temperature sensor data

i5 = TDS sensor data

f1 = Store data on
database f2 = Predict
purity
- Failure = System not showing accurate information.

- Success = System showing accurate information.

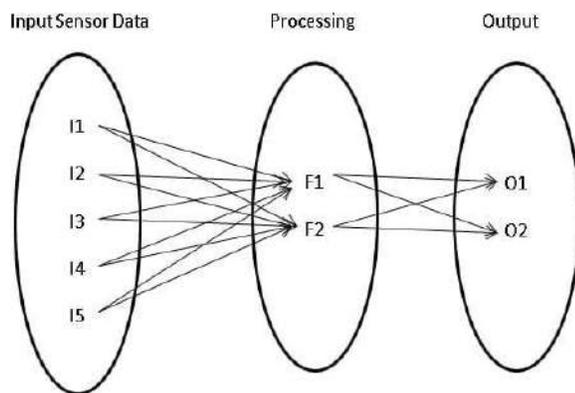


Fig2.Venn
Diagram

V. CONCLUSION

Monitoring of Turbidity, PH Temperature of Water makes use of water detection sensor with unique advantage and existing GSM network. The system can monitor water quality automatically, and it is low in cost and automatic. So the water quality testing is likely to be more convenient and fast. The system has good flexibility. Only by replacing the corresponding sensors and changing the relevant software programs, this system can be used to monitor other water quality parameters. The operation is simple. By keeping the embedded devices in the environment for monitoring enables self protection to the environment.

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Hi-Tech Traffic Signal System

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Abstract— According to Traffic Density the proper changes in the Signal the system is done and traffic is maintained and well manage through this system. Switching from one lane to another, first, it checks for High Density of traffic for remaining lanes, if there is high density, then Green signal shifted to that lane having a high density for few seconds to bring that lane to the normal traffic and after that signal came back to the lane from which signal is switched. When any Emergency Vehicle suddenly appears on the lane, then it will be detected 300-400 meter before the signal station and on that lane green signal is activated. After the passing of Emergency Vehicle form signal station then only the green signal of that lane turn ON and after that signal came back to the lane from which signal is switched. If any jumps the signal or Signal Violation occurs, in that case, the vehicle no. and other owner information is detected immediately and send to the traffic control room through the web portal automatically and next action will be taken by the RTO. By sending the message to this vehicle owner. Full accuracy is maintained in this system.

Keywords— Surveys and overviews, Scanners, Sensors and actuators, Hardware-software codesign, Board- and system-level test, Sensor networks.

I. INTRODUCTION

Living in 21st Century we all have latest technologies which are useful in every field but we did not have any fully automatic technology at traffic signal which will reduce the traffic, open a route for Emergency vehicles like Ambulance and collect the number of vehicle which crosses red signal. Now-a-days controlling traffic is very difficult due to increasing number of vehicles. 20% of emergency patient deaths are blamed on Traffic Jam Delays. Sometime there is traffic on only one lane due to insufficient timing of traffic signal. So we developed a Hi-Tech traffic signal system based on I.O.T technology which will give the solutions for all problems mentioned above. To reduce high density traffic to normal traffic from any lane using IR sensors. We are using RFID reader and RFID Tag to detect Ambulance or any kind of emergency vehicle to make a way for them before they

arrive at a traffic signal. We are using RFID Reader to scan the RFID tag of a particular vehicle to detect a number of vehicle and then RFID Reader sends the information of vehicle to the traffic control system. Some of Objectives are :

- 1) To control the lane which has maximum number of vehicles by giving green signal as per priority.
- 2) Control and remove the traffic from the lane if any emergency vehicle is detected.
- 3) Send the information of vehicle which jumps the red signal to the Department of R.T.O .

II. HISTORY & BACKGROUND

For our project, we collected some important information from various research papers. This research papers contains information about microcontroller board like traditional traffic signal system, IR and Ultrasonic sensors, RFID reader and RFID tag, arduino, raspberry pie, etc. We also get an idea about how to develop a system using Arduino software. So we mentioned some important papers from which we can able to develop our system.

A. Strategies for Traffic Signal Control in Indian Cities.

Published year : 2015.

Intelligent Transportation System Workshop, COMSNETS. Author Gitakrishnan Ramadurai has proposed that Most Indian cities face oversaturated flow conditions during peak periods. In this, researcher revisit the traffic signal control to improve urban network performance. Three novel strategies that address congested heterogeneous traffic flow are presented. The first two strategies keeping intersection signal cycle times shorter and bottleneck metering - are derived from field observed data while the third exclusive lanes and storage area near intersections for two wheelers - is supported based on a micro-simulation model. Potential improvements are presented based on the strategies. While most recent studies have focused on area wide / network signal control. improvements this paper shows potential for significant improvement even at the level of an isolated signal[1].

B. IoT-based Visitor Detection System.

Published year : 2016.

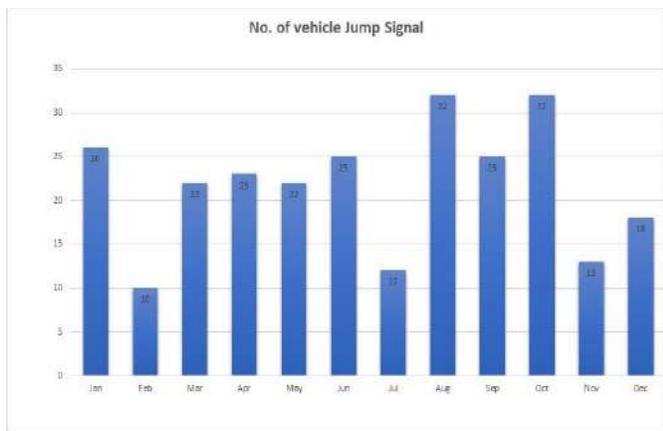


Fig. 2. Number of vehicles jumps the red signal

Following graph shows the traffic density with respect to every day from Monday to Sunday.

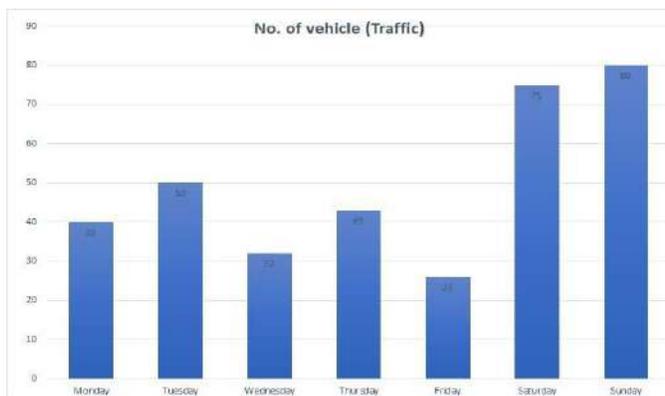


Fig. 3. Traffic Density

From the analysis of this information we come to know that which signal have more traffic density and which have normal traffic density. So from this result and analysis we managed to develop our project with flexibility.

V. IMPLEMENTATION

We are going to built a mobile application for this system. This application will contain the information such as vehicle details, documents like license, traffic rules, etc. There will be a feature of online fine payment if anyone disobeyed traffic rules. Limitation of this project is that RFID tag should be attached on all the vehicles for the implementation of Signal violation module.

VI. CONCLUSION

Thus we conclude that, this system will give full accuracy and system is fully automatic also. So to overcome the manual work of traffic police (sometimes Traffic Police handles traffic by switching off the signal) and make smart traffic signal system. Emergency vehicle like ambulance will get the route and we can reduce the time wasted in traffic also. Because of this system no one can dare to cross the red signal. We will built a mobile

application for this system. This application will contain the information such as vehicle details, documents like license, traffic rules, etc. There will be a feature of online fine payment if anyone disobeyed traffic rules. In future we can link people's bank account.

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Safety Tracking System for School Students

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Abstract— The system has a developed GSM based database-driven application that facilities its management and provides useful information about the children to authorized person through SMS using GSM. The system consists of two main units, first one bus unit and second one school unit. The bus unit system is used to detect when a child boards or leaves the bus. This information is communicated to the school unit that identifies which of the children did not board or leave the bus and issues an alert message accordingly. A complete prototype of the proposed system was implemented and tested to validate the system functionality. The results show that the system is promising for daily transportation safety. RFID-based detection unit located inside the bus detects the RFID tags worn by the children. It then sends via a GSM modem, the relevant data to the system database server. The system checks and detects which child did not board or leave the bus and issues an alert message to this effect. In addition, the system checks the children attendance and updates the database. The parents can log into system website and monitor the details of their children.

Keywords— Sensors and actuators ,Software Prototyping , Database Query Languages (Principles),Bootstrapping, Database web servers, Database design and models.

I. INTRODUCTION

Nowadays, most of the cases regarding child kidnaping and rape cases of small girls is increasing .So in our proposed system we are developing a band for the school children to reduce the cases for the same. If in case the child is lost or does not reach the school or back to home from school then the system will notify alert to the concerned authorities. Manual attendance of the student is done in the current system but in our system the attendance is marked automatically when the student enters school premises. If student band is lost or stolen, an alert notification is sent to the concerned authorities. This system has ability to uniquely identify and take attendance of the students. The users only need to present in school premises for marking their attendance. They do not need to go through the long list to look for their name. Hence, it is a very time efficient system. In recent years, RFID is one of the automatic identification technologies. There is a wide research and development in this area trying to take maximum advantage of this technology, and in coming years many new applications and research areas will continue to appear. RFID system has been successfully applied to different areas as diverse as transportation, healthcare, agriculture, and hospitality industry to name a few. RFID also brings about some concerns, mainly the security and privacy of those who work with or use tags in their everyday life which is proposed

in. RFID is used to uniquely identify tagged objects or people. RFID systems have been widely used in many application areas such as inventory control, product tracking through manufacturing and assembly, parking lot access and control, Bank Locker Security System, Automatic Toll Collection System (ATCS), Library Management system (LMS), Attendance Management System etc. The aim of this paper is to monitor student's attendance by using RFID for administration. Notification will be sent to parents as well as school's authority in case of absence of students. Commercially available antitheft devices are very expensive not affordable. The developed system makes use of an embedded system based on GSM, GPS, and RFID technology. The designed developed system can install in the student's band. GSM is the most popular accepted standard for mobile phones in the world. The band is provided with the RFID reader.

II. HISTORY & BACKGROUND

A.Gowtham,R.Mohanraj, A.Anadhan , S.Mohan, has proposed Implementation Of School Children Tracking System and Transportation Safety Enhancement by Using RFID Technique. The system has a developed GSM based database-driven application that facilities its management and provides useful information about the children to authorized person through SMS using GSM. The system consists of two main units, first one bus unit and second one school unit. The bus unit the system is used to detect when a child boards or leaves the bus. This information is communicated to the school unit that identifies which of the children did not board or leave the bus and issues an alert message accordingly [1]. Vishaka Asundkar ,Prof.S.P.Godse, has proposed Enhance Safety Security and Tracking System for School Bus and Children. A system monitors the daily transportation service for school going children to enhance the security and safety of the children. The system consists of three main units, bus unit, parent unit and school unit. The bus unit consist of hardware parts. The bus unit is used to detect when a child enters/exits from the bus using RFID Card. This information is communicated to the parent unit and school unit that identifies the children did/did not enter/exit the bus. The notification like the students whose next stop is, sent to the parent who stays on the next stop using Geofence. The system enhances the security of the children like the bus hijacked, extracting the location and instantly sending notification to the admin as well as the nearest police station using SOS and Spherical Cosine Rule. The system develops an android application for the parent for getting notifications and live tracking of the bus and web based application for the admin that facilitate the management and provides useful information about the children and some specific details like routing, allocating stops, scheduling, optimized route and reports. The system

tracks the school bus by the GPS Module and also gets an alert if the bus crosses the speed limit [2]. C.Deenadayalan,M.Mural,L.R.Baanupriya, has proposed Implementing Prototype Model for School Security System (SSS) Using RFID. Now days, the number of crime over children is increasing day by day .the implementation of School Security System(SSS) via RFID to avoid crime, illegal activities by students and reduce worries among parents. The project is the combination of latest Technology using RFID, GPS/GSM, image processing, WSN and web based development using PHP, VB. net language apache web server and SQL. By using RFID technology it is easy track the student thus enhances the security and safety in selected zone. The information about student such as in time and out time from Bus and campus will be recorded to web based system and the GPS/GSM system automatically sends information (SMS / Phone Call) to other parents [3].

Anusha R, Dr.R.China,Appala Naidu ,has proposed GPS and RFID Based School Children Tracking System. The educational institutions are unable to trace the students who don't attend college during regular working hours. To resolve this, in this paper we have implemented a new system which will help the parents to identify whether their kid reached the educational organization at correct time or not. In this paper the system keep track of the wards who board the bus and reach college or who manage to get down on the way to college or back home. To trace the students we implemented a system which uses an RFID, GPS, GSM and ARM processor. In this paper we have shown the results which are implemented and tested in our own organization [4].

Judy Thyparampil Raj ,Jairam Sankar ,has proposed IoT Based Smart School Bus Monitoring and Notification System. It is important for every school to have a trustworthy and secure transportation service to ensure the safety of the students. It helps the school administration to effectively manage their bus fleet and potentially reduce mishaps. This is where vehicle monitoring takes effect. The proposed system provides real time information about various parameters of the vehicle like the location, the route, the speed, the list of passengers, the adherence of drivers to schedule and much more. The system further allows the parents to be notified when their ward alights or boards the bus. In this system, we make use of RFID and GPS technologies and connect them to a remote server over WiFi using an ESP8266 microcontroller[5].

Jisha R.C, Aiswarya Jyothindranath, Sajitha Kumary L has proposed IOT Based School Bus Tracking and Arrival Time Prediction. Nowadays, parents are perturbed about school going children because of the increasing number of cases of missing students. On occasion, students need to wait a much longer time for arrival of their school bus. There exist some communication technologies that are used to ensure the safety of students. But these are incapable of providing efficient services to parents. This paper presents the development of a school bus monitoring system, capable of providing

productive services through emerging technologies like Internet of Things (Iota). The proposed IoT based system tracks students in a school bus using a combination of RFID/GPS/GSM/GPRS technologies [6].

Vinoth Rengaraj ,Prof. Kamal Bijlani ,has proposed a study and implementation of Smart ID card with M-Learning and Child Security. Among the Organized crime, Human trafficking hold third place where as the first and second or drug and weapon trade across the globe. Human trafficking is a shame on Humanity. As per the report of Human Rights commission of India over 40,000 children are reported missing every year of which 11000 are untraced Another statics report saying 80% of human trafficking is done for sexual exploitation and rest is for bonded labors [7].

III.PROPOSED SYSTEM

Our system contains AVR microcontroller, IoT Cloud, GPS + GSM ,RFID (Active), Proximity Sensor.The AVR Microcontroller is used to process and control the overall proposed system .The IoT cloud(Internet of Things)is a Salesforce platform which stores large amount of data. It stores all data and it will only pass the details of those students to the concerned authorities whose notification has to be send. GPS is used for continuous tracking of student and GSM is used for sending data to the cloud and sends notification to the concerned authorities .Through active RFID identification of the bus and school is done. Further the bus id and school id is used for tracking the bus and marking automatic attendance of students according to student id. Proximity Sensor is used to sense the safety band which is on students hand .Android application used to display the details of students which is send by IOT cloud.The message will sent from Cloud to the local server and from local sever to respective parents cell.

IV. MATHEMATICAL MODEL

Let S is the system for tracking the student with student wearing a band in his/her hand.

$$S = (I, SR, O)$$

Where,

S: System

$$I = \{ST, BU, SC\}$$

Are set of inputs

Where,

ST : Student

BU : Bus

SC : School

$$SR = \{SDB, BDB, CDB\}$$

Are set of database servers

Where

SDB : Student Database

BDB : Bus Database

CDB : School Database

$$O = \{LT, N, AT\}$$

Are set of outputs

Where LT : Location Track N : Notification Message
 AT :Automatic Attendance

Fig. 1.Venn Diagram

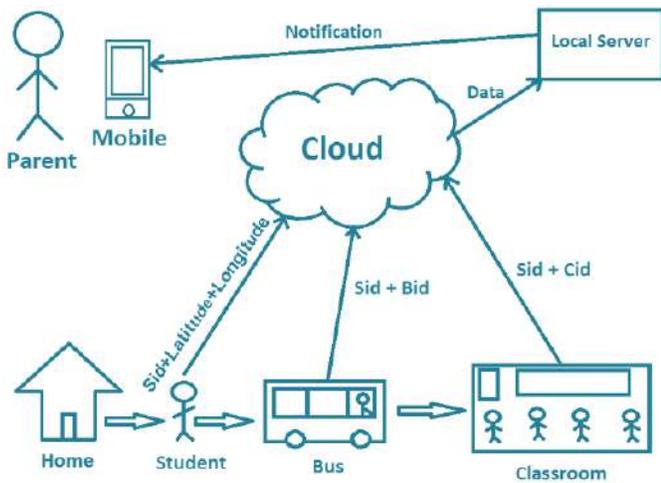
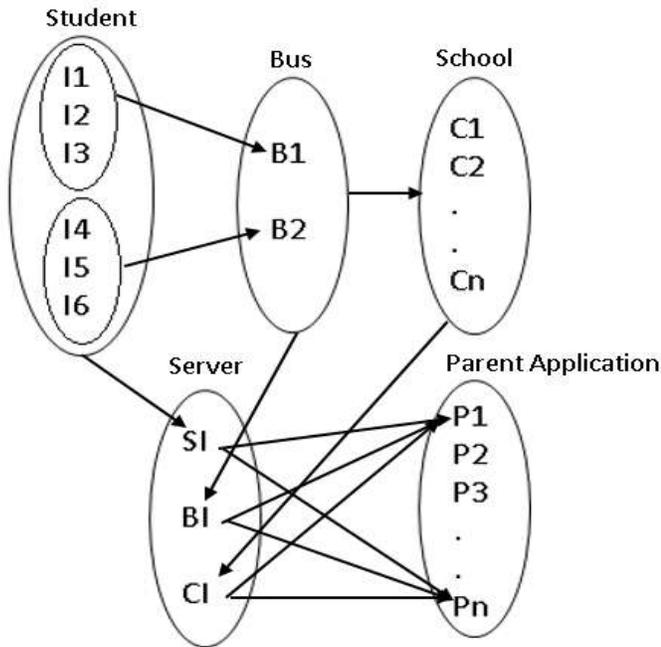


Fig. 2. System Architecture

Where, Pid : Parent Identity Cid : Classroom Identity
 Sid : Student Identity Bid : Bus Identity.

V. RESULT AND ANALYSIS

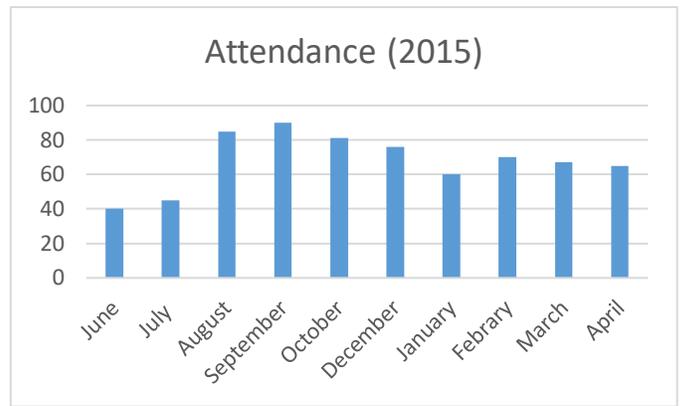


Fig. 3.Attendance Analysis Graph.

In the above graph attendance of the students of a particular class is been graphically presented .From the above graph, the highest attendance month of the year and lowest attendance month of the year can be analyzed . A meeting with the parents and the school authorities can be conducted to discuss the issues on why the student’s attendance is lowest in that particular month of the year.

Similarly, the graphs for various classes can be graphically presented and analyzed .The school authorities can also compare the attendance of a class with the other classes and award some credits to the class having the highest attendance compared to each other.

Through this the students would be motivated to attend the school regularly to earn the credits at the end of the year.

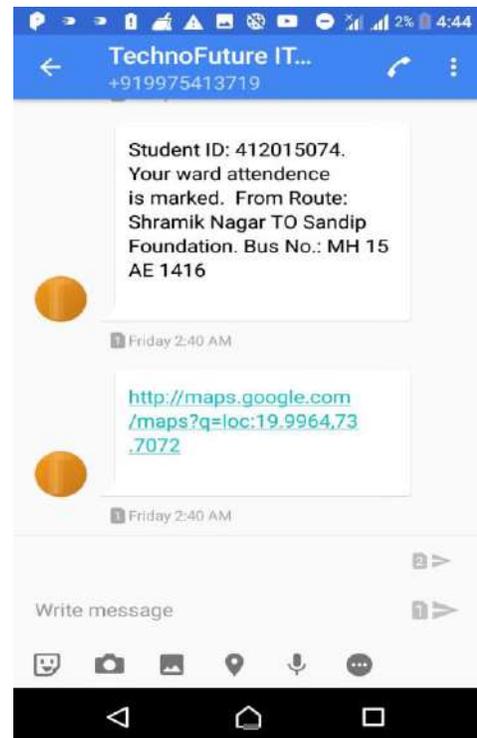


Fig. 4. Screenshot of Attendance

The above Fig.4 display a automatic text message sent to the concerned authorities about the ward being present or absent on that day.

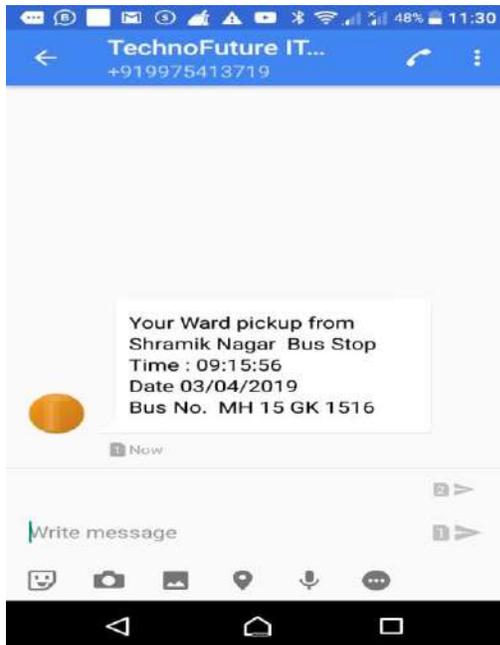


Fig. 5. Screenshot of Location

The above Fig.5 display a automatic text message sent to the concerned authorities about the details of the bus and the ward's pickup point to assure the safety of the ward during the travelling time period from home to school and vice-versa.

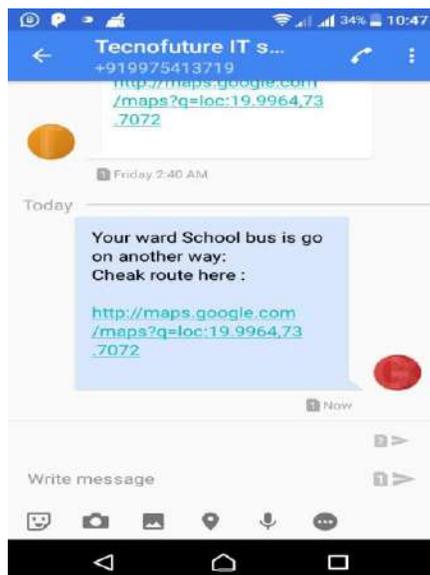


Fig. 6. Screenshot of track monitoring message

The above Fig.6 display a automatic text message sent to the concerned authorities about the ward's bus is went to wrong track or out of track .

VI. FUTURE SCOPE

This system is going to be helpful for the parents as well as school system. Students are kept on tracking and the current location of a student can be detected using this system in any case of the mishap or kidnapping case of a child.

Vi

VII. CONCLUSION

In our proposed system we have design the safety band to track the students and send the notification to the concerned authorities and in this way we are contributing towards society to save the children from being targeted by the criminals.

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- [6] Jisha R.C, Aiswarya Jyothindranath, Sajitha Kumary L IOT Based School Bus Tracking and Arrival Time Prediction

Mood Detector Using Image Processing, AI and Machine Learning

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Abstract— Behavior, Action, Poses, facial expression and speech; these are considered as channels that convey human emotions. Extensive re- search has being carried out to explore the relationships between these channels and emotions. This paper proposes a prototype system which automatically recognizes the emotion represented on a face. Thus a neural network based solution combined with image processing is used in classifying the universal emotions: Happiness, Sadness, Anger, Dis- gust, Surprise and Fear. Colored frontal face images are given as input to the prototype system. After the face is detected, image processing based feature point extraction method is used to extract a set of selected feature points. Finally, a set of values obtained after processing those extracted feature points are given as input to the neural network to recognize the emotion contained. Computational analysis of emotions has been considered a challenging and interesting task. Researchers rely on various cues such as physiological sensors and facial expressions to identify human emotions. However, there are few prior works who work with textual input to analyze these emotions. This survey attempts to summarize these diverse approaches, datasets and resources that have been reported for emotional analysis from text. We feel that there is an essential need to have a collective understanding of the research in this area. There- fore, we report trends in emotion analysis research. We also present a research matrix that summarizes past work, and list pointers to future work.

Keywords— Image Processing, Artificial Intelligence, Mood Detection, Natural Language Processing (NLP), Machine Learning.

I. INTRODUCTION

What is an emotion? An emotion is a mental and physiological state which is subjective and private it involves a lot of behaviors, actions, thoughts and feelings of humans. Initial research carried out on emotions can be traced to the book 'The Expression of the Emotions in Man and Animals' by Charles Darwin. He believed emotions to be species-specific rather than culture-specific. In 1969, after recognizing a universality among emotions in different groups of people despite the cultural differences, Ekman and Friesen captured six emotional expressions to be universal happiness, sadness, despite the cultural differences, Ekman and Friesen captured six emotional expressions to be universal happiness, sadness,

disgust, surprise and fear. Facial expressions can be considered not only as the most natural form of displaying human emotions but also as a key non-verbal communication technique. If efficient methods can be brought about to automatically recognize these facial expressions, striking improvements can be achieved in the area of human computer interaction. Research in facial emotion recognition has being carried out in hope of attaining these enhancements. In fact, there exist other applications which can benefit from automatic facial emotion recognition. Artificial Intelligence has long relied on the area of facial emotion recognition to gain intelligence on how to model human emotions convincingly in robots. Recent improvements in this area have encouraged the research first extend the applicability of facial emotion recognition to areas like chat room avatars and video conferencing avatars. The ability to recognize emotions can be valuable in face recognition applications as well. Suspect detection systems and intelligence improvement systems meant for children with brain development disorders are some other beneficiaries.

II. History & Background

Rituparna Halder et. All, [1] From this paper Behaviors, actions, poses, facial expressions and speech; these are considered as channels that convey human emotions. Extensive research has being carried out to explore the relationships between these channels and emotions. This paper proposes a prototype system which automatically recognizes the emotion represented on a face. Thus a neural network based solution combined with image processing is used in classifying the universal emotions: Happiness, Sadness, Anger, Disgust, Surprise and Fear. Colored frontal face images are given as input to the prototype system. After the face is detected, image processing based feature point extraction method is used to extract a set of selected feature points. Finally, a set of values obtained after processing those extracted feature points are given as input to the neural network to recognize the emotion contained.

Kun-Yi Huang et. all [2], This paper, an extended subjective self-report method is generally used for measuring emotions. Even though it is commonly accepted that speech emotion

perceived by the listener is close to the intended emotion conveyed by the speaker, research has indicated that there still remains a mismatch between them. In addition, the individuals with different personalities generally have different emotion expressions. Based on the investigation, in this study, a support vector machine (SVM)-based emotion model is first developed to detect perceived emotion from daily conversational speech. Then, a denoising autoencoder (DAE) is used to construct an emotion conversion model to characterize the relationship between the perceived emotion and the expressed emotion of the subject for a specific personality. Finally, along short-term memory (LSTM)-based mood model is constructed to model the temporal fluctuation of speech emotions for mood detection. Experimental results show that the proposed method achieved a detection accuracy of 64.5 compared to the HMM based method.

Tsung-Hsien Yang, et. all [3], In this paper In mood disorder diagnosis, bipolar disorder (BD) patients are often misdiagnosed as unipolar depression (UD) on initial presentation. It is crucial to establish an accurate distinction between BD and UD to make an accurate and early diagnosis, leading to improvements in treatment. In this work, facial expressions of the subjects are collected when they were watching the eliciting emotional video clips. In mood disorder detection, first, facial features extracted from the DISFA database are used to train a support vector machine (SVM) for generating facial action unit (AU) profiles. The modulation spectrum characterizing the fluctuation of AU profile sequence over a video segment are further extracted and then used for mood disorder detection using an ANN model. Comparative experiments clearly show the promising advantage of the modulation spectrum features for mood disorder detection.

Bhuiyan et. all [4], In this paper We present EmoTxt, a toolkit for emotion recognition from text, trained and tested on a gold standard of about 9K question, answers, and comments from online interactions. We provide empirical evidence of the performance of EmoTxt. To the best of our knowledge, EmoTxt is the first open-source toolkit supporting both emotion recognition from text and training of custom emotion classification models

Shadi Shaheen et. all [5], In this paper the growth of the Internet community, textual data has proven to be the main tool of communication in human-machine and human-human interaction. This communication is constantly evolving towards the goal of making it as human and real as possible. One way of humanizing such interaction is to provide a framework that can recognize the emotions present in the communication or the emotions of the involved users in order to enrich user experience. For example, by providing insights to users for personal preferences and automated recommendations based on their emotional state. In this work,

we propose a framework for emotion classification in English sentences where emotions are treated as generalized concepts extracted from the sentences. We start by generating an intermediate emotional data representation of a given input sentence based on its syntactic and semantic structure. We then generalize this representation using various ontologies such as WordNet and Concept Net, which results in an emotion seed that we call an emotion recognition rule (ERR). Finally, we use a suite of classifiers to compare the generated ERR with a set of reference ERRs extracted from a training set in a similar fashion. The used classifiers are k-nearest neighbors (KNN) with handcrafted similarity measure, Point Mutual Information (PMI), and PMI with Information Retrieval (PMI-IR). When applied on different datasets, the proposed approach significantly outperformed the existing state-of-the-art machine learning and rule-based classifiers with an average F-Score of 84%.

III. MATHEMATICAL MODEL

System Description:

$$S = (I, O, F)$$

Where,

1.1) System.

$I = (I_1, I_2)$ are set of Inputs

Where,

1) I_1 : Textual data.

2) I_2 : Human Face.

$F = (F_1, F_2, F_3, F_4)$ are set of Function

Where,

A.A.1 F_1 : Image Processing.

A.A.2 F_2 : Natural Language Processing.

A.A.3 F_3 : Machine Learning From Data.

F_4 : Data Sending.

$O = (O_1, O_2)$ are set of Output

➤ O_1 : Mood Detection.

➤ O_2 : Refreshment.

Success Condition : To do proper facial Recognition, Perform proper Natural lan-guage processing, data sending for refreshment.

Failure Condition : No database, No internet connection.

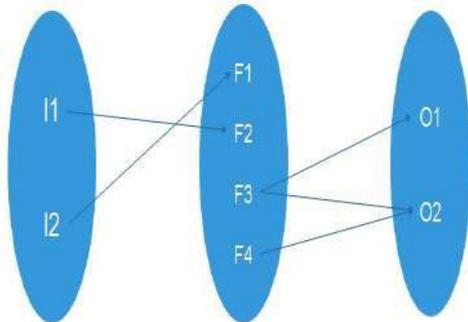


Fig2. Venn Diagram

IV. SYSTEM ARCHITECTURE

This system is an automated system which will help many people to get over multiple emotional barriers which are been caused because of stress or any other emotional attachment. It will make a clear view about human behaviour and can be used for further study of human behavioural synthesis. In this system we will have a user whose mood is to be detected that is going to be done in two ways one is with the help of his facial expressions and other is based on the textual data. In textual data it will involve chat box through which the user can chat and the system will respond to the text using the artificial intelligence and it will send data such as funny videos and funny text messages etc.

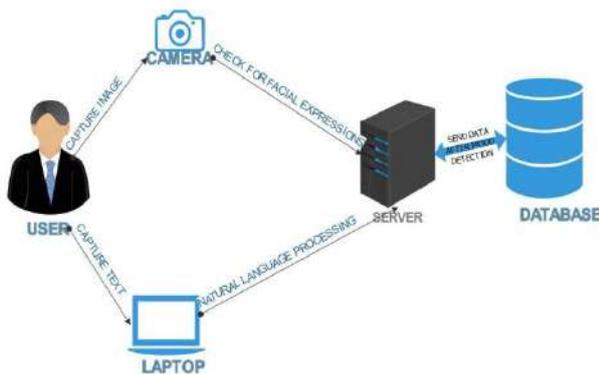


Fig. System Architecture

V. IMPLEMENTATION DETAILS

The basic requirement of the system is to improve the existing situation of mental pressure and stress. This will try to reduce the mental stress and other emotional barriers which are caused to human. There could be number of factors which could effect on human emotions so he can use this system to analyze as well as to get over their own emotions. Other thing is that people can enjoy with this system as this system is made to make people emotionally stable and fresh. We have used EEM and SSIM algorithms which will be used in image processing and detection of human mood.

System Analysis :

1. Image Processing:- In computer science, 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.

2. Natural Language Processing (NLP):- Natural language processing (NLP) is the ability of a computer program to understand human language as it is spoken. NLP is a component of artificial intelligence (AI).It is an area of computer science and artificial intelligence concerned with the interactions between computers and human (natural) languages, in particular how to program computers to process and analyze large amounts of natural language data. Challenges in natural language processing frequently involve speech recognition, natural language understanding, and natural language generation.

3. Artificial Intelligence:- AI (artificial intelligence) is the simulation of human intelligence processes by machines, especially computer systems. These processes include learning (the acquisition of information and rules for using the information), reasoning (using rules to reach approximate or definite conclusions) and self-correction. Particular applications of AI include expert systems, speech recognition and machine vision.

VI. RESULT AND ANALYSIS

Consider the current situation in which multiple people get emotionally as well as mentally disturbed because of lots of stress and work load as well as there are many other problems rather than stress which usually happens while we are in a stressful situation. So to overcome or to get proper judgement of the persons emotional behavior this system will be useful

and it will also give him or her proper guidance on what precaution or what could be done to overcome such a condition.

VII. CONCLUSION

This system is going to give a new way of human relaxation because of which people could focus on many new things in their life. People working in the offices will also be relaxed and they will work more efficiently. The time which was used by the employees for refreshment will be done on their desk so time will also be saved and people could concentrate on their work more. This system can also be used in medical field to analyse human behaviour because of which people suffering through many mental disorders can be monitored. So all over I conclude this system as very beneficial for all.

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UID Based Voting System- An Extension to EVM

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Abstract: In India, the traditional voting system is based on EVM machine. Every polling booth is having EVM setup and the voter casts his vote by validating the name available in a voter list. The possibility of fake voting might be occur due to a dummy identity proof. Irrespective of all authentication process, it also becomes difficult to identify the voter who are voting for more than one time. So a need is to create a secure, authentic, robust and sustainable system which overcomes all the limitations of existing system.

A new software application will be linked to the database of the main server. Where in the database voters AADHAR details are stored. With the help of these details it would be possible to detect the identity of a voter. This system will be solution for the problem of malpractices in traditional voting system. Also a person who is not living in his/her hometown where he has his voting registration will be able to vote without any difficulty with the help of his Aadhar number which would enable him to vote from any city or town. The main motto of our system is to overcome the limitations of the traditional voting system.

KEYWORDS: Voter, voting, EVM, Aadhar-number, biometrics.

I. INTRODUCTION

Nowadays, election plays a very important role in a democratic country. The election is a process for selection of a good candidate who will lead all the good thing. In democracy, people choose their leader by giving their vote. Recently, in India electronic voting system with EVM Machines is used. In this system the availability of the voter in the city during the time of voting is important. This is major drawback of electronic voting system. A voting system in which the voter can vote from anywhere is the solution to this problem. Each and every vote of the citizen is important. Due to many reasons the citizens is not able to vote, which reduces the voting count.

An effective voting system can bring a huge difference in the efficiency and count of the votes. A voting system should be hassle free, it should verify and authenticate the voter and lastly it should securely cast the vote without any malpractices. By observing the present voting system and the limitations faced by it, we have proposed a UID based voting system which will overcome all the limitations yet keeping the EVM at its place.

Thus in this paper, we are discussing about the existing system and proposed system with future scope of improvements.

II. HISTORY & BACKGROUND

Predecessors of online voting can be identified in the use of voting machines, which date back to the late 19th century in England and the US. The controversies surrounding online voting today are mirrored in the controversies surrounding this early use of voting machines. In the 1980s developments around the term teledemocracy made voting possible making use of TV sets via teletext.

The discussion about electronic voting picked up momentum in the early 1990s through the increasingly popular access to the internet and the rapid development of the World Wide Web. The USA and Switzerland, relying on their experience in direct democracy, voting machines and postal voting, were among the forerunners of developing online voting. Somewhat surprisingly, Estonia was the first country to employ online voting in national parliamentary elections in 2007. between, technology has established its place in society and continues to evolve faster than most of us can even believe.

By Implementing the AES encryption algorithms we are trying to overcome the difficulties which can occur in election time

In the traditional voting system the voter first has to register himself in the voter registration list by an authorized person. Now the voter can do the registration process by himself with the help of online registration. After the registration, the voter gets his voter ID. At the time of election the voter goes to the polling booth which comes under his area(ward number). The voter shows his/her voter ID to the authorized person at the polling booth. The authorized person checks his voter Id and checks for his name in the voter's list. After the verification is done and the voter is authorized to vote, he/she goes to the polling booth and casts the vote. But there are a few limitations that are observed in the traditional voting system. The limitations of the existing system are as follows:

1. Any person who looks similar to the voter can vote using the fake identity proof.

2. A voter has his name in multiple regions voter lists i.e Redundancy in voting
3. Distant voters do not come for voting.

I. Motivation for proposing a new system

Elections are important in any country. It has been observed that due to the limitations mentioned above, most of the citizens do not go for voting. It causes reduction of the count of voting as well as increases the number of malpractices in the voting system. Presently, the voting system works on EVM and for verification of the voter, voter Id is used. There is an observation that in this traditional method of voting system, a lot of fake identity of some other person and voting under his/her name, voting for more than once that is redundant voting and invalid voting takes place. Thus to overcome these challenges a new system is proposed which is, 'UID Based Biometric Voting System'. The main motivation behind proposing a UID based voting system is to enhance the vote count and reduce the level of malpractices in voting.

III .SYSTEM OVERVIEW

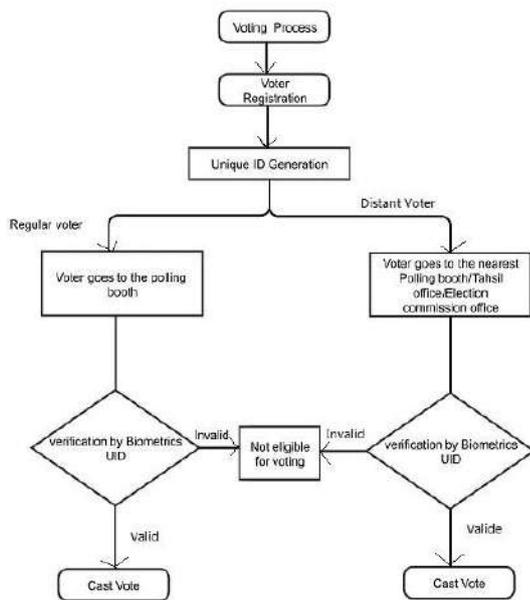


Fig 1. System Flow

.Technical specifications:-

1. UID - UID simply stands for user identification. A unique identification (UID) is a numeric or alphanumeric string

that is associated with a single entity within a given system. UIDs make it possible to address that entity, so that it can be accessed and interacted with. It is a way to establish a separate identity for all registered candidates. We are using UID to uniquely maintain the records of the voters and the candidates in the database.

2. Biometrics - Biometrics refers to technology used to detect and recognize human physical characteristics. There are several types of biometric authentication. Common examples include fingerprint scanning. Biometrics in our system is used to uniquely identify each and every voter. Just by giving a fingerprint it can be possible to verify the voter.

We are using Biometric in our system for the verification of the voter to avoid fake identity.

3. EVM – The EVM simply stands for Electronic Voting Machine. In technical terms it can also be defined as, A combination of mechanical, electromechanical, or electronic equipment that is used to define ballots; to cast and count votes; to report or display election results. EVM is used in the traditional voting system as well as it is used in our proposed UID based biometric voting system which is an extension to EVM (traditional voting system). EVM in our project is used for the purpose of voting and the functionality of it remains the same.

4. AES – For the voters who are not able to reach at his constituency or ward to cast the vote can go to nearest polling booth or at tehsil office (here the vote is casted online). For the secure online voting AES algorithm can be used. AES (Advanced Encryption Standard) is a U.S government encryption standard supported by the National Institute of Standards & Technology (NIST). AES is a cryptographic cipher that uses a block length of 128 bits and key lengths of 128, 192 or 256 bits.

We are using AES algorithm to secure the online voting.

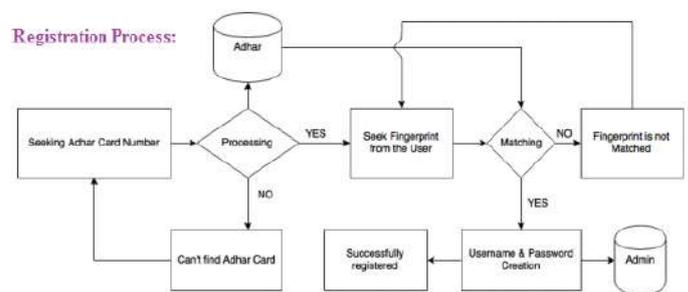


Fig 2. Voter Registration Process for online mode

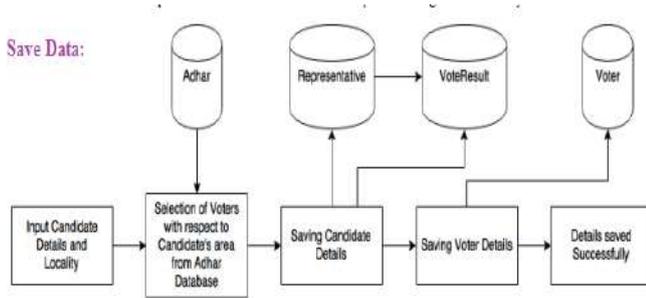


Fig 3. Voting Process for online mode

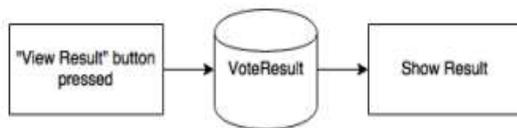


Fig.4. Declaring Result

A. Uploading voter Information

In the online voting system, all the information of each voter is added/ uploaded in main database of Election Commission of India according to AADHAAR Identity Number. This AADHAAR Identity number is unique for every citizen or voter of India. This AADHAAR Identity number has been introduced by government of India and this also recognizes the constituency of the voter. But the registration of the voter should be completed only after the verification of all documents by the field officer. The field officer also verifies AADHAAR Identity Number from the main AADHAAR card database. After completing verification, the registration of the voter should be complete and the voter will get auto generated e-mail which has all these information of the voter with the system generated password. The Voter can use this password for login and he/she can also change the system generated old password. Voter can also set the verification keys to ensure security. There should be restriction to use only virtual/on screen keyboard to type password or to change password. Main purpose of using virtual/on screen keyboard is to stop capturing password, if voter changes his/her password from some public place.

B. Voting from polling booth

When the voter stays in his constituency of voting, he can go to the respective polling booth for voting. He goes and his verification is done using biometrics. After verification, he proceeds with the voting by traditional method that is through

EVM (Electronic Voting Machine).

C. Voting where voter is present at his constituency

When the voter is not staying his constituency of voting, he/she can go to the nearest polling booth (if elections are held at that period) or he can go to the tehsil/ Election Commission office. The voter's verification is done through biometrics. After verification, he/she votes on a system secretly to his/her favourite candidate. And that vote is submitted in the main database. This voting is secured using security algorithms. We are using AES algorithm.

Considering the current voting system's limitations we have developed two methods of voting to solve the problem and to overcome the limitations. The first method simply works according to the following steps:

1. The voter registers himself through the election commission authorities using UID.
2. The system generates a username and password. This credential can be used for verification purpose.
3. Voter goes to the polling booth for casting a vote.
4. The authorised person authenticates him by taking his biometrics, thus verifying his identity and will also check if he has voted before.
5. The voter goes and casts his vote.

B. Voting where voter is not present at his constituency

The second method is provided for the distant voters. This system works according to the following steps:

1. The voter has to complete the registration process like any other regular voter.
2. At the day of voting the voter can go to the nearest polling booth or the election commission or tehsil office (in case the elections are being not conducted in the state or region where the voter is staying but his name appears in the voter list of other region).
3. The voter can get himself verified by giving his biometrics.
4. The voter can cast his vote online.

IV .CONCLUSION

Electronic Voting Machine (EVM) is the most powerful device in today's voting system. But to solidify it more, use of biometric fingerprint, various security algorithms and making the process easier for the voter is necessary. Hence, the voting system can be made much more powerful, if it is digitalized and made kiosk free.

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Hi-Tech Farm Pond Monitoring and Management System

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Abstract— The project one step take towards the Village Empowerment . The system can help to automate the farm Pond activities which will increase the income of farmer and one of the most important purpose of project is that to save the life of living that fall in farm pond like Human, animals, birds. The system can also help to regulates quality of pond water, which is necessary for farm activities to increase the crop production. The last module is that system can helps to provide water to crops as per the requirements.

Keywords— *Software Prototyping ,Microcontroller,Rain Drop Sensor, Moisture Sensor, Water Quality Moitoring GSM module ,Automatic Motor ON/OFF.*

I. INTRODUCTION

This project is one-step taken towards village empowerment. The system can helps to automate the farm pond activities, which will increase the farmer income and also serve the purpose to save the life (human, animals, garbage, etc.) fall in the farm pond. The system can also help to regulate the quality of pond water, which is necessary for farming activities to increase crop production. There are three modules in our system:

1. Security for Farm Pond
2. Management for crop production
3. Monitoring for water quality

This is fully automated system.It reduces manual work of farmers and helps to increase there crop production and income rate. Now a days farmers are operatingfarm pond manually which causing many man made mistakes, the water quality of farm pond is also not maintained due to some avoidable circumstances. Some applications of system are given below:

- 1.To increase the income of farmer income as per the crop Production.
- 2.It Regulates the quality of water for the crop Production.
- 3.It saves the life of living things like Human, Animals.

II. HISTORY AND BACKGROUND

Currently in India especially in Maharashtra state farmers are facing number of problems including, less crop production, bad quality of crops and irregular rain water which some time result in famers suicide. In such problems government of Maharashtra providing the support to farmers in many ways, such as providing the subsidy to farmers to dug a farm pond which will store the rain water and can be use during summer time where there is no/less water. A farm pond is a large hole dug out in the earth, usually square or rectangular in shape, which harvests rainwater and stores it for future use.[1] But, due to manual operation of farm pond has many disadvantages, such as, less quality and quantity crop production, less farmer income, water containment, human/animal causalities. The purpose of our project is to automate the farm pond and farming activities in order to increase crop quality and quantity, to maintain water quality and to save human/animal life.[1] Author Peng Jiang et al. has proposed "Design of a Water Environment Monitoring System Based on Wireless Sensor Networks". A water environmental monitoring system based on a wireless sensor network is proposed. It consists of three parts: data monitoring nodes, data base station and remote monitoring center. This system is suitable for the complex and large-scale water environment monitoring, such as for reservoirs, lakes, rivers, swamps, and shallow or deep groundwaters. This paper is devoted to the explanation and illustrationfor our new water environment monitoring system design.[3] The system had successfully accomplished the online auto-monitoring of the water temperature and pH value environment of an artificial lake. The system's measurement capacity ranges from 0 to 80 C for water temperature, with an accuracy of 0.5C; from 0 to 14 on pH value, with an accuracy of 0.05 pH units[4]. Sensors applicable to different water quality scenarios should be installed at the nodes to meet the monitoring demands for a variety of water environments and to obtain different parameters. The monitoring system thus promises broad applicability prospects. [2]Author SitiAsmah Daud et al. has proposed "Infrared Sensor Rig in Detecting

Various Object Shapes" This paper describes the application of infrared sensor installed in a sensor rig to measure the distance of the object located at the centre of the plate.[5] Data received by the sensor rig that is fully controlled by Arduino as a microcontroller, is then saved in a text file using CoolTerm terminal application. Post processing of the data is fully run using the Matlab software to reconstruct the image from the data obtained by infrared sensor.[2] Most of the objects used throughout this research are polygon shapes such as cylinder, rectangle, hemisphere, oval, trefoil, and curvilinear. The sensitivity of the infrared sensor used during the experiment should be considered in order to obtain accurate result and reduce the noise during the data captured process.[1] The closest distance of infrared sensor from the measured object is set into 5 cm. Results show that this sensor is capable to detect any changes in distance measurement and image from the object can be reconstructed.

III .DESIGN ISSUES

Mathematical Model

Input: Collecting input from sensors and GSM Module.
 Output: Execution of appropriate Alert Message and Level Of Water .

Functions : Verification of Water Level ,Moisture Level, Identify the object.

S = (I,O,F)

Where S : System

I = D1, D2 are set of Input

Where, D1,D2 : Data from sensors and GSM Module

F = ML, WL, WQ, OD are set of functions

ML: Moisture Level

WL: Water Level

WQ: Water Qual

OD: Object Detection

O=AM, RM are set of output

AM : Alert Message

RM: Rain Message

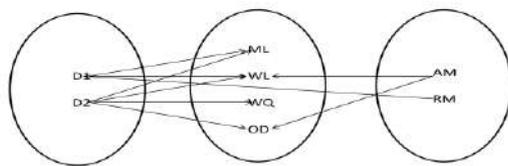


Fig. 1. A (if any). Venn Daigram

Farming mostly depends on rain water which is irregular.Human and animal causalities in unsecure manually operated farm pond.

Irregular electricity supply and mostly available at night hours in villages. Bad or not suitable water quality decreases the crop production.And many more problems....

In such problems government of Maharashtra providing the support to farmers in many ways, such as providing the subsidy to farmers to dug a farm pond which will store the rain water and can be use during summer time where there is no/less water.A farm pond is a large hole dug out in the earth, usually square or rectangular in shape, which harvests rainwater and stores it for future use.But, due to manual operation of farm pond has many disadvantages, such as, less quality and quantity crop production, less farmer income, water containment, human/animal causalities.The purpose of our project is to automate the farm pond and farming activities in order to increase crop quality and quantity, to maintain water quality and to save human/animal life.

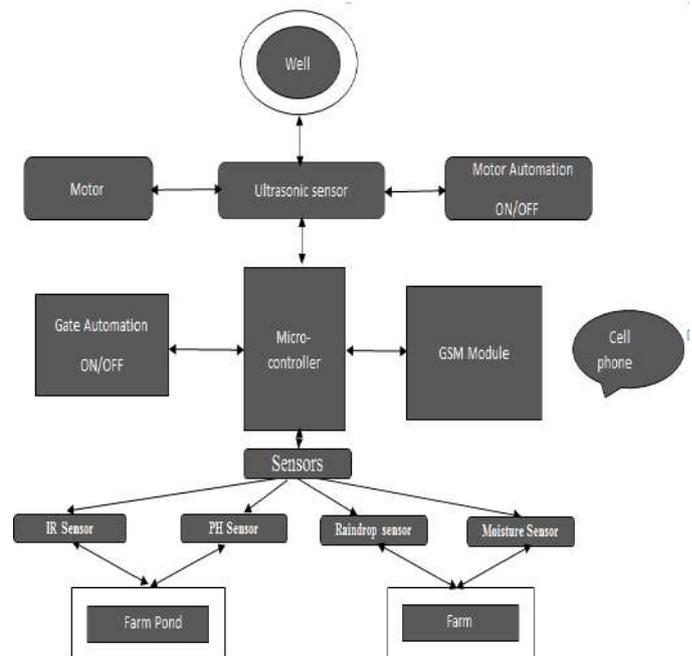


Fig.2. System Architecture

Basically there are three model in our system Security, Monitoring and Management which covers all farming activity

1. Security Model: IR sensor is used to detect object fall in farm pond and alert the concern user by alert SMS on mobile. The farm pond gate is operated by passcode system and which get closed automatically after 10 sec.

2. Monitoring Model: This module will help to regulate the water quality by using PH sensor. The moisture sensor will detect the moisture percentage of soil. As to produce good quality and quantity crop it requires specific moisture level.

3. Management Model: This module will monitor the water level of well. If well water level goes down below the set threshold level then system will start water motor in the farm pond to fill the well. The system also fulfills the requirement of the crops which require regulated water supply by detecting the rainfall to take necessary action by farmer.

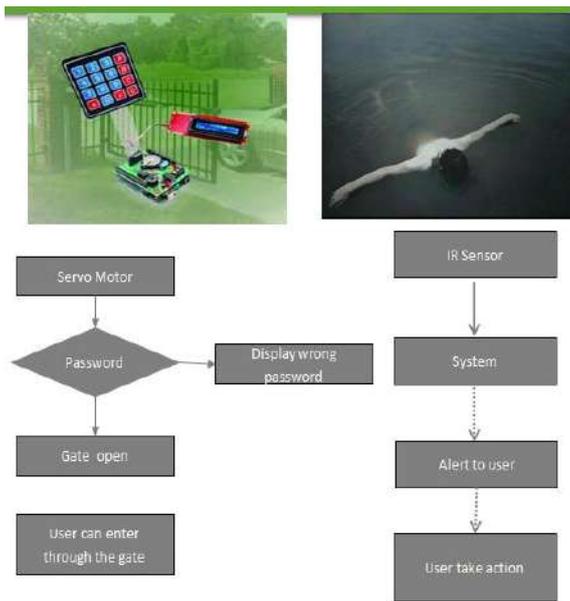


Fig. Security module

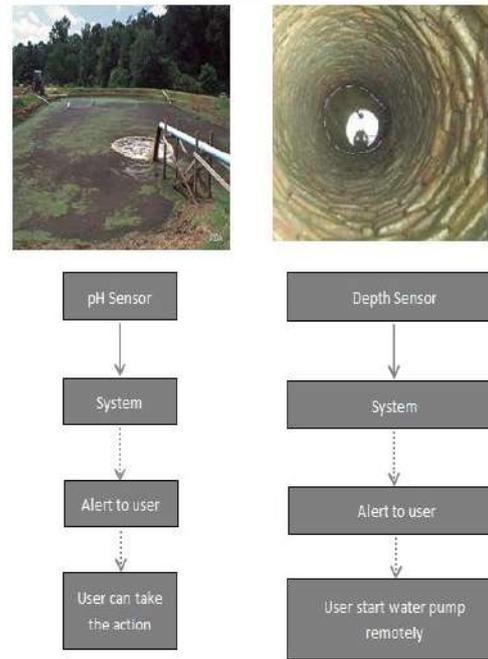


Fig: Monitoring Model

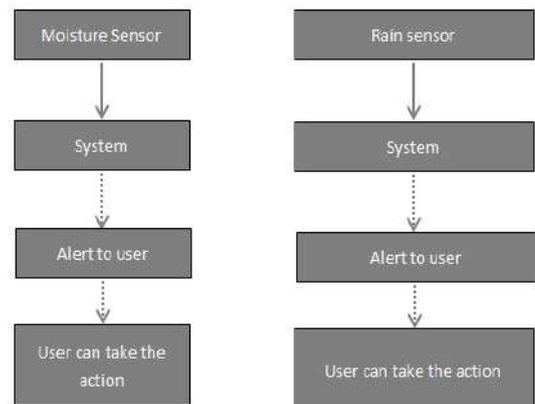


Fig: Management Model

IV RESULT AND ANALYSIS

Before we start developing this project, we collected some information. From the collected information we have two

graphs. Following graph shows the number of vehicles jumps the red signal in every month.

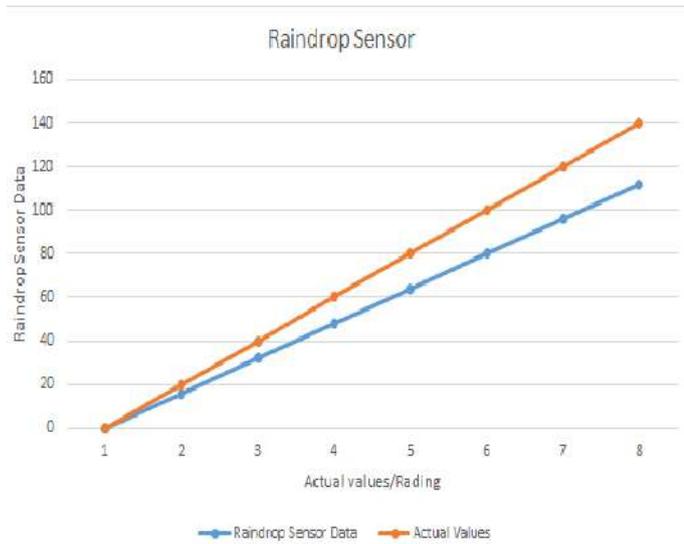


Fig.3. Detecting the level of rain water(rain drop sensor)

The above figure which describe the rain water level which gives the rain warning to the user

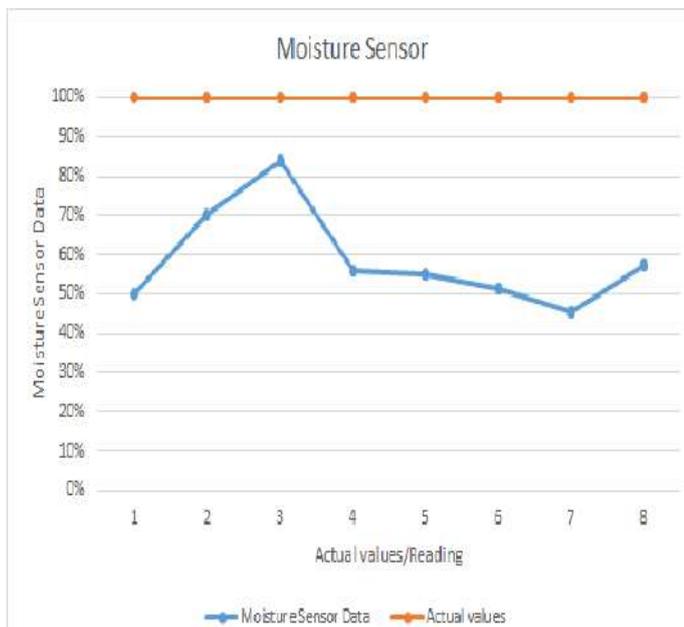


Fig.4. Moisture Level(Soil Moisture sensor)

The above fig which shows the how much amount water present in the soil and gives moisture percentage

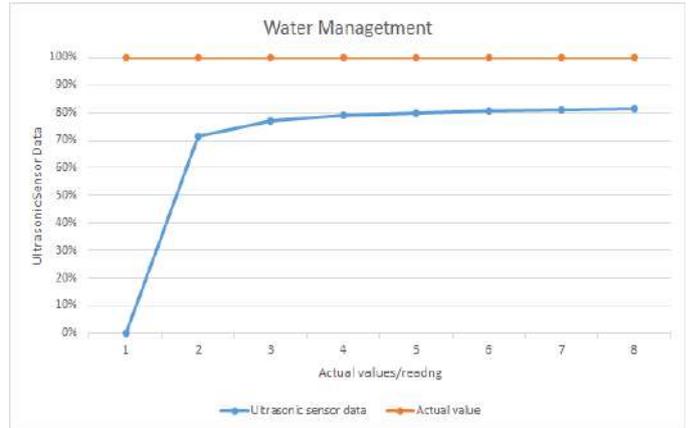


Fig.5. Water level of well(ultrasonic sensor)

The above fig which shows the water level of well when it goes down the below particular frequency

We are developing the wireless system using solar panel ,we use the different sensor to make the system affordable to the user. We are going to built a mobile application (Android app)for this system.This application will also implemented for fish pond.There will be a wireless Connection for the sensors This system will work on microcontroller board like arduino, GSM Module, etc. The programming for overall system is developed with the help of Arduino software which is based on C/C++ language.

V . CONCLUSION

Thus we concluded our project is one step towards Village Empowerment and which will solves many problems of farmers if implemented in real time. By the use of the system the income of the farmer get increased as farmer can able to use available water e_ectively to do the farming. In this way if all Engineering Students think about new innovation ideas towards the Nation to reduce the poverty and suicide attempts of farmers.

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Sentiment Analysis for Business Intelligence Buildup

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Abstract— Ubiquitous presence of internet, advent of web has made social media tools like blogs, Facebook, Twitter very popular and effective. People interact with each other, share their ideas, opinions, interests and personal information. These user comments are used for finding the sentiments and also add financial, commercial and social values. However, due to the enormous amount of user generated data, it is an expensive process to analyze the data manually. Increase in activity of opinion mining and sentiment analysis, challenges are getting added every day. There is a need for automated analysis techniques to extract sentiments and opinions conveyed in the user comments. Sentiment analysis, also known as opinion mining is the computational study of sentiments and opinions conveyed in natural language for the purpose of decision making.

Keywords: Machine learning; opinion mining; sentiment analysis; sentiment classification.

I. INTRODUCTION

Due to the huge growth of social media on the web, opinions extracted in these media are used by individuals and organizations for decision making. Each site contains a large amount of opinioned text which makes it challenging for the user to read and extract information [1]. This problem can be overcome by using sentiment analysis techniques. The main objective of sentiment analysis is to mine sentiments and opinions expressed in the user generated reviews and classifying it into different polarities. The output is the data annotated with sentiment labels. Machine learning techniques are widely used for the classification of sentiment.

II. HISTORY & BACKGROUND

This system presents an approach to opinion mining, where the product opinions are mined from the Website and analyzed using natural language processing techniques. Opinions are classified into positive and negative sentiments by the algorithm, while feature opinions and context are considered as well. Twitter and social media have gained popularity in sentiment analysis in previous years. Top three papers emphasize on working with Twitter data. present a method for automatic collecting of a corpus from microblogs and use it to build a sentiment classifier. In this instance, the corpus is retrieved from Twitter. The authors claim that the approach can be adapted to multiple languages, but in their work, it is only used with the English language. After examining around 100,000 tweets from Twitter as a prediction for election results. They conclude that the proportion of mentions of parties and distinguished politicians mirror the election results quite closely, but having less accuracy than opinion polls. Another attention-grabbing finding was that 40% of the messages were denoted by the 4% of the users. Knowledge from Twitter has additionally been accustomed gauge popular opinion in statistics. whereas the correlation between sentiment activity and poll knowledge varies across completely different knowledge sets, the broad trends are captured by the sentiment analysis.

III.MATHEMATICAL MODEL

MATH OR EQUATION

– Input: Set of Hashtags or Tweets

– Output: Sentiment Analysis

– Let S is the system for Tweets

$$S=(I,O,F)$$

Where,
S= System

$$I =\{H,C\}$$
 set of INPUTS

Where
H = Hashtags created by organization

C = Comments by users

$$F=\{CL,T,S\}$$
 are set of function

Where,
CL= classification of tweets
T= Text mining
S= Summarization of tweets

O= {G,A} set of output
G= graph of tweets
A= analysis of tweets

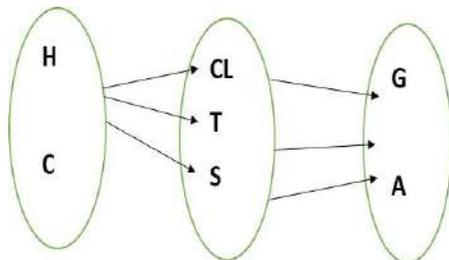


Fig: venn diagram

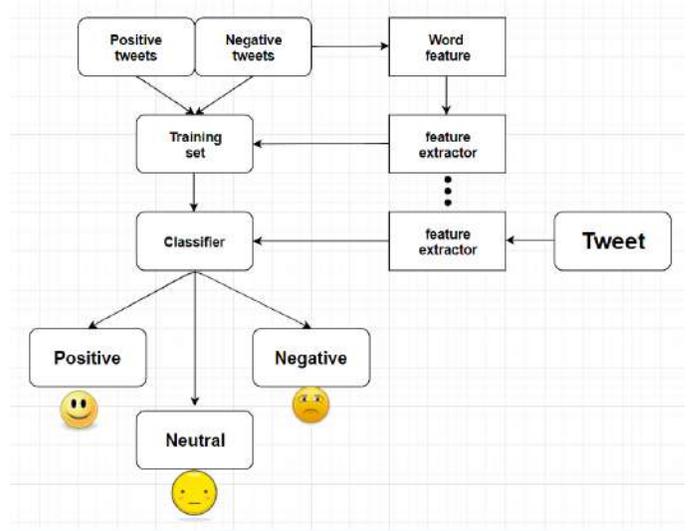


Fig. 3. A (Architecture diagram).

User will open the application and create an account, after creating account user will enter hashtag for which he need the analysis. Then the system will extract the data from twitter database and store the review of that hashtag in mongodb database.From there it will extract the features of every tweet and give it as input with the training data to naïve bayes algorithm. After that the hashtag will be classified.

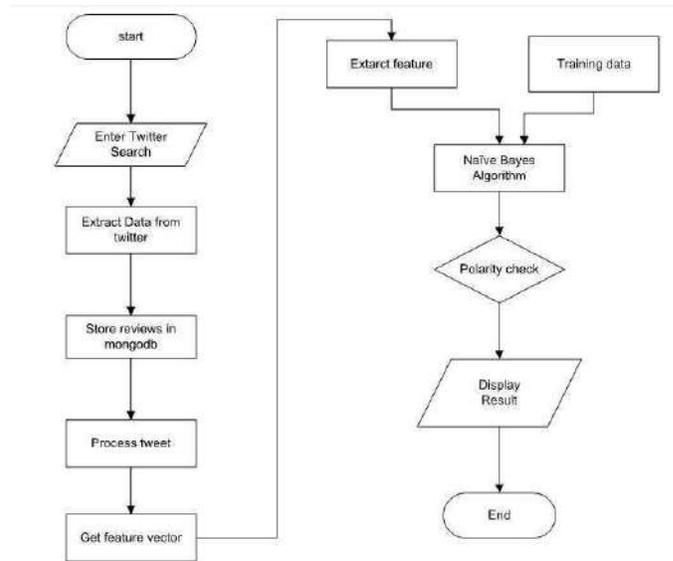


Fig: Flow Chart

IV. RESULT AND ANALYSIS

We collected dataset containing positive and negative data. That knowledge was trained data and was classified using the Naïve Bayes Classifier algorithm. Before training the classifier unnecessary words, punctuations, meaningless word was cleaned to get pure data. To determine the positive and negative feature of tweets we collected data using twitter API. Those data held on the database and then retrieved back to get rid of those redundant words and punctuations for pure data.

V. CONCLUSION

The Proposed Sentiment analysis based system is of tremendous use to the people and industries which are based on sentiment analysis. For example, Sales Marketing, Product Marketing etc. in this system, the tweets are not stored which is cost-effective as no storage space is needed. Also, all the analysis is done on tweets real-time. So the user is assured that, getting new and relevant results.

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Review: Forest Fire And Notification System

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Abstract— Forest fires generally occur in wild areas due to human carelessness and change in an environment. They cause the environment and may result in human and wild animal's deaths. So that, forest fires must be detected early to prevent greater damages. There are many existing system like Satellite Systems, CCD CAMERAS, wired system and Bluetooth technology Perhaps these systems provides a complete image of the earth but after a long scan period .This is not much accurate method because it prevents fire detection just at a time, the fire starts. Compared with the traditional methods of forest fire detection, a wireless sensor network was proposed. WSN's are used for various applications such as habitat monitoring, automation, agriculture, and security. This article presents the design of a system for detection of temperature and humidity and smoke to prevent a disaster (forest fire) that could lead to loss of a significant number of natural threads. In this project, several tests had been conducted in order to prove the viability of the system.

Keywords— Forestfire, Monitoring, Detection, Wireless Sensor Network, Forests, GSM, Arduino

I. INTRODUCTION

Wildfire is a kind of fire that occurs in the forests or reserved national parks. It starts as small fire but eventually turns into a huge fire due to some favorable con-ditions such as presence of dry trees and grasses as well as strong winds in the forests. The outcome may be due to failure of responsible authorities of getting early information about fire as soon as it starts so that they could be able to control before it turns into a huge fire. Human activities like clearing field for cultivation, charcoal burning or smoking can cause wildfire to occur. Broken glasses can be another source of wildfire because sometimes they can act as collective lens focusing sun light on a smallspot for a length of time, a condition that could trigger fire.Economic activities such as tourism can be affected in a negative way by wildfires due to damages it causes to the

vegetation of ecosystems. Wildfires are a constant threat to ecological systems of forests and human safety especially in regions which present hot climate. Just like other countries, Tanzania is affected by wildfires each year causing deaths of people and wild animals as well as damage to valuable infrastructures leading to loss of some valuable plants and animal species. According to the reported analysis of 2012 for Tanzania using MODIS (Moderate Resolution Imaging Spectroradiometer), in average Tanzania loses over 11 million hectares offorests and woodlands each year (ranging between 8.5 and 12.9 million hectares) This is equivalent to about 9% - 14% of Tanzania's total land area. In another study conducted in Tanzania by Finnish government in collaboration with Tanzania'sgovernment funded by FAO (Food and Agriculture Organization), it points out that between the year 2000 and 2012 there have been over 900,000 cases of wildfire detected by satellite with the number of fires occurring each year reasonably consistent . forest monitoring and wildland early fire detection system by a hierarchical wireless sensor network was reported. The research work adopts a standard wireless sensor network approach using two levels for the nodes, central nodes and sensor nodes, and some optimization techniques to minimize power requirements. During network deployment, each sensor would record its delocalization based on GPS (Global Positioning System) information. Sensor nodes capture data from the environment that are uploaded to the central nodes, which transfer all the information to the system middleware. The transfer of sensor data from the central node to the middleware for this system is in terms of packets, so for it to function there has to be internet coverage which is a disadvantage if the system has to be implemented in Tanzania due to unreliable nature of internet services in forests and remote areas. Also to realize the full potential of the system it has to be integrated with all key players in firefighting operations such as fire brigades, communication systems, and aerial, coordination, and land means so the cost of implementation is high.

II. LITERATURE SURVEY

Forest is considered as one of the most important and indispensable resource, furthermore, as the protector of the Earth's ecological balance. However, forest fire, affected by some human uncontrolled behaviour in social activities and abnormal natural factors, occurs occasionally. Forest fire was considered as one of the severest disasters.

In forest fire detection, it is essential to know how fire affects the soil mantle, stems and treetops, as well as how to detect underground fires. The sensor network must cover large areas, distributing high amount of sensing nodes, inexpensive sensors are needed to achieve cost reduction. Video cameras sensitive in visible spectrum based on smoke recognition during the day and fire flame recognition during the night, Infrared thermal imaging cameras based on detection of heat flux from the fire, IR spectrometer which identifies the spectral characteristics of smoke gases, and "Light detection and ranging" system which measures laser light backscattered by smoke particles. Infrared and laser-based systems have higher accuracy than the other systems. Generally if the infrared level exceeds a predetermined threshold, an alarm is sent; but this methodology has some drawbacks that affect detection capability and reliability. Detection capabilities is negatively influenced by the fact that often fires are not directly visible from the sensor because during the first phases they grow up in the underbrush and are occluded from the vegetation. On the other hand the smoke (water vapour plus carbon monoxide), copiously produced during the wood drying process, is perfectly transparent in the infrared region (3-7 μm) so it cannot be detected by means of IR sensors. To become directly IR-visible, generally a fire must be at the tree top, so that when it can be detected is already widely extended from the fire starting instant.

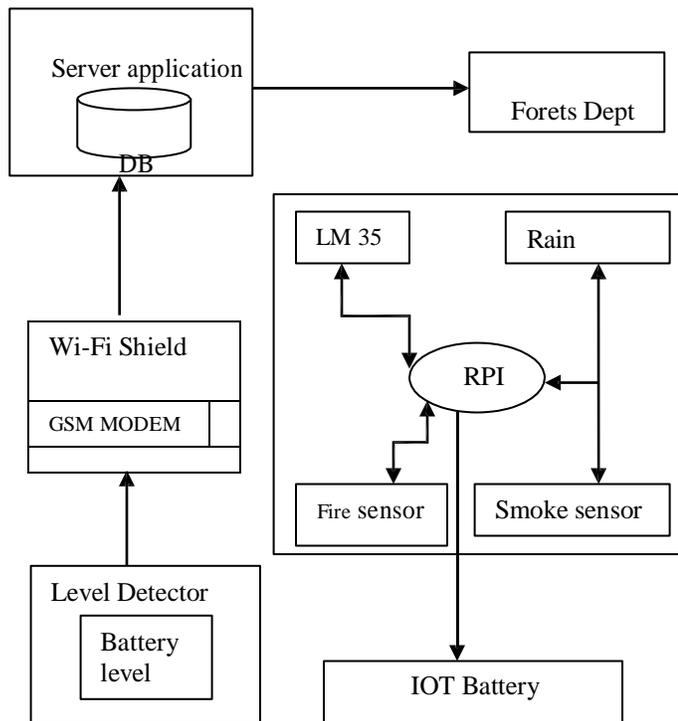
Handling uncertainty due to data aggregation and missing information requires space-time synthesis in rigorous formalism. Information granulation is at the heart of rough set theory. Rough set theory offers an attribute reduction algorithm and the dependency metric for feature selection. Meteorological data and images are parameters that change over space and time with relatively high frequency. The change of meteorological data could be recognized in hour scale, and the change of image data, taking into account only information connected to forest fires, in minute scale. Also for the forest fire prediction system, meteorological data history (archive values) is quite important. In order to monitor meteorological parameters and collect images in real time, the sensory network has to be established.

The most critical issue in a forest fire detection system is immediate response in order to minimize the scale of the

disaster. This requires constant surveillance of the forest area. Current medium and large-scale fire surveillance systems do not accomplish timely detection due to low resolution and long period of scan. Therefore, there is a need for a scalable solution that can provide real-time fire detection with high accuracy. We believe that wireless sensor networks can potentially provide such solution. Recent advances in sensor networks support our belief that they make a promising framework for building near real time forest fire detection systems. Currently, sensing modules can sense a variety of phenomena including temperature, relative humidity, and smoke which are all helpful for fire detection systems

III. SYSTEM ARCHITECTURE

The proposed system consist of two modules viz. IoT sensor node and web application deployed in the central location. The IoT sensor node is designed and integrated with Raspberry Pi. Here all the sensors are integrated with the Raspberry PI. The proposed architecture of Forest fire detection is shown in the Fig 1. The various steps of proposed work are explained in this subsection. The first step of forest fire detection is, before the fire starts ignited it monitor the temperature level of the battery and the sensors integrated in the Raspberry pi such as Temperature sensor, Smoke sensor, Fire sensor, Rain sensor. If there is any raise in temperature or it reaches above the threshold value it push the notification SMS to the forest department. Simultaneously it can be detected by using the various sensors such as rain, fire, smoke. If there are any such natural calamities like lightning, burning waste material sensors integrated in the Raspberry PI detects and sends signal to the Wi Fi inbuilt shield of GSM modem. The signals from the Raspberry PI are not directly send to the GSM modem it converts into Analog to Digital and then it sends into the GSM modem from which the signals are processed. And then send information to the admin if there is a high increase of temperature. With the help of temperature sensor it detects and sends the signal to the admin. According to sensor behavior all the Detected signals are sent to the forest department admin. Signals from the GSM modem are Processed and sent in to the server side application. Then in the second step of forest fire detection. By using IoT battery we can calculate how long the sensor battery will sustain. To monitor IoT battery there is a component called battery level indicator, by using this we can detect the battery life time of the sensors. If the battery level goes down it push the notification to the forest department. Finally all the sensor related values are stored in Database server for future purpose so that Forest department admin can login and can retrieve the details regarding forest fire. So that they can ensure the sensor values that to be set as a threshold hold value for a future purpose.



V. CONCLUSION

In this work the system is designed and evaluated for its effectiveness as well as scalability due to the improvement of sensor technology. In this work, the latest technology can help to reduce catastrophic accidents caused due to fire. With the improvement of IoT sensor technology, the system is more efficient and useful.

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Smart Helmet

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Abstract: The main cause of death in two-wheeler drivers is over-speeding, drunken driving and careless driving. Numerous lives might be saved if emergency medical service might get accident info and reach in time to the scene.

To resolve these current issues we are developing a helmet which gives best solution. These main issues motivate us for developing this project. The objective of our project is to design a low-cost intelligent helmet that is capable of identifying alcohol consumption and preventing road accidents. The main purpose of this smart helmet is to provide safety for rider. This is implemented by using advance features like alcohol detection, accident identification, location tracking, and fall detection. In our project, its compulsory to wear helmet, without helmet ignition switch cannot turn ON. If rider is drunk or if accident takes place, then automatically ignition switch is locked, and a message will be send automatically to their registered number with their current location. One more objective is to reduce the fatality of the accidents by sending a message to the riders' relative about the accident.

Keywords: Smart Helmet, Alcohol Detection, IoT, GPS, Sensors, Accidents Prevention, Message, Bikers

I. INTRODUCTION

Traffic accidents in India have increased year by year. As per Section 129 of Motor Vehicles Act, 1988 makes it required for every single riding a two-wheeler to wear protective headgear to follow the standards of the BIS (Bureau of Indian Standards). In India drunken drive case is a criminal offense of The Motor Vehicle act 1939, which states that the bike rider will get punished. In existence bike rider easily gets escaped from law.

Close to one fourth of the deaths concerned in accidents square measure motorcyclists. The main cause of death in two-wheeler drivers is over-speeding, drunken driving and careless driving. Various lives could have been saved if the emergency medical service could get accident information and reach in time to the accident scene. To resolve these current issues we are developing a helmet which gives best solution. Most of the countries are forcing the motorists to wear a helmet, however rules are being violated by uncivilized citizens. Thus the target of this project is to wear helmets then ride bikes. Another objective is to make sure that the rider isn't drunk. The rider won't be ready to ride the bike if he's drunk.

II. LITERATURE SURVEY

The primary goal of a motorcycle helmet is to protect the rider's head during impact, thus preventing or reducing head injury and saving the rider's life. Some helmets offer further conveniences, such as ventilation, face shields, ear protection, etc. Motorcyclists are at a very high risk in traffic crashes. A 2008 systematic review examined studies on bike riders United Nations agency had crashed Associate in Nursing checked out helmet use as an intervention. The review ended that helmets scale back the chance of head injury by around sixty nine and death by around forty second.

Although it absolutely was once speculated that carrying a bike helmet accrued neck and spinal injuries in an exceedingly crash, recent evidence has shown the opposite to be the case, that helmets defend against cervical spine injury, which Associate in Nursing often-cited little study chemical analysis to the mid-1980's, used blemished applied math reasoning.

According to the Research paper in 2015 titled 'Micro-controller based smart wear for driver safety', author has discussed on the speed of the vehicle. In this application the project will be monitoring the areas in which the vehicle will be passing. On entering any cautionary areas like schools, hospitals, etc. the speed of the vehicle will be controlled to a predefined limit. LCD screen is used for showing the numerous types of messages after wearing the helmet. The author has worked only on the concept of accident which is generally happens due to drunk and drive. But as we know that the accident in the area is not happens only due to consuming alcohol but also other parameters like speed are also responsible. According to the Research paper in 2016 titled 'Smart Helmet', the main objective of author is to force the rider to wear the helmet. In this competitive world one of the survey says that the death trolls due to motor bike accidents are increasing day by day out of which most of these casualties occurs because of the absence of helmet. Traffic police cannot cover remote roads of city. That's why over primary objective is to make the usage of the helmet for two wheelers" compulsory". Thus, no one other than the owner himself, who doesn't have the password which is created by the owner, can use the bike. In this author has proposed the feature that the bike will not start unless the bike rider does not wear the helmet. The other this module basically deals with the check-sum of rider if he is wearing the helmet or not on first place to achieve this ultrasonic sensor is been used. Based on this the signal are been sent to the next module voice recognition module use for authentication purpose of helmet. Traffic police cannot cover remote roads of city. That's why over primary objective

is to make the usage of the helmet for two wheelers “compulsory. Thus, no one other than the owner himself, who doesn’t have the password which is created by the owner, can use the bike. In this author has proposed the feature that the bike will not start unless the bike rider does not wear the helmet .The other this module basically deals with the check-sum of rider if he is wearing the helmet or not on first place to achieve this ultrasonic sensor is been used .based on this the signal are been sent to the next module voice recognition module use for authentication purpose.

III . MATHEMATICAL MODEL

Input: Bike Start, Left or right turn, Accident, Vehicle Stolen
Output: Ignition stop, Led indications, Message to the registered number, GPS Tracker
Functions :Helmet Detection, Turn and break signals, Alcohol Detection
S=(I,O,F)
Input:\{I1,I2,I3,.....In\}
Output:\{O1,O2,O3.....On\}
Functions : \{F1,F2,F3.....Fn \}
Success Conditions: Vehicle started successfully
Failure Conditions: Ignition stop.

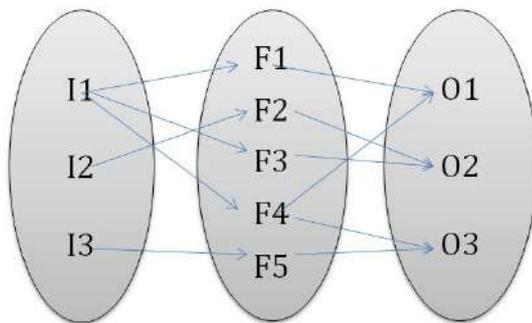


Fig. Venn Diagram

I. IMPLEMENTATION DETAILS

The WeMos D1 is a ESP8266 Wi-Fi based board that uses the Arduino layout with an operating voltage of 3.3V. The Wemos D1 appears like the conventional Arduino board with an equivalent pin layout because the Uno, which implies all of the shields which may be used with the Arduino Uno, can connect seamlessly with the Wemos D1.

While the association is one issue, the shields should have matching libraries is working with the esp8266 platform therefore on be ready to establish simple communication between the Wemos and the shield.

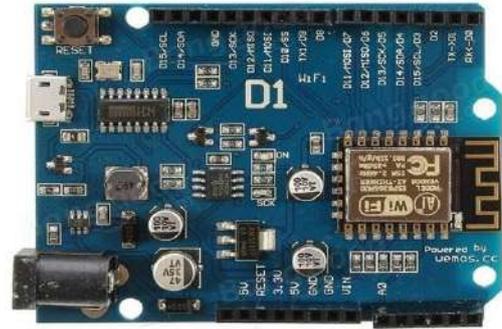


Fig. Micro-controller (WeMos D1)

Alcohol Sensor (MQ-3) will be used to detect if the person is drunk and the bike will not start in such case.

An alcohol detector detects the attentiveness of alcohol gas within the air and an analog voltage is an output reading. The detector will activate at temperatures starting from -10 to 50° C with an influence offer is a smaller amount than 150 Ma to 5V. The sensing vary is from zero.04 mg/L to 4 mg/L, which is suitable for breathalyzers.



Fig. MQ-3(Alcohol) Sensor

HC-SR04 Ultrasonic (US) sensor is a 4 pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This detector may be an extremely popular detector utilized in several applications wherever measurement distance or sensing objects are needed. The module has 2 eyes like comes within the front that forms the inaudible transmitter and Receiver.



Fig. Ultrasonic Sensor

A **vibration detector** or electricity detector may be a device that uses the piezo effect, to measure the changes in pressure, acceleration, temperature, strain, or force by converting them to an electrical charge. Piezoelectric sensors are versatile tools for the activity of varied processes. They are used for quality assurance, process control, and for research and development in many industries



Fig. Vibration Sensor

4-channel relay module 4-channel relay module may be a 5V 4-channel relay interface board, and each channel needs a 15-20mA driver current. It are often wont to management varied appliances and instrumentality with massive current. It is equipped with high-current relays that job below AC250V 10A or DC30V 10A. It has a regular interface that may be controlled directly by microcontroller.



Fig. 4 Channel Relay Module

IV . SYSTEM STRUCTURE

We are using micro-controller as Arduino Wemos D1 which is used for controlling all the functions of the overall system. This is connected to ultrasonic sensor, vibration sensor, alcohol sensor and 4 Channel Relay Module. The 4 Channel Relay Module is responsible to stop the bike if the person is not wearing the helmet. It detects the head by ultrasonic sensor.

Ultrasonic sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception. Alcohol sensor will be used to detect if the person is drunk and the bike will not start in such case.

An alcohol sensor detects the attentiveness of alcohol gas in the air and an analog voltage is an output reading. The sensor can activate at temperatures ranging from -10 to 50° C with a power supply is less than 150 Ma to 5V. The sensing vary is from zero.04 mg/L to 4 mg/L,

which is suitable for breathalyzers.

4 Channel Relay Module board is used to stop the bike in case of drunk and drive and if no helmet is detected, 4 Channel Relay Module board is used to interface any Micro-controller with Electrical Appliances/Loads.

Vibration sensors, also known as piezoelectric sensors, are versatile tools for the measurement of various processes. These sensors use the piezo effect, which measure changes in pressure, acceleration, temperature, strain or force by converting them to an electrical charge. A vibration sensing element can even be wont to verify aromas within the air by at the same time mensuration resonance and capacitance.

An android application will be built that shows the navigation and location tracking.

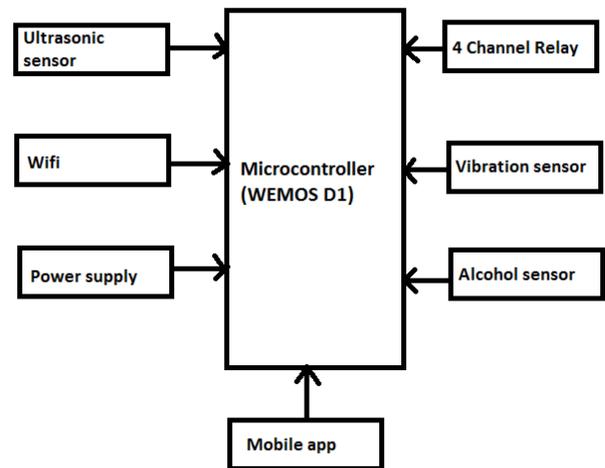


Fig. System Structure for Smart Helmet

I. FEASIBILITY CHECK

Technical Feasibility:

All the components that are required to make this project are easily available. For example: FSR Sensor, Bluetooth Sensor, Alcohol Sensor, etc. all are easily available and tested.

Economical Feasibility:

The project is economical feasible as instead of using microcontroller and other expensive hardware, we are using advanced GPS tracker that is economically feasible which makes our project cost effective.

Safety Feasibility:

Our project is built for safe riding and the project is embedded in the helmet thus if any of the functions fail to work, it won't harm any human life but will work as simple helmet which acts as safety instrument for the rider.

V . RESULT AND ANALYSIS

By implementing this system a safe 2 wheeler journey is feasible which might decrease the top injuries throughout accidents caused

from the absence of helmet and in addition cut back the accident rate. This system is extremely effective for the security purpose of the user. The outcome of project says that the bike ignition will start if the helmet is worn.

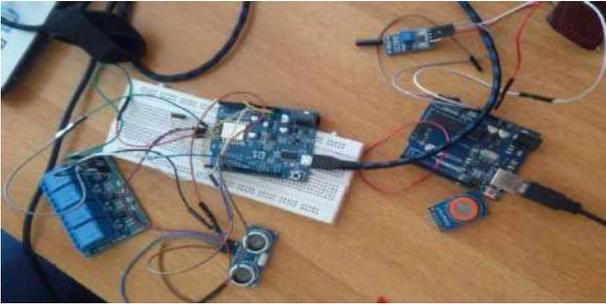


Fig. Proposed System

VI. CONCLUSION

This will decrease the impact from accident and it will avoid bike from stealing. User has to wear helmet to ride two wheeler vehicle and hence traffic rules will be followed with this. This system is under pocket control i.e. Ride 2 wheeler vehicle having safety in hand and in budget conjointly. Easy functioning to operate this system. It provides a better security to the biker. The project are often increased by adding Google Glass Technology. Through this technology, biker can see the upcoming road before reaching that particular place. It will stop biker from pits and pitiful condition of roads. Also, biker will see navigation on that and may alert him whereas taking sharp turns. Further, it can be implemented on cars also. People will use seat belt to begin ignition of automobile which might enhance the security of the motive force.

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Car Security System – A Review

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without the utilization of keys by utilizing an innovation called AFIS(Automatic Fingerprint Recognition System).

Abstract— In this current world where technology is growing up day by day and scientific researchers are presenting new era of discoveries, the need for security is also increasing in all areas. At present, the vehicle usage is basic necessity for everyone. Simultaneously, protecting the vehicle against theft is also very important. The main goal of this paper is to study how to protect the vehicle from any unauthorized access, using fast, easy-to-use, clear, reliable and economical methods. If the person is certified, vehicle access is allowed. This paper involves techniques like using alarms, SAM, GSM, GPS modules etc. This vehicle security system intimates the status of the vehicle to the authoritative person. This paper highlights the advantages of internet of things and shows how it can be used for realizing smart car security.

Keywords— SAM, GSM, GPS, unauthorized, economical

I. INTRODUCTION

Vehicles have been utilized in one form or other since the innovation of wheel. With the creation of wheel, came in the second most cutting edge innovation, The Steam Engine. With the improvement of steam motor vehicle appeared as what we see today. In prior occasions wrench shaft system were utilized to touch off the vehicles. Abandoning that ordinary technique came in the idea of touching off the vehicles utilizing key. What's more, now, Keys are being supplanted by Push begin catches. This undertaking was begun with the sole reason for killing keys as ordinary technique for beginning the vehicle. The four noteworthy techniques utilized in Biometrics are: Palm, Fingerprint, Iris, Voice, Face and so on. There are numerous more techniques, however these four are the most imperative. Biometrics are utilized in Schools, Banks, Colleges, and Universities and so on. One of the developing enterprises is the car business. One of the main organizations to present unique finger impression acknowledgment in autos was Mercedes, which was then trailed by Volkswagen. Yet, now a days all the auto producers are executing Biometric based security. Unique finger impression sensors are very shoddy in contrast with other Biometric sensors. Furthermore, they are moderately simpler to keep up too. The purpose behind going into primary reason for this task. First being the disposing of the

utilization of key totally to light the vehicle. Moreover even the section into the automobiles should be possible

II. HISTORY & BACKGROUND

A. An Embedded Fingerprint Authentication System

Author: Alilla, A.; Faccio, M.; Vali, T.; Marotta, G.; DeSantis, L.

An automatic fingerprint authentication system is based on Field Programmable Gate Array (FPGA).[4]

The system is able to process a fingerprint image in less than 1 second.

Working of system works on 2 stages :

1. Enroll Stage

In this stage the user's fingerprint characteristics are measured and stored as a template in the database

2. Authentication Stage

In this stage the user's fingerprint characteristics are measured again and stored as a template in the database . Finally the system outputs the authentication result.[3]

B. Fingerprint Recognition based Access Controlling System For Automobiles

Author: Zhaoxia Zhu , Fulong Chen

Traditional identifying system of automobiles includes key system, door controlling system, UHF, alarm system. Biometric recognition technologies can overcome this shortcoming. As an Automatic Fingerprint Identification System (AFIS), fingerprint recognition-based access control system of automobiles, in which fingerprint encryption technique is utilized, has some advantages such as smartness, security, low power, low cost, etc. Embedded systems can be defined as information processing systems embedded into these enclosing products.[7]

The whole process of fingerprint recognition is based on

- Acquirement of fingerprint
- Fingerprint Processing
- Saving of fingerprint minutiae
- Fingerprints matching

1) Acquirement of fingerprint

The quality of fingerprint is important . In AFIS , fingerprint image sensors include optics sensor , silicon crystal sensor and ultrasonic sensor.

2) Fingerprint Processing

After acquiring the fingerprint , the image has to be enhanced .The recommended technique to enhance the image of fingerprint is the wavelet-based method .

3) Saving of fingerprint minutiae

In this step the user's ID data is initially acquired, assessed processed and stored in the form of Template .

4) Fingerprint matching

The matching process involves the comparison of a verification template , created when the user provides the fingerprint with the template stored in the database at the time of registration in the system .If the templates match then the user is authorized , if not then the user is not given access to the system. This technique has some advantages like smartness , security , low cost .[5]

C. Study of Biometric Approach for Vehicle Security System Using Fingerprint Recognition.

Author: N. Kiruthiga and L. Latha

The framework is actualized utilizing inserted framework alongside Global System for Mobile (GSM) and Fingerprint Recognition. The primary part (BRAIN) of the security framework is PIC (Peripheral Interface Controller) microcontroller and screens and creates the sources of info and yields individually and yield of the framework will be shown on LCD of SMS entry status also, arrangement and so on.[15] The security framework component contains two modes: first, if the framework is dynamic and an unapproved individual endeavors to turn on the vehicle, at that point ready message will be sent to the enrolled client in framework and vehicle will be in OFF condition. In second mode, approved individual can will be verified and given access. This paper exhibited the execution investigation for unique mark biometric. It presents clear favorable circumstances over secret key and token-based security. Proper LCD show is acquired through programming and LCD interface outline. Absolutely three preliminaries will be given to the client and if the sweep matches access will be given. Else if interloper is utilizing and three preliminaries are fizzled at that point ready message will be sent to the proprietor's vehicle. On get SMS from proprietor; the disturbing framework will be enacted. If there should be an occurrence of system mistake on the proprietor position, the second alarm message might be sent to close-by police headquarters.[20][15]

D. Car surveillance Security System

Author: Aleesha Susan Jacob, Vandita Chaurasiya, Vagmayee Sharda, Shubhra Dixit

In this paper consists of a mini central processing unit, motion detecting sensor including with a camera module and buzzer. They monitor and control the car wireless using GSM. They have used Putty software which senses motion, triggers the buzzer, takes the picture and mails it to the owner. The common platform used here is the 'Raspberry Pi' which interfaces all the embedded peripherals simultaneously, so that vehicle can be managed through mobile phones.

Raspberry Pi 3 is interfaced with the GSM module. The main parts that will be needed are the 'Raspberry-Pi mini CPU processing unit, camera, GSM module and PIR sensors. The software mainly waits for the camera module to provide an input as an image. [12][15]

The GSM module will perform the text message sending function. The camera is interfaced with PIR sensors. The sensors distinguish movement and the camera interfaced to it in a split second snaps a photo. All the peripherals are interfaced through General purpose input Output pins also known as GPIO pins. when the camera gives a picture, the raspberry pi will begin the picture preparing. It sends the photo as an email alert to the proprietor. The messages can likewise be seen in a program and messages are matched up crosswise over devices. Notifications are additionally sent on any caution state change.

The following commands to trigger certain activities:

stop: Disables the administration until re empowered.

begin: Enables the administration after it being incapacitated.

In this paper, the programming was done successfully in the Raspberry PI Python 2.7.5 integrated design environment. The tiff-images were processed and then analyzed so that it can be converted into an email attachment and be sent to the owner respectively.

Initially problems were encountered during interfacing the GSM module as it was overheating but it was overcome after trial and error. Voltage adapter was used with the GSM module to give it a separate power. The owner can immobilize the car through his phone by a one-word text message.[2]

E. Authenticating Vehicles And Drivers in Motion Based on Computer Vision and RFID Tags

Author:A. Makarov, M. Španović and V. Lukić

A framework comprising of a vehicle inside mounted gadget and a supporting foundation is intended to enable approved drivers and approved vehicles to get too confined regions of the airplane terminals, and also government, office and private stopping offices. In vehicular confirmation, client benefits can be conceded to either a vehicle or its driver, or both. In security-basic circumstances, confirming both the driver and the vehicle is ideal. This methodology would forestall criminals of an approved vehicle to get to confined regions and administrations. In the meantime, such a framework would likewise monitor the driver's character, and subsequently of her or his own risk in these circumstances. Moreover, the framework verifying a vehicle and its driver and getting their ID information is relied upon to build up a relationship of trust, i.e., it ought to likewise confirm itself to the vehicle.

To secure the vehicle and the driver ID information from listening in and altering, the correspondence between the vehicle and the roadside unit must be scrambled. Also, the roadside unit should validate to the vehicle too before accepting the encoded information.

The framework for validating a vehicle and a driver comprises of the accompanying segments:

1. On-board (vehicle interior-mounted) RFID subsystem
2. Computer vision subsystem (CVS)
3. Roadside unit (RSU)
4. Public key infrastructure (PKI)
5. Back-end servers

The locally available RFID subsystem speaks with RSU through a radio channel.[14] The traded information is encoded and marked utilizing open key foundation (PKI) innovation. The PKI is additionally utilized in scrambling pictures gained by CVS before they are sent to back-end servers, and additionally in verification of information sources. Specifically, CVS verifies to the back-end and the other way around, keeping in mind the end goal to guarantee the protection of the ID and action information. Both out in the open and private applications, (for example, get to control), the vehicle and driver confirmation undertaking would be encouraged and quickened via robotized recovery of their descriptors. As the encasing electronic distinguishing proof records seem to be "incorporated circuit cards with electrical contacts" (as per standard ISO/IEC 7816), they require a physical contact with a reader, which is profoundly unrealistic for validation of vehicles and drivers in movement. In private applications, for example, access to office stopping offices, a representative identification could be utilized rather than a driving permit, yet than once more, worker get to identifications, notwithstanding when contactless, i.e., closeness cards (e.g., as indicated by ISO/IEC 14443 standard), are not reasonable for long-run information correspondence vital for vehicles in movement.

The arrangement lies in a gadget that reads contact ISO/IEC-7816 as well as ISO/IEC-14443 cards and transmits the required information over a long-extend correspondence channel (commonly 10 to 100 meters) to a close-by roadside unit.

With the end goal of the work introduced in this paper, a gadget equipped for perusing two ISO/IEC-7816 cards has been produced. One card is accepted to contain descriptors of the driver, while the other one contains the vehicle descriptors.

Since perusing encoded information from driving licenses and vehicle enlistment cards is dependent upon the administration approval, a worker gets to the identification, and a Security Authentication Module (SAM) card have been utilized.

SAM card (ID-000 configuration, 25 x 15mm) covered up inside the gadget lodging uncovers the enthusiasm for applications where the presence of vehicle check is obscure to pariahs and potential gatecrashers to an association. The descriptors put away on this card are Vehicle Identification Number (VIN), license plate number, make, model and colour, as well as the card digital certificate signed by the issuing organization.

Descriptors put away in the coordinated circuit card are the driver's name, confront picture and the unique mark particulars information. Note that the protection of holder's biometric data is safeguarded since the unique mark never leaves the card. Specifically, before beginning the motor, the driver embeds her/his card and swipes his finger over the straight capacitive unique mark scanner. the unique mark picture is changed over to particulars. The got details are contrasted and the ones put away on the ISO/IEC 19794-2 coordinated circuit of the driver's card. Just the carefully marked aftereffect of the coordinating procedure leaves the card and the on-load up gadget, staying away from any danger of the biometric wholesale fraud.[14]

At the point when a vehicle is in motion, it is extremely hard to outwardly check the Vehicle Identification Number (VIN): it is either composed in little characters behind the windshield or emblazoned on different parts of the motor square, outwardly out of reach from outside. In an across the nation framework, mechanized solicitations can be created by the street side unit to national databases of enrolled vehicles keeping in mind the end goal to bring different descriptors of the vehicle, for example, the license plate number, make, model and color. So also, in a private framework, the last highlights have been recorded in a neighbourhood information base amid the vehicle enlistment for the expected administration, which lessens the convenience of VIN. license plates are perceived with the most astounding precision, ordinarily over 85%. The characters which move between consecutive frames, likely to belong to a moving vehicle, are detected according to the algorithm[16]. The tesseract software is used for license plate identification. There are around one hundred vehicle makers on the planet[18]. They regularly utilize exclusive paints with various shading names for shading vehicle bodies and occasionally change shading palettes. colors can be caught with the these days generally sent True-Color cameras, for functional reasons, activity specialists restrict the palette they use in recognizing vehicle colors to under 32 colors.z

The first RGB picture is first edited to a little region around the beforehand recognized tag, where districts containing glass, tires and the encompassing foundation are overlooked and where the pixels already appointed to the tag are evacuated. This consequently trimmed picture is mapped to a lessened consistently quantized shading space of 10 hues. Pixels doled out to every one of these hues are checked, and the hues are positioned in diminishing request as for the quantity of pixels doled out to them. The three best positioning hues in the picture are then spoken to by their RGB segment esteems so as to make an arrangement of 9 highlights for each picture which is utilized as info esteems to a neural system based classifier with one concealed layer and 17 yields.

At the point when the RSU identifies a vehicle in its range, it transmits a RF flag which contains another session number. The vehicle acknowledges session number and produces the message containing plate number and session number. This message is then carefully marked with the private key of the gadget (put away on SAM). The on-board gadget sends this structure alongside the computerized signature and with the chain of

declarations (with a gadget testament toward the finish of the chain). The RSU approves these information by checking the advanced mark with the general population key of the gadget. After the approval is expert, the RSU can settle on choices in light of the personality of the auto. The character can be moreover affirmed by contrasting the plate number with the number read from the camera picture (OCR). While trading the information thought to be private or delicate, the RSU produces a symmetric key, scrambles it with general society key of the on-board gadget and sends it to the gadget. The gadget decodes this key with its private key which is known just to the gadget. Presently, the two sides in this correspondence have a similar key which is known just to them and the touchy data would now be able to be traded through this scrambled channel.[16]

F. Real Time Biometrics based Vehicle Security System with GPS and GSM Technology
 Author:N.Kiruthiga.

Different enemy of burglary frameworks have been created over the couple of decades. An Engine Control Unit (ECU) is associated with the Info-Security Circuit Board and sensors inside the vehicle transport.[3] The transport conveys with different vehicles, street side transportation and cell phones with remote interfaces. The inadequacy of this framework is that the information convenience and system deferrals to catch dependable secure auto interchanges Biometrics is the strategy for distinguishing human by their own one of a kind attributes. There are different biometric designs which incorporate face, iris, unique mark, DNA, retina, palm print, ear, voice, signature, hand shape, composing beat and step. In any case, no single biometric has yet been turned out to be splendidly solid or secure. For delineation, palm prints are normally frayed; Voice, signature, hand shapes and iris pictures are effectively manufactured; Due to different helping conditions and face-lifts, confront acknowledgment will result in poor precision. Also, iris and face acknowledgment are powerless to ridiculing assaults. The Fingerprint biometrics is the skilled biometric design for individual recognition as far as security and dependability.[6] It is hard to produce or take. It is acknowledged around the world. Live unique mark perusers in light of optical, warm and ultrasonic methodology are utilized.[5]

VI. LITERATURE SURVEY TABLE

Table 1.1 Table of Literature Survey

Sr No.	Name of Author	Proposed System	Drawbacks / Findings
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1.	Ms.Archana.S. Shinde Prof.Varsha Bendre	An Embedded Fingerprint Authentication System	<ul style="list-style-type: none"> • Response time is of fingerprint scanner is delayed in real time • OS does not support the real time constraints
2.	Zhaoxia Zhu , Fulong Chen	Fingerprint Recognition based Access Controlling System For Automobiles	<ul style="list-style-type: none"> • The access control system is not interconnected with other systems such as lighting system,engine system , GPS navigation system,multimedia system for automobiles through Controller Area Network (CAN) bus.
3.	N. Kiruthiga and L. Latha	Study of Biometric Approach for Vehicle Security System Using Fingerprint Recognition.	<ul style="list-style-type: none"> • In this system embedded technology is used along with GSM technology. • This system efficiently identifies the fingerprint pattern of the person, using Feature Extraction.The output is displayed on the LCD screen. • If person is not authorised then an alert message is sent to the owner.
4.	Aleesh a Susan Jacob, Vandit a Chaura siya,Va gmayee Sharda, Shubhr a Dixit	Car surveillance Security System	<ul style="list-style-type: none"> • Data analytics and visualization is not used hence monitoring and management of IOT devices is not efficient.
5.	A. Makarovy, M. Španović and	Authenticating Vehicles And Drivers in Motion Based on Computer Vision	<ul style="list-style-type: none"> • This system consists of various complex modules which are not in use.

	V. Lukić	and RFID Tags	
6.	N.Kiruthiga	Real Time Biometrics based Vehicle Security System with GPS and GSM Technology	<ul style="list-style-type: none"> The fingerprint recognition system is based on ultrasonic sensors which avoids fake authentication At the time of threat the authorized person is made aware through GPS and GSM module. GPS showing the location of the vehicle and GSM Technology to send the alert message to the owner as well as the nearby police station.

IV CONCLUSION

Security is major criteria in all sort of utilizations. This undertaking is gone for enhancing the level of security for vehicles. This paper is aimed for enhancing the level of security for vehicles. This is a one of a kind technique for scheming and gathering a minimal effort, pressed in burglary control framework for a vehicle which is very dependable. Customized vehicles will not only provide a more interesting drive but also safer one.

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Proposed Secure Content Modeling of Web Software Model

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Abstract — *The tremendous growth of web applications gave rise to number of cyber crimes in the real world. This has necessitated the consideration of security features of web application at the beginning stage itself rather than at later stages of web application as it is a very time consuming task and it increases the cost of software system exponentially. The security aspects need to be considered at the planning phase of web application modeling stage. The unique web engineering process content model is proposed to capture all the security requirements through Class diagram and State Transition Diagram in the web-based software application development. The various notations are proposed to provide security requirements in content modeling of Web Engineering. The proposed content modeling of Web Engineering is simulated by the case study- “Smart Agriculture Monitoring System”.*

Keywords — *Content modelling, WebML, Security Requirements, UMLSec.*

I. INTRODUCTION

Software engineering deals with the process of developing web applications using standard steps and methods [2]. Web engineering is generally defined as “the application of a systematic, disciplined, quantifiable approach to the development, operation and maintenance of web systems” [1][5]. Web engineering consists of different methods, techniques and efficient tools for different activities to be carried out at various stages of product life cycle [5]. Unified Modeling Language (UML) is general-purpose modeling language for the design of a system and Object Management Group(OMG) standard [19]. There are many web analysis and design methods like Object-Oriented Hypermedia Design Method (OOHDM) [20], *Web Search and Data Mining* (WSDM), Web Modeling Language (WebML), W2000 Hypertext Design Model (HDM), Object Oriented Web Solution (OOWS), HERA and Web Software Architecture (WebSA), UML based Web Engineering (UWE) for building the Web Information Systems. This paper is organised as follows - Section 2 discusses the detailed literature

survey related to Web Software Model. Section 3 describes proposed secure Content Modelling for Web Engineering. Section 4 deals with the case study on Smart Agriculture Monitoring System to simulate the proposed secure content

model.

II. LITERATURE SURVEY

This section presents detailed literature survey on web engineering methods.

UML is a graphical language to visualize the system design portraying system behavior and its structure. UML is largely adopted but it lacks security specification notions. UMLSec is an extension of UML providing security features in analysis and design of modern information systems resulting into development of secure software [6]. UMLSec provides security against attacks in system development [9][10]. Security specifications can be provided using stereotypes, tags and constraints in UML diagrams such as use case diagram, class diagram, state machine diagram, sequence diagram, activity diagram and deployments diagram [21]. Security extensions can be easily added to UML which led to the development of UMLsec, SecureUML and UMLpac [11].

In our proposed work we are providing security in class diagram and state transition diagram with UML notations [21].

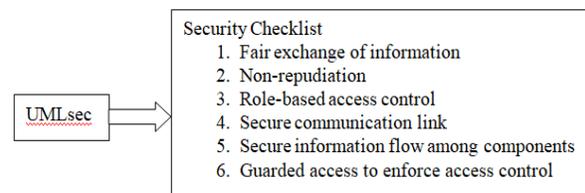


Fig. 1 UMLSec Security checklist

B. WEB ENGINEERING METHODS

Web Modeling Language (WebML) is considered as notation and a web-design methodology to serve complex data, process and service intensive web software applications. It is a visual Domain Specific Language (DSL) containing formal specifications of design process. It specifies the content structure of a high quality web software application. It describes web applications at three layers like content layer, navigation layer (hypertext) and presentation layer (look and feel). Content layer is presented with Entity-Relationship (ER) diagram or UML class and state transition diagram [3] [4]. Earlier, WebML, UWE or OOHDM [20] which are Model-Driven Web Engineering (MDWE) [25] methods that were providing mature solutions to the development of web software applications. The visualization of high level web applications into models can be done through these methods using Model Driven Development (MDD) concepts. The classic MDWE approach consists of the following steps – develop a domain object content model, defining hypertext model for navigation and define the web application's look and feel for presentation purpose [25].

III. PROPOSED SECURE CONTENT MODELLING OF WEB SOFTWARE MODEL

This section describes proposed notations for content modelling of Web engineering using notations in the case study. Web Engineering Model comprises of Content Modelling, Functional Modelling, Hypertext Modelling, Navigation Modelling. In this paper we are providing security in content modelling through the secure Class Diagram and secure State Transition Diagram.

C. CASE STUDY: SMART AGRICULTURE MONITORING SYSTEM

In this section, detailed discussion is given on Secure Content Modelling of web software model to consider security - Confidentiality, Integrity and Availability with secure notations in class diagram and state transition diagram. Smart agriculture monitoring system is an automated system using the concept of Internet of Things (IoT). A combination of Internet, wireless communication mechanism and Remote Monitoring System (RMS) is used to get instant overview of the field. GPS-Based remote controlled monitoring, sensing of moisture and temperature, scaring the intruders, security, wetness of the leaf and proper irrigation facilities [26]. This system is designed to use sensors working on wireless networks for capturing properties of the soil and weather patterns on a real-time basis. The control of these parameters are done through any remote device or internet services and interfacing sensors, Wi-Fi, camera with micro-controller are used to perform the operations. It is used to provide easy access to farm facilities such as prompt messages using Short Messaging Service (SMS) and it provides different suggestions on weather patterns, crops, etc. In this paper content modelling is built for this case study [26][27].

D. CONTENT MODELING

The formalisation of functional requirement of requirement engineering into a model is called Content modelling. Database

design and an object model can be constructed through content modeling. The purpose of database design and object model is to provide a base for the business logic of the system [8]. Content modelling produces both the structural aspects of the content and behavioural aspects of the system in the form of a class diagram, and state transition diagrams [21].

WebML is used to capture the detailed information about the contents of the web application. The most important features of WebML are like – it considers workflows involving multiple actors and controlling many types of activity flows through use of objects [8].

Content Model = Class Diagram + State Transition Diagram

In this model, we used security notations for class diagram as well as state transition diagram to secure the content model known as secure content modeling as shown in Figure 2. The use of notations is simulated with the case study of Smart Agriculture Monitoring System.

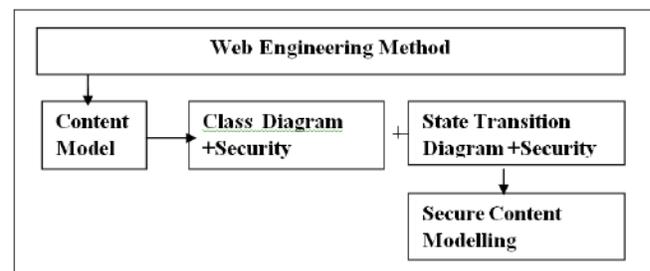


Fig. 2 Secure Content Modelling of web software model

E. CREATE USE CASE AND MISUSE CASE DIAGRAM WITH SECURITY FEATURES

The Figure 3 (Appendix B) describes the use case and misuse case diagram with the functional requirements and its associated actors [7]. Use Case diagrams are used to visualize, specify and document the behaviour of an element [18]. Misuse cases are widely used in UML to elicit security requirements [14][15][17]. It explains the expected malfunctioning to be done by attackers to pose threat to the web applications. It also shows the relationships between the activities which are compromised and original use cases. The advantages of Misuse case are they provide visual explicitness; understand ability, and their drawing is simple. It has limitations like representation of high-level threats only. It does not specify the detailed process and it is not suitable conveniently to reuse it [16].

In Figure 3 (Appendix B), security use cases are used as defence mechanism to provide security in Farmer Registration class diagram in Smart Agriculture Monitoring System [13].

F. SECURE CLASS DIAGRAM WITH SECURITY NOTATIONS

The secure class diagram notations are shown in Table 1 (Appendix A). The most basic and largely used UML diagram is Class Diagram [19]. A class diagram depicts a static view of a system containing classes, their interrelationships with each other, operations and properties of the classes [19]. The analysis

object model instantiates Entity, Control, Boundary (ECB) pattern. The simplified version of Model View Controller pattern (MVC) is ECB [24]. New security related semantic constructs are used in state chart [36] to provide security. These stereotypes are also used in class diagram.

Eg. <<Vulnerable>>, <<Defensive>>, <<Secure>>, <<Threatened>>, <<Compromised>>, <<Quarantine>>, <<Recovery>>

Common input tampering attacks can be prevented through well defined input validation. The security at high level of abstraction is provided through input validation. It solves the problem of poor security background for further development [11]. UMLpac integrates security into UML Class Design. UMLpac uses third party security packages. The security goal in UMLpac is provided by keeping a level of abstraction between the class diagram of a system and their security features [23]. Also, the Author S. Almutairi has suggested in [7] paper, the Confidentiality and Integrity in the class can be protected by mentioning keywords CONF, INT respectively before the class name to facilitate web developers [7].

UML modeller can use Object Constraint Language (OCL). It specifies constraints related to application in their models. It defines Five Primary Security Input Validation Attributes (FPSIVA) which can be used in the design phase of software engineering [11]. The foundation for applying FPSIVA in web design phase is OCL. Input validation can be done FPSIVA parameters for secure software development are as follows [16] –

- (1) var.type : < type> - To validates the input data type and checks whether it is acceptable <type>. e.g.: mobile_no.type : integer
- (2) var.format : < pattern> - To validate the input data format and to check whether it is acceptable <pattern>. e.g.: Format of a mobile no. is like : %d%d%d %d.
- (3) var.length : < number> - To validate the input data length. e.g.: mobile_no.length : 10
- (4) var.Charset : < pattern> - To check characters with its <pattern> e.g.: mobile_no.charset : [0-9]
- (5) var.value : < reasonableness> - To check reasonable values of input data . e.g.: age. Value>0

The confidentiality of the class can be protected using **CONF** in front of the class name. The integrity of the class can be protected using **INT** in front of the class name. This will help web developers to know which objects are to be protected during the transmission [7]. For example Farmer Registration Class is simulated in figure 4 (Appendix B).

The class diagram of Farmer Registration contains address, mobile_no., Email_id and password as attributes of class and the methods are BlockedRegistration(), SendSMS(), CaptureOTP(), EncryptionTech(), Nonmodifiable() and Submit(). These methods provide defence mechanism in the Use Case diagram. The Confidentiality and Integrity in the class can be protected by mentioning CONF, INT respectively in front of the class name

there by facilitating web developers [30]. Modelling security in proposed class diagram can be done using Five Primary Security Input Validation Attributes (FPSIVA) in Input Validation [11]. In the Farmer Registration Class Diagram of Content Model in Web Engineering, Input Validation parameter can be exposed to different threats like SQL Injection. Vulnerabilities are usually occurred in SQL, NoSQL queries, OS commands, SMTP headers, XML parsers, ORM queries, LDAP, Xpath and expression languages. These threats can be mitigated through FPSIVA, UMLPac, Used tag as CONF and INT [7][11][22].

G. SECURE STATE TRANSITION DIAGRAM

The secure state transitions diagram notations are shown in Table 2 Appendix A. State chart diagrams show the changes in the state through an object's life cycle. Security state charts describe the complex dynamics of security threats. It provides risk and impact analysis. UMLsec stereotypes [9][10][11][16] states requirements to be followed after analyzing defects in the model. If stereotype <<compromised>> is specified in the state, analyst has to identify requirements that will help to avoid entry into the compromised state. However stereotype does not specify what those requirements will be [22].

Security state charts describe the complex dynamics of security threats. The risk and impact analysis is supported by state charts. The state charts are enhanced by using UML stereotypes. These stereotypes will also support analyst in finding out defects in the model [22].

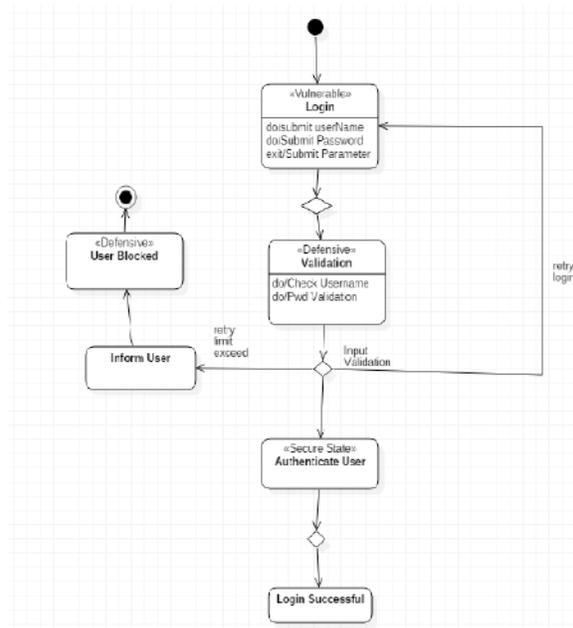


Fig. 3 State Chart Diagram of Smart Agriculture Monitoring System

The State Transition Diagram of Content Model in Web Engineering, Session management can be exposed to different threats like Session Hijacking. These threats can be mitigated through Vulnerable State Stereotype, Secure State Stereotype. Sensitive data can be exposed to threat such as sensitive data

exposure which can be mitigated through access control of critical storage data, blocking network sniffing and prevention from manipulation of data [7][11][22].

IV. CONCLUSIONS

A high-level approach to provide the security requirement in content modeling of Web Software Model has been discussed. The extensive literature survey done on UMLSec on the basis of that we have formalized various notations of class diagram and state transition diagram. The security has been provide by incorporating notations and security policies in Class Diagram and State Transition Diagram.

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Automated Crowd Surveillance using Drone and AI

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Abstract—Understanding and dealing with safety aspects of crowd dynamics in mass gatherings of people related to sports, religious and cultural activities is very important, specifically with respect to crowd risk analysis and crowd safety. In this regard, efficient monitoring and other safe crowd management techniques have been used to minimize the risks associated with such mass gathering. The system will deploy crowd monitoring technique using real-time images taken by Drone. A color-based segmentation method has been implemented to detect, identify and map crowd density under different camera positions and orientations. The proposed system is a valuable tool in terms of facilitating timely decisions, based on highly accurate information. We are proposing a video-based crowd density analysis and prediction system for wide-area surveillance applications using the drone.

Keyword: *Video Surveillance, Raspberry pi, Crowd Detection and managing.*

I. INTRODUCTION

Recently, there has been a high degree of attention paid to drones in civil applications. Unmanned aerial vehicles, which are widely referred to as drones, have been considered one of the top technologies of the first decade of the 21st century by drones, as they can be used to provide a larger view of the whole location.

Drones could also provide the possibility of creating shareable and link-able networking points between rescue teams who are attending the emergency location. Adding cloud capacity is a modern way of designing and implementing systems, as the cloud offers several benefits that include high performance and accessing a large pool of sources, including storage and computational capacity.

In addition to the benefits that can be gained from cloud resources (e.g. Storage and cores), the cloud can play an important role as it can provide a centralized solution to the whole system. Notifications can be sent through the cloud to alert a management department of an emergency event that has

occurred or might be occurring based on processing the photos collected by drones. The cloud can also add the ability to send

commands directly to drones, such as taking more photos of a particular location. Finally, drones can be controlled remotely from the cloud to undertake certain jobs without human involvement, in order to provide a fully automated solution.

II. Crowd Monitoring

Various investigations have been directed towards developing an approach that provides a comprehensive solution for crowd management and analysis. These studies have focused on three main principles of crowd analysis including estimation of the density of a group of people per square meter, finding the direction of motion of the crowds and Geo-referencing the crowd images in the real world coordinate system. It can be noticed that most of the studies have been conducted in either computer vision or navigation disciplines. Thus, crowd analysis approaches have been based on images processing and positioning solutions. In this regard, several sensors such as camera (color, infrared), GPS and IMU (Inertial management Unit) have usually been

mounted on a moving vehicle to detect and analyze the density along with the motion of the crowd in a specific location.

In recent years, UAVs have been extensively used for crowd analysis due to its low cost and fast, autonomous and flexible flying ability. Thus, crowd motion have been tracked via UAVs sensors. Talukder et al. [12] used optical flow and dense stereo as a combination technique for estimating object background motion at each pixel. This, in turn, increased the probability of detection of small or low texture objects where feature selection schemes might fail. While Rodriguez-Canosa et al. [7] proposed a real-time approach to detect and track moving objects from UAV. This approach was entirely dependent upon creating artificial optical flow by estimating the camera motion between two subsequent video frames and then comparing the artificial flow with the real optical flow directly obtained from the video feed.

The process of estimation of density and the people count per square meter have been investigated in detail in various studies (e.g., Hinz [13]; Sirmacek and Reinartz [14]; Perko et al. [6]). Hinz [13] estimated the background by applying a gray-level bounded region-growing approach based on sequential overlapped images. In order to filter out less crowded objects, a blob detector was used on the foreground pixels. The crowd density was then estimated by using Gaussian smoothing kernel with a fixed standard deviation/ bandwidth process. Sirmacek and Reinartz [14] proposed an automated detection technique based on FAST (Features from Accelerated Segment Test) features detector to detect the images of blob-shaped and cornered structures. Using airborne video recordings, Perko et al. [6] presented a novel framework for estimating human density and motion, based on custom tailored object detection techniques, a regression based density estimation and a total variation based optical flow extraction.

Other studies focused on sensor fusion techniques for direct Geo-referencing. They presented an overview of understanding algorithms developed at CMU Carnegie Mellon University) to perform cooperative and multi sensor surveillance. A network of smart sensors was deployed that are independently capable of performing real-time, autonomous object detection, tracking, classification, and gait analysis. Attya et al. [15] proposed by a new framework based on the constructing a 3D model of the desired location, and then used this model for Geo-referencing the collected images and finally used the same for estimation of the crowd volume.

In the same line of this research, Helbing et al. [9] used video recordings of the crowd disaster incident in Mina/Makkah during the Hajj in 2006. This was to analyze the time frame of the crowd as well as the reason behind it.

III. Methodology of Crowd Estimation

In this paper, we focused on estimating and Geo-referencing the crowd density levels through using image processing tools. This includes image segmentation for people detection, crowd density estimation and finally geo-referencing for mapping the crowd levels.

3.1 Image Segmentation

This process has been initiated in computer vision which basically changes the image into such feature that can be easily identified. Various methods have been proposed for image segmentation's. In this paper, $L^*a^*b^*$ color space method have been used to classify the content of the image into readable features. This method consists of three-colored channel namely "L*" indicating the luminosity, and the other two channels "a*" and "b*" indicating the chromaticity. Thus, the color is either full along "a*" (red-green axis) or "b*" (the blue-yellow axis) space.

In order to classify the content of an image into "a*" and "b*", a space reference must be selected first. This reference includes a color region as a sample and hence the average of

each sample's region is calculated in terms of "a*" and "b*" space. Then each image pixel is classified using nearest neighbor rule. This will allow to identify each color marker with respect to "a*" or "b*" value. The smallest distance will tell that the pixel most closely matches that color marker. Detailed information about LAB method can found in Bora et al. [16].

3.2 Estimation of Crowd Density

The density of crowd has been estimated through converting the segmented image into a binary image. The crowd in the image appears as white region while other image features appear in black color. Since the black and white image (BW) allows to calculate image properties (e.g, area), the density of crowd is measured through calculating the ratio between the white and black regions. Thus, crowd level density per meter square can be measured. Regardless the number of people in the scene, the density is simply classified into low, moderate, and high.

3.3 Geo-referencing and Mapping Levels of Crowd Density

For mapping the levels of crowd density, the need for mapping is to find out the object coordinates. Note that each region is considered as an object and then it is Geo-referenced through using GCPs (ground control points). With known GCPs, a triangulation can be performed through mapping the XYZ of image objects with XYZ coordinates of the real world object. The point of Geo-referencing is to show each object coordinate in order to identify the particular area with respect to the crowd level density. When UAV equipped with GPS and INS, direct Geo-referencing can be achieved without need of GCPs. In this case, an automatic system for real-time crowd monitoring is realistic. In this paper, however; due to lack of UAV sensory data, we investigated indirect Geo-referencing for mapping the crowd density.

3.4 Anomalies Detection

In any image processing procedures, anomalies/ outliers may occur in the new segmented images which may lead to ambiguous information. In color-based segmentation method, classification process becomes difficult due to the similarity of colored-classes between features. For example, the color which is basically used to identify people might classify other features as people too. This problem leads to the introduction of a technique that distinguishes between feature classes. In this paper, parameters like size, shape and position of the object have been used to achieve such tasks. A constrain based on these parameters is conditioned in the classifications. For example, the position of the crowd in the image is normally shown in flat areas (e.g., streets), thus surrounding environments such as buildings, trees and vehicles can be eliminated from image segmentation process.

IV. SYSTEM ARCHITECTURE

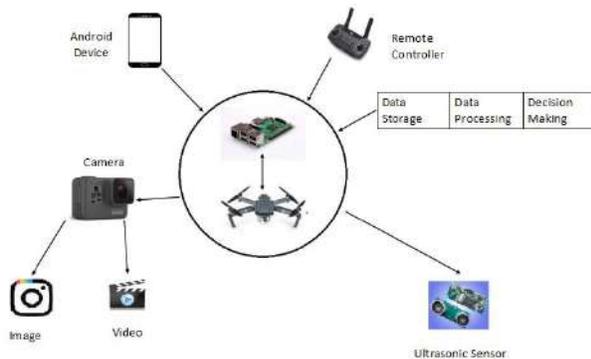


Fig 1. The architecture of Proposed System.

The main objective of this system is to detect the crowd and to have video surveillance on the crowd. The Proposed system consist of camera which captures the videos and images from which we can have surveillance on the crowd and the ultrasonic sensors that detects any barrier to protects the drone from crashing. Our system will be useful for crowded places like kumbhamela, live concerts, etc.



Fig 2. Drone connection

The proposed system has the following modules:

6. Drone module.
7. Camera module.

BLDC (Brushless DC Motors): electronically commuted motors (i.e. ECMs motors). BLDC motor are synchronous motor powered by DC electricity. Rated in KV, where it rotates 1000rpm per 1 volt supplied to it (if its rating is 1 KV). It offers several advantages over brushed DC motors like more reliability, low noise, reduction in EM Interference (EMI), high torque per watt etc.



Fig 3. BLDC Motor

Arduino: The Arduino/Genuino Uno has a number of facilities for communicating with a computer, another Arduino/Genuino board, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer.

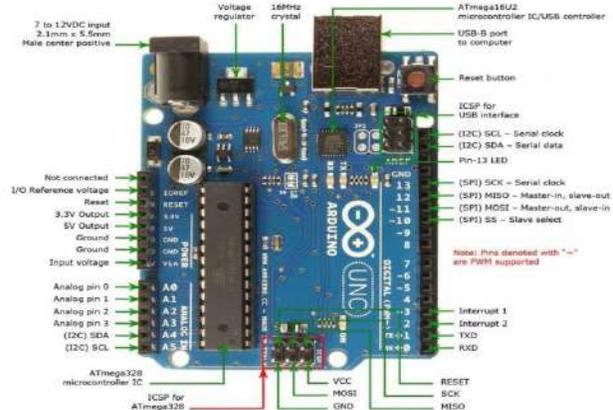


Fig 4. Arduino uno

Raspberry pi : The latest Raspberry Pi 3 Model B+ has a faster 64-bit 1.4GHz quad core processor, 1GB of RAM, faster dual-band 802.11 b/g/n/ac wireless LAN, Bluetooth 4.2, and significantly faster 300Mbit/s Ethernet.

- 1.4GHz 64-bit quad-core ARM Cortex-A53 CPU (BCM2837)
- 1GB RAM (LPDDR2 SDRAM)
- On-board wireless LAN - dual-band 802.11 b/g/n/ac (CYW43455)
- On-board Bluetooth 4.2 HS low-energy (BLE) (CYW43455)
- 4 x USB 2.0 ports
- 300Mbit/s ethernet
- 40 GPIO pins
- Full size HDMI 1.3a port
- Combined 3.5mm analog audio and composite video jack

- Camera interface (CSI)
- Display interface (DSI)
- microSD slot
- VideoCore IV multimedia/3D graphics core @ 400MHz/300MHz



Fig 5. Raspberry pi 3b+

Transmitter and Receiver: Radio transmitter uses radio signal to remotely control quad copter in wireless way, the commands given by transmitter are received by a radio receiver connected to flight controller. The no of channels in transmitter determine how many actions of aircraft can be controlled by pilot. Minimum of four channels are needed to control a quad-copter (which includes pitch, Roll, throttle, yaw). The stick control on radios transmitter is known as gimbal. RC receiver used operates on 2.4GHz of radio frequency (unless you do not have any specific need for a different frequency).



Fig 6. Transmitter

ESC (Electronic speed controller): Four 30A ESCs (electronic speed controllers) are used in proposed Quad copter. It convert the PWM signal received from flight controller or radio receiver and then drives the brush less motor by providing required electrical power. Thus ESC is an electric circuit that control the speed and direction of electric motor by varying the magnetic forces created by the windings and magnets within the motor.

Gyroscope: Quad copter requires a flight stability sensors that stabilizes quad copter during its flight mode. MPU6050 gyroscope is low power sensor with a sensing element and an

IC interface (able to provide the measured angular rate to users through digital interface I2C/SPI).

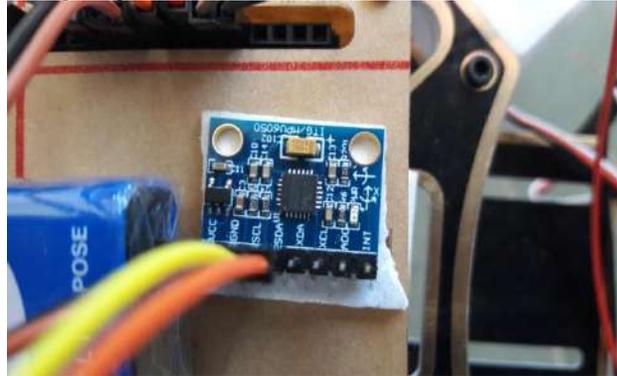


Fig 7. Gyroscope

Details of Camera: GPS assisted flight features, let you concentrate on getting great images while the drone helps you fly safely. You can achieve advanced camera perspectives with the Point of Interest, Follow Me and Waypoints modes. Fly up to 25 minutes with the included intelligent battery.

Now, coming to the popular feature, the camera is inbuilt and gives you some of the crispest and stable pictures from up high. You do not even need to be a professional, or have that much experience with photography.



Fig 8. Camera module v2

The ultra-intelligent camera of this device can do the job for you. The 2.7K video camera can capture pictures from mid-air at 12 megapixels. This means that pictured are 3 times clearer than the images displayed on your HD TV. The camera comes packed with a 20mm equivalent lens coupled with the f/2.8 aperture for best results. The lens comes with 9 elements that also include an a spherical element.

V. ALGORITHMS AND DATABASE

Blob method:

Aided by the estimated pedestrian size, we perform region growing on the patches of different categories. For example, we

scan all the green patches from up to down, left to right. A blob is growing from one patch at a certain position in the image to a connected component of patches. It stops growing when the number of patches reaches the estimated size of the pedestrian at this position, or there are no longer any connected patches. In this way, all the green patches in one frame are grouped into green blobs. The similar patch grouping is performed to all blue patches. All blobs (both green and blue) in pseudo-colour, with the black crosses denoting their centre. Although each blob does not exactly fit the boundary of every pedestrian, it captures the correct category label (green or blue) of each pedestrian and its neighbour. Thus this blob representation has the contextual information of pedestrians and ensures meaningful contextual analysis.

K-Means Clustering Algorithm:

k-means clustering is a method of vector quantization, originally from signal processing, that is popular for cluster analysis in data mining. k-means clustering aims to partition n observations into k clusters in which each observation belongs to the cluster with the nearest mean, serving as a prototype of the cluster.

Our algorithm works as follows, assuming we have inputs $x_1, x_2, x_3, \dots, x_n$ and value of **K**

Step 1:

We randomly pick **K** cluster centers (centroids). Let's assume these are c_1, c_2, \dots, c_k . We can say that;

$$C = \{c_1, c_2, \dots, c_k\}$$

CCC is the set of all centroids.

Step 2:

In this step we assign each input value to closest center. This is done by calculating Euclidean (L2) distance between the point and the each centroid. $\arg \min_{c_i \in C} \text{dist}(c_i, x)$

Where $\text{dist}(\cdot)$ is the Euclidean distance.

Step 3:

In this step, we find the new centroid by taking the average of all the points assigned to that cluster.

Step 4:

In this step, we repeat step 2 and 3 until none of the cluster assignments change. That means until our clusters remain stable, we repeat the algorithm.

VI. RESULTS

The expected results are as follows:

Sr.no	Test case	Expected Output	Actual Output
1	Flying drone	Properly flying drone.	Drone can stable and fly.
2	Camera	After drone flying camera on capture video and images.	Video and image are clearly display.
3	Cowed Surveillance	Search in send message security guard	Properly display cowed density and flow.

Actual Output:

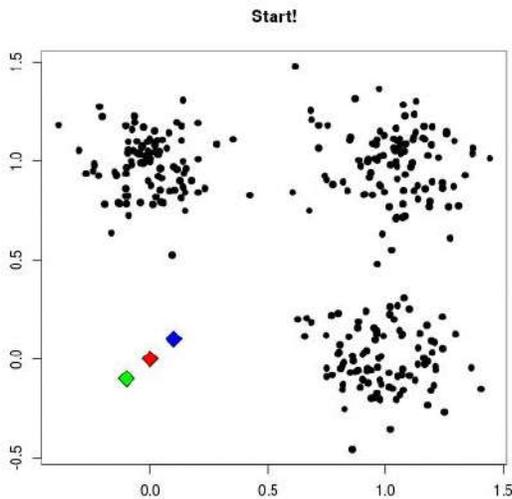


Fig 9. K-means algorithm

- **Step 1** - Pick K random points as cluster centers called centroids.
- **Step 2** - Assign each x_i to nearest cluster by calculating its distance to each centroid.
- **Step 3** - Find new cluster center by taking the average of the assigned points.
- **Step 4** - Repeat Step 2 and 3 until none of the cluster assignments change.

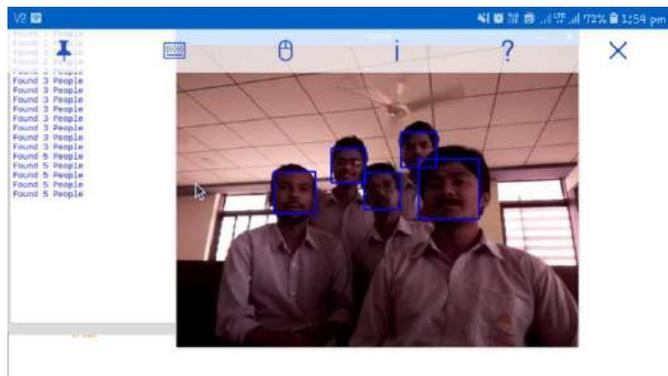


Fig.10 Count of Density

VII. CONCLUSION

Our research work yielded a successful development of Quadcopter at cheaper and low amount. It can be used as alternative to various applications which includes surveillance in crowded area, crowd flow direction detection and maintain the data. The system will be provided with barrier detection sensor for safety of the Drone. It will also detect the crowd Density. It can be also used for other sensitive places nation border, etc. with high level of precision.

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Wakeup My India

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II. HISTORY & BACKGROUND

Abstract— The past decade has seen a dramatic rise in natural disasters and inclement weather conditions leading to catastrophic loss of human life. In order to curtail the loss of lives in the advent of any disaster, it is important to have a system in place which can alert the general public well in advance so that they can be evacuated from the endangered area before the actual disaster strikes. In this paper we have designed and proposed a 'Smart Alert' mobile application which is capable of alerting the users during the development of a disaster or a threat. The proposed system is intended to provide timely help to the affected victims by navigating them to safe place before the disaster strikes. The system provides the alert to user in real time directly on their smartphones and informs them regarding the threat they are under. It further navigates them using a map to the nearest safe house so that they can be rescued by the disaster rescue team[3].

Keywords— Distributed System, Disaster Management System, Disaster alert, emergency services, Client Server.

I. INTRODUCTION

Smart Alert has been created with an aim of reaching out to maximum number of people in shortest span of time and the reason why mobile application was deemed fit for the purpose for alerting the user during the development of any disaster was based on the statistical data on how people use their mobile phones. Numerous studies and research on human habits and lifestyle have found that an average person checks his/her mobile 85 times a day or approximately once every 3 hours. This means that a mobile alert is the best way to warn person

of upcoming disaster. Information from varied and unofficial sources may lead to unwanted panic and confusion[1]

Intelligent disaster warning and response system with dynamic route selection for evacuation Smart Alert Application has many features

that make it a useful and lifesaving tool. It is mainly based on the concept of having safe houses. Safe houses are places which are not located in the area where the threat has been issued and these places serve as emergency shelters until the rescue team arrives for further support. The notification system notifies the user as soon as an alert is issued. This is seen as a notification on the mobile phone. Seeing this, the user can know that an alert has been issued and more detailed information can be found by the user in the form of a card when he/she opens the application[3]. The navigation system of Smart Alert Application is conceptualized and designed to accept real time information and then dynamically navigate the victim to a safe house. If a person gets a disaster alert they can tap the disaster and they would be automatically navigated to a safe house the only thing the victim has to do is, follow the navigation instructions and he/she would reach a safe house People are navigated through different routes to reduce traffic and bottleneck problems. Also safe house capacity is taken into account while selecting the safe house. The application also lists the nearby hospitals and medical[3].

III. EXISTING SYSTEM

Due to the increased frequency and unpredictability of climate in the 21st century owing to Global warming and climate change the frequency of natural disasters such as flash floods, tsunamis, tornados have increased leading to cataclysmic loss of human life.

Thus a centralized management of disaster is necessary to preserve life and to minimize the disruption in the advent of any such disaster. A mobile alert is the best way to warn a person of upcoming disaster. Information from varied and unofficial sources may lead to unwanted panic and confusion.

This can be solved by having a system which provides us with accurate information prior to any disaster so that the people are ready and prepared for the nature's fury. Smart Alert

Application navigates the user to a safe location by using location based tracking. This leads to safe passage way to multiple people as the information given is precise and concise. The aim is to navigate people away from the endangered area once an alert has been issued.

Limitations:

Smart Alert is an android based mobile application which forms the basic framework of our disaster management strategy.

This application serves as the primary mode of communication during the event of any disaster. It is a standalone application capable of alerting the user in case of an emergency and navigating him/her to nearest Safe House or the Emergency Shelter. The application provides the following functionalities to the user:

Tracking and Alerting the User in real time

The proposed application relies on the alerts and data issued by the agencies such as National disaster Management authority of India (NDMA) to get information regarding the possible disaster threat pertaining to a particular area.

This reliance on the agencies authenticates the threat and makes sure that no fallacious alerts are sent out to public.

Once the validity of any possible threat is confirmed from the government authority, the app issues an alert

notification along with the SOS sound to all those users who are currently located in the endangered area. Endangered area here refers to the area for which a disaster threat has been issued. Detailed information regarding the alert can be found by the user under the "Alert" tab of the application.

The Alert Tab within the application, has been specifically designed to update the user with regards to the issued alert. Here the user would be able to find the meticulous information such as:

- Type of threat
- Location of threat
- Area affected by the Disaster
- Severity of Threat

By providing a large scale real time alert to the users present in the endangered area directly on their smartphones in two languages which are English and Hindi we can reach out to larger number of people in short span of time thereby reducing the number of casualties.

Navigating the User out of the Endangered area using dynamic algorithm.

The Alert issued under the "Alert" tab of the application asks the user to click on the alert in order to start the navigation to nearest Safe House or the Emergency shelter.

Once the user clicks on the "Alert" Card, the application gets the geo-coordinates of the current location of the user and at the same time it dynamically fetches the geo-coordinates of the nearest Safe House or the emergency shelter from the our backend server. Once the coordinates are decided by the server, the user will see a map on the screen with the destination already set as the location of the nearest safe house and the

navigation would start.

The selection of the safe house would be done by the sever dynamically by considering the following parameters in real time:

- a) Proximity to the user's current location
- b) The maximum accomodation capacity of safe house

The application therefore provides an easy mechanism to navigate the people from the endangered area to relatively safe

areas before the actual calamity strikes.

A. Keeping track and count of affected people in real time During the occurrence of any disaster the toughest task that lies ahead of the rescue workers is to track the number of casualties in any particular area but such a problem is taken care off by the Smart Alert application[1].

IV. SYSTEM ARCHITECTURE

The application is based on a web platform. The advantages of using a web platform are:

The fact that the communication protocol has already been implemented and tested on an international scale (HTTP/HTTPS);

At the user level, no specialized software is required; a web browser is the only requirement; thus, the architecture can be implemented on a large number of systems with no particular configuration of these stations;

The system upgrading is a simple operation and requires just a single modification of the segments in the specified system. Data transmission security is ensured by using the HTTPS, which provides a secure channel between the user station and the system residing on the server.

The user requires a minimum number of software applications, which, as we shall see below, are rather inexpensive:

Web browser (Firefox, Internet explorer >5.5, Netscape) – to access the system residing on the server;

The access to the host server (intranet, internet) – to ensure this interconnectivity for this station. Any communication media may be usually employed, from wire to wireless technologies;

Hardware requirements are those of the abovementioned software application.

The server software requirements are the following: a) Operation System: Linux Based – better stability both in terms of security and performance; b) Programming language: PHP 5.x; c) SGBD: MySQL 5.x; d) WEB Server: Apache 2.x. The optimum system hardware will be specified only when the solution has been implemented on the host system. The higher the number of users, the more powerful should the hardware be to ensure optimum performance.

Specialized Hardware

The GSM communication is ensured by a GSM Modem and if the number of SMS messages is too high, the Bulk SMS Message service provided by a local mobile operator could be a good choice. The Bulk SMS Message service is a service provided by certain mobile operators which ensures the interconnection between the local system and the mobile operator. One of the drawbacks of such a system is the fact that the connection may be interrupted for implementation reasons (cable faults), but

then this data goes to the main server, as it will have the database which contains the telephone numbers of the people in charge. Then it will go to the GSM Modem.

The alerts can be sent to the affected area's telephone by tracing their location, which can be possible by using GSM. This system will help the people who are in disaster-prone areas, also provide them with a safe location.

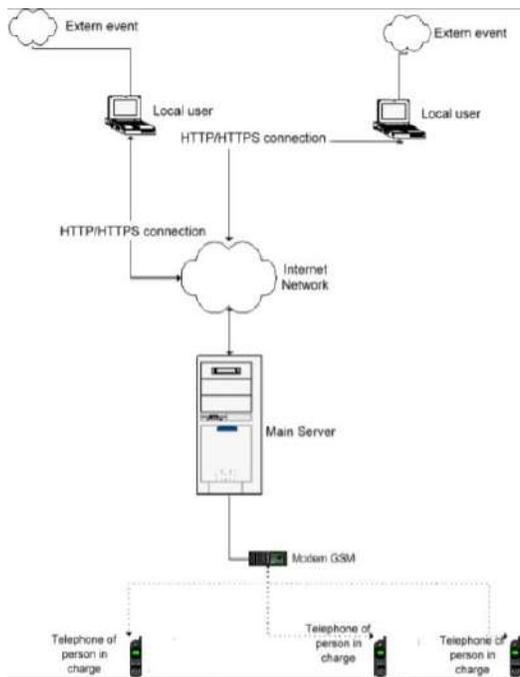


Fig. 3. Architecture diagram.

- *External Event*: an event that requires a warning alert (flooding, earthquakes, etc.)
- *Local Operator*: Human operator who acknowledges the external event and sends the alert request to those in charge.
- *Main Server*: server where the request is processed.
- *GSM Modem*: specialized hardware component that transfers the alert message to the mobile communication network.
- *Telephone of the people in charge*: personal telephone of the person in charge (mayor, prefect, etc.) [1].

V. ADVANTAGES

on the other hand this system is able to send a large number of SMS alerts [1].

How it works:

When an external event has occurred, its data is forwarded to the local user. As local users can also feed data to the portal. Through HTTPS connection, data is forwarded to the internet server.

Smart Alert is an Android-based mobile application which forms the basic framework of our disaster management strategy. This application serves as the primary mode of communication during the event of any disaster.

It is a standalone application capable of alerting users in case of an emergency and navigating them/her to the nearest Safe House or the Emergency Shelter. The Smart Alert Application system works in a very easy way.

It is developed in an understandable manner and as such can be used by virtually anyone [3].

VI. RESULT AND ANALYSIS

As nothing is perfect in this world, our system can be definitely developed and improved; our project team, in the event that this project should be continued, has focused on the important aspects: The possibility that the person in charge to send back to the server a code through which the system would be able to make decisions (create new alerts, distribute the alert to other levels); -

Adding sensors to the system that would help sending alerts automatically, or at least in an aided manner.

VII. CONCLUSION

A well-planned system can handle any crisis / disaster in a better way if a digitized alarm system is available.

Making people aware of the disastrous situation can increase their life-saving rate by 40%.

An alarm system connected to GPS and that too connected with smartphones is the best solution for this type of situations.

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New Approach To Strengthen The Password

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Abstract— User authentication becomes more and more important to protect the data of the users, with the rapid development of internet technologies, social networks, and other related areas. For legal users and defence against intruders password authentication is one of the widely used methods to achieve authentication. Many password cracking methods developed during the time, and people have been designing the counter measures against password cracking all the time. Many organizations enforce complicated password-creation rules and require that passwords include numeric and special characters to guard against such attacks. It has been already demonstrated that as long as passwords are not difficult to remember, they remain vulnerable to smart dictionary attacks. Using tools such as dictionaries or probabilistic models, attackers and password recovery tools reduces the number of attempts that are needed to guess a password. To move with this strategy we are presenting a password scheme that achieves this goal. The proposed system is based on intermixing between a fixed text (conventional part of a password) and a free random text (newly added) at different pre-defined indices having different pre-defined lengths. The extension of the random text adds an additional level of difficulty in breaching the password. We also added three more techniques to strengthen the proposed password scheme. We are also using CAPTCHA, keystroke pattern and security questions along with salt segment. We are trying to have more secure system combining this four techniques.

Keywords— *OTP, GPS, OMG, ERP, Captcha.*

I. INTRODUCTION

Authentication can be defined as verifying the validity of a user by using at least one form of the identification methods. To grant access to the system, the users identity should be verified by determining the following factors:

1) Knowledge-based factors: It is defined as what the user knows. Some of them are any forms of a password, personal identification number, answer to the secret questions and many more.

2) Possession-based factors: It is defined as what the user has. Some of them are an identification card, security token, device token or any unique hardware identifier.

3) Inherence-based factors: It is defined based on what the user is or how he does. Some of the physiological factors are fingerprint, iris and DNA patterns and some of the behavioural factors are biometric identifiers, signatures, voice and face Authentication can be a combination of the above. The types of authentication categories include:

- Single-factor authentication: To authenticate the user trying to login to the system only one factor is used. It is more prone to different cyber attacks.

- Two-factor authentication: Two authentication factors combines to increase the level of security in the system. A practical example of this implementation is the real-time banking login where some banks generate a onetime password (OTP) while the user logs in by typing the correct password. OTP gets generated, when the password entered is valid and if the user enters the generated number from his device correctly, he has the access to the system.

- Multi-factor authentication: Many authentication mechanisms combines to form a layered approach. The plethora of functionalities offered by multi-factor authentication includes protection from intrusion, enhancement of security, and reliable false proof system. Our system focuses more on this multi-factor authentication to develop a robust system to identify the users via using machine learning algorithms. The basic idea is to add three factors of authentication by correctly entering the password, verifying the device, and then identifying the user's typing pattern.

A strong authentication procedure goes by typing a password, which is strongly resistant to the cyber attacks and also the way of typing it. This double-layer protection offers more security from all Internet attacks such as brute-force, dictionary attack, and physical shoulder surfing. In brute-force attack, a hacker tries out all the possible password

combinations and are more easily guessable if the attacker knows what we know. The dictionary attack consists of trying the common passwords in the world which work in most of the cases [6]. In Shoulder surfing, the attacker looks for the password while one is typing it. One of the best solutions for all these attacks is to combine the various authentication schemes. By doing so, even if the attacker looks at or knows our password he or she cannot break all authentication schemes at once.

II. HISTORY & BACKGROUND

Chowdhury E. M. W. R., Rahman M. S. and Islam A. B. M. A. A. [1] performed a study on Traditional password system which is completely deterministic. Therefore, when a person looks at a password, he knows the complete information about the password that is worth of being copied and later used as is. However, what if some salt was added to the secret password so that parts of the password remain deterministic (the secret text), while some other parts become arbitrary (the salt)? Salty Secret, a novel authentication system, which enables use of arbitrary characters in user specified parts of password. The remaining parts, which contain the actual secret password, remain deterministic.

Reeder, R. and Schechter S. [2] developed a Secret questions (a.k.a password recovery questions) have been widely used by many web applications as the secondary authentication method for resetting the account password when the primary credential is lost.

Zhao P., Bian K., Zhao T., Song X., Jerry Park J. M., Li, X., Yan W. [3] have also conducted studies on a secret questions are generated by using the short term smartphone usage by the users. When an user forgot the password and trying to recover the password, most system uses the secret questions to recover the password. But the secret questions which most systems are using are guessable by the persons which are very close to users. But here smartphones short term usage are recorded and through this secret questions are generated like How many apps are currently installed? Who was your most frequent contact last week? etc. Blank-filling, true/false, and multiple-choice questions are used to generate using smartphones battery, app, call, sms calendar, GPS, etc.

Krishnamoorthy S., Rueda L., Saad S. and Elmiligi H. [4] designed keystroke dynamics based authentication was tested using .tie5Roanl password and the best classification performance metrics obtained were from the random forest classifier.

Yohan Muliono, Harry Ham, Dion Darmawan [5] The proposed method is that to implement an authentication system using keystroke typing behaviour. Keystroke typing behaviour can be defined as the unique characteristic of each user in typing each keystroke provided in the keyboard.

Dailey M. and Namprempre C. (n.d.).[6] Author propose a new construct, the Text-Graphics Character (TGC) CAPTCHA, for preventing dictionary attacks against password authenticated systems allowing remote access via dumb terminals.

Baykara M., Alniak F., and Cinar K, [7] An image based CAPTCHA was developed. In this captcha method, which is created with high noise value, it is very difficult to solve with OCR because the noise does not decrease even when the picture is converted to binary.

VII. PRESENT SYSTEM

1. INTRODUCTION :

In computer systems, the most frequently used method, textbased password system is the authentication method. A common threat model is an attacker who steals a list of hashed passwords, enabling him to attempt to crack them offline at his leisure.

It is believed that password composition makes password hard in guessing and hence make them more secure, different password composition policies or the individual requirements have provided the level of resistance to guessing that researchers has struggled to quantify [9].

Our approach is use of multi-factor authentication system. In this approach we are going to use multiple authentication schemes insted of traditional password approach. We are mainly using the salt generated scheme which generated the password in two parts, one is provided by user and another part will be generated by system. A combination of users password with salt will produces the password which will defend the password attacks. With the salt generation we are also added the key stroke analysis and CAPTCHA scheme to stregthen the password scheme. For recovering the password we had proposed the secret question approach to recover the password.

The objectives of this system include:

- Strengthen the password based system.
- Balancing the user friendliness of password with its strength.
- Combining static and continuous authentication.

A. SYSTEM ARCHITECTURE :

We are mainly using the salt generated scheme which generated the password in two parts, one is provided by user and another part will be generated by system.

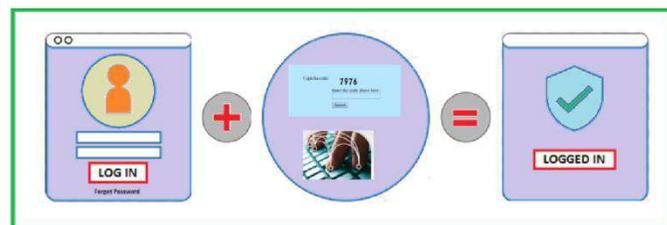


Fig. 1. System Architecture

B. MODULES DESCRIPTION :

(A) Salt Generation: System will generate the salt with users password, salt will be generated randomly by system. Every time salt password is different than previous one to make sure that no one guess the password as previous and current password is different every time.

(B) Key stroke analysis: Key stroke pattern are recorded of the user at the time of registration and are match every time when user enter the username while accessing the system. If pattern are matched then only access is granted.

(C) CAPTCHA: Text CAPTCHA are generated randomly, user need to give proper input otherwise system will generated the message about wrong CAPTCHA entered

(D) Security Questions: When user forgot the password, to recover the password he/she has to answer the security questions. We store the answers of security question at the time of registration

III. (A) WORKING OF CAPTCHA

CAPTCHA stands for Completely Automated Public Turing Test to Tell Computers and Humans Apart which is also known as a type of Human Interaction Proof (HIP).

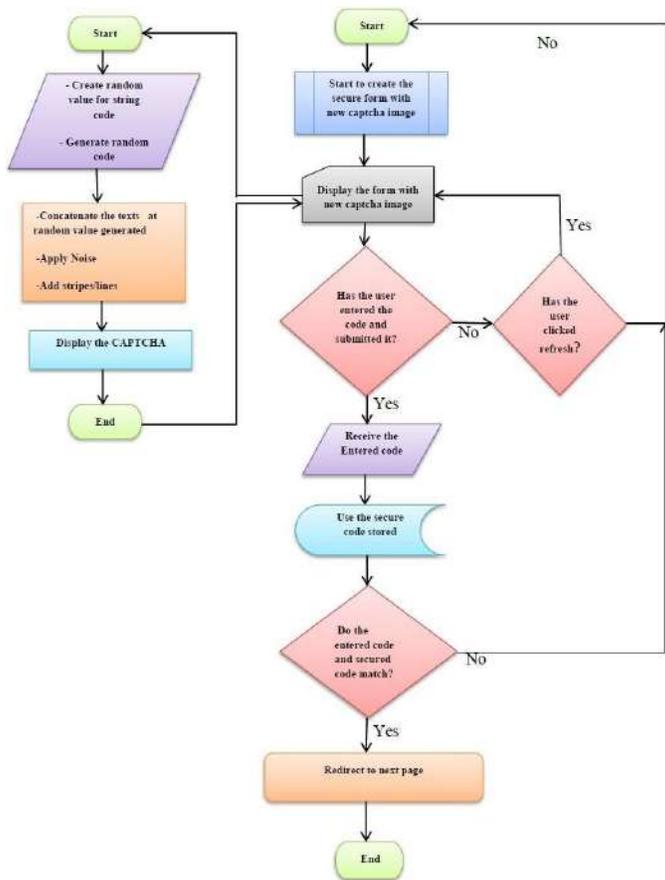


Fig. 2. Flow of CAPTCHA

Its goal is to check whether a user (of an app or a website) is a real person or a bot. For that, it completely relies on specific traits that people have but machines don't. It's most widely used in the web industry as a good protection against spam, bots or DOS attacks. The most common example is the DOS (The Denial of Service), which is a type of attack which is focused on making a resource unavailable. The attacker sends a large amount of requests to the server to make it incapable to return results. It simply blocks your website. This attack done by an individual, by a real person, would be a horror. It would be boring, exhausting and impossible. The person can't manually make the efficient amount of requests, but computers don't get exhausted or bored. They make hundreds of requests every second. CAPTCHA helps you to identify these behaviours and block them.

This scheme is simple. You can type some data or you can perform any other action and then confirm it by just passing a CAPTCHA test. The most common type of test is an image of a lots of distorted letters. Humans are easily able to read the above words and write them down, while for computers it's just a mass of zeros and ones. You always have to remember how machines work.

CAPTCHAs challenges shouldn't be limited to any fixed number but if they are it would be easy to teach a computer which text corresponds to a given image. Hence, many creators use sophisticated algorithms to generate their distorted texts in random manner. Creators of reCAPTCHA figured out another idea by using the process of digitalizing books and also asked users to decrypt the short pieces.

III. (B) KEY STROKE PATTERN ANALYSIS

Verification phase is all about checking the identity of the user. The pattern of the user to be verified is compared with the person's individual template. Keystroke verification techniques are grouped under two domains:

- Static
- Dynamic or Continuous

Static verification: approaches analyse keystroke verification characteristics only at specific instances, thus proving as additional security besides traditional username/password as in the case of user login sequence.

Keystroke dynamics: is a biometric based on the assumption that diverse people type in matchless characteristic manners. Keystroke dynamics is mostly applied to verification but identification can also be made possible.

This authentication system consists of three steps:

- Feature Extraction
- Pre-processing
- Feature Subset Selection (GA)

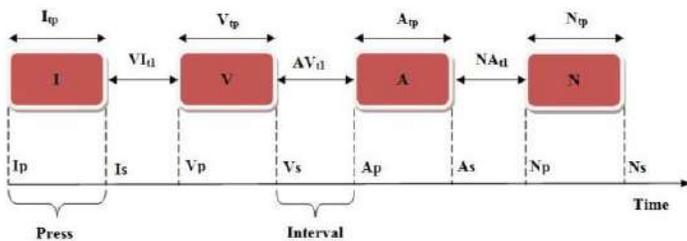
Feature Extraction: The input data is usually represented by a sequence of typed keys, together with appropriate timing information expressing the exact time at which keys have

been depressed and released. From the input data, some of the features will be extracted.

- Duration of typed keys (how long a key is held down)
- Latency between two consecutive keystrokes (the elapsed time between the release of the first key and the depression of the second key)
- Digraph
- Tri-graph- Pressure of keystroke - Force of keystroke.

Following Figure shows the extracted features: keystroke duration (duration) and keystroke latency (interval) of the word IVAN." The complexity label is assigned as CL= (1, 1, 1).i.e. the distance from I and V, V and A, A and N is longer.

Fig. 3.Extracted features of the Keystroke Dynamics



IV. RESULT AND ANALYSIS

This system is designed for the private organizations or companies where security is the main aspect. Suppose some client of the company wants to upload some file then firstly, he would register as a new client and would go through the 4 features i.e primarily he would go through key stroke analysis. Later, through salt generation, captcha and unique security question whose answers are known to authorized user only. This system tries to maintain tight security aspect so that if anyone tries to breach the password then also they can't login successfully.

The Result Analysis of the system is as follows:

1] Keystroke Analysis: It is the initial stage where client registers and when they set the username and password for their account at the back end the time of key pressed and key released is stored in the database. Later the average time is calculated each time when the user login. This calculated time is compared with time stored in the database at the initial stage. For the comparison a particular threshold range is set, if the time matches the threshold value then only the system ask for the password.

2] Salt Generation: It is a random password generated by the system each time. After entering the user password, the system password is generated and at the back end a combination of user and salt password is made. Even after getting the newly generated salt password it is difficult for an unauthorized user to predict the user password. This is the second phase of authentication process.

Example:

If user password :amol12

Salt generated password:Vmea32koglr1

3]CAPTCHA: After the password validation the third phase is captcha where it is used to verify whether the user is human and not a bot. CAPTCHA is used in both the cases while registering and while login. CAPTCHA can be of various types but we are using the image captcha with tilted line.

4]Security Questions: As we know there are many basic security questions but we are using unique questions whose answers are known to authentic user only where the answers are stored in the database itself. When the user forgets password it can be recovered using the security questions.

Example: What is the brand of your first phone?

V. CONCLUSION

Many web based applications are still using password based authentication system; we need to provide the strength to the system. So we propose a new way to strengthen the password with randomly generated salty password, where a different combination each time is made for the system. We also check the keystroke pattern in background with CAPTCHA in front end. Though an unauthorized user tries to login he can be detected in the first stage itself. Which provides more secured way to the user. If user forgot password we make the use of security questions for recovery of password. Combining all these techniques our system gives more secured authentication environment model.

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Automatic Solar tricycle for Physically Challenged People

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Abstract— *The percentage of handicap peoples in India as well as in world it's a big problem. But that handicap people can be work efficiently and regular life as all leave. So here in this paper we have survey different technologies and vehicle systems presently available for handicap people[6]. Also we have compared their advantages and disadvantage of the different vehicle systems. Proposed system report to design and built tricycle prototype that is capable of driving automatically. The existing tricycles are not efficient for disable person and it is inconvenient to cover long distance for them. Considering different disable persons needs, our proposed model come with features which will reduce the human effort and make their life easy. The automatic tricycle will employ use of solar panel to charge battery which will be used to run motor .Also it automatically handle headlight according to light intensity. It will check light intensity of surrounding and based on light intensity, headlight will be automatically on or off. It will detect obstacle and will get stop automatically. The turns of tricycle are controlled by user and this will be done by using hand gesture. So, proposed tricycle will give comfort to disable person and also normal person .*

Keywords—*Solar panel, Raspberry-pi, Pi-camera, Tricycle, Motor ,Python.*

I. INTRODUCTION

Our project review is about tri-cycles which operate on solar energy. Today's time electricity plays vital role in our day to

day life. To generate electricity is the main challenge and it's important for human being for living effortless life. To generate electricity solar is the best, easily available, cost free and eco-friendly option. Tri-cycle used by immobilized persons as well as daily workers also. Lots of solar tri-cycles are present in market but those have many disadvantages. Paddling solar tricycle is present at market which requires human effort to drive[5]. It requires man power to drive the

cycle. . A motorized tricycle requires fuel to drive. Fossil fuels are Non-renewable, costly, combustible source which act as pollutant. Combustion of fossil fuels play important role in pollution which causes global warming. An electric motor cycle requires electricity for operating. As per Fuel electricity is also significant. it is costly. All this information collected by

studying of different paper maintained in references. So overcome these disadvantages we are planning to develop a

solar tri-cycle which is instructed by hand gesture. We will use solar panel to charge battery. This battery is use to run motor which is use to run tricycle. We are using ultrasonic sensor to detect obstacle. After detecting obstacle it will stop automatically. Movements (turns) of tricycle will controlled by user. User can control turns of tricycle by using his/her hand movement[4]. If he/she indicate finger to right then tricycle will turn to right automatically and if indicate to left then tricycle will turn to left automatically. Also headlight will on/off automatically. . When light intensity is low then headlight will turn on automatically and if high then headlight will turn off automatically. Switches also provided to tricycle.If hand gesture did not recognized then user can use switches for taking turns.

II. RELATED WORK:

- **Solar panel and battery**

Solar power is the conversion of energy from sunlight into electricity, either directly using photovoltaic indirectly using concentrated solar power, or a combination[1]. We are using solar panel to convert the solar energy to the electrical energy by using solar cells, then converting this electrical energy to mechanical energy.

- **Ultrasonic Sensor(USN):**

As the name indicates, ultrasonic sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception. So we are using USN for object detection. When obstacle is detected by USN then interrupt is generated and raspberry pi stops working and so tricycle will stop automatically.

- **Light dependent resistor(LDR):**

LDR is basically a photocell that works on the principle of photo-conductivity. The passive component is basically a resistor whose resistance value decreases when the intensity of light decreases. This optoelectronic device is mostly used in light varying sensor circuit, and light and dark activated switching circuits. In our project LDR will check light intensity of surrounding and based on light intensity headlight will automatically on/off.

- **Pi Camera:**

The Raspberry Pi camera module can be used to take high-definition video, as well as stills photographs. It's easy to use for beginners, but has plenty to offer advanced users if you're

looking to expand your knowledge. There are lots of examples online of people using it for time-lapse, slow-motion and other video cleverness. You can also use the libraries we bundle with the camera to create effects. We are using pi camera for capturing hand gesture images.

III.METHODOLOGY:

• System Architecture:

System architecture is conceptual model that defines the structure, behaviour and more views of system. System architecture can consist of system components and systems developed that will work together to implement overall system.

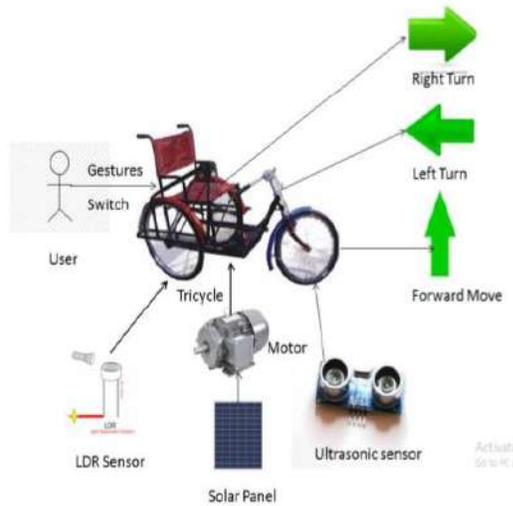


Fig 1.System architecture

• Block Diagram:

A block diagram is diagram of a system in which principal parts or function are represented by blocks connected by lines that show relationships of blocks..

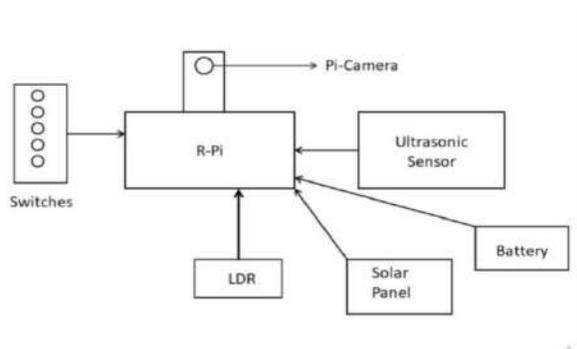


Fig 2.Block diagram

• Handgesture diagram:

Gestures a non-verbal form of communication provides the HCI interface.The goal of gesture recognition is to create a

system which can identify specific human gestures and use them to convey information or for device control[2][3].

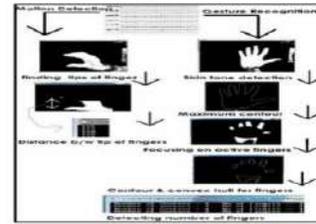


Fig 3.Handgesture diagram

IV.ADVANTAGES:

- It will reduce human effort as tricycle will operated through hand gestures.
- Tricycle will be easy to handle..
- As tricycle will stop automatically when obstacle is detected. So accident risk will reduce.
- As using solar panel in our tricycle, It will not create any type of pollution.
- Solar energy is better replacement for oil.

V. LIMITATIONS:

This system has following limitation:

- Hand gestures will not be recognised properly when light intensity is low.
- Although solar energy is an unlimited resource, it is not always available when its needed.
- It will not be useful for blind people.

VI.APPLICATIONS:

Applicable for:

- Designed tricycle will useful for physically disabled person.
- Tricycle will also be useful for normal person.
- Proposed tricycle model can be used as green vehicle.

VII.CONCLUSION:

By studying of different papers and techniques we decide to make project on Hand gesture controlled solar tricycle which removes different disadvantages.We will produce a tricycle that will be effective in providing mobility for a persons who have physical

disabilities. Proposed Tricycle model can be used as a green vehicle in developing countries due to its zero pollution effect nature. Hand gesture can be recognized easily, and action performed depends on gesture movement is primary focus of our project. Also obstacle can be detected using ultrasonic sensor and cycle will stop automatically.

VIII. FUTURE WORK:

In future, this robotic vehicle can be enhanced by adding following functions:

- In future, tricycle can be modified into bicycle which will be balanced automatically.
- By adding map features we can also use tricycle for transportation purpose.

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DIGITAL CAR PARKING SYSTEM

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Abstract— With the help of Internet of Things many devices and services are able to connect at any time in any place. Now a days population is increasing at a rapid pace and so are technologies. Due to this use of vehicles is also increasing. People are facing the issues regarding to the parking of their vehicles. So, we approach a special system for smart car parking reservation and security maintenance in a car parking area. This system mainly designed to avoid unnecessary time consumption to and an empty slot in a car parking area. By the same case we can also save more than 80 percentage of fuel wastage in a car parking area to find the empty parking slots. The reservation process is happening only by user. Hence the user find an empty parking slot and makes the action of reservation through an internet access with driver's own knowledge. For this use of cloud is done for data processing. We have proposed a system with multi-processing queuing mechanism (MPQM) to avoid Multi-user approach Problem (MUAP) during reservation process in our smart parking reservation system.

Keywords— RFID (Radio Frequency Identification), MPQM (Multi-processing Queuing Mechanism), MUAP (Multi-user Approach Problem), IoT (Internet of Things), QR Code (Quick Response Code)

I. INTRODUCTION

The parking problem in big cities, especially the mega-cities, has become one of the key causes of the city traffic congestion, driver frustration and air pollution. In the future, it is expected to have an increase in the demand for the intelligent parking service because of the rapid growth in world population as well as the automotive industries. An effective solution to this service can be provided by many new technologies. First, the nearest parking area will be found. After finding nearest car park, we can directly search only nearest car park for an empty spot. By doing this, we directly skip the car parks which are not close enough to driver. This method makes the search easier, faster and more efficient. Time is the most valuable metric in our project . we consume less time while finding nearest empty spot in car park. Saving time while parking a car means that we save energy, fuel, even less CO2 emission. As a

summary, main objective of this project is not only saving time but also wrapping different locations or areas with a common software and investing the land or area for parking vehicles in a fraction of seconds. This will revolutionize the business perspective.

II. HISTORY & BACKGROUND

[1] In 2016, Abhirup Khanna and Rishi Anand address the issue of parking and present an IoT based Cloud integrated parking system and propose the system provides real time information regarding availability of parking slots in a parking area. Users from remote locations could book a parking slot for them by the use of our mobile application. [2] In 2017, D. Vakula , Yeshwanth Krishna Kolli proposed a paper Low Cost Smart Car Parking System. In this ,studying and analysing the current parking problems in various cities and problems are categorized as Search of Parking space and Parking Fees. In this paper, an online based parking booking and management system are presented to address the parking issues in city and for deployment in Smart Cities. [3] The authors Burak Kizilkaya, Mehmet Caglar, Fadi Al-Turjman explain about an Intelligent Car Park Management System based on Smart parking system, green IoT , smart cities, android parking describes the use of android application and smart phones for the purpose of parking ,in 2018.

III. PROPOSED SYSTEM ARCHITECTURE

We are proposing a system for parking the vehicles safely which includes three types of users-

- [21] Admin
- [22] Parking slot owner
- [23] Vehicle owner.

the parking slot owner , viewing the book or unbook the slots, viewing all the transactions and feedbacks. 2. Parking slot owner can add the slots ,delete the slots ,view book or unbook slots ,can see all previous transactions ,add user to blacklist and can also view the feedbacks. 3.User will use an android application for booking the parking slots in nearby locations. We can book the slots from home without actually going to the location just by entering the user's information. The car before entering the parking area will scan the QR Code which was sent to the email of the user. The payment regarding to this will be done after the car departs the parking area which can be manual or online depending on the choice of the user.

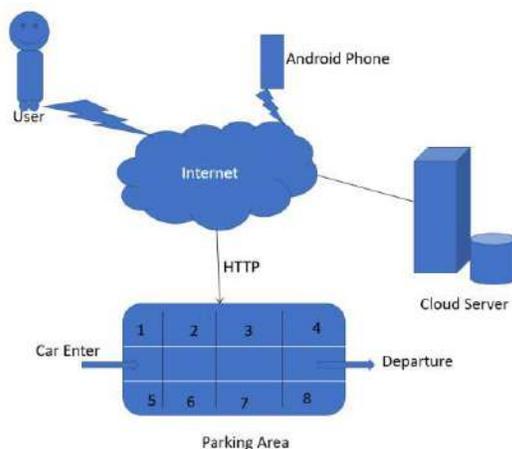


Fig. 1. System Architecture

IV. RESULT

In Digital Car Parking System, user can pre-book the parking slot using an Android application without actually going to the location and can park his/her vehicle safely.

Also, by using QR Code the payment can be done according to the choice of user. The LIVE update (car) is provided hence security is provided hence security is maintained.

CONCLUSION

The concept of IoT concept is going to become an important part of our daily life, and work life. It can be employed efficiently to create more comfortable environment and living spaces. On the other hand, our planet needs some green solutions because energy efficiency is a very important concept nowadays as we are running out of energy resources. So introduces an energy and time efficient approach which can be used in car parking applications. Development of the Smart Parking System that typically obtain the information about available parking spaces in college areas and placing the vehicle in a real time at available position by making the use of sensors like Ultrasonic sensors, RFID tags and the concept like QR code, etc.

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Smart tool dispenser machine using AI and IoT

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Abstract— In most cases, regardless of sector or industry, the most common areas waste in business is inventory wastage especially on product-based businesses, inventory can be massive waste. These might occur due to materials are not being used effectively or throwing out excess inventory that perishes or expires. Currently available vending machines don't provide facility to control stock and real time analysis for Business Intelligence. Proposed system is designed to give more user friendly experience to employee by voice user interface along with proper tool dispenser. It will provide real time alerts in over stock and understock conditions which helps for efficient stock management. System will also work 24*7 so the productivity will get increase. Digital signage helps to generate new revenue sources. Real time report generation will provide better offering by identifying top required and least required tools.

Keywords— *Artificial Intelligence, Business Intelligence, Digital signage, Internet of Things, Stock management*

I. INTRODUCTION

The modern vending machine comes in a drastic range of shapes and sizes, but most people know how to use them. This is because the steps in using vending machines are universal: insert money, and then press buttons corresponding to an item's label [1]. However, the overall design of vending machines has AWS. First, all interactions with vending machines are based on visual clues and physical interaction. This interaction model causes problems for persons who are visually impaired. Furthermore, those people who have trouble pressing buttons will struggle using vending machines. Second, it is impossible on most, if not all, vending machines to order multiple items at once due to the constraints of the steps and logic operating the machine. Additionally, these vending machines no longer feel "modern," and some users describe them as "boring"[2]. With the explosive growth in computer vision, hearing, and other artificial intelligence technologies, it is surprising that vending machines have been left behind. To help make vending machines more accessible to users, convenient, state-of-the-art, and generally fun to use, we set out to create Smart tool dispenser machine. Through a system of voice and intent recognition, as well as a system for gesture detection, users no longer need to manually

press buttons, but can instead order snacks as if they were interacting with a cashier. Recently, this vending machine

culture is changing its phase from a simple "convenient unmanned shop" to a station providing several services such as a) food supply to disaster area b) various kinds of information c) support to emergency patients d) security service for outskirts etc. Similarly to increase the market sharing of the industry, as a critical issue of business strategy, improvement and enhancement of supply chain management is a must to provide a better and user-friendly products or services [3]. However, in vending machines industry, a better replenishment schedule is a key component to fit in with a frequency and quantity control. Thus, it is important for the industry to review the replenishment policy and system of the vending machines. Traditional replenishment process is based on the estimation from historical inventory records. The main problem of the existing approach is using periodic review policy to replenish the goods of the vending machines. Periodic review policy is suitable only when the demand is very stable and the replenishment cost is very high [4]. However, the periodic review policy is not suitable to fit in the vending machine industry. The demand of the products of vending machine is very fluctuating and the cost of replenishment is quite high. The problems of the existing approach caused by periodic review policy are (i) Stockout occur frequently, (ii) Unreliable inventory control, (iii) Unreliable replenishment policy and (v) Low cost effectiveness. Thus, accurate and instant inventory information is another important issue to enable a reliability of product availability. Supplier can use the realistic information to better anticipate future demand. Therefore, it is critical for the vending service companies to construct a real time information network to perform a better supply chain management with a better replenishment strategy.

II. History & Background

It is said that the origin of the vending machine goes back to B.C. So vending machine is basically designed to provide services to many people and call it as 'convenient unmanned shop'. The reference paper given below describes several services which existing system provide to the customers. [5] Toshio Yokouchi, in "Today and

Tomorrow of Vending Machine and its Services in Japan", 2016. The above system is having environmental issue like power consumption. The system mentioned in the next reference overcomes the previous drawback thereby reducing a power consumption.[6] T.C.Poon, K.L.Choy,S.I.Lao in,"A real-time replenishment system for vending machine industry",2010 Also stock-out occur frequently which causes unreliable inventory control therefore accurate and instant tracking of inventory information is difficult.[7] kwan-gsoo kim dong-hwan park1, in "smart coffee vending machine using sensor and actuator networks",2014 this system is able to store the information related to coffee which previous system was unable to store. As the wired network is installed on the machine which is costly this might be the limitation of such system. [8] robert gruen, erich liang,"nuivend - next generation vending machine",2016 the nuivend system mentioned in the above reference is providing a natural user interface (nui) through system of voice and intent recognition which overcomes the previous system drawback of manual operation. This system may cause error while processing natural language. So we are trying to achieve NLP in our proposed system without fail.

III. DESIGN ISSUES

Automation is most important need nowadays which reduces human efforts and improve correctness of operations. Using feature of Internet Of Things(IoT) like QR code scanning we are going to provide security to tool dispenser machine .One of the Artificial Intelligence feature like Natural Language processing is a way to recognize human voice and take appropriate actions based on that so proposed system provide voice user interface which allow smooth interaction between human and machine.Speech recognition and speech synthesis API provided by google are to be used in this system which uses Hidden Markov Model algorithm for speech recognition[9]

Proposed system is to make intelligent and robust (continuous operation with very low downtime, failure rate ,high insensitivity to continuous changing environment) device which allow customer to achieve great user experience, 24* 7 service and real time reports for business intelligence. Natural language processing algorithm of artificial intelligence will be provided to convert employee voice commands into text for recognition of tools. Security and safety will be provided by QR-code identification which helps to only authorized employee can unlock the machine. In this way AI and IoT helps to increase productivity and decrease employee downtime.

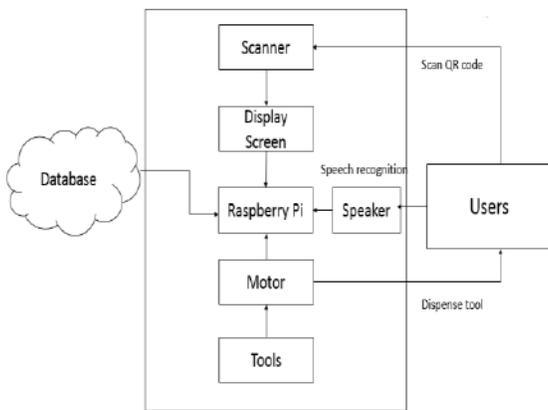


Fig.1. System Architecture

Proposed system architecture as shown in Fig.1 consist of following modules:

i. QR CODE SCANNING/UNLOCK MACHINE

In this module employees scan QR-code to unlock the machine and employee get login access. Details of employee are checked at the back-end and authorized employee get permission for further operations

ii. VOICE USER INTERFACE

After successful login of employee selection panel will display all the available tools and give user choice of selecting required tool. User can required tool by giving proper voice commands. Using Natural language processing [10] which is application of AI for speech recognition user voice command is converted into machine understandable format for tool recognition.

iii. TOOL RECOGNITION AND DISPENSE

By converting voice command into machine understandable code availability of particular tool is check at the backend and if available dispense tool and update database.

iv. ANALYSIS AND REPORT

Using database at backend tool which is most required by employee are analyze and accordingly stock management notifications will be provided based on availability.

Also personnel accountability is maintain to recognize which employee used which tool most of the time.

Detail workflow of proposed system is explain in Figure 2.

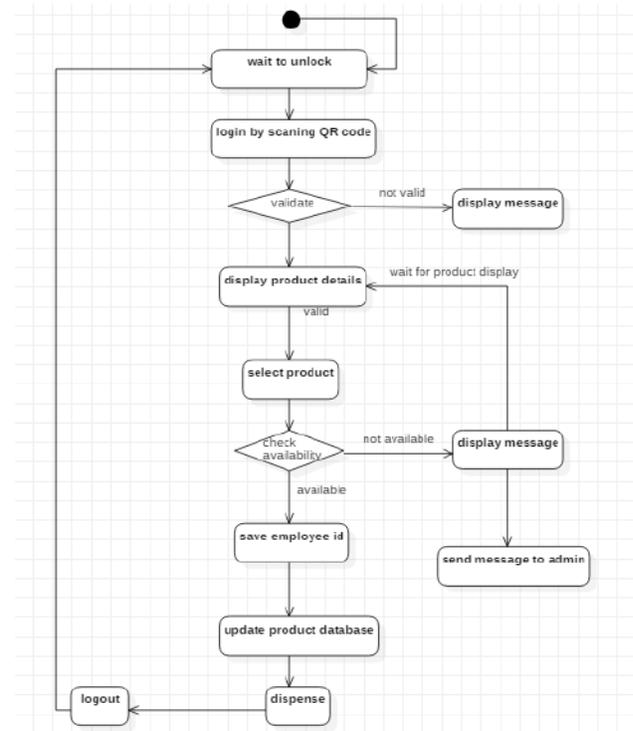
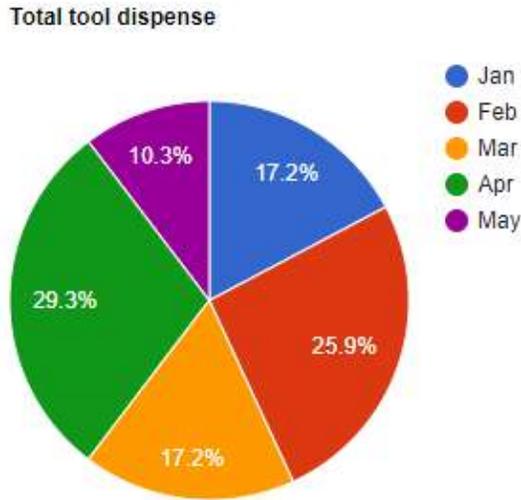


Fig 2. Workflow of proposed system

IV. RESULT AND ANALYSIS

As the tools are dispensed tools count get decreased and is updated in database and displayed at admin side. The following Fig 3 shows the pie-chart of overall tools dispensed monthly in year 2018. The different colours helps to identify months and the total tools dispensed are shown in percentage format.



Fig

3. Pie-chart

The following Fig 4 shows the chart of tools count monthly wise. In any particular month how many tools dispensed (i.e count) which is shown spline chart. The count helps to manage stock from overall stock.

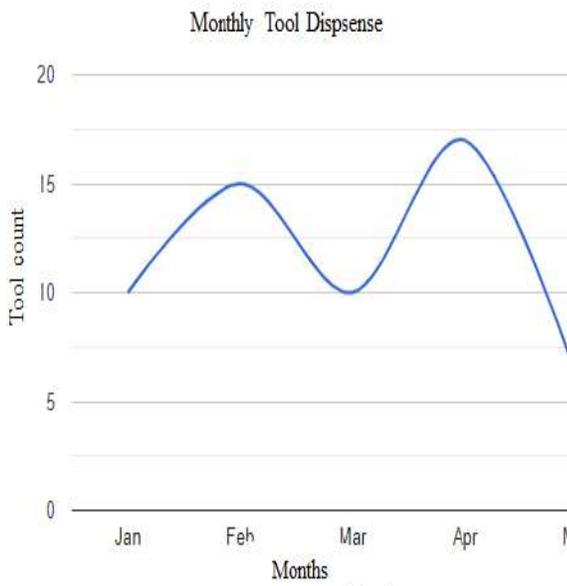


Fig 4. Spline-chart

When user speak the tool name the machine records the sound and give proper reply to user but when the machine can't able to

recognize the sound due to some factors then the machine will display proper message to user.

We have tested for different users input with respect to external parametrs like far from microphone, external noise, wrong ascent etc. which is summarized in below table Table.1

Table 1.NLP Responses

Users	Voice Correctly	
	Identified(Yes/No)	Reason
User 1	Yes	
User 2	Yes	
User 3	No	External noise
User 4	Yes	
User 5	Yes	
User 6	Yes	
User 7	No	Far from microphone
User 8	No	Not clear ascent
User 9	Yes	
User 10	Yes	
User 11	No	External noise
User 12	Yes	
User 13	Yes	
User 14	No	Far from microphone
User 15	Yes	

V. CONCLUSION

Proposed system will help to achieve maximum productivity by providing real time alerts for stock management and efficient use of stock. Maximum profit will be achieve by reducing stock wastage and digital signage when machine is inactive. Machine will work 24*7 which help to reduce employee downtime. By using NLP we will customize user experience by providing voice user interface and real time reports will be generated for BI.

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Automatic Scheduling System Using AI

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Abstract— The traditional method of manually creating a timetable is very tedious and time consuming, due to this many times different problems occur like various classes may clash, extra load on certain teachers and this all may ultimately affect the curriculum of students. To overcome all these problems we propose an automated timetable scheduling system. This system will be capable of handling both hard and soft constraints which are specially required for preparing timetables in colleges where there is a large number of students and limited classrooms, labs, and faculties as well as limited time to complete the curriculum considering the exam period. We propose a system which will take faculty details, allocated subjects and number of classrooms and labs available as well as hours allocated by the university as an input. Once the final timetable is generated, separate timetables for faculty, labs and different classes will be available as an output. It will also keep a track of previous year's generated timetables.

Keywords: *Agile, Genetic Algorithm, Hard constraints, Random Adaptive Search, Soft constraints.*

I. INTRODUCTION

Today almost every facility and institute needs a timetable to execute any work in a timely and orderly fashion. Especially in educational institutes where there are different courses, a large number of students and few teachers. The traditional method of creating a timetable includes a staff member who is responsible for creating the timetable; he/she would manually create the timetable and try satisfying the required structure. Now usually the person would refer the previous year's timetables and with that would create the new one. One problem with this is that the same old format of timetable would be repeated again and again with some minute changes. This would be unfair to that faculty who would have the same time slot, again and again, every semester or year. We would primarily look into engineering colleges, where there are different branches and many times for some classes the faculties of different branches are also required. In this case, it becomes very difficult to efficiently create a timetable which would satisfy all the needs. This process would take a considerable time of the faculty as well as efforts which rather could have been used at another important task. It also requires a lot of paperwork, and in a time like today where there is such advancement in reducing human efforts in almost every field then why not here?

The timetable scheduling is considered as a Constraint Satisfaction Problem (CSP) in Artificial Intelligence because to generate a single timetable we need to satisfy many different constraints or conditions, only by which we would be able to generate an efficient timetable for the required job. Even during scheduling simplest and smallest constraint can cause a huge problem because of which an optimal timetable is even harder to create and find. Hence this problem is also an NP-Complete problem.

Automatic Scheduling System is a Java-based software used to generate the university timetable automatically. The system would help to manage all the periods automatically. It would make sure that no faculty is given extra load in a day or treated unfairly. The system will need different inputs like the details of staff, rooms, labs, subject allocated to the staff as well as time allotted to each subject from the university. The constraints to generate the timetable will already be set according to the specific institute and can be changed later onwards if institute requests for it. These constraints can be soft as well as hard. Hard constraints are those which the system has to satisfy and cannot generate a timetable without them. Soft constraints can be avoided if they are violating any hard ones. The system would try to satisfy all the hard constraints and maximum of the soft ones. While dealing with the leave request, the system will check which faculty can substitute the faculty on leave and try to minimize their load. The system will display the list of prospects and the admin has to decide which faculty will be best suited for that subject and the system will generate the new timetable. Selecting a faculty as a substitute it allows viewing timetable of that faculty to ensure that the faculty is free at that particular period.

II. History & Background

Timetable generation problem is a highly constrained one, but above all the problem differs greatly for different colleges, institutions, and others. It is hard to generate the timetable for all of these diverse applications based on a single problem. There exist a lot of different timetabling problems like university timetable, exam timetable, school timetable, sports timetable, and worker timetable. Also, there exist different approaches to problem-solving which use meta-heuristics like a genetic algorithm, Backtracking, Constraint Logic Programming. In recent years two major approaches have

proved beneficial namely Local Search Procedures and Constraint programming.

Heuristic Procedures

Different heuristic methods are used for solving computationally hard optimization problems within a reasonable time frame which is good enough for the problem. Local Search algorithms like a genetic algorithm, the traveling salesman problem are also heuristic in nature. These algorithms move from solution to solution in the space of candidate solution by applying local changes until an optimal solution is found. Heuristic methods do not guarantee that the solution found will be optimal [1][5][6].

Constraint-Based Approaches

One major advantage of constraint programming is that clear definitions of the constraints serve beneficial for solving the given problem. This enables the program easy to adjust. The main disadvantages of this approach are:

1. The difficulty with expressing soft constraints
2. The potential problems that occur while enhancing the initial basic solution.

The capability to convey composite constraints in a simple, declarative way is critical for establishing the specification of the colleges and university timetable problem into the program and is critical for their successful result [6].

Constraints

There are two types of constraints namely Hard and Soft Constraints. Hard constraints are those constraints which while solving any problem cannot be violated in any case. We can obtain the desired solution when all of these hard constraints are satisfied. On the other hand, the maximum of the soft constraints' satisfaction will be the goal [5].

Different constraints for the timetabling problem are as follows:

Basic mandatory constraints:

- 1) At a particular slot a teacher, classroom or lab cannot be allocated more than once.
- 2) During the break time, no lecture should be scheduled.
- 3) Teacher's working hours cannot exceed the institute timings.
- 4) A load of every teacher must be balanced weekly.

Some Hard Constraints are as follows:

- 1) A Teacher must teach a particular class every morning for a certain time.
- 2) A specific day's working hours for a teacher is fixed.

- 3) Class Y's hours are from 5 pm to 7 pm Monday to Friday.
- 4) Room R is not available on Saturdays.

Some examples of secondary constraints are:

- 1) If possible, total working hours for a teacher between 8 am to 5 pm should not exceed 4 hours.
- 2) If possible, a teacher should not be required to come in the morning at 8 am more than 3 days a week.
- 3) If possible, there should be at least a 30-minute gap between any two lectures for every teacher.
- 4) If possible, a Teacher or student need not come to college for a single lecture.

DESIGN ISSUES

There are different methods which can be followed to get a feasible solution for the timetabling problem. One approach is to create a semi-automatic timetable. To create effective timetable requires hybrid approach and therefore the semiautomatic two-phased user interactive approach is discussed by Aditya Bhatt and Lakshmi Kurup [2] that first creates an initial population and then the mutation is done on a selected solution in the second phase by combining best approaches.

There is extensive use of hash tables in this approach. Hash tables are used to store slot availability of each entity and the constraints associated with it. Here entities are nothing but the rooms, labs, faculties, etc. They not only simplify the development but also help in running the algorithm faster as the time required to search for availability is reduced.

The Hash Tables can be used to store the unavailability or availability of different entities. For these, availability hash tables will look like this

For an entity Room R:



Slots from 6 to 8 are removed and slots from 11 to 16 removed.

For Lectures L:



Slots after 6 and before 9 are removed because the lecture L cannot be allotted in those slots.

Another famous method to solve the timetabling problem is to use the genetic algorithm completely or to use in combination with other algorithms.

Genetic Algorithms are inspired by Darwin's evolutionary theory. GA comes under the class of Evolutionary algorithms that use the principle of natural selection to derive a set of solutions towards the optimal solution. It is a search heuristic which generates solutions to optimization problems using techniques inspired by natural evolution like mutation, inheritance, crossover, and selection [1].

Initially, the genetic algorithm starts with a set of solutions which are called as the population. Solutions from one generation of the population are taken and then used to form a new generation of the population. This is done in hope that the new population will be better than the old population (stronger). The new solutions are selected based on their fitness to form new solutions (offspring); suitable solutions will have a higher chance to produce more suitable solutions and so on. This is repeated until all the constraints are satisfied.

Algorithm: Genetic Algorithm (GA)

BEGIN

INITIALISE population with random candidate solution.

EVALUATE each candidate;

REPEAT UNTIL (termination condition) is satisfied DO

1. SELECT parents;
2. RECOMBINE pairs of parents;
3. MUTATE the resulting offspring;
4. SELECT individuals or the next generation;

END.

The reasons to use a genetic algorithm for finding the fittest solution are:

- 1) There are multiple local optima.
- 2) The objective function is not smooth (so derivative cannot be applied)
- 3) The number of parameters is very large
- 4) The objective function is noisy or stochastic
- 5) A large number of parameters can be a problem for derivative-based methods when you don't have the definition of the gradient. In this type of situation,
- 6) Optimal Resource Allocation: Assign teachers and classrooms for periods and optimize the allocation of resources in the best manner possible.

IX. Limitations

- 1) It may not be fair in terms of slot generation for all staff and students.
- 2) Incomplete data provided by admin would lead to
- 3) Invalid Constraint specification may lead to faulty algorithm generation.

X. CONCLUSION

The proposed system concludes that for automated generation of timetable many different approaches are

you can find an acceptable solution through GA which can be improved with a derivative based method.

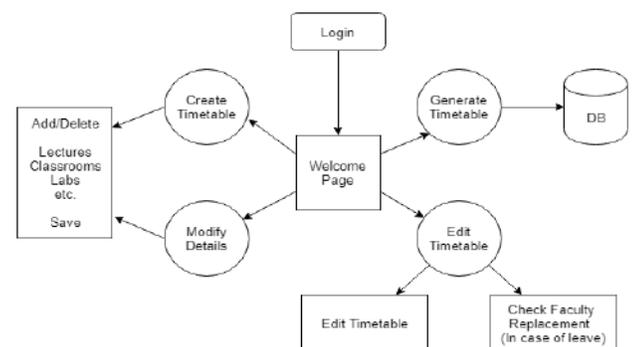
GA is able to find fit solutions in very less time. Here fit solutions are solutions which are good according to the defined heuristic. Due to the random mutation, we can obtain a wide range of solutions.

VIII. Result and analysis

The resulting system would have a model as shown in figure 1.

Advantages of the system

- 1) Eliminate Paper-based process: Manual creation



of timetable involves a huge amount of paperwork as well as manually scheduling the timetable which would involve many errors. Due to this, delays may occur and waste resources as well as the time of the institute.

- 2) Intuitive & User-friendly: It is simple and easy to use. Very less technical knowledge is required to operate it. It is very easy to implement in any institutions of any size.
- 3) Customization & Flexibility: Timetable software can be fully customized to meet the unique class scheduling needs and suggestions of the institution

available like meta- heuristic methods as well as constraint satisfaction methods. Depending on the user's interaction with the system and the system's requirements any algorithm can be followed or a hybrid one can also be created. Thus to get an optimal solution different algorithms can be used at different phases.

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A Review on Fiber Reinforced Hybrid Composites

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Abstract— In this world of innovation, supportive structures to implement ever increasing technology are needed. Hybrid composites are now in huge demand in various fields like aerospace, marine, automotive, sports, etc and can be used when single fiber material does not have all the desired properties. Many researchers studied various hybridization possibilities which revealed mechanism at the micro level of composites. Different combinations in different orientation increased the research work to be done for overcoming future demands. This review paper discusses in details about hybrid composites with its effect on different parameters. Discussing work in three types of hybrid composite viz. natural-natural, synthetic-synthetic and natural-synthetic hybrid composites.

Keywords—*Hybrid composites, Natural Hybrid composites, Synthetic Hybrid composites.*

I. INTRODUCTION

Composites can be defined as a structure made out of different constituents i.e. reinforcement and matrix which are not soluble with each other. Since the stone-age, mankind has been using composite materials like for building houses which were made up of mud and straw or grass. Previously coconut fiber/ latex rubber was used for automotive applications but this was substituted by newly developed synthetic fibers having good performance. Each and every component of a composite will contribute to its overall properties [1-5]. The vital thing which makes composite an ideal component for a structural application is manufacturing ability to withstand the extreme condition [6]. Composite materials have taken over the conventional materials in recent times in various fields like automotive, aerospace, marine, sports, biomedical, defence industries. Due to ever increase in demand of specific strength, specific modulus, resistance to fracture, fatigue, impact, and creep, composites are preferred in most applications.

Composite materials are generally made up of fibers and matrix, in which fibers are generally synthetic like glass fiber, carbon fiber, aramid fiber on the other hand in some applications. Natural fibers like coir, sisal, cotton, flax, jute, abaca, banana, hemp, etc. Synthetic fibers are preferred over natural fibers where strength and high load carrying capacity are required. But the cost of synthetic fibers is high compared to natural and also non-degradable in nature. The important parameters which contribute to the composite of fiber are fiber length, weight ratio, fiber orientation and interfacial adhesion between fiber and matrix [7]. It noteworthy that the principal load carrier in the composites are fibers and on the side, matrix keeps the fibers orientated and at a desired location, acts as load carrying medium and protects fibers from the environmental damage [8].

A huge changeover was reported on the usage of natural fibers all over the world for the production of composites [9-11]. Natural fibers are abundantly available across the world such as jute, coir, sisal, pineapple, ramie, bamboo, banana, etc. These are generally used in low load applications like panels, panel roofing sheets, packaging, automobile components, and railway coach interiors. Some research shows that natural fibers can easily replace the use of glass fiber in some application which will reduce the cost of composite [12-13]. Natural fibers are used in different forms in fiber-reinforced polymer composites, such as continuous, randomly oriented and as woven fabric mat [14] The advantage of natural fiber in context of glass fiber, it is lightweight, low energy production, and environment-friendly. The use of natural fibers reduced the weight by 10% and also reduces the required energy for production by 80% as compared to glass fiber reinforced composite [15]. Natural fibers are more focused due to their property of recyclable and biodegradability. On the other hand, it has some disadvantages of moisture absorption, thermal stability, and variations in quality.

Hybrid composites include the composition of two or more natural or synthetic fibers or both with a matrix to get the expected properties for a given application. Hybridization of different fibers in a composite has proved to be effective in designing structures [16]. In recent times, more research is been going in the hybrid composites, to overcome the drawbacks of individual synthetic as well as natural fiber composites. The hybridization of fibers comes with three possibilities: Natural – natural fibers; Natural – synthetic fibers; Synthetic – synthetic fibers. The mechanical properties of hybrid composites of short fiber can be theoretically evaluated by the rule of hybrid mixtures (ROHM) [17-18]. The hybridization approach is intended for cost reduction of composites

In this review, research work done with various combinations of different fibers has been presented regarding the mechanical properties of hybrid composites.

II. Natural Natural Hybrid Composites

Most of the Natural- Natural Hybrid composites are used for low loading condition whereas some of them are specifically used for medium loading conditions. The main reason for the failure of such hybrid composite is the interfacial failure at the fiber and matrix due to cellulose and lignin present in natural fibers. In most of the natural fibers, cellulose content is present which acts as a barrier to the fiber and matrix interfacial bond. Treatment of natural fibers with

appropriate methods has shown an increase in the strength and elastic modulus. The banana fibers reinforced composite showed a significant increase in their properties when fibers are chemically treated than untreated fibers [19-24]. Cao et al. [25] gave heat treatment to kenaf fibers which resulted in improvement of tensile strength by 60%. Also, heat treatment of sisal fibers increased the tensile strength by 37% [26]. Fiber strength can also be improved by alkali treatment [27-28]. The fiber treatment is done to improve the fibers hydrophobic, interfacial bonding, roughness, wettability, and also decreasing the moisture absorption percentage to enhance the tensile properties of composite [29-33].

M. Boopalan et al [34], experimented on jute and banana fiber reinforced unidirectional epoxy hybrid composites, fabricated using hand lay-up followed by a compression molding technique. The tensile, flexural, impact properties for this hybrid composite was found maximum at 50/50 weight ratio of jute and banana fibers. The addition of banana fibers increased the tensile strength by 17%, 4.3% in flexural and 35.5% in impact.

The weaving of natural fibers in different orientations makes the composites stronger and comparable to those of synthetic fibers [35-36]. A. Alavudeen et al. [37], investigated mechanical properties of banana polyester, kenaf/polyester, and banana/kenaf fiber-reinforced hybrid polyester composites using woven fabric with different weaving patterns and found that the weave with plain pattern showed more tensile strength than twill pattern irrespective of the type of fiber used. The hybrid composite showed a significant increase in tensile strength than both banana/polyester and kenaf/polyester, this increase can be attributed to the load sharing properties of both banana and kenaf fibers. Also, a randomly oriented composite was compared with the plain weaved composite and thus as expected the plain weave composite had more tensile strength due to stress transferring properly. On the other side, flexural properties also showed hybrid composite better than individual fiber composites. Research has shown that flexural properties of hybrid properties are influenced by composition and adhesion level of fibers [38]. Also, a fractography analysis was done to check the failure analysis at the micro level thus showing that better fiber-matrix adhesion present in hybrid composites due to interlocking of fibers.

N. Venkateshwaran et al. [39] investigated the mechanical and water absorption behaviour of banana/sisal reinforced hybrid composites for which it was observed that addition of sisal fiber in the composite, results in 16% increase in tensile strength, 4% increase in flexural strength and 35% increase in impact strength whereas for moisture absorption study of hybrid composite shows the minimum moisture uptake was by 50:50 hybrid composite.

Less research work has been observed in the natural-natural hybrid composite. As observed that there is a need for treatment of natural fibers. Also, the strength of these hybrids is only limited to low scale applications. Moisture absorption in such fibers can weaken the structural aspects

A hybridisation of natural fiber composite by another natural fiber does not yield superior mechanical properties as hybridization by glass fiber and carbon fiber [40]. M.Ramesh et al. [41], compared properties of sisal - glass fiber reinforced composite with jute - glass fiber reinforced composite with matrix as an epoxy and found that the sisal - glass fiber composite gives more tensile strength as compared to jute - glass fiber composite, whereas jute - glass fiber and sisal/ glass fiber show slight change in values of flexural strength. Such composite is used for such application which requires medium strength.

Kasama and Nitina [42] investigated the effect of hybridization of glass fiber and sisal fiber with polypropylene composite and observed that the addition of glass fiber increases thermal, mechanical and water absorption properties. Thwe et al. [43] investigated the properties of bamboo/glass fiber polymer matrix hybrid composite and observed that the tensile strength and elastic modulus reduced after ageing. The tensile strength of jute fibers is directly proportional to the area of cross section of fiber [44].

Banana fiber has more tensile strength than neat polyester resin and can be used for industrial applications like packaging and panels [45]. The flexural and impact properties of the banana composite is high than the hybrid composite [46].

V.S. Srinivasan et al. [47] evaluated the thermal and mechanical properties of banana- flax fiber hybrid composite by structural build-up such that the banana fiber composite is sandwiched between two flax fiber composite with the help of hand lay-up method of manufacturing. Glass fiber reinforced composite on the other most layer for lamination on both sides. Due to glass fiber lamination, the overall mechanical properties of hybrid composite also increases. Results were as per ASTM standards and observed that hybrid composite has better mechanical properties than single fiberglass fiber composite under various loads like impact and flexural loads and also found that hybrid composites have good strength than single glass fiber composite.

V.P. Arthanarieswaran et al [48] worked on bananas and sisal fiber with glass fiber hybrid composite with different composition laminates for a different test which was fabricated with the compression molding process. Different mechanical properties were found, the maximum tensile strength was 104MPa in laminates of banana-sisal hybrid combination with three layers of the combination. The laminates with banana-sisal fibers as a sandwich and glass fibers at the extreme layers show better performance on the flexural strength and it withstands up to 192 MPa. The impact energy of 13.3 J was withstand by the sisal fiber laminate with three alternate glass fibers layers. Such hybrid composite can be used of applications like automobile panels.

R. Bhoopathi et al [49], investigated banana-hemp-glass fiber reinforced composites and found that banana/glass fiber composite has more tensile strength up to 39.5 MPa, the maximum flexural strength is 0.51 kN by banana-hemp-glass composite and 0.50kN by the banana-glass composite and impact strength varied from 5.33 joules to 8.66 joules.

III. Natural-Synthetic Fiber Hybrid Composites

Atiqah Afzaluddin et al[50], investigated the mechanical properties of sugar palm/glass fiber reinforced thermoplastic polyurethane hybrid composites with the total volume fraction of the fibers to be 40%. The tensile and impact properties of the composite increased when 30% sugar palm and 10% glass fiber content was included. Flexural strength was observed to be increased when the glass fiber content was increased to 40%. Yongli Zhang et al[51], studied mechanical behaviors of unidirectional flax-glass fiber reinforced hybrid composite and concluded that tensile properties will be increased when the glass fiber content is increased. The stacking sequence of the laminates shows great influence on the tensile strength of hybrid composites. Sreekala et.al [52] studied the mechanical behavior of oil palm fiber with glass fiber and used phenol formaldehyde as a resin and concluded that the maximum mechanical performance is observed at 40% loading.

The natural fiber has significantly contributed to this type of hybrid composite for the application of medium scale loading. More such research studies are possible by hybridizing various natural fibers. As seen above, much research has not been observed in the hybridization of carbon with natural fiber.

IV. Synthetic-Synthetic Fiber Hybrid Composite

Nowadays, synthetic- synthetic fiber hybrid composite is much widely discussed world as it has found applications in various critical as well as complicated problems in design. There have been significant efforts taken by researchers to achieve the positive hybrid effect with tough and brittle fiber to reinforce composite for enhancing the mechanical properties [53-54]. HaNa Yu et al[55], manufactured intermingled hybrid composites using aligned discontinuous fibers to achieve pseudo ductility. The specimens were made with semi-closed and cured at 90° C for 135min in an autoclave using vacuum molding. The intermingled hybrid composite with 0.25 relative carbon ratio gave the maximum pseudo-ductile strain, 1.1%, with a 110 GPa tensile modulus. Moreover, the initial modulus of the intermingled hybrids with 0.4 relative carbon ratio is 134 GPa, 3.5 times higher than that of E-glass/epoxy composites.

Yentl Swolfs et al. [56], observed the effect of fiber dispersion on initial failure strain and cluster development in unidirectional carbon/glass hybrid composites by adding glass fibers to carbon fiber composites. After adding glass fiber, the failure strength is observed to be increased. Different orientations of fibers were observed. The hybrid effect for a composition of 10/90 carbon/glass hybrid is 32%. The bundle of 50/50 carbon/glass fiber hybrid with alternating layers of carbon and glass fiber hybrid gave a maximum of 16% hybridization effect. The result indicated that the thin ply hybrids have more potential for large hybrid effects than comingled hybrids. M.R. Wisnom et al. [57], experimentally suggested that there is an enhancement in strain at failure of up to 20% for very thin plies, but no significant effect for thicker plies. For this experiment, M. R. Wisnom, modeled specimens of S-glass and carbon fibers with varying proportions and found that the magnitude of the hybrid effect

depends on the ply thickness. For the carbon/S-glass-epoxy there is a hybrid effect of up to 20% at the first knee on the stress-strain curve when the carbon is only 29 μm thick, but there is no significant effect for plies over 80 μm thick.

Chensong Dong et al. [58], studied the flexural strength of bidirectional hybrid epoxy composites reinforced by E glass and T700S carbon fibers. Test specimens were made up by hand lay-up method, modeled numerically using finite element analysis and also analytically by classic lamination theory approach. The flexural strength decreases when partial laminas from a carbon/epoxy laminate are replaced by glass/epoxy laminas. Also, concluded that the bidirectional hybrid composites have the advantage of balanced 2-D flexural strength, which is more robust when there are variations in loading orientations.

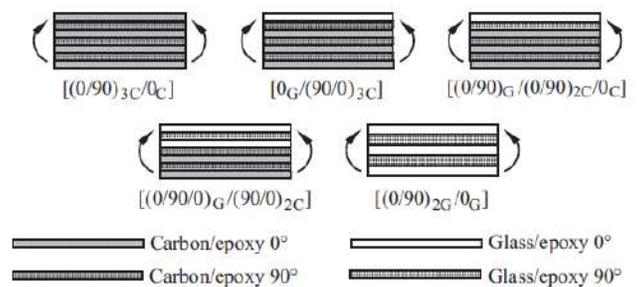


Figure 1. Stacking configurations of carbon fiber (C) and glass fiber (G) plies[58].

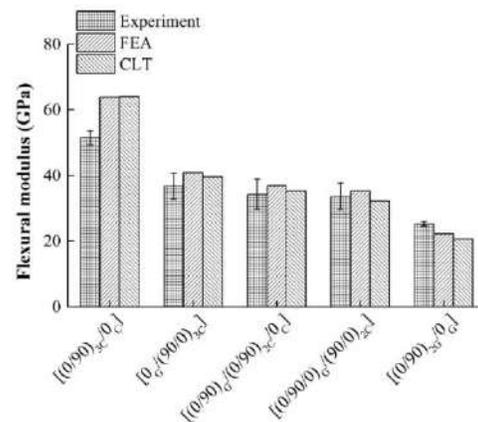
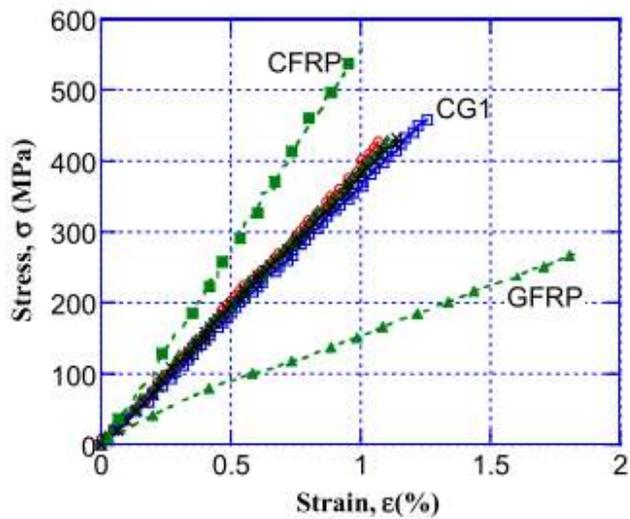


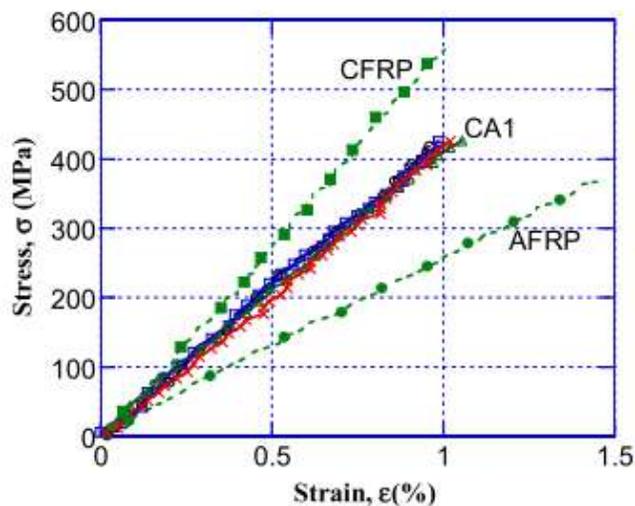
Figure 2. Flexural moduli from experiments, FEA, and CLT [58]

Jun Hee Song[59], studied the pairing effect and tensile properties of laminated high-performance hybrid composites prepared using carbon/glass and carbon/aramid fibers with the VARTM process. For the tensile test, both the hybrids showed properties intermediate as shown in fig(3). Although, both the aramid and glass fiber has different properties the mechanical properties of the hybrid composites were dominated by the carbon fiber due to larger strength and rigidity. Delamination was not observed in aramid/carbon composite but was well observed in glass/carbon composite. Since the carbon fiber layers were accumulated in the central region, the tensile strength was high. Hence, central laminating condition plays an important role in deciding the

pairing or stacking sequence of a hybrid composite to be designed.



(a) CG1 sample



(b) CA1 sample

Figure 3. (CG and CA are carbon/glass and carbon/aramid stacking) Stress and strain curves of samples laminated by 1 ply pairing [59].

Kedar S. Pandya et al[60] investigated the behavior on carbon and glass woven fabric hybridization in quasi-static loading conditions, a significant rise in properties were observed, supportive to central laminating to higher properties. Limited studies have been done over woven fabric hybridization and hybridization is a trade-off between the increase in ultimate strain and impact resistance and a decrease in in-plane strengths of hybrid composites compared with high modulus fiber composites. It is shown that placing glass fabric in exterior and carbon fabric in the interior significantly increases the ultimate tensile strain and tensile

strength than placing the glass fabric in interior and carbon fabric in the exterior. Hence, the percentage gain in ultimate tensile strain is higher than the percentage loss in tensile strength in hybrid composites. Hybrid composites may be produced in many different arrangements like an intra-ply, inter-ply, sandwich or intimately mixed [61]. However, research into the mechanical properties of hybrids has limited to configurations in which fibers have been intimately mixed within the matrix, or arranged in a purposeful manner.

Chensong Dong and Ian J. Davies[62] studied flexural and tensile properties of S – 2 glass and T700S Carbon using both finite element analysis (FEA) and classical lamination theory (CLT). This investigation showed that flexural modulus increases as the span to depth ratio increases from 16 to 32 and then becomes stable. The flexural modulus decreases rapidly as the carbon fiber composite on the outermost layers decreases. This is due to the maximum tensile and compressive stresses occur at the two faces of the laminate in bending, and the stresses around the mid-plane are close to zero. Unfortunately, the setback of typical CFRP composites is that they possess a low ratio of compressive to-tensile strength, which can hinder the performance of the composites [63]. Jin Zhang et al. [64] conducted research on the tensile, flexural and compressive properties of woven hybrid composites by using different arrangement and varying glass and carbon ratio. The results showed that the ratios of glass/carbon FRP composites in 50:50 have improved the tensile, flexural and compressive strength effectively. Irina M.M.W et al[65], evaluated the mechanical properties of glass/carbon hybrid fiber reinforced polymer composite with vacuum assisted resin transfer molding (VARTM) method of fabrication. Besides that, vacuum assisted resin transfer molding (VARTM) process also shows its ability to fabricate high volume fraction composites panel. This believed to produce better mechanical properties, uniform thickness, and lower void than the wet hand lay-up process[66].

Recently, a new class of materials for reinforcement has been introduced. Basalt fiber has excellent physical and mechanical properties, such as good sound insulation, high heat resistance, strong chemical resistance and low water absorption [67]. Basalt fiber is produced by extrusion continuously from high temperature melting basalt stones which is available abundantly in the earth's crust, has the advantage of more eco-friendly, greener and lower cost [68]. Basalt fiber is a good replacement for glass fiber. For this reason, basalt fibers have been introduced into carbon fiber composites which will lower the costs with comparable or even better mechanical properties in comparison with carbon/glass hybrid composite. Guangyong Sun et al. [69], studied the mechanical properties of hybrid composites reinforced by carbon and basalt fibers. The specimens were made up of carbon plain weave fabric and basalt plain fabric. Seven specimens were fabricated with vacuum assisted resin transfer molding (VARTM) process where four specimens with the same orientation and varying fiber content and rest of the specimens with different orientations. Thus, found that hybrid composites show more progressive failure mode than pure carbon composite. On the other side, basalt fibers show a

toughening effect which prevented crack propagation through the thickness.

V. CONCLUSION

This review showed many research has given impetus to more development of hybrid composites which has made a significant improvement in various application. The hybrid composite material not only enhances the properties but also shows a unique stacking sequence. More such research is to be expected in the coming days. Many of the research have fabricated the hybrid composite with hand lay-up method. Fabrication with other different methods may give better results. New fibers, which are introduced recently must be considered for hybridization. Classical Lamination Theory and Finite Element Models predict the failure modes in the hybrids which can be helpful for considering the experimental data produced. Currently, only two fibers have been added to hybrid composite, this raises questions about what effects will occur when used more than two fibers. Similarly, orientation, stacking sequence and at different test environments more such researches are possible. Use of carbon nanotubes in hybrids may be effective for many applications.

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ENERGY HARVESTING SPEED BREAKER

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Abstract— Energy can neither be created nor be destroyed but can be transformed from one form to another. Pressure is a kind of energy that is exerted almost all the time as force can be either reused within the same process or transferred to another process. Force or pressure when it converts into energy, it is called potential energy and free of charge energy. Thus, this energy can reduce the operating cost and can increase the output productivity. Pressure has large opportunities and stronger range of force recovery on the road. Therefore, this project utilizes force created from vehicle hump as an alternative and new renewable energy source. A model of road speed breaker which uses power hump technology is used as device to harness force created from applied pressure from the heavy vehicles hitting the speed breaker which act as the input. The speed breaker is used as it can function into two different uses such as for slowing of road vehicles and hence generating energy by harnessing applied force into electrical energy. The electrical energy produced can either be used to power up street lights or stored in a battery for emergency purposes.

I. INTRODUCTI ON

In the present scenario power becomes the major need for human life. The availability and its per capita consumptions are regarded as the index of national standard of living in the present day civilization. Energy is an important input in all the sectors of any countries economy. Energy crisis is due to two reasons, firstly the population of the world has been increased rapidly and secondly standard of living of human beings has increased. India is the country, which majorly suffers with lack of sufficient power generation.

Electricity is the form of energy. It is the flow of electrical power. Electricity is a basic part of nature and it is one of our most widely used forms of energy. Before electricity generation began slightly over 100 years ago, houses were lit with kerosene lamps, food was cooled in iceboxes, and rooms were warmed by wood-burning or coal-burning stoves. Direct current (DC) electricity had been used in arc lights for outdoor lighting. In the late-1800s, Nikola Tesla pioneered the generation, transmission, and use of alternating current (AC) electricity, which can be transmitted over much greater distances than direct current. Tesla's inventions used electricity to bring indoor lighting to our homes and to power industrial machines.

Electricity generation was first developed in the 1800's using Faradays dynamo generator. Almost 200 years later we are still using the same basic principles to generate electricity, only on a much larger scale. Now we are throwing some light on the very new and innovative concept i.e. generating electricity

from a speed breaker. Producing electricity from a speed breaker is a new concept that is undergoing research.

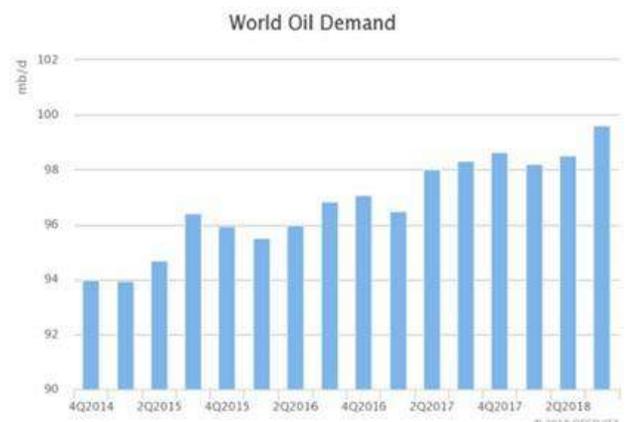


Fig.1. Summary of global oil demand

India's installed capacity is nearly 20 per cent of China's capacity though both countries have billion plus people. There is roughly 12 per cent power deficit in the peak hours. Tariffs are set by the state governments so power firms are not allowed to pass on rising fuel costs to consumers. Banks are burdened with loans to loss-making state-run electricity distribution firms and are unwilling to lend to new projects that do not have assured fuel supply. India has nearly 10 per cent of the world's coal reserves but lack of environmental clearances and other disputes have hindered production. Shortage of domestic supply has resulted in costlier imports.

India's oil demand is expected to rise by 5.8 million barrels per day (bpd) by 2040, accounting for about 40% of the overall increase in global demand during the period, OPEC's secretary general said on during the weekend.

India is set to overtake China as the biggest source of growth for oil demand by 2024, according to a forecast

announced Monday by research and consultancy group Wood Mackenzie. The country's oil demand is set to increase by 3.5 billion barrels per day from 2017 to 2035, which will account for a third of global oil demand growth.

India's expanding middle class will be a key factor, as well as its growing need for mobility, according to Wood Mackenzie. On the other hand, China — currently the second-largest oil consumer in the world — may soon need less oil. In 2017, it overtook the U.S. as the biggest importer of crude oil, but it's set to see a decline in oil demand growth from 2024 to 2035, Wood Mackenzie research director Sushant Gupta told CNBC. For India, as demand grows, an oil shortage is already imminent.

The number of vehicles on road is increasing rapidly and if we convert some of the potential energy of these vehicle into the rotational motion of generator then we can produce considerable amount of electricity, this is the main concept of this project. At present we are facing shortage of electricity. Electricity can be generated using speed breakers. The benefits from this idea will be to generate electricity for the streetlights, hoardings and then for other use. Generally when vehicle is in motion it produces various forms of energy like, due to friction between vehicle's wheel and road i.e. rough surface heat energy is produced, also when vehicle traveling at high speed strikes the wind then also heat energy is produced which is always lost in environment and of which we can't make use of or directly we can say that all this energy that we can't make use of is just the wastage of energy that is abundantly available around us. In this project we are just trying to make use of such energy in order to generate an electrical energy. This project will work on the principle of “potential energy to electrical energy conversion”.

II. LITERATURE SURVEY

Recently several attempts and models have been suggested and tested for harnessing kinetic energy of vehicles via a speed bump. Mechanisms which include springs by A.K. Singh, Deepak S., Madhawendra K. and V. Pandit [1], Rack and Pinion by Aswathaman. V and Priyadarshini.M in “Every speed breaker is now a source of power” [2]; by Shakun Srivastava, Ankit Asthana in “Produce electricity by the use of speed breakers”[3] and by Ankit Gupta, Kuldeep Chaudhary & B.N Agrawal in “An experimental study of generation of electricity using speed breaker”[4] and slider crank by Noor Fatima and Jiyaul Mustafa in “Production of electricity by the method of road power generation” [5] have been suggested for producing electricity. Electrodynamics based models by Ankita and Meenu Bala in “Power generation from speed breaker” [6] have also been suggested, but are not only expensive to fabricate but involve complicated calculations and can't be used a large scale very easily. Totaram [7] uses a platform plate which is kept inclined on a raised base level to allow vehicles to pass over the raised surface. This system will not work till a vehicle passes on road way. Energy harvesting is the process where the energy is harnessed

from other sources like traffic energy which is unused and depleted, which is then converted to a more usable form. Energy harvesters provide power for low energy electronics in a very small amount. The source of energy for the energy harvesters is free without depleting the natural resources. There are some researches on the traffic energy harvesting in the pavement engineering field. Andriopoulou (2012) had discussed on the technologies for traffic energy harvesting that have been studied such as asphalt solar collector combined with piping system, photovoltaic applications in the road infrastructure, embedded piezoelectric sensors and so on. For asphalt solar collector,

the solar energy are being extracted and converted into thermal or electrical energy. The warmth of the asphalt pavement is captured by the water piping system and the energy is stored. As for the PV system, it is embedded into the pavement infrastructure. It captures the solar energy and converts it into electrical energy which is then being stored. Then, for the embedded piezoelectric sensors in the pavement infrastructure, it generates electrical voltage due to the alteration to its dimension when there are mechanical stresses. However, in this paper, traffic harvesting through speed breaker is being introduced and studied. This is because this mechanism has a high energy efficiency and cost effective to be implemented.

There are different types of mechanism developed for generation of electricity from speed breaker. Among these, the popular ones are rack and pinion, roller and crankshaft mechanism. For rack and pinion and crankshaft mechanism, basically, it involves weight from vehicles that exerted a force upon the speed breaker. The potential energy from the compression of the dome of the speed breaker is converted into kinetic energy through these mechanisms where the motion is transfer into a generator to generate electricity. In roller mechanism, the friction force due to the vehicle movement acted upon the roller is then transmitted to chain sprocket arrangements where the rotary motion is then transfer into a generator for electricity generation.

Anyaegbunam, F.N.C concluded that in coming days, demand for electricity will be very high. Speed breaker power generator will prove a great innovation to world. This research is to develop another green power generation and to use the wasted energy of automobiles.[10]

Shah Mohazzem Hossain, C.K. Das, Md. Shahdat Hossain, Sams Jarin concluded that Advancement of nation depends on use of electricity, but due to increasing population present power generation does not meet the requirement. This study shows feasibility of using “power generating speed breaker”. Due to increasing vehicles on-road this system will be effective to shorten the energy crisis to some extent. Mohamad Ramadan, Mahmoud Khaled, Hicham El Hage concluded that Speed breaker power generator is a system that is capable of using kinetic energy of vehicles & converting it into electric energy. In this work, a prototype is constructed and an experimental study is performed. It was concluded that

26.2 to 44.7 W can be generated from this system when masses of 65 to 80 kg are applied. An average of 0.37W/kg forms a promising sign for performance of such system in real applications.[17]

Pravin K Ghule suggested that in this project we discover technology to generate electricity from speed breakers in which the system used is reliable and this technique will help conserve our natural resources. In coming days, this will prove a great boon to the world, since it will save a lot of electricity of power plants that gets wasted in illuminating the street lights. In coming days, this will prove a great boon to the world since it will save a lot of electricity of power plants that gets wasted in illuminating the street lights. As the conventional sources are depleting very fast, it's high time to think of alternative resources. We got to save the power gained from the conventional sources for efficient use. So this idea not only provides alternative but also adds to the economy of the country.[16]

Iyen, C., Anyiin P., Umar, I., Jaafaru, S. , Wansah, J.F., Iseh, A., Akeredolu, B. concluded that designing energy recovery systems that are pollution free has become a significant goal within the research

community. One of numerous systems that have been proposed is Speed Bump Power Generator (SBPG) system that produces electrical power by utilizing the movements of commuting vehicles on highways, boulevards, and streets. When vehicles pass over a SBPG system, the system translates vertically. Consequently, a kinetic energy is produced and transferred into electrical power. In this project, an experimental analysis is performed on the rack-and-pinion system. Results show that electrical power of upto 1.9 kw can be generated from the designed system.[13]

Kuldeep Singh Chauhan, Ayushi Tomar, Dheeraj kumar, Gaurav kumar explained that the energy crisis is any great bottleneck in the supply of energy resources to an economy. The studies to sort out the energy crisis led to the idea of generating power using speed breaker. Firstly, South African electrical crisis has made them implemented this method to light up small villages of the highway. The idea is basic physics, to convert the kinetic energy into electrical energy that gone wasted when the vehicle runs over speed-breaker. Since then, a lot has been done in this field. An amateur innovator, Kanak Gogoi in Guwahati has developed a similar contraption to generate power, when a vehicle passes over speed-breaker. The idea has caught the eye of IIT-Guwahati, which funded the pilot project related to generate electricity from speed-breakers. They has evaluated the machine and recommended to the Assam government. Their work has provided the need to think on this

alternative to generate electricity on the large scale, as it proves to be a boon to the economy of the country.

Amal Abraham, Cibin Geevarghese Jacob, Glen Martin Thomas & Jobby George concluded that for the vehicular flow per day, which includes 2/3/4/6/8 wheelers, the energy produced will be much more significant compared to the experimental results obtained, thus making it a good energy producing setup as energy of vehicles on impact with the speed breakers is anyway lost. This is lost to heat and sound. This energy can be tapped, stored and used as back up or for small applications. Improvements have to be made in the setup to increase the efficiency which is discussed in following section. This method have many advantages such as power generation does not require any fuel input, Running cost is very less, this is a nonconventional form of energy and therefore very useful in the present scenario of energy crisis. [15]

Mohamad Ramadana, Mahmoud Khaleda, Hicham El Hagea experimentally studied about use of speed breaker for power generation. One of numerous systems that have been proposed is Speed Bump Power Generator SBPG system that produces electrical power by utilizing the movements of commuting vehicles on highways, boulevards, and streets. When vehicles pass over a SBPG system, the system translates vertically. Consequently, a kinetic energy is produced and transferred into electrical power. In this paper, different types of SBPG systems are presented. An experimental analysis is performed on the rack-and-pinion system. Results have shown that electrical power up to 45 W generated when a mass of 80 kg is applied to SBPG system considered. Extrapolation of results confirms around 0.56 kW powers can be produced when various vehicles with different masses pass through the bumps. [12] Mr. Amol Sheshrao Fawade concluded that the growth of any nation depends on utilization of energy and this paper helps for that. It is successfully produced electricity and compressed air by using speed breaker. This electricity can store in battery in day time and we

can use it in night time for high way illumination, signal system on road, tollbooth or any other useful work and compressed air can use for cleaning purpose in tollbooth and refilling of air in tires. This paper helps for conservation of natural resources. [18]

Anand Kumar Pandey suggested that rack and pinion arrangement is a mechanism which is used to convert the reciprocating motion to rotary motion. Whenever a vehicle would pass over the breaker, it would push it

down. So rack will move downward and will rotate the gears. A gear train is used to increase the speed ratio at shaft of generator. Then the springs will push the breaker upside to its initial position and again it will rotate the gears. As the shaft of D.C. generator starts rotating, it produces electricity. This electricity is stored in a battery. This project will work on the principle of “conversion of mechanical energy into electrical energy”, mechanical energy can be thought of as energy stored within a physical system. During daytime electricity is not needed for lightening the streets, so we are using a control switch which is manually operated. This control switch is connected by wire to the output of the battery. The control switching mechanism allows the current to flow when needed. [14]

III. METHODOLOGY

Energy harvesting from speed breaker is a system design to capture waste and kinetic energy from all vehicles. This device converts the kinetic energy of the vehicles into electric energy. This project explains the mechanism of electricity generation from speed breakers. The load of vehicle induced on speed breaker acts as input for mechanism which gives reciprocating motion to slider. Slider is attached to speed breaker and supported by a linear bearing for smoother reciprocation. A circular stationary bar fixed to ground surface is attached to speed breaker by means of spring. The spring is used to control return stroke. The slider reciprocates around the circular bar. Slider is connected to crank. In this way linear motion is converted to rotary motion. Crank is mounted on shaft. This shaft is connected to flywheel which is further connected to gear drive. Gear drive is used for increasing rpm of shaft. In this way kinetic energy of mechanism is converted to electrical energy which can be stored in battery or directly used for different applications.

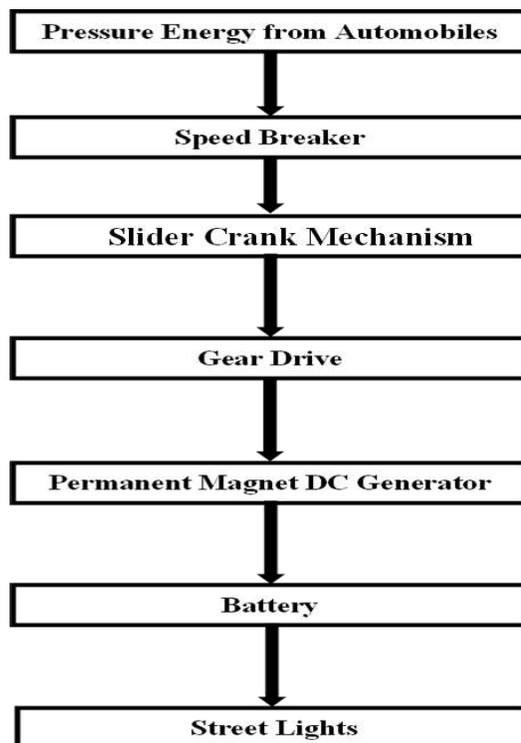


Fig.2. Energy flow diagram
IV. CONCLUSION

With the help of this work we discover technology to generate electricity from speed breaker. The system used is reliable and this technique will help to conserve our natural resources. The generation of electricity using the weight of vehicle can be considered as an input in power generation at speed breaker using various mechanisms. We have designed a model and collected the data about speed and weight of the vehicle. It was found that a slower and heavier vehicle can produce much energy at speed breaker than a lighter weight and fast moving vehicle. This application can be helpful to government for economic purpose and it gives the way to utilize the waste pressure energy for other purposes.

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Design and Development of Mecanum Wheel with Forklift Application

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ABSTRACT -In this paper, review researches on multi-directional automobile vehicle design with Mecanum wheel as component in the forklift vehicle. Multi-directional automobile vehicle has vast advantages over conventional design likes differential drive in term of mobility in congested environments. Multi-directional automobile wheel can perform various types of work in small spaces, such as those commonly found in manufacturing floor, hospitals and offices. There are variety of applications of mecanum wheel can be possible as per work. A variety of designs of Mecanum wheel installed forklift have been developed in recent years in order to improve their Multi-directional movement and practical applications. These features are expanded at the expense of improved mechanical complication and increased complexity in control mechanism. Mecanum wheel systems work by applying rotating motion of each individual wheel in one direction similar to regular wheels with a different. Mecanum wheel systems are able to move freely in a different direction. They can slide frequently perpendicular to the torque vector. The main advantage of using Mecanum wheel systems is that it can move or slide in any required

direction with respect to each wheel rotation in narrow spaces. By replacing conventional wheel with mecanum wheel the time and space required to handle a product or work is reduced.

I.

INTRODUCTION

One of the common Omni-directional wheel designs is Mecanum Wheel or Ilon wheel. Mecanum wheel was design and invented in Sweden in 1975 by Bengt Ilon, an engineer with Swedish company Mecanum. Mecanum wheel is based on the principle of a central wheel with a number of roller placed at an angle around the periphery of the wheel. The angled peripheral roller translates a portion of the force in the rotational direction of the wheel to force normal to the wheel directional. Depending on each individual wheel direction and speed, the resulting combination of all these forces produces a total force vector in any desired direction thus allowing the platform to move freely in direction of resulting force vector, without changing the direction of the wheel. Figure 1 shows a traditional Mecanum wheel design by Ilon with the peripheral roller with 45° degree slope held in place from the outside. This design only can operate in even work surface. When encountering an inclined or an uneven work surface, the rim of the wheel can make contact with the surface instead of the roller, thus preventing the wheel from operating correctly. To encounter this problem a simple alternative design, also proposed by Ilon, which consist two split roller mounted centrally on the periphery of the wheel as shown in figure.

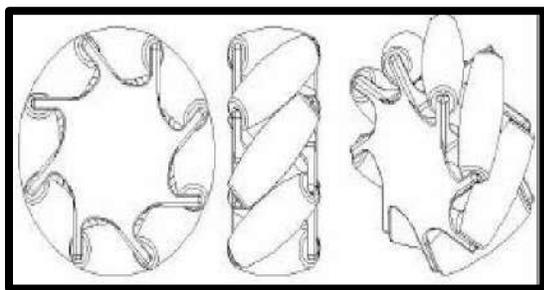


Fig Mecanum wheel based on Ilon's concept.

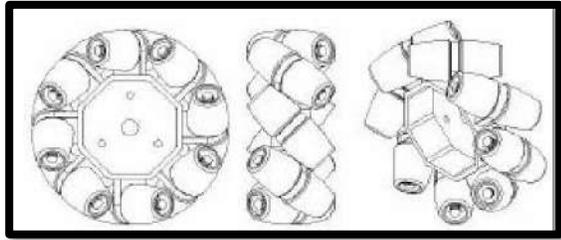


Fig Mecanum wheel with centrally mounted rollers.

This design ensures that the rollers are always in contact with the work surface, thus allowing better performance on uneven surfaces. Using four Mecanum wheels provides Omni-directional movement for a vehicle without needing a conventional steering system. Slipping is a common problem in the Mecanum wheel as it has only one roller with a single point of ground contact at any one time. Due to the dynamics of the Mecanum wheel, it can create force vectors in both the x and y-direction while only being driven in the y-direction. Positioning four Mecanum wheels, one at each corner of the chassis (two mirrored pairs), allows net forces to be formed in the x, y and rotational direction. Refer to Figure 1.3. A difficulty with this strategy is that there are four variables to control three degrees-of-freedom. In this case the system is said to be over determined and it is possible to create conflicts in the actuation. As a result of the constraints associated with the Mecanum wheel some form of controller is required to produce satisfactory motion.

II. LITERATURE SURVEY

Olaf Fiegel, Aparma Badve, Glen Bright, et al. "Improved Mecanum Wheel Design for Omni directional Robots" in *proc.australasian conference on robotics and automataion*, 27-Nov 2002, Omnidirectional is used to describe the ability of a system to move instantaneously in any direction from any configuration. Omnidirectional robotic platform have advantages over conventional design in terms of mobility in congested environment. They are capable of easily performing task in environment congested with Static and dynamic obstacles and narrow aisles. This environment are commonly found in factory workshop, offices, warehouse, hospitals and elderly care facilities. This paper proposes and improved

design for a Mecanum Wheel for omnidirectional robot. This design will improve the efficiency mobile robots by reducing frictional forces and thereby improving performance

Tough an ingenious system the traditional mecanum wheel is somewhat inefficient in its use of energy. The addition of the ability to lock the mecanum wheel peripheral roller increase this efficiency when travelling in a forward direction. The addition of the ability to dynamically adjust the angle of the peripheral roller to base should the direction of travel to large extent resolve the inefficiencies inherently present in the traditional design. The AGV is able to move and perform complex tasks within a congested factory environment while having the ability of rapid movement over rough terrain. This ability is invaluable during material transfer and handling.

J.A Cooney, W.L. Xu, Glen Bright, "Visual Dead-Reckoning for Motion Control of a Mecanum-Wheeled Mobile Robot" Given an omni-directional mobile platform using four Mecanum wheels requires further a capability to be programmed to achieve various motion behaviors and intelligence. This paper describes an undergraduate solution to the problem involving both hardware and software developments. With a path following behavior as the aim, the research focused predominantly upon; sensors for dead-reckoning, motor drive, closed-loop feedback control, and microcontroller interfacing and programming. A four channel high power MOSFET and relay H-Bridge driver circuit board was designed for driving four motors. Two optical mice were attached to the front and rear of the robot giving positional feedback for closed-loop control and dead-reckoning for navigation. A Mitsubishi M16C/62 microcontroller was interfaced to these TTL compatible devices and subsequently programmed to implement various robotic behaviours. A closed-loop control scheme using three independent PID controllers was implemented to follow three degrees-of-freedom motions, i.e., x- and y-movement and rotation motions. The path following performance of the robot was tested in both open-loop and closed-loop modes and the optical mice were found to be a promising but inexpensive sensor, providing dead-reckoning for robot motion control Stephen L. Dickerson, Brett D. Lapin, "Control of An Omnidirectional Robotic Vehicle with Mecanum Wheels", Georgia Institute of technology The authors explore three aspects of the Mecanum wheeled vehicles, the ability to maneuver in congested spaces, the kinematics of wheel design, and considerations for wheel loading and traction. It is shown how omni-directional capability greatly reduces the amount

of area and time required for maneuvers, and how the Mecanum wheel in particular reduces time because of the absence of singularities. The algorithms to convert desired motions to required wheel motions do not require excessive computation even in the case where they include compensation for wheel slip detection and correction. The authors also present some novel concepts, the multiple row driven wheel and the screw type variation of the Mecanum wheel.

P. Viboonchaicheep, A. Shimada, Kosaka, “Position Rectification Control for Mecanum Wheeled Omni-directional Vehicles”, In recent years, an omni-directional vehicle system using Mecanum wheels has been developed and used in wheel-chairs. It should be more widely utilized as a kind of robot for intelligent wheelchairs or vehicle robots for hazards by making the best use of its unique features. This paper presents a position rectification method during position and orientation control with multi-sampling periods. The control system is based on unique kinematics, which are under holonomic constraints. The idea for the proposed rectification method consisting of symptomatic rectification and preventive rectification has been borrowed from medical science.

Jonathan J. Plumpton, M. John D. Hayes, Robert G. Langlois and Bruce V. Burlton, Department of Mechanical and Aerospace Engineering, Carleton University, Ottawa, ON, Canada , “Atlas Motion Platform Mecanum Wheel Jacobian In The Velocity And Static Force Domains “, In this paper, novel generalized kinematic and static force models for the Atlas spherical platform, actuated with Mecanum wheels, and has been presented. The model was first formulated at the static force level leading

Jun Qian , Bin Zi , Daoming Wang , Yangang Ma and Dan Zhang , “The Design and Development of an Omni-Directional Mobile Robot Oriented to an Intelligent Manufacturing System”, The mechanical system of the mobile robot is made up of three separable layers so as to

simplify its combination and reorganization. Each modularized wheel was installed on a vertical suspension mechanism, which ensures the moving stability and keeps the distances of four wheels invariable, the mobile robot was integrated in an intelligent manufacturing system for material conveying. Experimental results show that the Omni-directional mobile robot can move stably and autonomously in an indoor environment.

Ramirez-Serrano, A., Kuzyk, R., “ Modified Mecanum Wheels for Traversing Rough Terrain”, 6th International Conference on Autonomic and Autonomous Systems, IEEE Computer Society, Mecanum wheels give vehicles and robots autonomous omni-directional capabilities, while regular wheels don't. The omni-directionality that such wheels provide makes the vehicle extremely maneuverable, which could be very helpful in different indoor and outdoor applications. However, current Mecanum wheel designs can only operate on flat hard surfaces, and perform very poorly on rough terrains. This paper presents two modified Mecanum wheel designs targeted for complex rough terrains and discusses their advantages and disadvantages in comparison to regular Mecanum wheels. The wheels proposed here are particularly advantageous for overcoming obstacles up to 75% of the overall wheel diameter in lateral motion which significantly facilitates the lateral motion of vehicles on hard rough surfaces and soft soils such as sand which cannot be achieved using other types of wheels. The paper also presents control aspects that need to be considered when controlling autonomous vehicles/robots using the proposed wheels

Bengt Erland Ikon, the inventor of the Ikon wheel. The Mecanum wheel is a design for a wheel which can move a vehicle in any direction. It is sometimes called after its inventor, who came up with the idea in when he was an engineer with the Swedish company Mecanum AB. The US-Patent was filled on the 13 November 1972.

III. METHODOLOGY

METHODOLOGY FOR MECHANICAL DESIGN A)

DESIGN OF WHEEL

One of the more common omni-directional wheel designs is that of the Mecanum wheel, invented in 1973 by Bengt Ilon, an engineer with the Swedish company Mecanum AB (Ilon, 1975). The wheel itself consists of a hub 1 carrying a number of free moving rollers 2 angled at 45° about the hub's circumference (Fig. 1). Because the solution shown in Fig. 1 is more difficult to manufacture, a simpler wheel hub has been chosen. The angle between rollers axis and central wheel axis could have any value but in the case of conventional Swedish wheel it is 45° . The angled peripheral rollers translate a portion of the force in the rotational direction of the wheel to a force normal to the wheel direction. Depending on each individual wheel direction



and speed, the resulting combination of all these forces produce a total force vector in any desired direction thus allowing the platform to move freely in the direction of the resulting force vector, without changing of the wheels themselves.

B) CONSTRUCTION AND TESTING

Selection of proper manufacturing methods

Working as per process scheduling and plan

Testing of equipment on field

Error analysis

Repair If Any

C) DEPLOYMENT

Comparing the paper with the designed output

Preparation of testing results

IV. DESIGN PROCEDURE

Roller Type	Bush
Body Material	Aluminium
Internal Diameter of Roller	22mm
Length of Roller	38mm
Load Capacity Per Wheel	15kg
Net Weight	600gm
Number of Plates	2
Numbers of Roller / Wheel	15
Outer Diameter	152mm
Roller Material	Nylon+TPR
Spacer Material	Nylon
Wheel Width	46.06mm
Plate Thickness	2.5mm
Diameter of Holes	5mm(MS Bolt)
Holes of Mountings	PCD 47.5mm
Nut Type	HEX Nyloc Nut

Table:- Design Specification

V. CONCLUSION

In this paper, the design of Omni-directional mobile robot using Mecanum wheel. The strength of this wheel is the enhanced maneuverability of the forklift that needs extreme maneuverability in congested environment. The paper also presents some research that being carried out in Mecanum wheel fork lift in order to improve the wheel design and practical application using Mecanum Wheel forklift.

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Reclamation of Exhaust Gas From Pneumatic System

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Abstract— Pneumatic systems are one of the mostly used systems in various industrial setups related to manufacturing, automation etc. It is being implemented in press shops, automatic production lines, mechanical clamps etc. Pneumatic system uses constant supply of compressed air to transmit and control energy. The air is provided by compressor and supply through various valves and after completion of work, it is exhausted to the atmosphere. To compress air lots of electrical energy is being consumed, as compressor efficiency is relatively much lower i.e. 25-30%. So by reclaiming exhaust gases from pneumatic system can cause a significant drop in energy consumption, as it already is in compressed form. In this Project work, we propose to optimize the energy consumption in Pneumatic system by reclaiming and reusing the exhaust air for various other applications, as per the available exhaust air pressure.

Keywords— Exhaust air reclamation, Reclamation system automation, optimization of reclamation system

I. INTRODUCTION

A pneumatic system is a system that uses compressed air to transmit and control energy. Pneumatic systems are used extensively in various industries. Most pneumatic systems rely on a constant supply of compressed air to make them work. This is provided by an air compressor. The compressor sucks in air from the atmosphere and stores it in a high pressure tank called a receiver. This compressed air is then supplied to the system through a series of pipes and valves and then exhausted to atmosphere. Compressed air is the air from the atmosphere which is reduced in volume by compression thus increasing its pressure. [1] It is used as a working medium normally at a pressure of 10 bar to 20 bar. For using pneumatic systems, maximum force up to 50 kN can be developed. Actuation of the controls can be manual, pneumatic or electrical actuation. Compressed air is mainly used to do work by acting on a piston or vane.

In working cycles of pneumatic cylinders, the air with certain pressure in the discharging chamber is usually exhausted into the atmosphere directly. If a part of the exhausted-air could be

reclaimed, great energy would be saved for an industrial pneumatic system. For this, a simple and direct method is to develop a system in which the discharging chamber of a cylinder should be connected with an air receiver and the exhaust air is reclaimed into the receiver for reuse. However, there might be some potential problems for this system. On the one side, when the pressure in the receiver is increased near the pressure in the discharging chamber, the remaining air in the discharging chamber could not be reclaimed to the receiver and it should be discharged into the atmosphere. Moreover, the pressure in the receiver would vary with the increasing or decreasing of the air mass in it. Therefore, it is necessary to control the connecting of the discharging chamber with the receiver and the air discharging from the cylinder (for short, expressed as exhaust switch). On the other side, the cylinder velocity characteristics might be changed when the cylinder circuit attached with an additional air-reclaiming device. Therefore, in order to reclaim more energy and make less influence on the cylinder velocity characteristics, the suitable control criterion and the switching-point for controlling the reclaiming process should be carefully studied and determined. Moreover, the reclaiming system should be simple in structure and low in cost. In following contents, the constitution of the reclaiming system is introduced and the mathematical model of the system has been studied. Through theoretical analysis and experimental research, the varying law of the cylinder velocity characteristics when with reclaiming device is discussed and the criterion of control differential pressure at the switch points is determined. [7]

II. HISTORY & BACKGROUND

Pneumatic system used in industry powered by compressed air or gases. A centrally located and electrically powered compressor power cylinder, air motor and pneumatic devices. The existences of pneumatic system in industrial work was first introduced in mid of 18th century.

Both pneumatic and hydraulic system works on fluid power. Pneumatic system uses pressure between 550 KPa to 690 KPa, whereas it ranges between 6.9 MPa to 34.5 MPa and more in

hydraulic system. But hydraulic system has problem of leakage, slow velocity of piston etc. which are overcome by pneumatic system.

Pneumatic system has drawbacks like un-precise control of piston, dumping of exhaust air to atmosphere, noisy operation etc. In which dumping of exhaust air has vital effect on efficiency of pneumatic system. Exhaust air is a pure form of energy as it is in compressed form and if reused can increase overall efficiency of system because the compressor efficiency is much lower i.e. 25-35% only. Thus we aim to reclaim exhaust air without effecting the performance of pneumatic system.

In this project we refer various research paper and scientific journals of various authors' who has contributed their work in various aspects of pneumatic system.

P. Goyal et.al [1] Worked on the project which deals with the design of pneumatically controlled small scale punching machine to carry out piercing operation on thin sheets (1-2 mm) of different material (aluminium and plastic). Reduction in punching force requirement was the main aim of this project. This was obtained by modification in punch tool design i.e. by provision of shear on punch face. Subsequently it resulted in reduction in amount of punching force requirement.

Sudeep Kelaginamane et.al [2] Worked on the design and fabrication of automatic sheet metal punching machine controlled by Programmable Logic Controller (PLC). It also described the working principle and the hardware structure of the system. By automating the punching system one can have greater control over the whole process. This system can replace existing manual feed and operated punching machines. By interfacing PLC, it was possible to get good results in the form of increased safety of the worker, reduced manufacturing lead time and reduced angular misalignment.

Anand Kumar et.al [3] The purpose of this paper was to reduce the cycle time by replacing drilling machine and riveting machine by special purpose machine (SPM) for drilling and riveting operation. The concept was that the plate having different size and thickness are drill on drilling spindle first and then riveted on orbital riveting spindle. Both the operation performed on same machine having two separate spindles. this paper gave the detail information of design, fabrication and analysis of special purpose machine and compare the cycle time with conventional method. This machine was containing automation by using pneumatic system. Modelling was done using CAD software and analysis by FEA tool. The design was analysed for induced stress on work piece due to various load condition.

Rohit Kumbhar et.al [4] This research article presented the advanced method design and development of pneumatic operated washer making machine. The pneumatic system has gained a large amount of importance in last few decades. This project work was mainly included the main components of designs of pneumatic operated washer making machine such as: design of cylinder, selection of direction control valve, and selection of tube, design of aluminium sheet, plastic sheet, tar felt sheet and pneumatic circuit design. Design analysis also done by using CATIA software. Fabrication and

implementation included: fabrication of frame and components. This importance was due to its accuracy and cost. Due to ease of operation, handiness, and expediency in operating the pneumatic system has made them to design and fabricate this unit as their project. This pneumatic operated washer making machine unit could be operated easily with partially skilled operators also.

S.Y. Lee et.al [5] Worked on the Concept of recirculation system in recycling the compressed air in a pneumatic system for increasing the compressing efficiency. This system consisted compressor, regulator, reservoir, pneumatic artificial muscle (PAM), Re-valve, gage pressure sensor, control board and power supply. A pneumatic actuator ensured the safety of the wearable robots due to its compliant characteristics and high force density. However, the pneumatic actuator had the following problems: low compressing efficiency, low control bandwidth, and high noise. To overcome these problems, they have proposed the recirculation system. The concept was recycling high-pressure exhausted air in order to increase compressing efficiency.

Ming Hung Tsai et.al [6] Worked on pneumatic control systems that have played the important roles in the industrial automation equipment owing to the following advantages - low cost, clean of the working environments, easy in power transfer, and so on. In recent years, high accuracy and high speed systems were growing up rapidly, and were important in high-tech industry. However, the precise position control of a pneumatic cylinder was very difficult due to the compressibility of air, nonlinear behaviour of the air flow rate through the servo valve, the friction force between the cylinder and the piston, and the stick slip effect at the low speed of the system. This paper was mainly to study the precision performance of positioning to the vertical pneumatic cylinder under vertical loading. In this paper, the friction force and the vertical loading had the great effect on the positioning accuracy.

III. DESIGN OF RECLAMATION SYSTEM

Design of reclamation system is based on the following two philosophies

3.1. Research Philosophy: -

Our project is based on realism philosophy. By referring to different scientific literature and papers we can conclude that, in working cycle of pneumatic cylinder, the air with certain pressure in discharging chamber usually is exhausted in the atmosphere directly. This reduce the efficiency of the system by great extent. Thus by overcoming this problem by various means we can extend the working efficiency of the pneumatic system to its optimum level.

3.2. Research Strategy: -

For this a simple and direct method is to develop a system in which the discharging chamber of the cylinder should be connect to the receiver, so that the air can be reclaimed and reused for other various purposes. However, there might be some potential problem in this system.

Table no. 3.1 Reservoir Selection

Airflow capacity		Receiver tank volume
(cfm)	(lpm)	(gal)
10	283.2	10
20	566.4	20
30	849.6	30
40	1132.8	40
50	1416	50
75	2124	75
100	2832	100
150	4248	150
200	5664	200

Design Procedure

Steps to be involved for reclamation of exhaust air from pneumatic system are

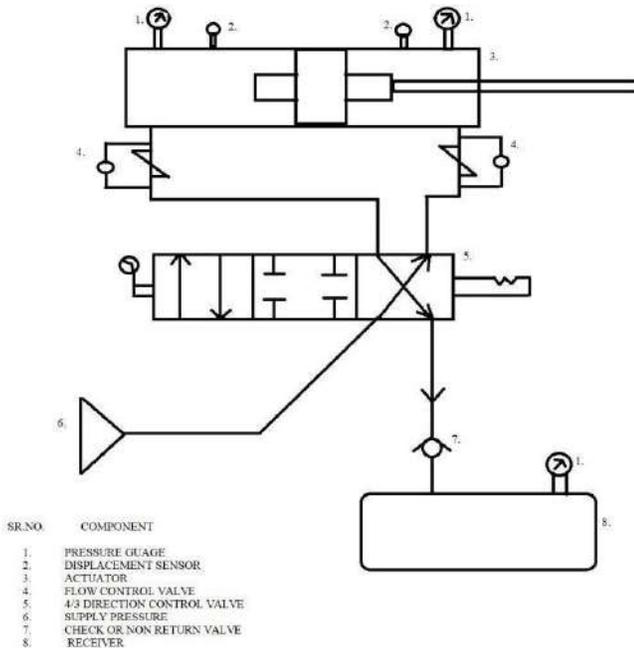


Fig.No.3.1.Construction of the exhausted-air reclaiming system

STEP 1: -

To find following parameters of pneumatic system

a. Find out the velocity of piston:

Velocity = length of travel by piston/time taken
 $V = L/t$ (mm/sec)

b. Flow rate of piston:

$Q = LAN/60$ (m³/sec)

Where, L = length of travel of piston in cylinder
 A = area of cylinder
 N = no. of reciprocation in a minute or 60 sec

c. Find out pressure out outlet of exhaust:

This can be known by using pressure gauges

STEP 2: -

Now as per data is obtained from the exhaust of pneumatic system in above calculations, design a reservoir as per the requirement. Below chart suggest selection of air reservoir; Air reservoir should be atleast 2.5 to 3 times bigger in capacity as per the output requirement of flow rates. All safety measure should be installed on reservoir like, pressure relief valve, pressure gauge etc.

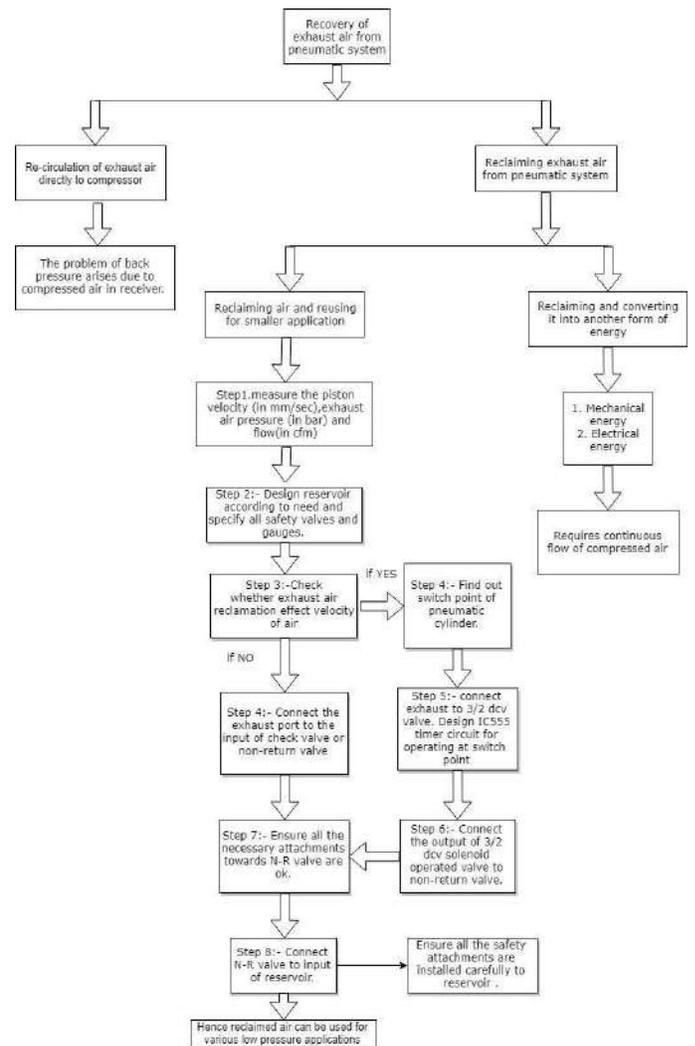


Fig. 3. 2 Flow Chart for Exhaust Gas Reclamation System

STEP 3: -

Check whether the velocity of piston is affected because of the back pressure. For this, install sensor on cylinder of pneumatic system. Displacement sensors are used to find velocity. "Hall effect sensor" is used for cylinder having magnetic piston and "Ultrasonic sensor" for non-magnetic piston in pneumatic system.

STEP 4: -

If velocity of piston is uniform then connect output of exhaust to input of pneumatic system as in fig3.1. If velocity is non-uniform and its performance is affected then find the position uptill which piston is displacing with uniform velocity in working stroke. This point is known as 'Switch point'. Uptill this point the exhaust air is stored in reservoir and after this point the exhaust air is released into the atmosphere.

STEP 5 :-

Connect exhaust of pneumatic system to 3/2 solenoid operated DCV as in fig3.2. Design an IC 555 timer circuit which will operate 3/2 solenoid operated DCV at the switch point attach muffler to exhaust port of 3/2 DCV valve. Inputs to IC 555 circuits form sensors.

STEP 6:-

Connect the output of 3/2 solenoid operated DCV to the input of non-return valve.

STEP 7: -

Ensure all the attachments towards non-return valve are ok.

STEP 8: -

Connect the non-return valve to the input of air reservoir.

IV. RESULT AND ANALYSIS

We conducted an experiment as per available power press machine operated through clutch of maximum 200 tonne capacity and air pressure required to operate clutch is maximum of 5.5 bar. In this experiment we are able to collect pressure upto 3 to 4 bar. If we are able to reclaim pressure of 5.5 bar and above in higher pressure arrangements then it will be more useful for operation of power tools and other applications.

V. CONCLUSION

As we know that the air has potential to work as medium to do the useful work. The pressurized air can be used after completing regular operations of system as its exhaust pressure is upto 5.5 bar. The system which we have developed has capacity to store air upto a pressure of 3.5 bar at the output of 5.5 bar of system exhaust. And by this we are achieving efficiency upto 63 %. If we get some other high pressure arrangements then we will be able to recover upto 6 bar pressure which will be more useful in power tools applications like grinding, finishing, painting etc.

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Review of Solar Operated Vapour absorption Refrigeration System

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Abstract— At the present time refrigeration plays a very important role in our daily as well as industrial life. But due to some problems like, refrigerant of CFC is also affecting our ecosystem very rapidly. So there is need of working on these systems in order to avoid such harms. Vapour absorption Refrigeration System acts as an alternative to existing systems as it requires low grade of energy for example; solar energy as it's renewable and present in enormous amount. So, in recent times a lot of research is going on to improve such systems that affects least to the environment and humanity but acts for same purpose in very efficient manner. As the energy is the backbone of the technology it affects the price of product as well as the overall economy of the industry

Keywords- Absorber, Aqua-Ammonia Vapour, Coefficient of Performance, Generator, Solar Energy, Tonnage of Refrigeration

I. INTRODUCTION

Refrigeration is the process of removing heat from enclosed system or space and rejects it to another system or surrounding. The refrigeration is used to lower the temperature of the enclosed system. A vapour absorption refrigeration system is similar to a vapour compression refrigeration system. The vapour absorption system comprises of all the processes in the vapour compression refrigeration system like compression, Condensation, expansion and evaporation. In the vapour absorption system the refrigerant used is ammonia-water or lithium-bromide. The refrigerant gets condensed in condenser and evaporated in evaporator. The refrigerant produces cooling effect in the evaporator and release the heat to the atmosphere through the condenser. The difference between the two systems is the method of the suction and compression of the refrigerant in the VARS cycle. In the vapour compression system, the compressor sucks the refrigerant from the evaporator and compresses it to the high pressure. The compressor is also enables the flow of the refrigerant through the complete refrigeration cycle. In the vapour absorption cycle the process of suction and compression are carried out by two different devices called as absorber and generator. Thus the absorber, generator and the pump replace the compressor in the vapour absorption cycle. The absorbent enable the flow of refrigerant from the absorber to the generator by absorbing heat. In the vapour absorption system the energy input is in the form of heat this can be from the excess system from the process or hot water.

The heat can be created by another source like natural gas, kerosene, heater etc. Though these sources are only in the small system. The above sources are conventional and are being used extensively in such way that their known reserves have been depleted to a great extent. At same time it is becoming increasingly difficult to find and exploit their new deposits of petroleum on our country will get exhausted by the few decades and their reserves are expected to last for another some years. But here we are using the solar energy to heat the water. Because the solar energy the abundant source of energy. Solar energy systems allow you to absorb free sunlight and convert it into usable power in your system. Unlike conventional power, solar produces no harmful emissions that hurt the environment. Solar energy will save your money each month. In addition, the investment that you made in solar, will improves property value. Vapour absorption system is basically uses the low grade energy such as waste heat and solar energy coming in the nature from thousands of years.

II. HISTORY & BACKGROUND

Attempts have been made to run vapour absorption systems by solar energy with concentrating and flat plate solar collectors. Several small solar absorption refrigeration systems have been made around 1950s in several countries. Professor G.O.G. Lf of America is one of the pioneers in the area of solar refrigeration using flat plate collectors. A solar refrigeration system that could produce 250 kg of ice per day was installed in Tashkent, USSR in 1953. This system used a parabolic mirror of 10 sq m area for concentrating the solar radiation. F. Trombe installed an absorption machine with a cylindro-parabolic mirror of 20 sq m at Montlouis, France, which produced 100 kg of ice per day. Serious consideration to solar refrigeration systems was given since 1965. Due to the scarcity of fossil fuel based energy sources. LiBr- water based systems have been developed for air conditioning purposes. The first solar air conditioning system was installed in an experimental solar house in University of Queensland, Australia in 1966. After this several systems based on solar energy were built in many parts of the world including India. In 1976, there were about

500 solar absorption systems in USA alone. Almost all these were based on LiBr-water as these systems do not

require very high heating temperatures. These systems were mainly used for space air conditioning. Intermittent absorption systems based on solar energy have also been built and operated successfully. In these systems, the cooling effect is obtained during the night time, while the system gets "charged" during the day using solar energy. Though the efficiency of these systems is rather poor requiring solar collector area, they may find applications in remote and rural areas where space is not a constraint. In addition, these systems are environment friendly as they use eco-friendly refrigerants and run on clean and renewable solar energy.

FIGURE AND TABLE

An absorption refrigerator is a refrigerator that uses a heat source (e.g., solar energy, a fossil-fueled flame, waste heat from factories, or district heating systems) to provide the energy needed to drive the cooling process.

Absorption refrigerators are often used for food storage in recreational vehicles. The principle can also be used to air-condition buildings using the waste heat from a gas turbine or water heater. Using waste heat from a gas turbine makes the turbine very efficient because it first produces electricity, then hot water, and finally, air-conditioning (called cogeneration/tri-generation).

Both absorption and compressor refrigerators use a refrigerant with a very low boiling point (less than $-18\text{ }^{\circ}\text{C}$ ($0\text{ }^{\circ}\text{F}$)). In both types, when this refrigerant evaporates (boils), it takes some heat away with it, providing the cooling effect. The main difference between the two systems is the way the refrigerant is changed from a gas back into a liquid so that the cycle can repeat. An absorption refrigerator changes the gas back into a liquid using a method that needs only heat, and has no moving parts other than the refrigerant itself.

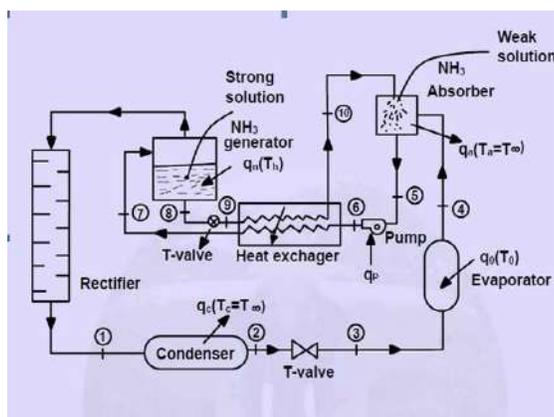


Fig. - Vapor Absorption Refrigeration System

III. RESULT AND ANALYSIS

This paper describes about the utilization of solar energy by concentric collector tracking mechanism for

domestic refrigeration purposes. Power of the sun can be efficiently used to harness energy for need for various applications. Different systems are available to collect or utilize the solar energy, but the incident angle of

direct radiation keeps changing vis-a-vis the day length. So, we cannot use the solar energy to full extent with

the fixed collector. To attain the incident angle nearly perpendicular to the collector, need to deal with the

moving collector system. Thus we employed for mechanically operated automatic tracking system which gives ease in operation. An „Electrolux refrigeration system“ used in this present work is a three fluid system namely Ammonia, water & hydrogen. Instead of a compressor it uses low grade energy to run a generator, as opposed to a standard refrigerator.

IV. CONCLUSION

Vapour absorption refrigeration system with R-717 as refrigerant and water as working fluid have been studied theoretically. Consistently increasing CO₂ emission and ozone depletion from CFC's are serious environmental issues challenging scientific community. In conventional refrigeration system, compression machines are employed, which requires high-grade energy as input and this is in the form of electricity. Therefore it is better to use the Vapour absorption refrigeration system which gives scope of utilizing low grade energy source i.e. solar panel for generating cooling effect which is dominated by high grade energy driven compression technology. Absorption refrigeration system provides large potential for reducing heat pollution of the environment. Therefore, in future it is decided to compare the performance between conventional systems and vapour absorption system using solar thermal energy.

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Automatic human following trolley

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Abstract— In this paper we tried to accomplish an automatic or smart trolley system which can carry any amount of specified weight. Our aim is to design a trolley which will follow the human being and can carry the weight so as to reduce the effort required by human being. During shopping we have to carry shopping cart all over the mall, So the human following trolley can follow the shopper anywhere the shopper goes without any actual effort. The primary goal of our work is to design and fabricate a trolley that not only tracks the target but also moves towards. Smart trolley system works with help of Bluetooth and GPS module which are used to identify the presence of a user. Aurdino UNO is the main programmable part that bluetooth and GPS detect the user's position with respect to trolley. In order to make things simpler, Trolley will locate the smartphone of the user. All the processing is carried out by the microprocessor while the control of the motors is carried out by the controller.

Keywords—Human following trolley, Bluetooth, GPS, Aurdino UNO, position.

I. INTRODUCTION

Every day we see shopping carts in the supermarket customers usually push the carts with both hands, and so, if the customer had only one hand or had to carry a child, then pushing shopping carts becomes a real burden. Thus, in order to improve the situation and assist those with disability, we plan to develop a trolley system that follows the user. Enabling disabled people to enjoy shopping with the need for human assistance. There are certain stages in life that people needs help from others to carry their loads. This project aims to help those people to avoid asking others for help. A Trolley will help in carrying heavy loads and follow the person in a convenient way without disturbing their attention in shopping. GPS on the smartphone of the user will detect the person's location from the trolley. The programmable application called blynk is used to communicate and transfer data between trolley and the smartphone. The Bluetooth on the user smartphone will act as sender and the Bluetooth receiver is integrated in the trolley. The Bluetooth signal will be sent

from the smartphone and the receiver will locate and calculate the distance from the user. Aurdino will process the data and will command the relay and according to the distance between person and trolley current is supplied to motor, and the motor speed is varied. Four wheel trolley mechanism on top to hold the various types of heavy loads. The trolley will have the drive and steering mechanism being motorized and is backed by DC batteries. The sensor will sense the person who is in front and in the predefined range of the sensor area. The sensor is continuously connected via Bluetooth hence giving the approximate distance of the person.. If the person moving forward towards the trolley, the sensor will sense the distance between them and gives signal to arduino about the distance. Arduino will execute the program by moving the motors in forward direction and hence if the person moves towards trolley it will tend to move away from the person. If the person moves backward the trolley will tends to come closer to the person. If the person stops suddenly, the trolley will move at specific distance from the user.[1]

II. HISTORY & BACKGROUND

Shopping trolleys in mall require a great effort to carry around, The smart trolley will help reduce this effort. The human following trolley motion can be achieved by using various sensors and arrangements. Such as camera, ultrasonic sensor, RFID, LRF. Muhammad Sarmad Hassan, 'Design and development of human following robot' paper stated the method of a human following robot based on tag identification and detection by using a camera. Intelligent tracking of specified target is carried out by the use of different sensors and modules i.e. ultrasonic sensor, magnetometer, infrared sensors and camera. An intelligent decision is being made by the robot control unit based on the information obtained from the above sensors and modules, hence finding and tracking the particular object by avoiding the obstacles and without collision with the target. The biggest advantage of their

method was that their algorithm worked in complex environments as well. System consists of a three wheel robotic vehicle mounted with a separate microprocessor and control unit along with different sensors and modules. It can assist the public in shopping malls. So there it can act as a luggage carrier, hence no need to carry up the weights or to pull that. Using this algorithm the robot will automatically follow that person. But this implementation has its limitations. Range of the implementation is limited and environmental lighting affect the tag detection.

III.

COMPONENTS

Arduino UNO & Genuino UNO, L298n Motor Driver, Parallax PAM-7Q GPS Module, HC-05 Bluetooth Module, 12V battery, 4 Wiper motor .

The Arduino Uno and a 12v battery to power the sensors, Bluetooth, and control logic. A 12v lead acid battery was used to power the motors. A HC-05 Bluetooth module was mounted at the front of the platform for better range. The rest of the components including a L298N motor driver, PAM-7Q GPS, were mounted inside and connected to the Arduino through the breadboard. The compass works with I2C, so we connected the SCL and SDA pins to A5 and A4 respectively. The rest of the pins were connected through digital I/O. The motors are powered by attaching them the L298N motor driver board. The battery is connected as the main power source and the Arduino power source for control logic. Once everything configured , verify and upload the code to your Arduino. It will take a few seconds for the GPS to acquire a satellite lock. Once it does, it will begin flashing while the android device is paired with HC-05 bluetooth module.

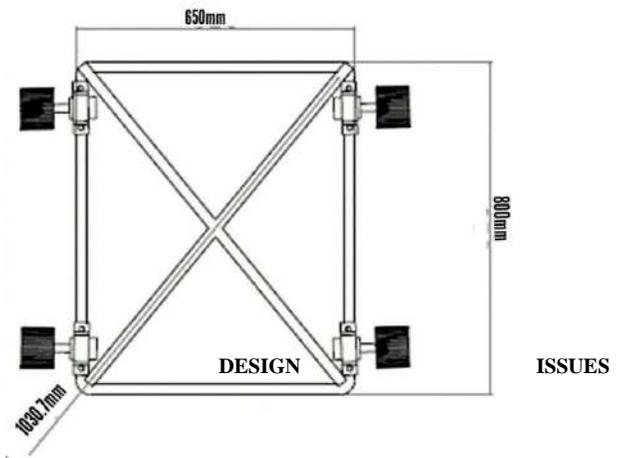


Fig.2.Base structure of trolley

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FIGURE AND TABLE

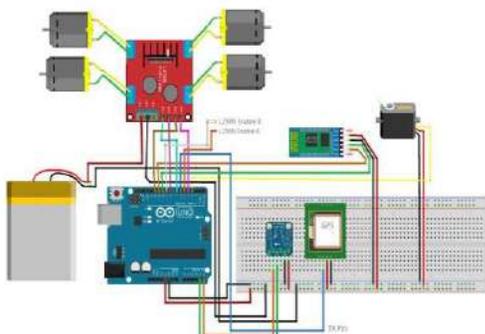


Fig. 1.Circuit diagram

Solar Automated Lawn Mower

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Abstract— Good growth of various high-tech efficient tools and equipment makes our jobs done comfortable and sophisticated. These days we are facing the problems like pollution, power cut problem etc. In order to overcome these problems, we have thought about the device, which can be performing its functions without causing any of these problems. The project aims at fabricating a grass cutting machine system which uses solar energy for its power requirement. A solar powered grass cutter is designed and developed, based on the general principle of mowing. This project deal's with design of solar powered grass cutter comprises of direct current (D.C) motor, are rechargeable battery, solar panel, a shearing action blade and IOT based control system. The solar powered grass cutter is operated by the switch on the board which closes the circuit and allows the flow of current to the motor which in turn drive the blade used for mowing. All the switching is automatic and can be done through the smart devices. The battery recharges through the solar charging controller.

Keywords— *Cutter, Solar Panel, DC Motor, lead acid battery*

I. INTRODUCTION

A lawn mower (also named as mower or lawnmower) is a machine utilizing one or more revolving blades to cut a grass surface to an even height. The height of the cut grass may be fixed by the design of the mower, but generally is adjustable by the operator, typically by a single master lever, or by a lever or nut and bolt on each of the machine's wheels.[3] The blades may be powered by muscle, with wheels mechanically connected to the cutting blades so that when the mower is pushed forward, the blades spin, or the machine may have a battery-powered or plug-in electric motor. The most common power source for lawn mowers is a small (typically one cylinder) internal combustion engine. Smaller mowers often lack any form of propulsion, requiring human power to move over a surface; "walk-behind" mowers are self-propelled, requiring a human only to walk behind and guide them. Larger lawn mowers are usually either self-propelled "walk-behind" types, or more often, are "ride-on" mowers, equipped so the operator can ride on the mower and control it. A robotic lawn mower ("lawn-mowing bot", "mowbot", etc.) is designed to operate either entirely on its own, or less commonly by an operator by remote control. [1]

Two main styles of blades are used in lawn mowers. Lawn mowers employing a single blade that rotates about a single vertical axis are known as rotary mowers, while those employing a cutting bar and multiple blade assembly that rotates about a single horizontal axis are known as cylinder or reel mowers (although in some versions, the cutting bar is the only blade, and the rotating assembly consists of flat metal pieces which force the blades of grass against the sharp cutting bar).

II. HISTORY & BACKGROUND

There are several types of mowers, each suited to a particular scale and purpose. The smallest types, non-powered push mowers, are suitable for small residential lawns and gardens. Electrical or piston engine-powered push-mowers are used for larger residential lawns (although there is some overlap). Riding mowers, which sometimes resemble small tractors, are larger than push mowers and are suitable for large lawns, although commercial riding lawn mowers (such as zero-turn mowers) can be "stand-on" types, and often bear little resemblance to residential lawn tractors, being designed to mow large areas at high speed in the shortest time possible. The largest multi-gang (multi-blade) mowers are mounted on tractors and are designed for large expanses of grass such as golf courses and municipal parks, although they are ill-suited for complex terrain.

III. DESIGN OF COMPONENTS

Cutter

The cutter is main component which actually cut the lawn. It will be mounted on face side of the lawn mower. The cutter design consists of two components namely base and upper cutter. The lower cutter called base is to grab the grass like in comb in it and hold it straight while cutting. Besides holding it performs one more operation helping cutting upper cutter. The motor will be mounted base cutter which will help to reciprocate laterally upper cutter on it. The cutter will be

rested on base cutter and the contact between them is very smooth. The friction between these upper and lower cutter is kept minimal by optimizing design. The upper and lower cutters are fairly similar in design with slots made by milling. The slot will be of rectangular shape which are of 5mm in breadth. And the slots lies throughout the length of blade and the studs are provided to hold the cutter on chassis. The lower base will be mounted on the chassis and the upper base is fixed on the lower base by mean of hinge type joints which give only one degree of freedom to the upper blade. The cutter act as a scissor like multiple scissor working to gather as it makes a sense because our ancestors taught us to cut grass first hold it and then cut it same wise we cut the grass. The lower cutter hold the grass and then upper cutter cuts the grass. Than it cuts the grass with excellent perfection. In rotary cutters the cutter is unable to cut the grass uniformly because the cutter itself bents the grass and that's why the cutting becomes inefficient .in this cutter this problem is solved and the base part of cutter thus it holds the grass to cut it. The grass cutter material selection will be done on basis of the strength of the grass to be cut the different grasses has different tensile and lateral strength this all parameters depends on the nature condition in that particular area so material should be accommodate to all the type of grasses so that in polymers the thermosetting polymers can be used and in the metals aluminium of brasses and bronzes can be uses to avoid the corrosion because in case of copper and iron the problem of the corrosion will be there because the dew drops will be there on grass and the grass itself release the liquids water while cutting and the mover have to work in the sunny environments the corrosion rate are higher in the sunny environments. To avoid this, aluminium and thermosetting polymers will be the perfect choice for the cutter.

Chassis

Chassis mainly consist of frame and components like solar panel, battery, wheels, motors, etc. Frame is made from hollow pipes of lightweight material.[1] It will provide housing for battery and collect lawn which is cut. On top of the frame solar panel is to mounted to collect solar energy. Chassis is divided in two compartments for battery and to store the collected lawn. Stress concentration is well distributed to carry the loads of other components and the collected lawn. Wheels are placed so that they carry load concentration evenly. Chassis have mechanism to adjust the height of cutter for desired cutting or cutting in aesthetic manner.

FIGURE AND TABLE

Circuit Digram

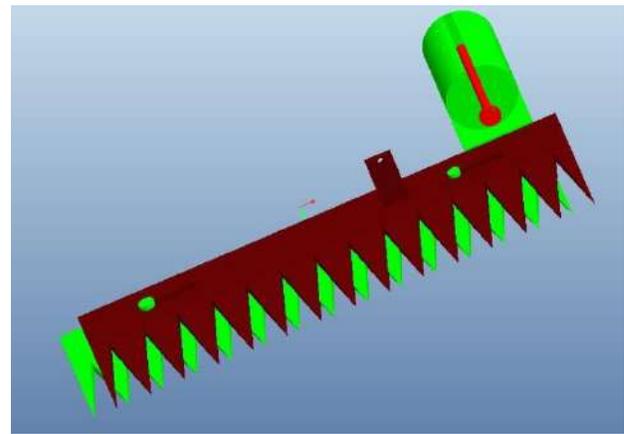


Fig. Pro-E Model of cutter

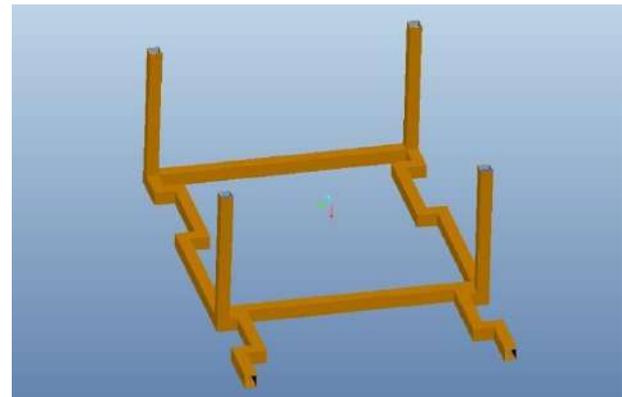


Fig. Pro-E Model of Chassis

IV. OTHER COMPONENTS

Node MCU

It is open source Iot based platform which runs esp8266 wifi SoC from Espressif system, and the hardware which is based on ESP-12 module. It is default firmware. It provides access to 12 GPIO pins and the connections can be done with this pins and this runs on 3.7V and the input can be given from the Vcc pin.[4] The program uploaded through Arduino IDE sketching software and the connecting is provided by micro-usb.

Motor Control Unit L298N

L298N is capable of controlling multiple motors at same time with providing alternate polarities. This is with the help of embedded dual H bridge configuration. It supplies required input power to the motors. Also provides power input to firmware like Arduino, Node MCU, etc. It can take inputs in the range 3V to 35V and produce 5V power supply for Node MCU or Arduino upto the current rating of 2A.[6]

Design and Manufacturing of Camphor Tablet Making Machine

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Abstract— This entire work focuses on the Manufacturing of Tablet making Machine. It is run or operated by using the Mechanical drive. Tablet making Machine are most commonly used in pharmaceutical industry. This Tablet making Machine is use for making the tablets of camphor. Camphor (Kapur) have been used in sweets, insect repellent, anti Rusk coat on tools, anti microbicidal balls, local aesthetics, vapour based camphor gels (Vicks). Camphor is widely used in Hindu religious ceremonies. Camphor Based substances are important part of various pharmacy products. Camphor has been widely used as a fragrance in cosmetics, as a food flavoring, as a common ingredient in household cleaners, as well as in topically applied analgesics and rubefacients for the treatment of minor muscle aches and pains.

Using this machine the production rate is increased the operating cost is also optimised as the production rate is increase the cycle time is reduced. Initially we design the machine using software. Later on in order to verify or to check the design finite element method is used modelling in catia is done and also meshing is initially done and by using structural analysis software. So that maximum stress as well as maximum deflection induced in the various components is checked this also verifies the design of parts.

Keywords— *Tablet, Machine, Camphor, production, cost.*

I. INTRODUCTION

Press work is a method of mass production involving the cold working of material, usually in the form of thin sheet or powder. It may be defined as the chipless manufacturing process by which various components are made from layer of camphor powder. These processes are also termed as cold stamping. The machine used for press working is called press. It is one of the extensively employed methods of fabricating parts of intricate shapes with thin walls. It uses large forces by press tools for short time interval which results in cutting or shaping the camphor layer.

The requirements of high productivity, reduced costs and guarantee of high product quality to which all manufacturing companies are exposed, applies particularly to companies in the field of press working. This situation leads to reconsider the press drive mechanism in use up to now. The new drive

for the camphor presses with camshaft described here allows us to optimize the kinematics of simple mechanical presses. This means that the cycle time is shortened to achieve high productivity and the kinematics follows the requirements of the punching and blanking processes.

II. HISTORY & BACKGROUND

The controlling parameters in compression molding method to develop superior and desired properties of the composite. All the three dimensions of the model (pressure, temperature and time of application) are critical and have to be optimized effectively to achieve tailored product as every dimension of the model is equally important to other one. If time of application of these factors (pressure and temperature) is not sufficient (high or low), it may cause any of defects associated with insufficient pressure or temperature. The other manufacturing factors such as mold wall heating, closing rate of two matched plates of the plates and demolding time also affect the production process. The overall properties of camphor differ to a large extent from thermoplastics and other materials. Therefore, it is important to consider properties while designing the mould which will affect mould parameters. Dimensional accuracy of molded camphor parts is very important and in such cases, the design of the mould must allow for shrinkage of the parts. Linear shrinkage values can be obtained from test molded samples of flat camphor sheets and can be used as a rough guideline to mould design values for very simple parts only. Analyzing the above properties of given camphor sample and mould parameters, we have to design and manufacture the camphor compression mould. Hydraulic system should be avoided because hydraulic oil leakage may affect the production vigorously. Hydraulic oil may react with camphor and it is highly undesirable, thus instead of hydraulic system cam and follower operated mechanical system is very much suitable and suggested to use.

The project work start with identification of problem, as the camphor is chemically reactive towards the hydraulic oil thus we cannot use hydraulic press for the operation which is generally prefer for press operation on the other hand we have

option of pneumatic press but as the camphor is sublimatory substance which will vaporize the camphor material when come in contact with air and pneumatic system also have high initial investment as well as complicated components like pump ,direction control valve, actuators, FRL unit etc. and those are need to be handled with skilled and experience operator so the press operation must be carried out using the mechanical system which includes the various mechanisms like cam and follower, speed reduction using gears, reciprocating motion for press operation uses the slider crank mechanism.

The next step is literature survey after identification of problem the papers related to chemical properties of camphor, papers on design of cam and follower, research papers on the slider crank and spring design etc are referred. On addition to that we have use the reference books based on design of machine element. The detailed literature survey is given further in the same report.

After the literature survey we studied about the various compression mould and compression moulding machine which are using in market by various companies. Through the market survey we decided our design and started the pre design work which includes drafting and analysis using the software. We use the CATIA V5 for drafting and use the ANSYS 18.2 for structural and dynamic analysis.

We are done with the base and support structure of machine and further work will be selection of spring and gears according to design. We are also generating the NC code for path generation on gear using VMC. At last we are going to assemble the all components and then we will carry few test on it for the quality inspection.

III. DESIGN ISSUES

As our compression moulding machine is mechanically operated there are various mechanical components are use those are need to be design and analyze structurally and dynamically according to boundary conditions which are depends upon the Force and rotational velocity of components.

A. Crankshaft for punch holder

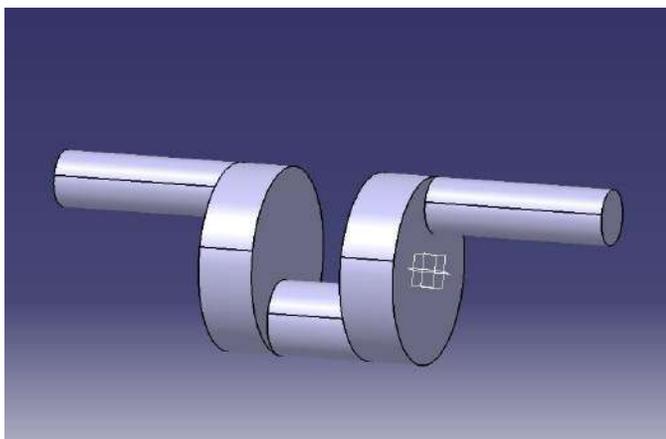


Fig. 1 Crankshaft for punch holder

The above fig shows the crankshaft for punch holder this shaft is coupled to motor through the gear pair which does the work of speed reduction. this crankshaft is located at the top of the assembly into the holding post. It convert the rotary motion of motor into the reciprocating motion it is one of the link of slider crank mechanism. The force transmitted by motor and the is converted into press force using the crankshaft.

B. Punch holder

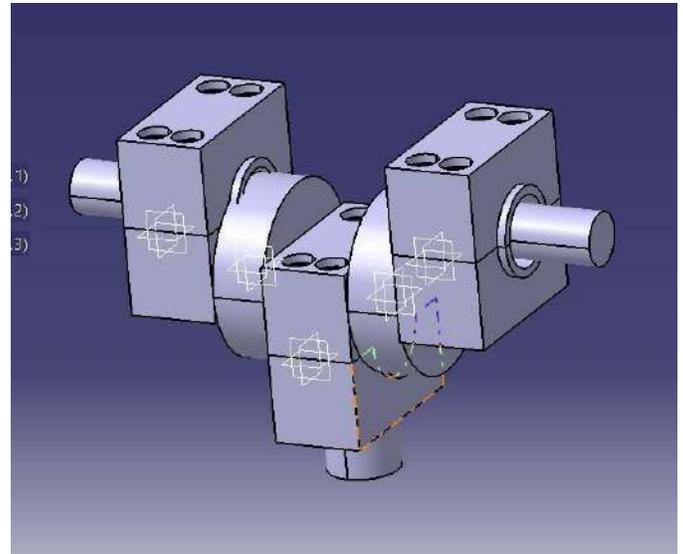


Fig. 2 Punch holder.

IV. RESULT AND ANALYSIS

Structural analysis of Punch holder assembly. The assembly includes crank shaft, punch holder and punch. From these components the punch holder material is weakest thus it is become a necessary to carry out the structural analysis on the punch holder to avoid the failure during the operation

Boundary conditions

Force on punch holder = 10 KN vertically upward
Rotational velocity = 500 RPM

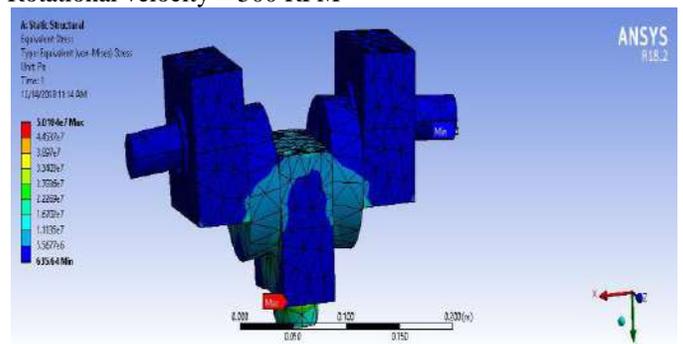


Fig. 3 stress induced in the material with extreme boundary conditions.

The above structural analysis is carried out on the ANSYS 18.2 for the punch holder assembly which is undergoing through the cyclic force due to continuous reciprocating motion and hammering of punch during punching operation this is responsible for the maximum stress generation into the middle Punch holder

Material of punch holder

- Cast iron
- Ultimate tensile strength = 414 Mpa

The maximum stress induced due to extreme boundary condition is 50.104 Mpa which is less than the ultimate tensile strength of the cast iron which is 414 Mpa. The above design is safe as far as maximum stress induced in the material due to extreme boundary condition is concern.

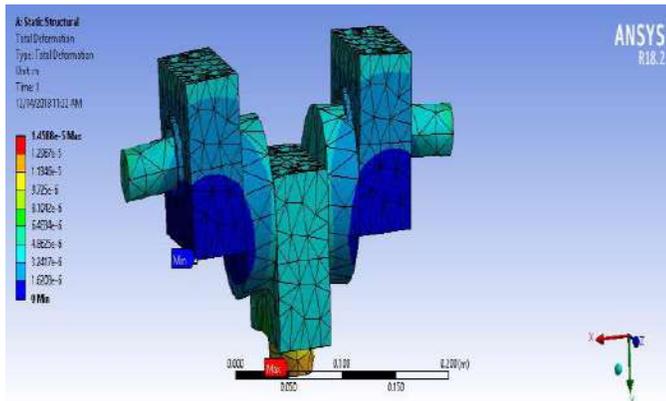


Fig. 4 Deformation due extreme boundary conditions

This is the second step of the of the structural analysis where we calculated the maximum deformation due to extreme boundary condition after evolution of the results from the ANSYS workbench 18.2 we come to know that the maximum deformation due to extreme boundary conditions is 14.588 micrometer. The deformation of 14.588 micrometer is almost negligible in this case thus the design for the punch holder is safe as far as the maximum deformation due to extreme boundary condition is concern

Construction And Working Of The Camphor Tablet Machine

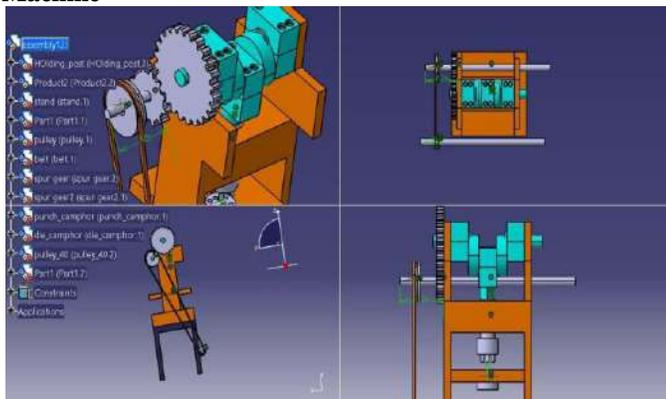


Fig. 5 Overall Design Of Camphor Tablet Machine

Construction: - This machine is seated on the cast iron bed. The holding post is attached to the bed. This holding post is holding gear drive, Crankshaft, Punch holder, and cam and follower arrangement as shown in fig above. Punch holder holds the punch and the die are attached on to the movable post. The motor is situated at the bottom supply the power through the v belt to the gear drive.

Working: - Motor situated at the bottom of the assembly convert the electrical energy into mechanical power this power is transmitted through the v belt to the gear drive. In the gear drive speed reduction is achieve and the torque is increased. This power in terms of reduced speed and increased torque is supply to the crankshaft which is one of the link of slider crank mechanism. The crankshaft will convert the rotary motion into the reciprocating motion and the punch on the punch holder starts reciprocating in die. The die is attached on the movable support which is operated by cam and follower arrangement. Where the cam is attached on to the extension of the crankshaft. Thus this will be responsible for simultaneous feeding of material and compression.

V. CONCLUSION

From the chapter of validation, using various software we can conclude that punch for the desired tablet product is withstanding in all the working conditions. The objective of the project was to manufacture a Tablet making machine for camphor product as per given dimensions. In this project, we studied various moulding techniques used for manufacturing of polymer products. According to the desired properties of product, mechanical drive system is preferable for machine. Using various research papers and design data books we studied the methods of gear and spring design. Pre design work such as modeling of desired product in geometric modeling software was helpful in visualization as well as for machine shape and geometry finalization. This punch was analyzed using software to find out maximum stress induced in all parts during the moulding process. Drafting of the punch after analysis was important in manufacturing point of view.

The small scale industries will get the affordable and less complicated option for the manufacturing of the camphor tablet in mass quantity. The high initial investment for the systems like Hydraulic press and Pneumatic press will avoided. The maintenance cost reduction will be the main advantage of Mechanical press thus they may occupy the small scale segments.

Quality inspection device may attach to the camphor tablet machine to inspect the quality of the product which will take care of the quality in terms of the shape and size. This will be responsible for the detection of defective pieces and the good reputation of the company into the market due to Quality.

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Fabrication Of Railway Track Detection & Ballast Cleaning System

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Abstract:

India rail transport is rapidly growing day by day and it occupies tremendous position in transport facility the most eye catching thing that Indian railway is 4th largest network in the world .but if we consider about the safety and reliability of it, the Indian railway is lacking behind. The main problem associates is the railway accidents which is caused due to cracks in tracks and till there is no remedial option to overcome such serious problem in India. Manual detection of track is cumbersome and not fully effective owing to much time consumption and requirement of skilled technicians. Also the Ballast Cleaning is necessary railway track. This article also presents an overview of the recent advancement in the identification of subsurface rail track problems using geophysical methods and conventional track monitoring and cleaning. The Indian railway follows coarser ballast gradation and conventional procedure to identify the rail track subsurface problems. Many advanced methods need to be experimented in Indian rail tracks to modernize the railway track foundations for the fast transportation of goods and passengers.

Keywords: GSM,GPS, IR Sensor, Tilt Sensor,Ballast.

1. INTRODUCTION

The Indian Railway network is the largest rail-passenger transport and most of the commercial transport is being carried out by the railway network because it is being cheapest mode of transportation preferred over all other means of transportation such as buses ,flights etc. Economic prosperity has always been dependent on increasing capacity and rationality of transport. But the infrastructure and operation of transport has great impact on land and largest resource of energy making transport sustainability and safety a major issue. The crack and other problems with the rails generally go unnoticed due to improper maintenance and irregular manual track line monitoring that is being carried out in the current situation. Nowadays system have some limitation, if the bridge or track damaged, that information goes to railway authority people, they notify and inform to the corresponding train it will take more time informing those information ,Also soil removing from track is major issue. This project relates to design system in a such way that developed combine system railway track crack detection

system and Ballast Cleaning System together. In track

detection railway carriage carrying the control equipment is provided with IR sensor oriented to detect the crack and tilt sensor used to detect alignment of track. When crack is detected its latitude and longitude values are send as a message to mobile phone. an arrangement for cleaning of ballast and its control. These was design by collaborator .The unit has three cabin, one cabin is for keeping hydraulic tank and accessories ,control panel ,workbench etc. another cabin is rear cabin with drive control and breaking of vehicle. Third cabin is hanging cabin with excavation and cleaning control

for movement during cleaning, track lifting ,breaking etc. This will help in maintenance and monitoring the condition of railway track without any error and their by maintaining track in good condition, preventing train accidents to very large extent.

2. METHODOLOGY

In this project, we have used the two tracks; each track will be monitored by one IR obstacle sensor. Whenever there is a crack on the track, the IR obstacle sensor senses the crack and activates GPS. The location Latitude and Longitude coordinates of the crack is sent to the pre-defined number with the help of SIM inserted into GSM module. Once the crack has been successfully identified and message is sent, the vehicle moves further on the model path till next crack is detected. The designed Railways Track Crack Detection Autonomous Vehicle has been successfully tested on the model track and the detected location has been sent to the phone number which is 4km away from the prototype. This vehicle can be used to detect the track and send GPS coordinates in SMS form to even longer distance provided the GSM signals are intact.

The function of ballast cleaning machine is to carry out cleaning of ballast by removing muck, thereby improving drainage of track and elasticity of the ballast bed. Basically, the machine excavates and picks up ballast by means of cutter chain and carries it to a set of vibrating screens where muck is separated and thrown out by chute and clean ballast is transferred back to the track.

3. COMPONENT AND DESCRIPTION

The main components of the railway track crack detection

system with ballast cleaning vehicle are

- Microcontroller89c52
- Ultrasonicsensor
- GSMSIM900
- 16x2 CharacterLCD
- IRSensor
- TiltSensor
- GPS
- ExcavatingUnit
- ScreeningUnit
- Conveyor system with Distribution of ballast and disposal ofmuck
- Track lifting and slewingunit
- Recordingunit

MICROCONTROLLER 89C52

Compatible with MCS-51® Products 4K Bytes of In-System Programmable (ISP) Flash Memory

– Endurance: 1000 Write/EraseCycles

- 4.0V to 5.5V OperatingRange
- Fully Static Operation: 0 Hz to 33MHz
- Three-level Program MemoryLock
- 128 x 8-bit InternalRAM
- 32 Programmable I/OLines
- Two 16-bitTimer/Counters
- Six InterruptSources
- Full Duplex UART SerialChannel
- Low-power Idle and Power-downModes
- Interrupt Recovery from Power-downMod

Ultrasonicsensor

- Ultrasonic ranging module HC SR04 provides 2cm 400cm non contact measurement function,the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit.
- The basic principle of work using IO trigger for at least 10us high level Signal. The Module automatically sends eight 40 kHz and detectwhether there is a pulse signalback.
- IF the signal back, through high level, time of high output IO duration is the time from sending ultrasonic to returning.
- Test distance = (high level time X velocity of sound(340M/S)/2

GSM SIM900

- The SIM 900 GSM module has been chosen to achieve the SMSfunctionality.
- Featuring an industry -standard interface,the SIM 900 delivers voice, SMS, data and Fax in a small form factor.
- The leading features of SIM900 make it deal fir virtually unlimited application, such asWLL applications, M2M application, handheld devices and much more.

16 x 2 CharactersLCD

- 5x 8 dots withcursor
- Built-in controller (KS 0066 orEquivalent)

- + 5V power supply
- 1/16 dutycycle
- B/Ltobedrivenbypin1,pin2orpin15,pin16or A.K (LED)
- N.V. optional for + 3V powersupply

IRSensor

- High radiantintensity
- Peak wavelengthp=940nm.
- 2.54mm Leadsspacing
- This product itself will remain within RoHS compliantversion.

TiltSensor

- A tilt sensor can measure the tilting in often two axes of a reference plane in two axes. In contrast, a full motion would use at least three axes and often additional sensors.
- One way to measure tilt angle with reference to the earths ground plane, is to use an accelerometer. Typical applications can be found in the industry and in gamecontrollers.

GPS

- High tracking sensitivity of-159dBm
- Frequency L1, 1575.42MHz
- Channel 66 channels
- Altitude Maximum 18,000m (60,000feet)
- Velocity Maximum 515m/s
- Acceleration Maximum4G
- Baud Rate 9600 bps (default) Hardware powersaving control pin allowing poweroff.

The components of Ballast Cleaning vehicle :

- ExcavatingUnit
- ScreeningUnit
- Conveyer system for distribution of ballast and disposal ofmuck
- Track lifting and slewingunit.

4. WORKINGPRINCIPLE

Part I - Crack Track Detection System:

When the vehicle is Powered On, it moves along the model track. The IR Obstacle sensors monitors the condition of the tracks When a crack is detected by the IR sensor the vehicle stops at once, and the GPS receiver triangulates the position of the vehicle to receive the Latitude and Longitude coordinates of the vehicle position, from satellites.

The Latitude and Longitude coordinates received by GPS are converted into a text message which is done by PICmicrocontroller.

The GSM module sends the text message to the predefined number with the help of SIM card that is inserted into the module. Once the message has been successfully sent to the number, the vehicle resumes its movement forward depending on the type of crack.

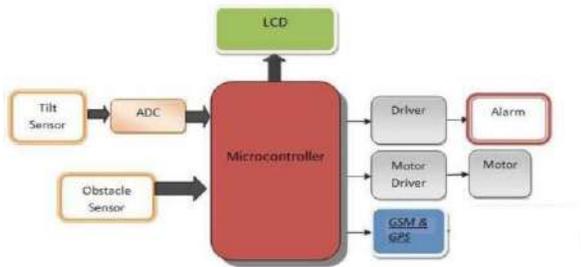


Fig. Block Diagram of Train track crack detection system

Part II- Working of Ballast Cleaning Machine:

The function of ballast cleaning machine is to carry out cleaning of ballast by removing muck, thereby improving drainage of track and elasticity of the ballast bed. Basically, the machine excavates and picks up ballast by means of cutter chain and carries it to a set of vibrating screens where muck is separated and thrown out by a chute and clean ballast is transferred back to the track.

Ballast Cleaning Machines have following basic Units:

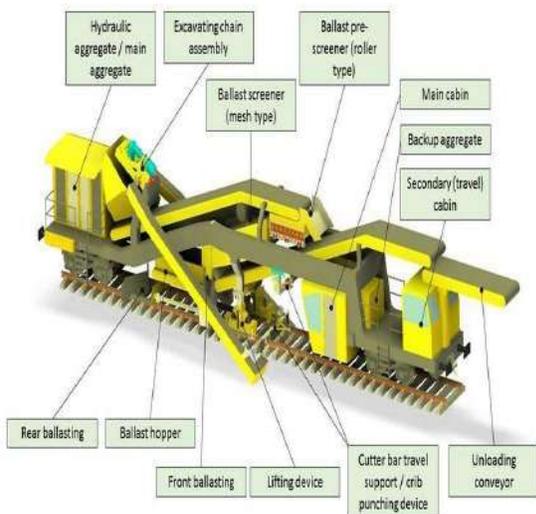


Fig: Ballast cleaning Machine

- i) ExcavatingUnit

- ii) ScreeningUnit
- iii)Conveyer system for distribution of ballast and disposal ofmuck
- iv)Track lifting and slewingunit.
- v) Recordingunit.

The excavating ballast,there is endless scrapper chain located between bogies and running under the track when working. excavation chain is guided in two slanted channel, one is horizontal and one is incline. The beginning of work at a site, cutter is inverted underneath the sleepers and connected to lateral guides by quick action hoist. Also at end of particular site, cutter is removed. In conveyer system for distribution of clean ballast and distribute it evenly across entire surface of track right behind excavating chain. From the underneath screening unit,waste drop to conveyer belt. The waste can be discharged outside track by means of tilting waste conveyer belt. The track lifting and slewing unit is located next to cutter for adjusting excavation depth and for avoiding obstacle.

Ballast regulation and profiling becomes necessary primarily due to the following:

- i)After a maintainance operation such as tamping oftrack
- ii) After relaying oftrack
- iii) After training outballast

These machines have their main application in ballast transfer, spreading and profiling operations. For this purpose, a front mounted one pass transfer plow, left and right ballast wings and a rear mounted track broom are provided as standard equipment. The machine can move ballast towards center of track or away from center of track transfer ballast across the track and transfer ballast from a surplus zone to deficient zone..

5. ADVANTAGES

Ballast Cleaning Machine

- [1] It is an automatic machine that is it required less number ofstaff.
- [2] It takes less time of cleaning in ballast with respect to manualoperation.
- [3] It is highly efficient with respect to manual cleaning of ballast.

TrackDetection

- [1] Costeffective

- [2] Accurate crack detection compare to the other detection system.

6. RESULT AND ANALYSIS

- [1] 20 March, 2014 – Six coaches of a local train at Titwala station got uncoupled from the rest of the train. It derailed and killed an 18-year-old student and nine others.
- [2] May 4, 2014 - 50105 Diva Junction-Sawantvadi Passenger train derailed between Nagothane and Roha stations killing near about 20 passengers and injuring 100 others.
- [3] July 10, 2011 – 71 people were killed by the derailing of Kalka mail at Malwastation.
- [4] May 28, 2010 – Naxals derailed Jyaneshwari Express and killed 148 people.
- [5] June 22, Mumbai Central Holiday Special's three coaches and engine got derailed near Vaibhavwadi station in Maharashtra. 2003 – In a first major accident 53 people were killed and 25 were injured when the Karwar

7. FUTURE SCOPE

The Proposed system in future can be more enhanced by using the garbage collector system to it because the garbage is more seen on tracks and if we use the garbage collector system to it. Ultimately with a cracks detection we can also able to clean the rail tracks environment dust free.

In our project model we can use compressor or blower for prototype purpose because in actual practice while moving Railway on track in either forward or backward direction air flowing in opposite direction so passengers throw garbage from window so we can used collector and garbage collect in tank which are located at both sides of Each Railway couch.

8. CONCLUSION

By using this automatic combine system of vehicle is related to design system in a such way that developed combine system railway track detection and inspection system and ballast cleaning system together.

In a ballast cleaning machine cleaning of ballast by

removing muck, thereby improving drainage of bricks and elasticity of bed. Basically it will have great impact in the maintenance of the track which will help in preventing train accidents to a very large extent. the region where manual inspection is not possible like in deep coal mines, mountains regions and dense thick forest region can be easily done using this vehicle. by using this system in ballast cleaning machine excavates and pick up ballast by means of cutter chain and carries it to a set of vibrations screens where muck is separated and thrown out by chute. in railway track inspection and detection system tilt sensor and ultrasonic sensor is used tilt sensor is used to detect the alignment of track and IR sensor oriented to detect the crack in track. When crack is detecting its latitude and longitude values are send a message to mobile phone. This will help maintains and monitoring the condition of railway track without any errors. This vehicle design in such way that it detects the crack or deformities on track which when rectified in time will reduce train accidents.

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UNIVERSAL SHOCK ABSORBER TEST RIG

Prof. K.U. Shinde¹, Bhushan Wagh², Rutuja Phadol³, Mansi Hirve⁴, Mangesh Pawar⁵

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Abstract— Shock absorber is one of important component in a vehicle suspension system. The shock control spring motion by damping energy from the spring. This paper was focused on the dynamic characteristics of an automotive shock absorber. The design of interchangeable shock absorber test rig was developed and fabricated for the dynamics measurement system. It is an example of under damped vibration system which absorbs maximum amount of kinetic energy and sometimes potential energy. Main purpose of our research is to measure transmissibility of shock absorber and to analyze it for different loads and speeds. Effectiveness of the vibration absorber can be measured by transmissibility. And for measurement of transmissibility shock absorber test rig is designed and developed. an experiment on test rig is carried out at various loads and speeds which results to output in the form of sinusoidal waveform on paper by using stylus. The waveform is used to find out the transmissibility at various load-speed combinations. It gives the behavior of shock absorber at various speeds and loads.

I. INTRODUCTION

Shock absorber is the necessary element of every automobile. It absorbs some amount of force and motion and transmits remaining force and motion to the person who is sitting on vehicle. Input force and motion is given by due to uneven path like speed breakers, ditches etc. The shock absorber testing rig estimates that how much force that shock absorber absorbs and how much motion it transmits. To control the vibrations of suspension system of every automobile Shock absorber is used. If this vibrations are uncontrolled can lead to apocalyptic results like Excessive stresses, Undesirable noise, Looseness of parts, probability of happening accidents increased in very big extent, to minimize these effects proper testing of shock absorber is necessary.

The main objectives of the design of shock absorber are: To determine dynamic characteristics like displacement, vibration etc. of automotive shock absorber system, to test and indicate the condition of shock absorber in automotive vehicle, to calculate accuracy of shock absorber.

Force transmissibility is defined as the amplitude ratio of the transmitted force to the impressed force. In order to reduce as much as possible the amount of force transmitted to the seat of the vehicle due to the vibration of the vehicle because of interaction with the roads, vehicles are usually isolated from the roads by means of wheels and suspension system which involves the shock absorber and

the spring damper system in it. As a result the force transmitted to the seat of vehicle is the sum of the spring & the damper force of the shock absorber. i.e. $F_t = kx + cx$

Force transmissibility is defined as the amplitude ratio of the transmitted force to the impressed force. The formula for the force transmissibility is given as per equation 1

$$Tr = \frac{1}{\sqrt{[1 - (2\zeta r)^2]^2 + [2\zeta r]^2}}$$

Where, $r = (\omega/\omega_n)$ = frequency ratio, ζ = damping factor

The transmissibility curve of the fig gives us a lot of useful information. The first thing is that, we see is that all the curve starts from unity value of transmissibility, pass through the unit transmissibility at $(w / \omega_n) = 2$ & after that they tend to zero as (w / ω_n) . These curves can be divided into the three distinct frequency region as shown in the lower part of the fig. (1.3.a).

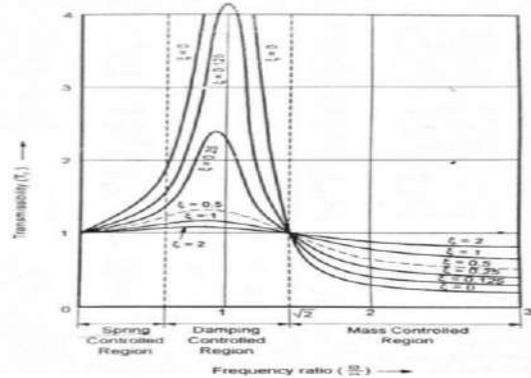


Fig 1.1. Transmissibility Vs Frequency ratio

These regions are respective control by the three parameters of the system, mass, damping & stiffness. The region where the isolation is really effective is when (w / ω_n) is large. These are the mass controlled region. Larger mass gives low natural frequency & consequently higher value of (w / ω_n) . Damping in this region deteriorates the performance of the system. This is controlled region. Larger stiffness gives high value of natural frequency & consequently low value of frequency ratio. The middle region always to be avoided is the damping control region.

II. LITERATURE SURVEY

Recently several attempts and models have been suggested and tested for shock absorber test rig. HYDRAULIC DAMPER USING SINUSOIDAL TESTING by Hitesh K. Tare¹, C.S. Dharankar² [1], Design of Shock Absorber Test Rig for UNSW@ADFA Formula SAE Car by Carl D Heritier¹ [2] Vibration Damping Modelling for a Passive Car Shock Absorber by Aukasz Konieczny [3] DESIGN AND ANALYSIS OF A SHOCK ABSORBER by Pinjarla. Poornamohan¹, Lakshmana Kishore² [4] Development and Implementation of Load Cell by T. Shi Kee¹, Brenda C. T. Lee², F.Y.C. Albert¹ [5] Shock Absorber Test Rig by Chaudhari Arati G.¹, Shilawat Pooja S.², Butte Vinod Y.³, Dhage Pradip U.⁴, Prof. Londhe B.C⁵ [6] Shock absorber device is generally used in all automobiles. It is an example of under damped vibration system which absorbs maximum amount of kinetic energy and sometimes potential energy. Main purpose of our research is to measure transmissibility of shock absorber and to analyze it for different loads and speeds. Effectiveness of the vibration absorber can be measured by transmissibility. And for measurement of transmissibility shock absorber test rig is designed and developed. an experiment on test rig is carried out at various loads and speeds which results to output in the form of sinusoidal waveform on paper by using stylus. The waveform is used to find out the transmissibility at various load-speed combinations. It gives the behavior of shock absorber at various speeds and loads.

The elements that constitute a vibratory system are shown in fig. They are idealized & called the mass, the spring, the damper θ & the excitation. The mass 'm' is assumed to be a rigid body. It executes the vibration can gain or lose kinetic energy in accordance with the velocity changes of the body. The spring 'k' possesses elasticity & is assumed to be the negligible mass. Spring forces exist if the spring is deformed, such as the extension or a compression of a coil spring. Therefore, the spring force exists only there is a relative displacement between the two of the spring. The damper 'c' has neither mass nor elasticity. Damping force exist only if there is a relative motion between the ends of the dampers. The work or the energy input to the dampers is converted into heat. Hence the element is neoconservative. Energy enters in a system through the application of the excitation. An excitation force may be applied to mass or motion applied to the spring & the damper. Mechanical exciter to determine transmissibility and natural frequency by Akash S. Nandurdikar, Anuraj R. Naik, S.S. Pachpore, Padmanabh A. Manurkar, Vivek S. Nalawade.[7]

Ankit Kumar Dixit*, Aradhya Saxena, Arpit Gupta, Chandransh Pandey, Prashant Chauhan concluded that The concept of a universal testing procedure has been projected by this paper. Determining, analyzing & rating the performance of shock-absorbers is discussed in this paper. The concept discussed enables the industry to evaluate, compare and choose between various shock-absorber systems and help them improve their damping system and vehicle performance. It is a thorough analysis and a full report generation approach which will help the industry to know more about the shock-absorbers. The concept is in operation and would not be suitable for mass

testing or where accuracy and exact values are not major concern. However, this conceptual approach is lengthy, vast and detailed which further

makes it complex and time consuming. The concept can be materialized and implemented to obtain experimental results and development of data-base in future. The concept will benefit future researches and complement other projects based on suspension systems greatly.[8]

Rutuja Deshmukh¹, Prof. Sumant S. Patil², Prof. Amol Kokare³ concluded that From this Suspension testing setup we can test multiple numbers of suspensions at different loads and different speeds. Also we can use suspensions of different height.

By changing different suspensions and oils we can find out optimum motion transmissibility. With ultimate objective of studying and plotting dynamic characteristics for Hero Splendor suspension and Honda Shine suspension using single wheel model of suspension analysis to produced large number of results. However it concludes the project work with following points:

1. The suspension system gives best performance when designed to be slightly under-damped.

2. From experimental results and graphs we can conclude that for good ride, transmissibility should be as low as possible and this can be attained by using low damping constant and high spring stiffness and Honda Shine suspension gives the better results as compared to Splendor suspension [9]

Sagar D. Shinde¹, Jeevan J. Jagdale², Ashish A. Salunkhe³, Aditya V. Shinde⁴, Sushant R. Koli⁵ concluded that Shock absorber is one of important component in a vehicle suspension system. The shock control spring motion by damping energy from the spring. This paper was focused on the dynamic characteristics of an automotive shock absorber. The design of interchangeable shock absorber test rig was developed and fabricated for the dynamics measurement system. This test setup integrated with the computer systems to record the signal. An experiment was conducted to identify the stiffness and damping parameter for 850 cc and 1600 cc shock absorber. Simulation study was performed utilizing the COSMOS Motion software. It can be seen from the results that there is a good agreement between the experimental and simulated results in terms of stiffness and damping value except few discrepancy. The acquired results show that the range of discrepancy within 10%. The good range of stiffness of the passenger vehicle shock absorber is 20 N/mm to 60 N/mm while the damping of passenger vehicle shock absorber is 1 Ns/mm to 6 Ns/mm.[10]

III. METHODOLOGY

The concept is vast and complex. It needs to simplified in order to understand. The method of testing and rating a shock-absorber can be divided into three segments: Input, Processing and Output.

In this project following parts are used :-

1. Motor: - This motor does not require any mathematical design because it is required to produce necessary torque to rotate the circular plates through a gear box at certain r.p.m.

2. Gear box: - Gear box of reduction ratio 1:10 is used to slow down the r.p.m. of circular plate and to eliminate the force acting on the motor.

3. Circular plate: - the plate is used to support cam and shock absorber. It is used to transmit force from motor shaft to shock bushes. If diameter of plate increased beyond the certain limits, this will increase the distance between pillars. This will give resistance to the easy movement of bushes.

4. Cam: - The main purpose of cam is to give shock to the shock absorber. Cam is having the exactly the radius of curvature for the easy lifting of shock absorber. Particular height is given to cam so as to get sufficient measurable displacement at output. The length of the cam is 20-30 percent of the diameter of plate for easy lifting of shock absorbers. The thickness of bearing is to avoid sleeping.

absorber. Circular plate is given a particular thickness to support large loads and diameter is selected to ensure easy movement of

9. Weights: - Shock absorber of vehicle is used to set up, so the scientific weights (around 50 kg) are used (which are equivalent to an average weight of a man).

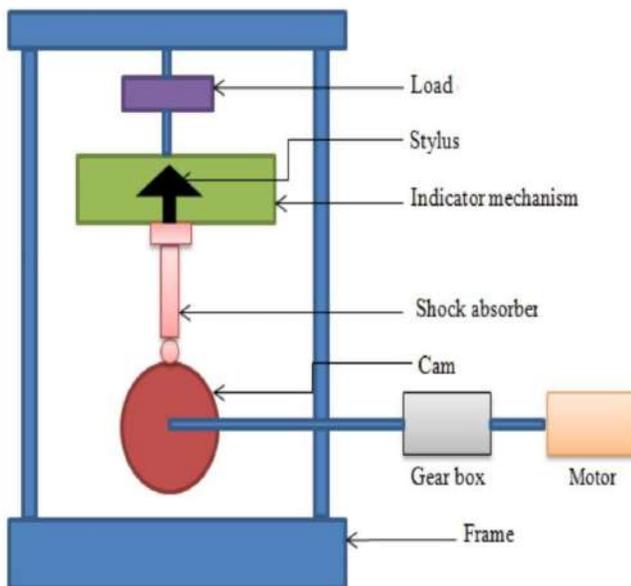


Fig. 3.1. Conceptual design of shock absorber test rig

5. Bush: - Inner diameter of bush is approximately same as that of outer diameter of pillar with permissible tolerances for easy movement. Outer diameter is selected in such way that welding should not affect the inner diameter of inner surface of bush. Height of the bush is in the required limits. If the height is larger than the initial load on the shocker/plate will be more and also the friction between the pillars & bushes will be more. If the height is not sufficiently large, problem to hold shock absorber may occur.

6. C-channels (base of set up): - Selection of C-channel is decided on the basis of weight of the machine (mainly two large heavy pillars). The standard size of C-channel is selected from the steel table.

7. Indicator mechanism: - This set up is totally mechanically operated, so as it is provided with a mechanically operated indicator mechanism.

8. This mechanism is cheap as well as light in weight. It consists of graph-paper or paper/scale pen/ pencil, connecting rod, pen / pencil holder etc.

IV. CONCLUSION

This mechanism converts rotary motion of the circulating disc into the linear motion of the shock absorber. At various loads and speeds combinations the readings on the test rig can taken with the help of stylus mounting on test rig and by using the data, characteristics of shock absorber can calculate. Thus the shock absorber test rig design is very important for characteristics of shock absorber and to find effectiveness. It is done by conceptually.

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Performance of Solar Dryer with Phase Change Material

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Management

ABSTRACT- In the recent years there has been a growing interest in agricultural products dryer from the point of view of the commercial value for farmers and reduction in the wastage. Solar dryer base on thermal energy storage materials is quite effective for continuously drying agriculture and food products at steady state in the temperature range (40°C-60°C). Storage materials utilized in these dryers can store energy during the sunshine hour and deliver the stored energy during off-sun shines. It reduces the existing load on the gap between energy demand and supply, hence plays a vital role in energy sustainability. A number of studies have been done in last few decades for drying agriculture and food products with a solar dryer based on thermal energy storage concept. This paper mainly presents a review on the important contributions made so far in the field of solar drying systems based on the thermal energy storage medium, with a focus on recent updates in thermal energy storage technology available in terms of materials capable of storing heat as sensible and latent heat.

Keywords - Solar Dryer, Thermal energy Storage, Solar Energy, Phase change material.

I. INTRODUCTION

The drying is the basic process to reduce moisture from a product, which is one of the oldest techniques used for food or agricultural products storage. Food products, particularly fruits and vegetables require hot air in the temperature range of 45–60 °C for safe drying i.e. drying the products so as to keep their edible and nutritious properties intact. Requisite moisture content and superior quality of the product can be achieved under controlled conditions of temperature and humidity. In the case of vegetables, which is the main nutrients product generally contain 50% moisture, the moisture content can be reduced with the help of drier. Vegetables can be further used for the feeding of the animals. Moreover, the transportation cost of vegetables is also reduced due to reduction in the weight and size of such dried product. It has been studied that lack of appropriate technology, inappropriate farming, fertilization, the non-existence of marketing channels,

inappropriate transportation, high post-harvest losses etc., cause a food loss in the range of 10 to 40%. Hence, food preservation is the need of the hour to reduce the food loss and drying is widely accepted as an important tool in this direction, since a long time. Therefore efficient drying technologies are required to reduce moisture content from food and vegetables for preservation. Well-designed solar dryers may provide a much-needed suitable substitute for drying of some of the agricultural crops in developing countries.

Application of solar energy in the agricultural area has enlarged due to fluctuation in the price of fossil fuels, environmental concerns and expected running down of conventional fossil fuels.

II. HISTORY & BACKGROUND

The phase change material (PCM) has the ability to store large amount of excess thermal energy during its melting process and benefit of it under constant temperature later, makes it excellent device to enhance thermal performance of the solar drying system. In this work, for the first time, Valeriana rhizomes are dried at its prescribed drying temperature (40 °C) in an indirect solar dryer, in which the PCM storage unit is located at the bottom of the drying compartment to provide isothermal heating [1]. An experimental study to test the effectiveness of continuous solar dryer combined with desiccant thermal energy storage for drying cocoa beans. The experimental setup consists of three main components namely: Solar collector, drying chamber and thermal energy storage [2]. the performance of indirect solar dryer using Phase Change Material as an energy storage medium for drying Nerium Oleander. The ISD implementing PCM was tested using the test rig shown in Fig. 4. The experiments were conducted outdoors during October 2013. The global solar radiation on a (30o) tilted surface, I , was measured using a high precision Pyranometer model MS-802 (sensitivity of 7.03 (μ volts/W m²)). Calibrated K-Type thermocouples (0 to 1100 °C) coupled with KYORITSU KEW1011 multimeter were used to measure the temperatures at different locations of the

heater and drying compartment[3]. An experimental investigation of shell and tube latent heat storage for solar dryer using paraffin wax as heat storage material. By using paraffin wax as a thermal storage the temperature inside the chamber is maintained at 41°C-45°C. After performing experiment Agarwal et al. concluded that melting rate is faster at the uppermost section due to buoyant effect and Time required for discharging of LHS is longer compared to time required for charging of LHS due to low heat transfer rate between PCM and HTF during discharging[4]. Developed a solar dryer integrated with PCM for drying grapes. The developed solar dryer consist of the different components like flat plate collector based solar air heater, thermal energy storage system, dryer cabinet and blower. On the basis of the criteria mentioned, the design of the individual component was prepared and corresponding parameter (i.e.flat plate collector, dryer cabinet and PCM storage) were calculated[5]. However, power consumption by a chip is given by the equation $P = C \times V^2 \times F$, where P is power, C is the capacitance being switched per clock cycle (proportional to the number of transistors whose inputs change), V is voltage, and F is the processor frequency (cycles per second). Increases in frequency increase the amount of power used in a processor. Increasing processor power consumption led ultimately to Intel's May 2004 cancellation of its Tejas and Jayhawk processors, which is generally cited as the end of frequency scaling as the dominant computer architecture paradigm [6].

III. METHODOLOGY

FIGURE

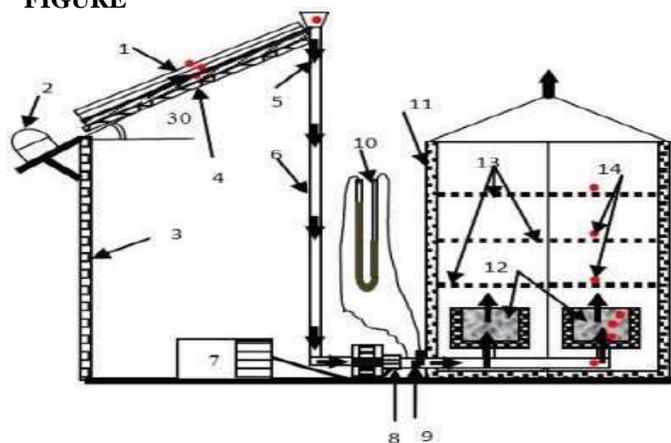


Fig. 5. A schematic diagram of the experimental setup

1-Solar air heater; 2-Pyranometer; 3-The room wall; 4-The room roof; 5-Flowing air; 6-PVC tube; 7-Inverter; 8-Three phase induction motor coupled with fan; 9-Pitot tube; 10-U tube manometer; 11-Drying compartment; 12-PCM; 13-Trays; 14-Thermocouple positions

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K-Type thermocouples (0 to 1100 °C) coupled with KYORITSU KEW1011 multimeter were used

To measure the temperatures at different locations of the heater and drying compartment as seen in Fig. 5. The temperatures of the drying air at each tray were measured and its average value was obtained. A three-phase induction motor (Type K 120 T, 0.75 HP, 2.5 A, 390 V, 50 Hz, 2610 r/min) coupled with a fan (0.3 m diameter) was used to blow the air to the drying compartment. The air flow rate was controlled and measured with the help of SJ 300 Hitachi inverter and pitot tube, respectively.

In order to determine the initial moisture content, the plants were weighed while they were fresh then dried at electric oven for 48 hours on 70°C and the dried products were weighed for the second time. A digital balance, type 300-9213/b 125A, of readability 0.0001 gm was used to measure the mass of the sample every 60 minutes until it reaches a constant weight.

Use of Software In Solar Drying System

Solar dryers exist in a variety of designs and sizes depending on the requirement and drying capability. To investigate a dryer, it is important to calculate its complete and relative performance with the other similar dryers. The investigation results provide the related facts to the researchers, producers and end consumers. The use of software has proved to be very significant in developing and analyzing the mathematical models to forecast the performance of different types of solar dryers. The design of solar dryer can be improved with the help of software and it saves time which otherwise is spent in

Performing real-time experiments. It is also useful for predicting the moisture content, crop temperature and drying rate, texture drying kinetics, and color of the crop. Computational fluid dynamics (CFD) can be used for the analysis and investigation of air flow rate, temperature distribution pattern and humidity inside the solar dryer, through appropriate simulation of energy and momentum equations and heat and mass transfer in both gaseous and solid phases. It is also very helpful to investigate the melting of PCMs used in solar dryers. The commonly used software tools for such studies are Ansys, Comsol Multi-physics, CFX, FORTRAN etc. MATLAB is successfully used to investigate the crop temperature, air temperature, the moisture evaporated and for forecasting the thermal performance of the solar dryer.

IV. SELECTION CRITERIA

Melting temperature in the desired operating temperature range
High latent heat of fusion per unit volume
High specific heat, high density and high thermal conductivity
Small volume changes on phase transformation and small vapor pressure at operating temperatures to reduce the containment problem

Congruent melting

Kinetic properties

High nucleation rate to avoid super cooling of the liquid phase
High rate of crystal growth, so that the system can meet demands of heat recovery from the storage system

V. CONCLUSION

The present study gives an overview of solar dryers based on thermal energy storage materials. The effective thermal energy storage technology in solar dryers for drying of products is an area, where existing information should be consolidated to better facilitate the end user in cost effective manner. For a better thermal performance of solar dryers, a PCM with a high latent heat of fusion and with a large surface area for heat transfer is mandatory and is currently explored widely. The poor thermal conductivity characterizes a common problem to most of the PCMs. A number of studies are currently underway to investigate

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A Review On Solar Dryers

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Abstract— In order to improve the life of the agricultural products, dryers have been developed and used. Greater emphasis is given to solar energy sources in this process as the high prices of fossil fuels and their deficiency. Solar drying is one of the simplest and most conventional forms of drying known to mankind. The use of solar dryer in drying of agriculture products significantly reduces or eliminates product wastage, food contamination and boost the productivity of the farmers. Hence there is need of developing efficient and low cost solar operated dryers. There are various types of solar dryers. These dryers are classified on the basis of mode of circulation of the air e.g., natural circulation and forced circulation; type of operation e.g., batch or continuous. In this paper, we reviewed how these dryers are better over open sun drying and also all different enhancement techniques applied to them, in order to improve their efficiency and reduce the drying time.

(Keywords—solar dryer, mode of circulation)

I. INTRODUCTION

Drying, used to preserve food grains, is a complex process which involves heat and mass transfer between the product surface and its surrounding medium and also within the product. Drying is high energy consuming process. Farmers make use of solar energy or the energy for the drying or heat energy from bio mass is used for drying. In open sun drying, products are spread on ground where they get exposed to direct sunlight. But this method has a drawback.

losses takes place during this drying process because of some influences such as rodents, birds, insects, rain and microorganisms. Solar dryers have thus been developed to overcome these problems of open sun drying.

Pranav C. Phadke et al.[1] analysed the properties of various types of dryers and came to conclusion that though the mixed mode type of dryers are more efficient but they have the disadvantage that they expose the product direct to the radiation also the natural convection dryers doesn't require external power source and they are easy to develop and low in cost.

Hariprasath et al.[2] concluded that efficiency of solar drying system is affected by moisture content, size, shape and geometry and also surrounding conditions like solar radiation and temperature, relative humidity, velocity and atmospheric pressure of ambient air.

A. DEVELOPMENT OF SOLAR DRYER :

BENA ET AL[3] observed that a direct-type natural convection solar dryer and a simple biomass burner have been combined to demonstrate a drying technology suitable for small-scale processors of dried fruits and vegetables in non-electrified areas of developing countries. The capacity of the dryer found to be 20 to 22 Kg. approximately. This solar dryer has advantage that it can work in

night (or in absence of sunlight) as it involves biomass back-up heater. The drying process of product involves natural convection. The viability of a simple natural convection solar dryer for small-scale commercial producers of dried fruits and vegetables in non-electrified locations will be improved if it is combined with a suitable biomass back-up heating system.

Kumar and Rajesh [4] proposed that Solar dryer is the best alternative technology to avoid disadvantages of conventional drying methods. Solar dryer is designed for a particular crop and atmospheric conditions of location. Various types like mixed mode, natural circulation, forced circulation, green house type and tunnel type of solar dryer are reviewed with design parameters and performance. In mixed mode of drying the product may dry in less time compared to direct and indirect mode drying. But indirect mode of product drying will essential whenever requires avoiding direct exposure of product to the solar radiation. Forced circulation solar drying shows better result with reduced drying time than open air solar drying and natural circulation solar drying. But natural and forced circulation solar drying should use for limited quantity of product. For large quantity of product drying, it is better to use the greenhouse type solar dryers.

WANDRA AND HUSSAIN [5] concluded some experimental observation, shows that the solar dryer can be used as an alternative in case of food preservation and the efficiency is also acceptable. The people can make it in their homes, especially in the developing countries where the energy demand is skyrocketing. It can be handy in times of recession .The food stuffs can be stored in this dryer and

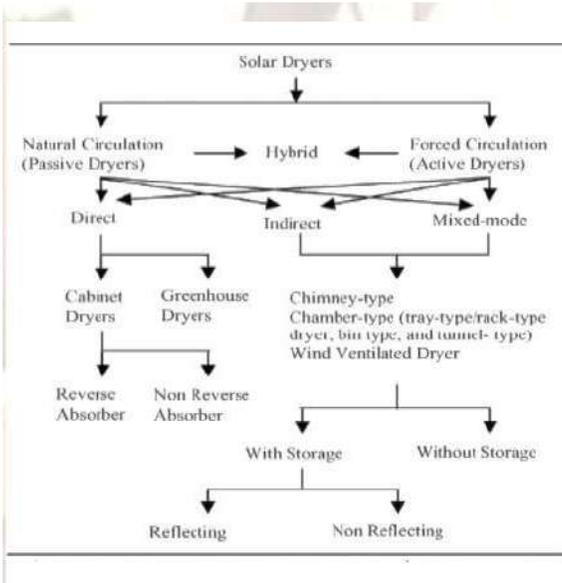
used for days without wasting it. The data concluded while performing this experiment was, the final moisture content for grapes was 58% while for green chilies was 64% and that of Apple was 60%.

Basunia and Abe [6] observed that the drying rates of rough rice in a natural convection solar drying system have been determined. In this the range of average drying air temperature was $22.3 \pm 34.9^\circ\text{C}$, and the relative humidifies were between 34.5% and 57.9%. The initial moisture contents were in the range of $37.07 \pm 37.69\%$ dry-basis. In

this experiment, a mix mode natural convection solar grain dryer is used. The data of sample weight and dry- and wet-bulb temperatures of the drying air were recorded continuously from morning to evening for each test.

B.CLASSIFICATION OF DRYERS

Solar dryers mainly classified as natural convection dryer or forced convection dryers.



(Fig 1)Classification of solar dryers[7]

1) Sun dryers:

It is traditional method of drying. In this method grains are spread in field for drying. Sun heats up the grains and surrounding air due to this moisture from the grains get lost. It is the most preferred conventional method in Asia. it takes 3-4 days for drying. Also in night it is not useful and climate conditions are the big obstacle for this method. Temperature

control for this is very difficult and there may be the chances of over drying due to extra heat.

2) Direct solar dryers:

It is like sun drying but in this process direct contact between grains and solar radiation is avoided by placing transport sheets or panels.

3) Indirect solar dryers:

In this type of dryers air is first heated in the chamber and then passed over the product which is to be dried.

4) Mixed type solar dryers:

In these dryers solar radiation incident directly on the material to be dried and the pre-heated air in the solar air heater furnishes the energy required for drying process.

APPLICATIONS

Berinyuy et al [8] designed and develop double pass solar tunnel dryer integrated with heat storage using local materials and evaluated it for drying leafy vegetables and other agro products (figure 2). Face of the dryer kept in south with an inclination of 6° . Solar radiation falling on dryer was estimate to 12.13 KJ/m^2 per day. Heat storage system used helps to maintain temperature 5°c above ambient temperature even after sunset.the dryer was capable of drying 17kg of cabbage from 95% moisture content wet basis falls to 9% in five days. Efficiency of this dryer was found to be 17.68% wiyh the moisture extraction efficiency 79.15% and air flow of $9.68 \text{ m}^3/\text{hr}$.

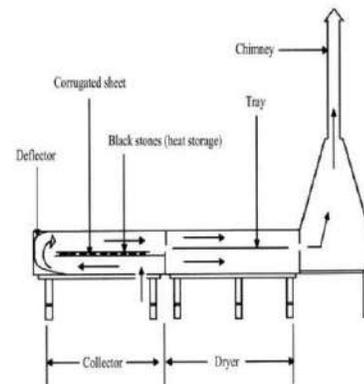
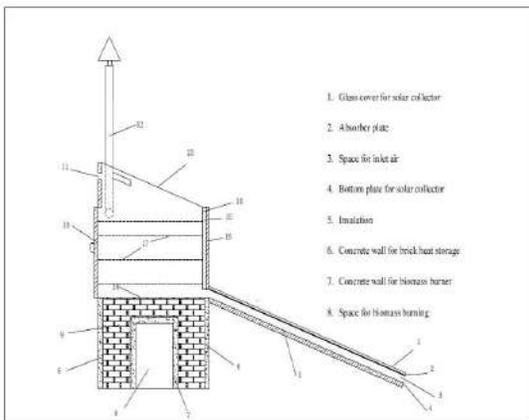
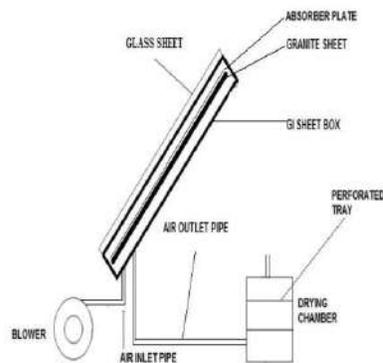


Fig.2 double pass natural convection solar tunnel dryer [8]

E. Tarigan and P. Tekasakul [9] proposed the mixed mode natural convection of solar dryer integrated with a simple biomass burner and bricks for storing heats. This dryer is combined with a simple biomass burner and bricks heat storage as back-up heating system. It can work in absence of sunlight too.in day time the heat from sun radiations is absorbed by the stones used in layer and this heat is used up for removing moisture from grains.in night use of burner is made for the heat energy production. (Fig 3).



(fig. 3) Dryer developed by tagarian .(side view) [9]



(Fig 4) Experimental setup layout [10]

CONCLUSION

Solar dryers are simple construction and can developed with ease. Variation is available in the dryers according to size and loading capacity. These dryes were used to dry vegetables,agro products, medicinal herbs,seeds etc. solar dryers are best alternatives for the open sun drying process. Use of solar dryer reduces the drying time.efficiency of dryer is affected by the properties of product which is to be dried e.g.moisture content,size,shape also the ambient conditions like temperature,solar radiation, air velocity,relative humidity.

Jithinraj and Karim [10] develop solar dryer (fig.4) and made conclusion that the drying of grapes in the open sun takes 20 to 25 days during clear sunny weather conditions. However, it only takes 7 days in the multi pass solar dryer with aluminum absorber plates and granite sheet as heat storage medium but the same two pass solar dryer without granite sheet as heat storage medium takes 10 days to dry the grapes under similar weather conditions. From that we could conclude that the granite sheet acts as good thermal storage medium and gives extra drying time in the evening. Here we get an extra drying time of one hour in the evening and the heat of the granite gets reduced slowly throughout the night and keeps the grapes warm and dry at night. Also, the quality of dried grapes is remarkably better in two pass solar dryer compared to open sun drying as the product is protected from dust and insects.

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Supply Chain Management

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Abstract— India is the fourth largest country in terms of Purchasing Power Parity and constitutes one of the fastest growing markets in the world. Globalization of businesses, infrastructural bottlenecks, increasing uncertainty of supply chain networks, shortening of product life cycles and proliferation of product variety have forced Indian firms to look beyond their four walls. They face issues related to choosing and working with the right supply chain partners (suppliers, customers and logistics service providers), fostering trust between them and designing the right system of gauging performance.

In this paper, we present a snapshot picture of logistics and Supply Chain Management (SCM) practices in India. It is borne out of the felt need by managers, expert professionals and academicians to address logistics and supply chain practices at the national level. Our exploratory study is based on both field visits and secondary data. We capture facts, figures as well as qualitative responses about the logistics infrastructure and supply chain practices. We focus on supply chain collaboration and partnerships, supply chain structure, facilities network design, transportation and logistics and the role of Information and Communications Technologies (ICT). Field visits to at least one major facility of 25 firms were carried out during 2005. We analyze and assess existing logistics and SCM practices and discern emerging trends as well as areas of concern. The paper gives insights into how far the firms and their supply chains in India have come in dealing with major logistics and supply chain issues, the practices they focus on or need to focus on. We also highlight and address a few issues related to supply chain managers and policy makers.

INTRODUCTION

A few years ago, SCM was seen as necessary evils in India; today they are seen as a matter of survival and competitive advantage. As companies look at logistics and SCM strategically, they turn to specialized service providers to cut out non-core activities from within. A

rising focus on outsourcing is leading to a surge in business performance for logistics service providers.

The essential point is to identify and describe a domain of theory and practice where there is potential for some additional gain by reconceptualising it in a particular way. The important idea captured at least in part by “supply strategy” (or “strategic supply management”) is that a mode of thinking and action which encompasses, and seeks to exploit, interlocking relationships could potentially be used as a powerful lever for competitive advantage. It is apparent that much of the focus in the increasingly voluminous literature on supply strategy, operations strategy and supply chain management is directed at meaning making. Often this comprises assertions about what it essentially “is”. The precepts of SCM as currently portrayed are a mixture of three elements: description, prescription and the identification of alleged trends.

Previously manufacturers were the drivers of the supply chain - managing the pace at which products were Manufactured and distributed. Today, customers are calling the shots, and manufacturers are scrambling to meet customer demands for options/styles/ features, quick order fulfillment, and fast delivery. Manufacturing quality - a

longtime competitive differentiator - is approaching parity across the board, so meeting customer’s specific demands for product delivery has emerged as the next critical opportunity for competitive advantage. Companies that learn how to improve management of their supply chain will become the new success stories in the global market place. Study on Benchmarking shows significant cost differences between organizations that exhibit best-in-class performance and those with average performance. Traditionally, Supply Chain Management (SCM) has been a melting pot of various aspects, with influences from logistics and transportation, operations management and materials and distribution management, marketing, as well as purchasing and information technology (IT). Ideally, the all encompassing philosophy of SCM embraces each of these functions to produce an overall

supply chain strategy that ultimately enhances firm performance. In actuality, the literature is still very fragmented and although several studies purport to discuss supply chain issues, most of the existing research only examines one link of the chain, or most importantly only focuses on one ingredient in the supply chain performance mix. Six major movements can be observed in the evolution of supply chain management studies. Creation, Integration, Globalization, Specialization Phases One and Two, and SCM 2.0 These phases are given in Table 1. The six stage evolutionary era depicts that in a particular era which strategy was emphasized. For instance in the sixth era information Technology was given priority and IT enabled supply chain was the burning issue.

LITERATURE REVIEW

Literature portrays logistics and SCM practices from a variety of different perspectives with a common goal of ultimately improving performance and competitiveness. Based on literature, we find that the important supply chain practices concerns are mainly related to:

1. Supply Chain Collaboration and Partnership with various stakeholders such as the product developers, suppliers, channel partners and end-users.
2. Supply Chain Structure including facilities network design taking into account related transportation and logistics.
3. Forecasting and Demand Management to cope with supply chain complexity in a cost-effective and delivery-efficient way.

While there is plenty of published literature that explains or espouses SCM, there is a dearth of empirical studies examining logistics and SCM practices. Galt and Dale (1991) study ten organizations in the UK and find that they are working to reduce their supplier base and to improve their communications with the suppliers. Ferine (1995) carries out an international comparison of SCM in the grocery retailing industry. He finds significant differences in inventory held in the supply chain by the US and European grocery retailers, which could be explained by difference in degrees of their SCM adoption. Tan and Wisner (2000) compare SCM in the US and Europe. Tan (2002) relates SCM practices and concerns to firm's performance based on data from US companies. He lists nine important supply chain concerns such as lack of sophisticated ICT infra-structure, insufficient integration due to lack of trust and collaboration among the supply chain stakeholders and thereby lack of supply chain effectiveness and efficiencies. Basnet et al. (2003) report the current status of SCM in New Zealand, while Sahay et al. (2003) discuss supply chain strategies and

structures in India. These surveys rank the perceived importance of some SCM activities, types of hindrances and management tools on the success of SCM using representative samples mostly from manufacturing. Quayle (2003) surveys supply chain management practice in UK industrial SMEs (Small Manufacturing Enterprises) while Kempainen and Vepsalainen (2003) probe current SCM practices in Finnish industrial supply chains through interviews of managers in six supply chains. They analyze the change of SCM both in terms of operational practices and organizational capabilities. Chin et al. (2004) conduct a survey that examines the success factors in developing and implementing supply chain management strategies for Hong Kong manufacturers. Moberg et al. (2002) state that there is little literature on information exchange. Feldmann and Muller (2003) examine the problem of how to establish an incentive scheme to furnish reliable and truthful information in supply chains.

There is little literature on logistics and SCM practices in India. Available literature focuses either on the best practices (Joshi and Chopra, 2004) or on re-engineering of internal operations of the firms (Deshmukh and Mohanty, 2004, Kankal and Pund, 2004). In context of ICT, Saxena and Sahay (2000) compare the manufacturing intent to be an agile manufacturer and their Information Technology (IT) infrastructure in terms of scope of use, extent of use and integration of IT-based systems. The more recent studies are mainly based on questionnaire surveys and secondary data sources (Sahay and Mohan, 2003, www.etintelligence.com, Sahay et al., 2006). Vrat (2004) discusses some issues and challenges as well as the potential of SCM in India. All these studies find Indian firms generally lagging behind their counterparts in the developed countries.

Richard Lamming (1996) has given a general review on lean supply chain in which Lean supply has been characterized as “beyond partnership”. Lean supply is the system of purchasing and supply chain management required to underpin lean production. Ben-Daya et al. (2008) explored the topic in a particular context, i.e. The industrial district (ID), that constitutes a specific production model where complex SC networks can be identified. SC cooperation may take on several forms in IDs and may produce several benefits (e. g. Upgrading quality and reducing costs). Vaart and Pieter (2003) drawn conclusions on the need for an inter-disciplinary approach, combining the technical and relational aspects from the respective fields of system dynamics and collaboration in order to deliver superior order replenishment performance. Gunasekaran and Ngai (2005) indicated that E-Business, product, and service-quality, all have a significant direct effect on customer behavioral intentions to purchase again. Balakrishnan and Cheng (2005) reviewed and update the methodology based on

spreadsheet that provided enhanced solutions in complex environments with multiple products and bottleneck situations. Nagarajan and Susic (2004) reviewed literature dealing with buyer vendor coordination models that have used quantity discount as coordination mechanism under deterministic environment and classified the various models. of SCM, the existing literature was examined, in an effort to identify the extent to which these underlying elements were present in SCM academic research to date. A review of previous literature studies, as highlighted in Table 3 (Appendix A), provides the basis for how this review extends our understanding of SCM research. Burgess et.al. (2006) reviewed 100 randomly selected articles from 614 usable articles found in the ABI/Inform Database across a 19 year (1985 to 2003) period.. Their sample addressed manufacturing and consumer goods industries, and the research articles reviewed by them focused on a more narrowly defined operations management approach to Supply Chain Management. They classified the articles into four groups, namely (1) Descriptive features of SCM, (2) Definition issues, (3) Theoretical concerns and (4) Research methodological issues. They found SCM to be a relatively young field with exponential growth in interest from researchers in the recent past. The importance of this research in contrast to Burgess et al. (2006) is that instead of sampling 100 articles from a pool of 614 over a 5-year period, we examined 588 articles over 18 years. This not only makes for a more in-depth review, but provides a larger base from which to chart the maturation of the SCM field. It also helps to assess gaps in the literature and project future trends, thereby underscoring the importance and robustness of this study. Finally, Burgess et al., include books, manuscripts and conference proceedings while this research focuses solely on published articles in peer reviewed SCM journals.

OBSERVATIONS & DISCUSSION

It is seen from the preliminary discussion that 588 articles were found in 13 journals after selecting for multi-faceted ness of the articles, and approximately 370 articles were dropped from the analysis, as they pertained to treatment of only one single parameter. It is seen from Table 6 that 64.50% of the selected articles appeared in only 04 Journals, out of which also, The Journal of Supply Chain Management contributed the lion's share – 138 articles forming 23.46% of all the 588 articles across 13 journals. However the wide ranging interest and activity in SCM is evinced by the fact that there are ten Journals with twenty or more articles. The data of Table 7 depicts that Exploratory Research Method (43.37%) that makes observations of supply management for the purpose of developing theories, but leaves the testing of the theories

for other studies, dominated over other methods and closely followed by Normative study Earlier literature reviews provided the basis of selecting the relevant journals, which was supplemented by an intelligent internet scanning of the journals to determine those where articles on SCM appeared during the review period. A journal-wise count of the short listed SCM articles appearing in these journals (25.31%) that examines what ought to be and what individuals and organizations ought to do" (Mentzer and Kahn 1995). After that Methodology Reviews (15.15%),

This indicates that more research is needed in hypothesis testing research method. A journal-wise, year-wise categorization of the 588 articles is presented in Table 8. The Table 8 shows that the topic of SCM has seen a major research thrust over the recent years, and 30% of the selected articles have appeared in the last 2 years only, 54.08% in the last 4 years.

SUPPLY CHAIN MANAGEMENT STRATEGY

Given the relative recency of SCM for researchers, as well as how it continues to evolve, Supply Chain Strategy SCM Frameworks, Trends and Challenges should remain an important topic going forward. In other words, at some point in the future, the lines between categories such as these may become blurred because IT and e-commerce are continually integrated into the frameworks and strategies of supply chain Giunipro et al. (2008) in his review of SCM literature up to 2006 observed that articles on e-commerce peaked in 2004. The authors find from their data which specifically looks at only those papers which address multiple aspects of supply chain gained in numbers only from 2005 and 7, 7, 10 and 8 numbers of papers were published in year 2005, 2006, 2007 and 2008 respectively. This shows that the impact of rapid development of Information Technology has manifested in development in supply chain field and further developments in multidimensional aspects of scm will increase in terms of their value to SCM researchers and managers in the coming years. For a successful integrated supply chain continuous flow of information is necessary. Our study confirms the observation of Giunipro et al. (2008) that traditional areas such as Quality, Human resource and Supplier Development areas have remained fairly stable, and this trend continues. However, the field of Environmental and Social Responsibility has seen an increased activity, reflecting the heightened government and public concerns and industry awareness in these areas. (Cruz, 2008). Literature on green

supply chain is emerging (Zhu and Sarkis, 2004) and gaining prominence and represents a research area with a huge potential. There was very little discussion on the global supply chain up to 2006 (Giunipro et al., 2008). Our study found no appreciable increase in numbers of papers published in this field in 2007 (publication =4) and in year 2008 (publication =3). Therefore this field is still developing and has a lot of potential for research. This confirms the findings of Giunipro et al (2008) that this field should continue to see increased activity given the increased emphasis on global business. Integrating supply chain strategy with the overall firm strategy is an important consideration to maximize profitability (Tan et al. 1998). This has resulted in a sharp increase in the literature concerning SCM Strategy, and 21.6% of the articles included in our literature review are seen to belong to this category, even though Time-based strategies have been separately categorized and add an additional 6.71%, making the attention on Strategy as 28.31% of the total articles. The articles dealing with strategy are observed to be concentrating on various aspects, mainly on Risk Management in Supply Chains, Competitive Advantages, Resource based Views and Agency theory, Strategic Alliances, Strategic Alliances (Sandelands 1994; Carr and Pearson 1999), Strategic Performance Measures (Tan, Kannan and Handfield 1998; Gunasekaran, Patel and Tirtiroglu 2001) and Supply Chain Forecasting (McCarthy and Golicic 2002). Gong (2008) highlights flexibility as an important determinant of Strategy and proposes an economic model for evaluation of Supply Chain Flexibility.

Also, most of these articles only investigated strategy alignment between the firm and one key supplier rather than a chain investigation. The idea of a supply chain organization has been presented (Ketchen and Giunipero (2004), but this has yet to be systematically investigated. Additionally, there is still considerable work yet to be done in terms of merging existing strategic management literature with theoretical work being conducted in the SCM field.

IV. SCM FRAMEWORKS, TRENDS AND CHALLENGES

SCM Frameworks, Trends and Challenges represent the second largest area of recent growth within the supply chain field. 101 of the 588 total articles, or approximately 17.38%, fall into this category. While SCM has, in some form or other, existed for several decades, the true value of SCM to the organization's growth and profitability targets has been realized only recently with the emergence of global supply chains and information technology advances. The development and mechanics of supply chains have become very complex, and Blackhurst et al.

(2005) showed as to how supply chain complexity can make the modeling of the chain a multifaceted task. The authors have concentrated only on those articles which focus on the multi-faceted aspects of the Supply Chain and examine the inter-dependence and co-ordination of two or more facets of the Supply Chain. Several authors have examined several aspects of the SCM and contributed to enhance overall understanding of multifaceted SCM. This category also includes several definitions and frameworks which were developed for multi-dimensional SCM (Sanders et.al. (2007). Jüttner and Baker (2007) examine aspect of integrating marketing and supply chain management. Sanders et.al. (2007) suggested a Multidimensional Framework for Understanding Outsourcing Arrangements. Frizelle and Efstathiou (2007) report a study the impact of operational complexity on the cost in customer. supplier systems. Zhao et.al. (2007) discuss the value of early order commitment in a two-level supply chain. Adhitya et.al. (2007) developed a model-based rescheduling framework for managing abnormal supply chain events.

V. SUPPLIER ALLIANCES/RELATIONSHIPS

The resurgence of publications in this area was observed by Giunipro et al. (2008) and explained as a result of a general trend within industries of moving away from simple transaction and contractual-based relationships, and toward more long-term relational forms of collaboration between parties involved in supply chain activities. The development of these long-term, strategic relationships between buyers and sellers within the supply chain has been previously shown to offer opportunities to create considerable competitive advantage (Tanner 1999). Ghosal and Moran (1996) cautioned that many firms were recognizing these implications and as a result were attempting to adopt a more collaborative and trusting relationship between the two parties. The publication of relationship-oriented SCM articles is seen to more than double within a decade from 5.88% in 1998 to 13.64% in 2008, underlining the growing importance of this field. The authors feel that a substantial activity will be seen in the coming years in this field as more and more companies from the developing world go global.

FUTURE AREAS FOR RESEARCH

As evident from the literature, supply chain management has been the topic of interest for researchers in recent past. It offers almost unlimited possibilities of exploration as the market dynamics are widely varying among economies, regions, climate zones, time zones, political systems, countries, population demographics, markets,

and so on. The field will continue to grow as the world is integrated into one great global marketplace, and the researchers are faced with new scenarios from time to time. Supply chain management is an exploding field, both in research and in practice. Major international consulting firms have developed large practices in the field of supply chain, and the number of research papers in the field is growing rapidly. Firms operate in global environments, deal with multiple suppliers and customers, are required to manage inventories in new and innovative ways, and are faced with possible channel restructuring. The field promises to continue growing as the research advances and as firms continue to apply new knowledge in their global networks. It would be almost impossible to foray into the unknown and predict the future course research in SCM is likely to take. However, there are a few issues within SCM which are identified as suitable and appropriate for further research exploration.

1. Demand Driven Supply Chains

Aligning supply and demand in today's complex and dynamic manufacturing environment can be challenging at

best. Many companies spend much amount of time and resources in an attempt to better predict demand. But still, static forecasts are often out of date within hours of creation, making some question the real value of traditional planning tools as it relates to near-term demand volatility.

2. Supply chain in Food and Service industry is also a prominent field of research.

While the objectives to be addressed by future research are outlined broadly above, certain barriers exist to deter the

research in these fields. With the expansion of the supply chain to a global status, the average researcher is left high and dry, with little or no access to the corporate data, problems and with little resource to look into the status and

devise solutions. Large MNC's tend to be severely confidential and closed, and fend for their own, particularly

in the developing economies where the possibilities of research largely exist. Due to this reason, most research has

been limited to individual aspects of SCM with limited data, and mostly has been empirical research. Large consultants do have access to corporate working and data, and that is perhaps one reason that more and more information is sought by researchers on the Internet, where one can find secondary and processed data like the reports of major consultants like McKinsey. The researcher community needs to find a way around this problem.

Geographic distances between the different parts of a supply chain present another problem. A normal researcher can work at one location, and trade, tariff, financial and diplomatic barriers often prevent the researcher from

accessing the other parts of a global supply chain. Earlier research has suffered from a major drawback pointed out in Giunipero et.al. (2008) who cited Malhotra and Grover (1998) as reporting that 30% of the operations management survey studies they assessed suffered from statistical conclusion errors due to small sample sizes.

Tanner (1999) suggested involving trade associations to increase access to more companies and increase sample sizes.

CONCLUSION

There is an increased interest in SCM and Internet by academicians and practitioners. Some directions for further research that we have identified are: to conduct empirical studies about the impact of Internet on several e-SCM processes. Another important area of research is the application of decision models and technologies on Internet. As more and more firms have high quality and real-time information available, the use of these decision technologies will increase, since they add significant value to the members of a supply chain. The SCM is continuously redefining itself. Past literature reviews provided valuable results, they were based upon the random selection of articles, book chapters and conference proceedings. Other literature reviews were either more focused on operations management or examined a single journal. A review of suspended data collection in 2003 was carried out. The aim of this study was to provide an up-to-date and extensive review of the SCM literature that was focused on a broad definition of the SCM concept. Also, the most recent literature review was given by Giunipero et al (2008) in which they had given past present and future implications of SCM. It is our hope that researchers will use the gaps identified herein to generate much needed conceptual and empirical work in the SCM literature, thereby creating a body of literature that is more heavily influenced by a deeper analysis of the supply chain on a chain wide or network basis.

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REVIEW ON 3D MACHINE VISION SYSTEM AND IT'S APPLICATION

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Abstract

The availability of robust sensing devices, image processing, hardware and advanced system design increased the use of computer vision systems. Image analysis is generally based on the 2D binary system, 3D vision system and color image become standard sensors for various applications in Industrial automation, navigation, remote sensing, food industries, biomedical fields.

1. INTRODUCTION

Machine Vision is the technology used to provide image-based analysis for applications such as automatic inspection, process control and robot guidance in industry. Machine Vision Systems analyze images to perform appearance inspections, positioning, and defect inspections. The machine vision systems can be used in a wide range of applications because of their flexibility and versatile features. The use of vision systems in inspection and motion control applications imposes several real-time constraints on image processing. However, constantly increasing performances and decreasing costs of machine vision software and hardware make vision measuring systems more advantageous than the conventional measuring systems. These vision systems can be used to precisely measure variables such as distance, angle, position, orientation, Etc.

The main advantage of a machine vision based system is its non-contact inspection principle, which is important in

This report is about new machine vision system application from recent progress has been made in field. It based on methodologies of image processing, like 3D sense Analysis for quality control, Image Sequence and motion analysis, 3D Modeling, Human Interface techniques. Machine vision is concerned with the concept behind artificial systems incorporates image processing. Machine vision systems based on extracting images of the objects which are to be inspected and processing them to retrieve the required data.

the cases where it is difficult to implement contact measurements. Also Machine Vision technology helps to achieve better productivity and aids in the overall quality management, thus posing a prominent competition to other industries which do not implement vision systems. The scope of Vision based systems is not only limited to the fields it extends widely to much more industries such a welding industries, Automobile industries where Machine vision is used to identify and classify weld defects in welding environments, sparkplug gap where human inspection is not efficient.

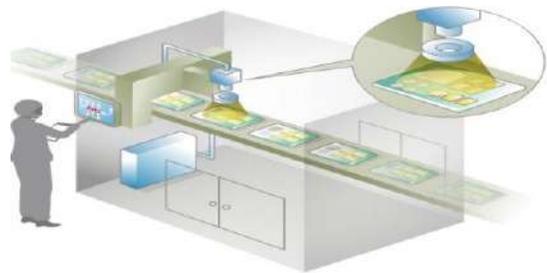


Image 1. Basic working of 3D Machine vision system

2. LITERATURE REVIEW

Mohan 1989, IEEE, pp. 91-96, describes the paper regarding design growth and difficulties of vision system. It can perform a variety of examination and manipulation task. Robot first identifying the accurate position of the section using a camera calibration program and after that computer vision system can be developed an objective position map for a range of devices on the panel. These code displayed on LCD meter specifies the inspection or task to be performed. To test the system robustness and accuracy we have more than 100 experiment involving varying condition and performance geometry [1].

Crevier, Daniel in 1996, IEEE, pp. 90-92, introduces experimentation color coordinate system, Hough transform, stereo vision and related component analysis. . It can also be verify that there is a large dissimilarity across any given object in the passion component, but remain approximately constant within each object or can still different from one object to another. This experiment is realizing on hardware that implementation of efficient algorithm for practical application of computer vision [2]. Cristina in 'Control of an Industrial Desktop Robot Using Computer Vision and Fuzzy Rules'. 2005, IEEE, pp. 1297-1302. discussed that in how flexibility engineering production, equipment must become usual to varying the manufactured goods demands and to product style with short life cycle. To solve the problem image data processing concept on source of fuzzy logic are applied to engineering application to increase its flexibility. This approach the evaluation the system of performance and growing the processing speed. To control inspection counting: finding of surface flaws and infected, authentication of the presence of the section and whole location [3].

Frank in his 'A Study of Using 2D Vision System for Enhanced Industrial Robot Intelligence.' 2005, IEEE, pp.

1185-1189. discussed the recent improvement in business developed aimed at humanizing elasticity and intelligent of manufacturing robot application using the method of applying two-dimensional vision technique and include methods of camera calibration, vision dimension and vision statement to robot. It can accumulate the camera on the robot arm or move the camera to unusual in view position for identify the true position of a three dimensional objective on plane [4].

Hyoungh-Seok in his 'Development of Computer-visionbased Pipe Inspection system.' 2006, IEEE, pp. 403-406 discuss measuring rate and precision of the examination, a computer-aided measuring and investigation method is highly desirable. Because not possible to test the error of all parts. It can be edge finding is processed by using Laplace operator. Conventional person-vision based examination causes a lot of problems such as eye overtiredness, concentration decrease, incompatible criterion, and high labor costs. The inspection algorithm detects line segments from side-view image using Hough transform and calculate pipe angle, eccentricity, and diameter. In view inspection algorithm calculates center points, inner and outer diameters of pipe by using a line-scanning method. It can be used to analyze the pre-processed image modified Hough transform and line scanning method, and from which the status of the pipe is determined to be good or defective [5].

Toal 'Review of Machine Vision Applications in unmanned underwater vehicles.' 2006, IEEE, pp. 1-6 investigated the study of the application machine vision in the control of UUV. Spatial intensity incline of the images is filtered to show up nothing crossings using a Laplacian of Gaussian clean. Filtering in this case is an effort to highlight image texture and decrease the achieve of sound and non-uniform clarification. Today currently available

solutions for underwater navigation, it is perceptible that there is a require for more elasticity and preference [6].

Jonathan in 'Robust Machine Vision Based Parts Inspection: Intelligent Neuro-Fuzzy versus Threshold Based.' 2007, IEEE, pp. 1-9. presented in manufacturing for inspection system requirement for a robust system. Need to be an intelligent neuro-fuzzy based image processing algorithm was developed. The neuro-fuzzy systems to classify accept and reject images, and then use the method to sort new images. Goal of this research get better the parts inspection based on the intelligent neuro-fuzzy system [7].

Jia and Jiancheng at current immediate, complex mechanized systems require the growth of mechanization technologies that can be proficiently integrated into the system. Because production need to preserve high levels of superiority while maximizing production to transport their products at a ready for action price. It can result on the design and can be integrated into industrialized arrangement for the dimension, inspection, confirmation of geometrical magnitude, and part integrity and provided that a lot of worth and image information during the operation for superiority [8].

Heyer 'Human-Robot Interaction and Future Industrial Robotics and Application.' 2010, IEEE, pp. 18-22. discuss application in present oil and gas industries to improve protection and good organization and decrease green collision recommend the use of engineering robotics. Robots can perform ordinary field worker tasks in dangerous and intolerable environments. For example, robots are used in factory to transfer equipment, and recent versions planned to purpose in dynamic environments and are able to be check impact. A few cases proactively direction in the region of obstacles. Nowadays industrial robots have a long well-known record for given that consistent, exact and well-organized service in the industrialized production [9].

3. 3D MACHINE VISION SYSTEM

It is automatic extraction of information from digital images. If we consider steady flow production line we need camera and optical system on a production line with a enough lighting to capture details. From this camera catches digital images of product and analyse as per criteria.

We prefer Machine Vision system over Human Inspection

- 1.It works faster.
- 2.It is more Consistent.
- 3.It works longer period of time.

4. HISTORY

Machine vision technology is started earlier in 1950. But it started uses in industries more specifically in between 1970s and 1980s.



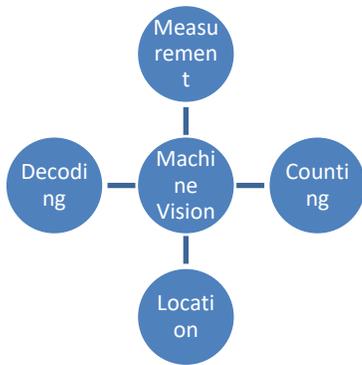
Image 2. 1st Demonstration od machine vision system

The photo Shows 1st demonstration of Machine Vision System in 1983 by automatrix. It shows pioneering Demonstration. Now it is part of Microscan.

After that machine vision system comes long way and now it uses in various applications like 1.High speed inspection 2.Check for completeness 3.Shape inspection 4.Pattern comparison 5.Measurement 6.position Detection 7.OCR reading .

5. FEATURES

It works basically on 4 common types



Layout 1. Features of machine vision system

5.1.Measurement

Machine Vision System is widely uses for Measurement . It can check the measurement upto its specific tolerance.



Image 3. spark plug

We are checking spark plug gap from many years to ensure vehicle work carefully. For that we can use Machine vision system by which we can take Digital images of spark plug for measurement and eliminate the need of person to be there for everytime.It can be done accurately and easily without wasting of time.

5.2.Counting

It is the feature which helps to know No. of parts or No. of features on the part to be machined. It help us to know about any missing parts or No. of parts are assembled accurately.

If we take example on job we need to drill 8 holes and we exactly drill 8 holes it means we dobe our job accuretly and correctly.

And in another example there are 8 pack of sodas and 1 of that missing we immediately know that pack is incomplete. It done very quickly so that if we want to see the process we need to slow down the process.

5.3.Location

Machine vision system it also uses for knowing the orientation and locaion of job and also to check the specified tolerance of the job.

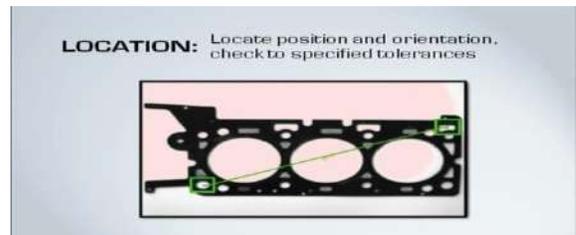


Image 4. Locate position and orientation

When we inspect the job on production line they can lie in any direction but we can take digital image of that and stretch the image and run our machine vision system precesses.

It also uses unique patterns to identify product. For example Tomato ketchup bottle where we locate TOMATO name by unique pattern and identify the product.

5.4.Decoding

Decoding is about the 1D,2D. It is about the linear barcodes, stacked symbologies and 2D symbologies, OCR optical character recognition fonts. It makes simultaneous human and machine readable.

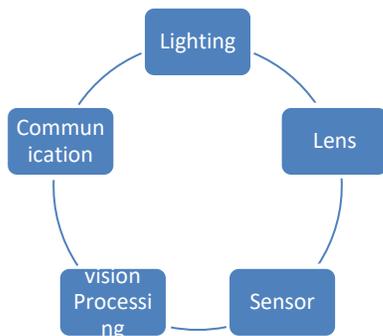
Thw barcode or that symbologi contains the historical data of that part from No. of partsthat part goes to No. of process are carried away. It uses for track down the fault in process and take the immediate action as per history of product.

Decoding is last process which consists data of Measurement, Counting and Location. It uses this data to validate the product.

For example scanning the OCR code on vegetable canes to ensure that right vegetable on right cane and it only recognize by code.

6. Working

There are 5 key components on machine vision system on which it works.



Layout 2. Components of machine vision system

There are two types of Machine Vision System,

1. Component System :- which consists p.c , camera along with external lighting source for illuminating the product.
2. Integrating System :- In these system components built in a single device which also called as smart camera.



Image 5. Types of machine vision system

Choosing right configuration depends on application. In which lighting is critical parameter which illuminate product to be inspect. It highlights the feature of components to allow camera to see the features. Lens which captures the image and present to sensor in form of light which converts light into Digital image for the analysis. Vision processing which review the image and get the required information and take measurement which are need to run other processes. And then gives to the outer worl for working.

In machine vision system to achieve best possible result the product presentation and orientation should be consistent and repetable.

6.1. Lighting

Proper lighting is critical in success of application. The type and position of light should be carefully selected to

maximum contrast the feature to be slected and minimum constarst of everything else. The feature you need to see should be brighter and clear.

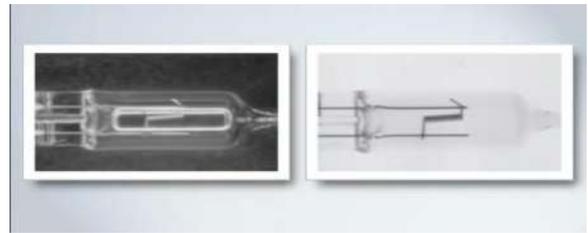


Image 6. Difference of lighting between light bulb

For Example , Light bulb in which we want to examine filament in 1st image it quite hard to see the filament because of the position of lighting is in front of bulb but in 2nd image we can clearly see the filament because position of lighting is backside of bulb . from this we can clearly understand position of lighting is critical. If we can not locate or see the necessary feature on product we can not measure or read it properly so that lighting is key element for measurement and clearly visible features.

6.2. Lens

Purpose of lens to capture the image and deliver to sensor. Lens determine field of view, depth of focus and foacl point.

There are two types of lens Fixed lens and Interchangable lens.

1. Interchangable lens with suitable lens and connection will aquire best possible Image.

2. A fixed lens is integrated with Smart camera. It typically uses Autofocus. These can mechanically adjusting or liquid lens. Autofocus have fixed view on given distance.

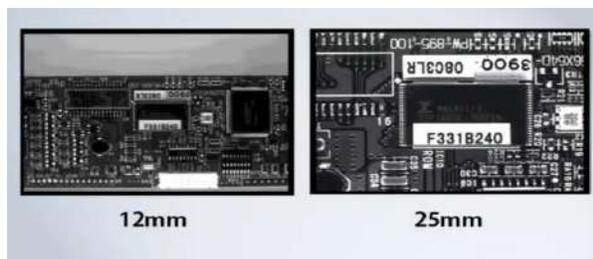


Image 7. Difference between two lenses

If we use different lens for ex. Circuit . In which 1st image shows 12mm with wide angle lens which provides larger field view and less magnification than 2nd image in which image take by 25mm lens.

If we use lens with longer focal length we can magnify image and reduce field view. Lens delivers the image to sensor in the form of light.

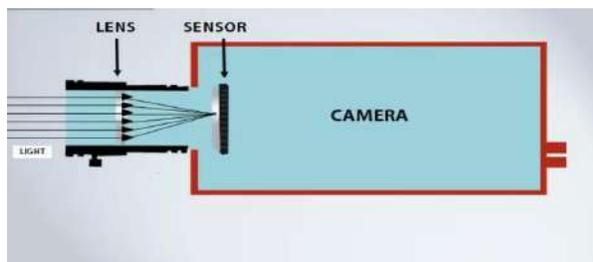


Image 8. Conversion of light into Digital image

6.3.Sensor

In sensor it uses CCD or CMOS technologies to capture this light and convert into Digital Image And when we zoom on that Image will see the collection of pixels. Low light produces dark pixels and bright light create brighter pixels.Camera should have suitable sensor as per application.

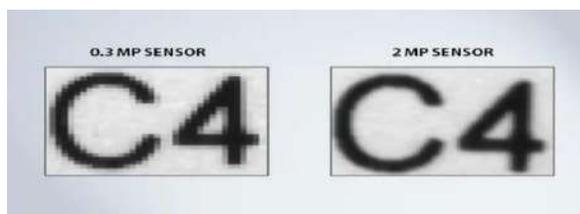


Image 9. Two images capture by Two different sensors

1st Image is capture is taken by 0.3MP sensor which also known as VGA sensor and the 2nd image which is also same captured by 2MP sensor

1st Image has much less resolution and it is more pixelated. Higher the resolution higher the detail image we have and there more accurate measurement.

6.4.Vision Processing

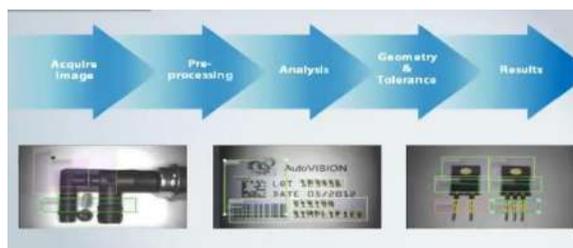
Processing process is core of Machine vision process. Extracting the information that required from application. Processing the image may take place externally on PCB system or Internally in smart camera.

Vision processing is done by software which have wide variety of interfaces and tools available .some common tools are Locate, Count, Measure and Decode. This are use to achieve desire result.



Image10.Processing on software

Typical example is to locate the cap on bottle. Then measure tool is use to measure its height and check it properly sitted on bottle.Vision Processing consists several steps or algorithm perform by software.Image is aquire by sensor before that pre-processing take place to optimise the



Flowchart1. Flowprocess of Machine vision system

Image and ensure all necessary features are stand out. Then software find the features which is to look for then run measurement and compares it with specification. After that result is communicate as pass or fail.

6.5.Communication

The purpose of machine vision to extract information from digital images and communicate that data. This done by either Discrete I/O or Data communication.



Image11.Indicator Stack light

The discrete I/O points are connected to PLC for use the information to control work or as a indicator stack light or Direct to solenoid. Which might use to trigger or reset the mechanism.

Data Communication by serial communication is conventional RS-232 serial or Ether-net. It use at higher level industries to provide visual conformation.

Which connected HMI screen to provide visual conformation that system is running.



Image12.Visual Communication

The working of Machine Vision system with all components work together.

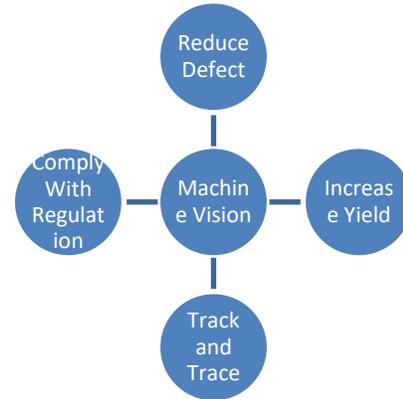


Image13.Actual process of machine vision system

7. Benefits and Application of Machine Vision System

By using Machine vision system we can get no. of different applications. And the motivation for doing so

generally like to save money and increase the profitability and this can achieve in several ways.



Layout 3. Benefits of machine vision system

Reduce Defects

Machine Vision system can reduce the defects . fewer bad parts getting out to the world in the coustmers hand which could damage company reputation and lead to recall costly parts. Another problem is product is match does match its packing label and with this mislabel product create unhappy coustmer and it cause company reputation and may leads to safety risks. Because in pharmaceutical companies this mislabel product can harm the coustmer which have allergies.this common reason to recall the products. For this barcodes shoud be check properly to ensure the product is correctly filled.

Increase Yield

It is another incentive to turn raw material in product and more saleable. If we catch defect in early stages of production then we can reduce wastage.

Because defected products can identified and eliminated before larger assembly . it will reduce the scrapping.

It helps to reduce downtime of production. It will helps to ensure that product fit accurately on production line if it is not then it will jam the production line and loss of product.



Image 14. Aligning of Baked goods

In this machine vision ensuring that the baked goods are aligned with conveyor and products which are out of tolerance they can done system jam they are removed.

Track and Trace

We all well known about product tracking. In this uniquely identified product so that can track and trace the manufacturing process. If we know all the parts that are required and which are needed in production. Then we needed less stock of products and can use JIT Manufacturing Process.

Decoding system is use to track down the products by OCR code. It will reduce product shortage by reducing inventory and Delivery time. It also perform some other tasks such as alignment, measurement in addition with reading barcode OCR for ex. Reading datamatrix code on PCB and verify its location on board.

Comply with Regulations

It will help to reduce cost. If you not follow the rule then you not able to participate in the market.

In pharmaceutical companies earlier uses the machine vision system. In this industry it should follow strict government regulations to ensure coustmer safety. In this common verification of Date, lot , Datamatrix and other code formats . it not only read the codes but also verify it should printed accurately. And also readable to supply chain.

Main advantage of machine vision over Human inspector

1.Machine vision work tirelessly. They can do repetitive tasks and once they do the setup it work allday and everyday. Where human inspector get tired and distracyed after 20 or 30 min.

2.Machine vision works faster.

3.Machine vision is more consistent than human inspector. Once role is set it works until it stops. Where human tendency to change the rules as per there comfort level.

8. Future Scope

1. The monochrome (gray scale) camera line of force is towards faster cameras and interfaces, and larger sensors, if sensor pixel defects can be eliminated. Some machine vision tasks, such as location or defect detection, could benefit from color or 3-D information, but monochrome cameras are used because of their low cost and higher resolution. The use of color and 3-D will continue to grow and new technology and markets will accelerate this growth.

2. Currently, most color machine vision cameras use colored filters over camera pixels. This is inexpensive but leads to errors when making color measurements. I think there will be a new color camera technology that will give us much better accuracy, at a competitive price, perhaps using programmable filters to sequentially take red, green and blue images. Perhaps this would be a substantial cost reduction in multi-layer sensors. The result would be a much larger market share for color machine vision systems.

3. 'Smart' cameras move vision processing into the camera and return results rather than, or in addition to, images. Smart cameras must use low-power processors and the development of these processors is driven by huge consumer demand for mobile computing devices, such as tablet computers.

4. Windows is currently the operating system of choice for machine vision systems, but the Linux line of force is growing stronger. Linux variants are used in most mobile computers and so, again, consumer demand is driving the adoption of Linux.

5. Vision for automotive safety is used in high-end Volvos and Mercedes, and will migrate 'down market'.

Back-up cameras will soon be mandated and that will help reduce the cost of adding collision detection. Despite successful autonomous vehicle demonstrations, I think fully autonomous vehicles are well beyond my five-year window.

9. CONCLUSION

It works on low operating cost. This helps to reduce overall cost of inspection it helps to improve manufacturing and its inspection.

It based on finding flaws and surface cracks which leads to harmful accidents which damage company reputation. So it need to install M/c vision system to detect those flaws and find solution on it.

We can use smart cameras to compact the M/c vision system. And do 100% inspection on the job so that no flaws occur in final product.

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Analysis of Weld Strength for Pressure Vessel

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Abstract— A pressure vessel defined as a container. The inside pressure is usually higher than the outside. Pressure vessels often have a combination of high pressures together with high temperatures, and in some cases flammable fluids or highly radioactive materials. Because of such hazards it is imperative that the design be such that no leakage can occur. In the present work, the pressure vessel nozzle has been analysed for cases of loading. In this case a welded area of the nozzle region is considered to find the strength. Initially the welded model is built using shell approach and thickness is assigned as real properties, nozzles are built as per the drawing and analysis is carried out for all major nozzles as per the load specifications for the problem. The nozzle regions are fine meshed to obtain accurate results as the solution accuracy depends on the finer size of the mesh. The results for equivalent stress are captured due to the ductile nature of the pressure vessel system. The stresses are concentrated near the nozzle opening regions as per the observation.

Keywords— *finite element analysis, pressure vessel nozzle, weld strength*

I. INTRODUCTION

A pressure vessel is a container designed to hold gases or liquids at a pressure substantially different from the ambient pressure. Pressure vessels accidents can be dangerous and fatal have occurred in the history of their development and operation. Consequently pressure vessel design, manufacture, and operation are regulated by engineering authorities backed by legislation. Design involves parameters such as maximum safe operating pressure and temperature, factor of safety, corrosion allowance and minimum design temperature (for brittle fracture). Pressure Vessel Related

Accidents Below is some examples of major accidents involving pressure vessels that have occurred in the past few years: A pressure vessel weighing 22680 kg (50,000 pounds) exploded at Marcus Oil in 2004, a Chemical plant in Houston, Texas, throwing heavy fragments into the community, which damaged a church, shattered car windows, nearby buildings experienced significant structural and interior damage due to improper modification and faulty welds of the vessel.

The Buncefield (UK's fifth largest depot) accident on Sunday 12 December 2005 that injured 43 people readily comes to the mind. Twenty petrol tanks were involved in the Buncefield blaze rage; each held three million gallons of fuel. Over 2,000 people were evacuated from the neighbourhood of the depot during the accident.

Pressure vessel failure in Houston, United States, in the summer of 2008 killed a veteran supervisor when a heat exchanger exploded in a resin-production facility.

Two employees killed at an oil refinery in southeast New Mexico, USA and two others critically injured after a storage tank exploded into flames on 03 March 2010. Nozzles or opening are necessary in the pressure vessels to satisfy certain requirements such as inlet or outlet connection, manholes, vents & drains etc. If geometrical parameters of nozzle connections significantly vary even in one pressure vessel, nozzles cause geometric discontinuity of the vessel wall. Therefore a stress concentration is created around the opening and junction may fail due to these high

stresses. It is well known that high residual stresses occur after any welding process due to the high thermal gradient and mechanical history at the heat affected zone during the welding

process. These residual stresses, especially the tensile stresses, have a significant effect on the material strength, fatigue strength and resistance to corrosion cracking. For this reason, it is important that some knowledge of the internal stress state be deduced either from measurements or from modeling predictions. However, prediction of distortions remains difficult, as it requires simulations, which take accurate account of the constraining conditions induced by the weld bead. Moreover, the problem is far more difficult when considering multi-pass welding. Indeed, computation of residual stresses and distortions induced by these processes, using the usual finite element method, requires very a refined mesh to correctly describe the properties and stress gradients in the heat-affected zone along the path of the weld. Butt welding is a welding technique used to connect parts which are nearly parallel and don't overlap. It can be used to run a processing machine continuously, as opposed to having to restart such machine with a new supply of metals. Butt-welding is an economical and reliable way of joining without using additional components. Usually, a butt-welding joint is made by gradually heating up the two weld ends with a weld plate and then joining them under a specific pressure. This process is very suitable for prefabrication and producing special fittings. Afterward, the material is usually ground down to a smooth finish and either sent on its way to the processing machine, or sold as a completed product. This type of weld is usually accomplished with an arc or MIG welder. It can also be accomplished by brazing. With arc welding, after the butt weld is complete, the weld itself needs to be struck with a hammer forge to remove slag (a type of waste material) before any subsequent welds can be applied. This is not necessary for MIG welds however, as a protective gas removes any need for slag to appear. Another with a MIG welder is that a continuous copper coated wire is fed onto the stock, making the weld virtually inexhaustible Fillet welding notation is important to recognize when reading blueprints. The use of this notation tells the welder exactly what is expected from the manufacturer.

II. LITERATURE REVIEW

V. Anand Rao (2014) et al, aims at the analysis and optimization of joining similar grades of stainless steel by TIG welding. The

parameters like current, filler materials, welding speed are the variables in the study. The mechanical properties and microstructure of 310austenitic stainless steel welds are investigated, by using stainless steel filler material of different grades. Higher tensile strength was achieved with a current 120A and 309L filler rod and also the weld has fewer defect. Experiments were carried out with

accuracy in order to keep the error minimum and determine the results appropriately. The results are prone to deviations due to some uncontrolled conditions, but are not taken into consideration during this work. Welding current 120A and electrode 309L has produced greater tensile strength of 454.6MPa while a welding current 80A and electrode 316L has produced minimum tensile strength of 51.79MPa for the specimen studied. In bend test the welding current with 120A and electrode 316L has produced maximum bending strength of 646.55MPa while the same welding current with electrode 347 has produced minimum bending strength of 211.37MPa for the specimen studied. The filler material 309L has produced better tensile and bending strength. The ultrasonic test results showed defects of penetration, but in general results indicate that the defect does not create much impact. Microstructure images show that 309L has prominent second phase formation because of varying chromium percentage retarded transformation and uncontrolled heat input. [1] A. R. Deshmukh (2014) et al, present work shows the effect of weld penetration levels on the stress level and the fatigue life at the weld joints. Finite element analysis was used to estimate stress pattern of welded joints having different levels of penetration for "Bend Loading" and "Tensile loading" were selected for studies. Specimens with variation in the penetrated throat length between 1.80mm to 0.60 mm were selected. Study has clearly highlighted the corresponding fluctuations observed in the fatigue life with change in weld penetrations. A side loading will be more detrimental than a tensile loading. Theoretically, an empirical formula cannot be generated for accurately defining depth of the penetration required at the various locations for the targeted fatigue life. However, the above study has clearly highlighted the corresponding fluctuations observed in the fatigue life with change in weld penetrations. It is observed that the lack of penetration allows a natural stress riser from which a crack may propagate. Measures should be taken to ensure that the weld attains sufficient penetration. Another conclusion which is evident from this study is detrimental effect of type of loading. [2]

R. K. Kesharwani (2014) et al, presents multi objective optimization of parameters affecting weld quality in tailored friction stir butt welding of 2.0mm thin dissimilar sheets of AA5052-H32 and AA5754-H22 using Taguchi grey based approach. The L9 orthogonal array has been used to design the experiments, and the experiments have been conducted in a laboratory stage vertical milling machine by varying tool rotational speed, worktable translational speed, tool shoulder diameter and tool pin geometry. After welding, the weld strength and percentage elongations have been evaluated using uniaxial tensile test. Based on the experimental data, empirical

relations among the parameters correspond to each output feature has been developed using simple regression method. Optimum levels of parameters have been identified using grey relation grade. The analysis presents effect of tool rotational speed, worktable translational speed, tool shoulder diameter and tool pin geometry on weld quality. Based on the analysis following conclusions can be made. According to applied grey based approach, 1800 rpm of tool rotational speed, 50 mm/min work table translational speed, 20 mm of tool shoulder diameter and square pin geometry are the optimum parameters for fabrication of AA5052-H32 and AA5754-H22 dissimilar 2.0 mm thin tailored friction stir butt welded blanks. FSW using 1800 rpm of tool rotational speed, 50 mm/min of worktable translational speed, 20 mm of tool shoulder diameter and square tool pin geometry gives maximum weld strength (UTS = 175 MPa, approx.) and maximum % elongation (13.854, approx.). Location of fracture in uniaxial tensile test of the welded sample using optimized parameters is at TMAZ, which confirms relatively higher strength of the weld NZ. [3] Mohammed Asif. M (2015) et al, says that Solid state joining techniques are increasingly employed in joining duplex stainless steel materials due to their high integrity. Continuous drive friction welding is a solid state welding technique which is used to join similar and dissimilar materials. This joining technique is characterized by short cycle time, low heat input and narrow heat affected zones. The simulation becomes an important tool in friction welding because of short welding cycle. In the present work, a three dimensional non-linear finite element model was developed. The thermal history and axial shortening profiles were predicted using ANSYS, a software tool. This numerical model was validated using experimental results. The results show that the frictional heating stage of the process has more influence on temperature and upsetting stage has more impact on

axial shortening. The knowledge of these parameters would lead to optimization of input parameters and improvement of design and machine tools. Continuous drive friction welding of duplex stainless steel was simulated using 3D non-linear finite element model developed in ANSYS. The thermal history and axial shortening were studied using experimental and numerical results. The following conclusions were drawn from the study. The simulation results of temperature distributions, peak temperatures and axial shortening showed a fair agreement with actual experimental results. Online temperature measurement was done using infrared thermometer. It was found that the highest temperature rise occurred during frictional heating stage. The peak temperatures are much below the melting point of the material. A large amount of axial shortening is obtained in the upsetting stage as compared to heating

stage due to high temperature forging of the material. From the metallurgical characterization, it is confirmed that no intermetallic phases are formed after welding. The thermal effects are dominant as compared to mechanical worked effect. This was confirmed from the hardness measurements. [4] P. Schumann (2013) et al, states Multi-wire submerged arc welding (SAW) process is conventionally used for long welds with large cross sections in tubular steel tower manufacturing. By applying non-vacuum electron beam welding (NVEBW), the number of passes and the heat input can be notably reduced. For plate thicknesses of 20 mm or more the continuous appearance of solidification cracks inside the weld cross section rouse a great challenge. The fatigue resistance is reduced significantly and the safety of the component cannot be ensured. In this paper analytical and experimental investigations are discussed for predicting fatigue life of defective welds. [5] P. Mithilesh (2014) et al, investigates the weld ability, metallurgical and mechanical properties of the dissimilar joints of Inconel 625 and AISI 304. Dissimilar joints were obtained by gas tungsten arc welding process employing ERNiCrMo-3. Tensile fracture occurred at the parent metal of AISI 304 in all the trials. The structure-property relationships on these dissimilar weldments were evaluated using the combined techniques of optical microscopy and SEM /EDAX techniques. The typical filler metal ERNiCrMo-3 was used to obtain dissimilar Inconel 625/304 austenitic stainless joint using the gas tungsten arc welding process. The following conclusions can be drawn from the results. Successful weldments of Inconel 625 and AISI 304 could

be obtained by the GTA welding process employing ERNiCrMo-3. The weld microstructure was fully austenitic; Segregation effects have been witnessed at the interface of AISI304. Hot cracking tendency was totally avoided on using Mo rich filler wire and the lower heat input employed in the GTA welding. In all the trials of tension tests, the GTA weldments undergo ductile fracture with considerable amounts of plastic deformation. [6] John A. Francis (2014) et al, SA508 steels are typically used in civil nuclear reactors for critical components such as the reactor pressure vessel. Nuclear components are commonly joined using arc welding processes, but with design lives for prospective new build projects exceeding 60 years, new welding technologies are being sought. In this exploratory study, for the first time, autogenous laser welding was carried out on 6 mm thick SA508

Cl.3 steel sheets using a 16 kW fibre laser system operating at a power of 4 kW. The microstructure and mechanical properties (including micro hardness, tensile strength, elongation, and Charpy impact toughness) were characterized and the microstructures were compared with those produced through arc welding. A three-

dimensional transient model based on a moving volumetric heat source model was also developed to simulate the laser welding thermal cycles in order to estimate the cooling rates included by the process. Preliminary results suggest that the laser welding process can produce welds that are free of macroscopic defects, while the strength and toughness of the laser welded joint in this study matched the values that were obtained for the parent material in the as-welded condition. The conclusions can be drawn from this work are, the laser welding process produced welds with acceptable weld profiles in 6 mm thick SA508 steel plates over a relatively wide range of welding parameters. The welds were free of macroscopic defects. In the as-welded condition, the mechanical performance of the laser weld in a 6 mm thick SA508 steel plate was similar to the performance of an autogenous GTA weld. Cross-weld tensile specimens fractured in the parent material away from the weld region. The absorbed energies of the fusion zone in the laser weld were found to be comparable to those of the parent material, based on sub-size Charpy specimens. The hardness in the fusion zone and HAZ for both the laser and GTA welded samples, in the as-welded condition, was approximately double that of the base material, with the measured values for the laser weld being slightly higher (430 HV0.3) than those for the GTA weld (410 HV0.3). FEM modelling established that the cooling

rates during laser welding in the absence of preheat were between 20 and

40 times higher than the critical cooling rate for martensite formation. This suggests that martensitic microstructures will almost always form in SA508 steel as a consequence of laser welding. These findings were confirmed in experimental work, in which the as-welded microstructures in the fusion zone and HAZ of the laser welded joint were found to comprise martensite mixed with some self-tempered martensite. While these preliminary results are encouraging, further work is now required to assess the properties of laser welds in SA508 steel in the post-weld heat treated condition, and it is also essential that this work is extended to assess the performance of laser welded joints in thicker sections of material. [7] Raghuram Karthik Desu (2016) et al, Austenitic Stainless Steel grade

304L and 316L are very important alloys used in various high temperature applications, which make it important to study their mechanical properties at elevated temperatures. In this work, the mechanical properties such as ultimate tensile strength (UTS), yield strength (YS), % elongation, strain hardening exponent (n) and strength coefficient (K) are evaluated based on the experimental data obtained from the uniaxial isothermal tensile tests performed at an interval of 50 °C from 50 °C to 650 °C and at three different strain rates (0.0001, 0.001 and 0.01 s⁻¹). Artificial Neural Networks (ANN)

are trained to predict these mechanical properties. The trained ANN model gives an excellent correlation coefficient and the error values are also significantly low, which represents a good accuracy of the model. The accuracy of the developed ANN model also conforms to the results of mean paired t-test, F-test and Levene's test. In this work, the mechanical properties, viz., UTS, YS, % elongation, n and K for ASS 304L and ASS 316L are evaluated based on the experimental data obtained from uniaxial isothermal tensile tests. To predict these properties at any unknown temperature and strain rate, feed forward back propagation ANN models have been developed.

85% of the data is used to train the ANN model and 15% data is used for testing it. Based on the machine learning techniques, the best ANN architecture is found to be [2-6-5] for ASS 304L and [2-17-5] for ASS 316L. The ANN model accuracy is validated based on the statistical parameters such as correlation coefficient, average absolute error and its standard deviation. The results of these statistical parameters indicate the highly accurate predictions

of ANN models. The goodness of fit of these models is also verified by conducting the hypothesis testing using mean paired t-test, F-test and Levene's test. Finite element (FE) analysis in simulating the various processes, like drawing requires the mechanical properties at various temperatures. The current practice in FE simulations is to feed the values of these mechanical properties manually at different temperatures. [8]

III. METHODOLOGY

A. Specification of Nozzle

Outside Diameter of Nozzle= 89mm

Inside Diameter of Nozzle = 84.8mm

Flange Diameter = 210mm

Thickness of Flange = 31mm

Thickness of Nozzle = 2mm

B. Selection of Materials for Pressure Vessels

1. SA508 Steel

The life span and safe operation of the pressure vessel (PV), which is one of most critical components in nuclear power plant, depends on durability of the PV materials in high temperature, high pressure and radioactive environments. The need for materials with higher strength, toughness and resistance to irradiation embrittlement is rising due to increases in the power generation capacity and the design lives of nuclear power plants. SA508 steel grades have been used in the manufacture of many PV's for pressurized water reactors because they offer the combination of strength, good ductility,

fracture toughness, homogeneity with respect to mechanical properties, and they are economic.

2. SA 533

SA533 low-alloy steel is the material mainly used for the pressure vessels (PV) of nuclear power plants. This is mainly focused on the effects of strain amplitude, dissolved oxygen content in feed water and fatigue frequency on the low-cycle fatigue (LCF) behavior of SA533 pressure vessel steel in a high temperature, high pressure water environment. The test results show the fatigue life is significantly decreased with increasing the strain amplitude.

kg/cm)

Table 3 Force and Moment on Nozzle

Nozzle	Fx	Fy	Fz	Mx	My	Mz
	1000	666.667	866.667	200000	166700	181200

67

From the observations, it can be inferred that the fatigue-corrosion interaction plays a significant role in determining the fatigue life of SA533 PV steel.

3. Properties of SA 533 and SA 508

The demands placed on pressure vessel (PV) steels are severe. They must be manufactured in required sizes and thicknesses, be of sufficient strength and toughness, show little deterioration under irradiation, allow the production of high quality welds and be compatible with the cladding. SA533 and SA508 and similar grade steels have become well established. Both grades are of the vacuum treated, quenched and tempered type of 600 N/mm strength class. The specific requirements for PV steels are to give, even to large size component materials of PVs, higher values of the following properties:- Uniformity and isotropy of mechanical properties, including less mass effect in the mid-section

- High fracture toughness
- Less internal effects
- Good weldability
- Resistivity to neutron irradiation embrittlement

Some further items were added during the past two decades primarily for the purpose of easier execution of non-destructive examinations both pre-service and in-service. These are:

- Fewer weld seams in PV
- Larger and more integral design of component materials

The requirements have been steadily realized. With respect to the weld, improvements have been made by adequate selection of flux in combination with requirements on the chemical composition of the weld wire, welding parameters such as weld bead size and sequence to minimize the coarse grained areas in the heat affected zone (HAZ). Table 1 Properties of Material

Material	Min Tensile Strength (MPa)	Min Yield Strength (MPa)	Strength at Design Temp (MPa)	Strength at Working Temp (MPa)	Young's Modulus (GPa)
SA 304L	485	170	110	110	200
SA-508	550	345	158	158	205.77275
SA-533	620	485	259	259	210

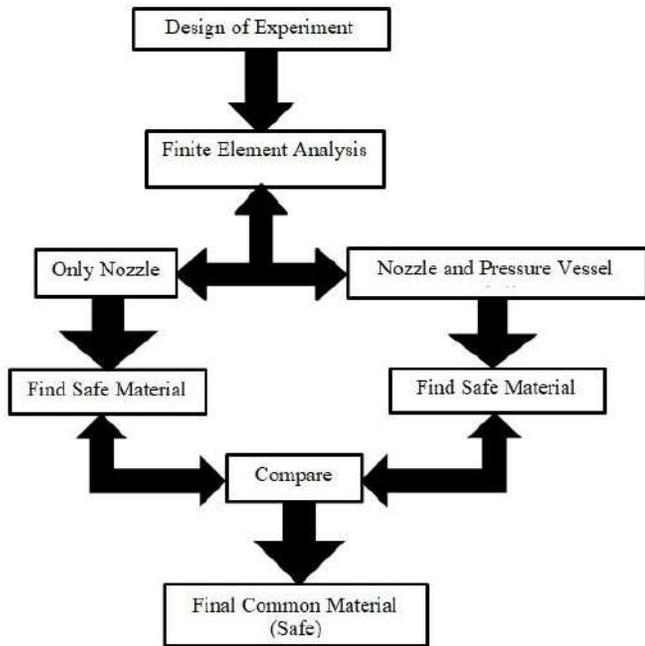
C. Boundary Condition According To Design

Table 2 Design & Working Conditions

D. 3D Model of Nozzle

Design Temp (°C)	Design Pressure (kg/cm ²)	Working Temp (°C)	Working Pressure
300	39	241	34
GIVENDATA	Outer tube	Inner tube	Unit
Design pressure	3.8245935	16.1809725	MPa
Design temp.	300	300	°C
Working pressure	3.334261	12.50347875	MPa

E. Design of Experiment



IV. RESULT AND ANALYSIS

A. Nozzle Analysis:

For SA 304L Material:

Stress at welded region of nozzle:

A: SA304L
 Equivalent Stress
 Type: Equivalent (von-Mises) Stress
 Unit: MPa
 Time: 1

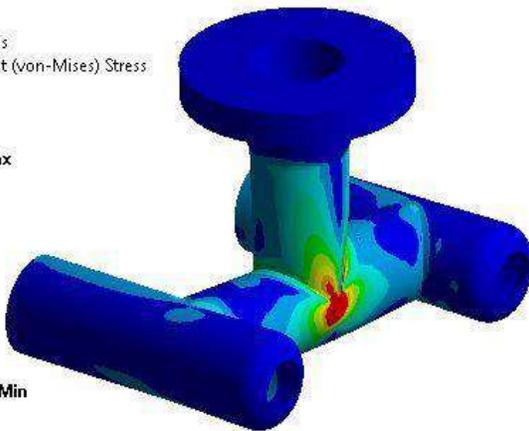
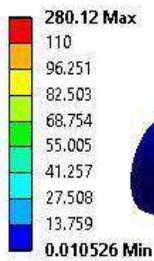


Figure. Equivalent Stress

For Material SA 508:

Stress at welded region of nozzle:

B: SA 508
 Equivalent Stress
 Type: Equivalent (von-Mises) Stress
 Unit: MPa
 Time: 1

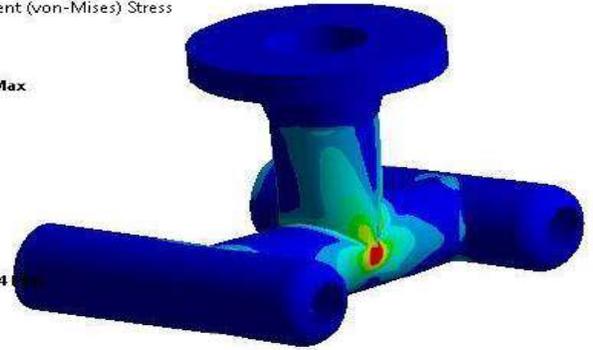
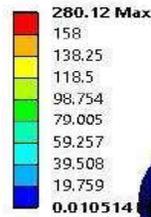


Figure. Equivalent Stress

For SA 533 Material:

Stress at welded region of nozzle:

C: SA 533
 Equivalent Stress
 Type: Equivalent (von-Mises) Stress
 Unit: MPa
 Time: 1

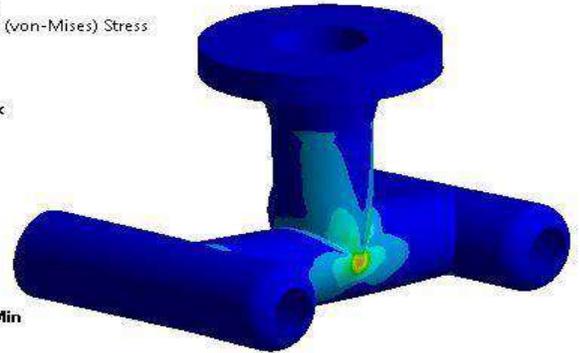
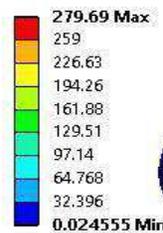


Figure. Equivalent Stress

**Result Table:
 For Nozzle**

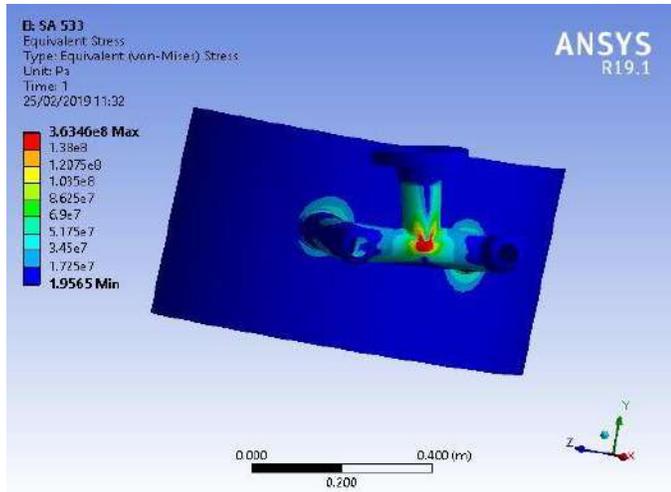
Sr. No.	Material	Equivalent Stress (MPa)	Total Deformation (mm)	Total Strain
1	SA 304L	280.12	0.70165	0.0014093
2	SA 508	280.12	0.682	0.0013699
3	SA 533	279.69	0.66541	0.0013506

From the analysis of nozzle we came to know that the maximum stress developed is in material SA 304L. SA 533 has the minimum induction of stress as

compare to other materials. Total deformation induced is 0.6654 mm which is least among the materials. SA 508 has less stress induction than SA 304L but have comparatively higher stress and deformation than SA 533. We conclude Nozzle is safe for

SA 533

B. Finite Element Analysis of the Nozzle with Shell base using the recommended material



temperature is less than 0.7, else allowed stress has to be "3xSavg only"

Length [mm]	Membrane [MPa]	Bending [MPa]	Membrane-Bending [MPa]	Peak [MPa]	Total [MPa]
1 0	133.44	172.31	278.11	35.967	265.95
2 0.55219	133.44	165.13	271.44	29.732	266.48
3 1.1044	133.44	157.95	264.79	25.129	266.05
4 1.6566	133.44	150.77	258.18	22.988	265.57
5 2.2088	133.44	143.59	251.59	21.433	263.97
6 2.7609	133.44	136.41	245.04	21.128	261.73
7 3.3131	133.44	129.23	238.52	22.985	259.35
8 3.8653	133.44	122.06	232.04	26.404	256.83
9 4.4175	133.44	114.88	225.61	30.971	255.13
10 4.9697	133.44	107.7	219.22	36.005	254.68
11 5.5219	133.44	100.52	212.88	35.336	247.59
12 6.0741	133.44	93.336	206.6	35.58	240.57
13 6.6263	133.44	86.157	200.38	36.796	233.66
14 7.1785	133.44	78.977	194.22	32.751	222.83
15 7.7306	133.44	71.797	188.14	27.331	210.74
16 8.2828	133.44	64.617	182.14	22.462	198.51
17 8.835	133.44	57.438	176.22	18.68	186.14
18 9.3872	133.44	50.258	170.4	16.858	173.64
19 9.9394	133.44	43.078	164.69	17.74	161.04
20 10.492	133.44	35.899	159.1	19.57	148.08
21 11.044	133.44	28.719	153.64	20.872	147.03
22 11.596	133.44	21.539	148.33	17.552	147.45
23 12.148	133.44	14.359	143.18	23.312	145.86
24 12.7	133.44	7.1797	138.21	33.366	129.43
25 13.253	133.44	1.5789e-013	133.44	38.332	117.41
26 13.805	133.44	7.1797	128.9	40.819	103.36
27 14.357	133.44	14.359	124.6	46.594	90.233
28 14.909	133.44	21.539	120.58	54.329	78.926
29 15.461	133.44	28.719	116.86	64.045	70.926
30 16.013	133.44	35.899	113.48	67.091	64.432
31 16.566	133.44	43.078	110.45	63.139	56.929
32 17.118	133.44	50.258	107.83	63.373	52.291
33 17.67	133.44	57.438	105.62	66.556	48.931
34 18.222	133.44	64.617	103.87	60.237	56.62
35 18.774	133.44	71.797	102.59	55.104	68.671
36 19.327	133.44	78.977	101.8	52.911	84.41
37 19.879	133.44	86.157	101.52	46.785	96.159
38 20.431	133.44	93.336	101.74	38.36	94.092
39 20.983	133.44	100.52	102.46	28.036	91.961
40 21.535	133.44	107.7	103.68	20.295	91.787
41 22.088	133.44	114.88	105.38	16.629	97.8
42 22.64	133.44	122.06	107.53	20.238	106.57
43 23.192	133.44	129.23	110.1	29.399	116.19
44 23.744	133.44	136.41	113.08	40.87	126.58
45 24.296	133.44	143.59	116.42	53.465	137.88

C. Find optimized result from FEA and recommend the material

Calculations of Safe Stress

Material	Min Tensile Strength (MPa)	Min Yield Strength (MPa)	Strength at Design Temp (MPa)	Strength at Working Temp (MPa)	Yongs Modulus (GPa)	
SA 304L	485	170	110	110	200	
SA-508	550	345	158	158	205.77275	
SA-533	620	485	259	259	210	
			Ratio Yield/Ulimate	0.7822581	S_{pl}	388.5
			Ratio greater than 0.7			

Stress At Min Operating Temp	259 MPa
Stress At Max Operating Temp	259 MPa
Savg	259 Mpa
Sps = 777 MPa	

Where, S_{PL} = 1.5*S or Sy (1.5*S shall be used when the ratio of the minimum specified yield strength to ultimate tensile strength exceeds 0.70)

4.5.2 Stress Analysis Calculations

SPS Calculation

1. The allowable stress for Induced Primary+Secondary stresses as "3 x average of stresses allowed at minimum (38Â°C) and at maximum (Input design temperature)"

Various Stresses associated with Analysis

2. The limitation of use of 2xYield avg (Yield Average is average of maximum & minimum operating temperature of material Yield limit) is when ratio of min yield strength and ultimate strength at room

PL + Pb + Q is compared with SPS. (According to ASME Sect VIII, Div. 2, Annex 5-F.3.10)

$$(P_L + P_b + Q) \leq S_{PS}$$

Stress comparisons are made as per ASME Sect VIII, Div. 2, and Figure 5.1

•Stress induced in channel will be compared with the yield

limit of material. Where,

- S = allowable stress limit for material
- SPL = 1.5*S or Sy (1.5*S shall be used when the ratio of the minimum specified yield strength to ultimate tensile strength exceeds 0.70)
- Sps = allowable stress for primary and secondary stresses
(ASME Sect VIII, Div. 2, Part 5.5.6.1.d)

PL + Pb + Q	314.067	Less Than Sps	Safe
PL	133.44	Less Than Spl	Safe

V. CONCLUSION

This Project includes the analysis of the stress state in the cylindrical shells of pressure vessel with nozzles. Stress state has been provoked by the load on the free end of the nozzle by the torque moment. Formula for determination of tangential stress which occurred as the consequence of the force couple action on cross section consoles has been used. Based on the obtained results of conducted regressive analysis, it can be concluded that proposed procedure for determination of maximum stress on the cylindrical shell near the nozzle loaded at the free end by the torque moment, can be successfully applied in technical practice. Maximum stresses as well as its value appearing on the envelope near the nozzle, and which can be determined by the method proposed in this article can be used as the initial basis or further analyses which would include high cycle fatigue, low cycle fatigue, and linear behavior material. It is important to mention that the whole procedure of stress state analysis is conducted for the structures made of carbon steel.

- 1) We have done investigating the joint with respect to fatigue life with ASME and IIW standards.
- 2) Analyzing the model for critical location with the aid of FEA tool is done

PL is compared with SPL.

- 3) Found the variation of results with FEA and practical approach to reduce the error using FEA.

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WELD ANALYSIS OF DISSIMILAR GRADE METALS USING FEA SOFTWARE

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Abstract— In this paper we are analyzing the cracks found on wheel rim. The wheel rim should not fail during its working. The wheel rim must withstand a various loading conditions to achieve better performance and quality. The wheel rim is the main component in the vehicle and has to meet all safety required for driver. Finite element analysis of dissimilar metal joints are also analyzed and compared with experimental work. Experiments are performed to study about the, Tensile stresses and equivalent stresses found in wheel rim. the wheel rim designer and producers use a number of tests rotating bending test, radial fatigue test, and rim impact test to insure it meets the standards. The wheel rim tests are time much expensive and consumes lot of time. Computer simulation and Finite Element analysis of these tests can reduce the time and cost required to perform a wheel rim design at significant level. In this paper we discussed the simulation and Finite Element Analysis of wheel rim using Radial Fatigue test.

I. INTRODUCTION

As we know, The modern age demands fast production of structures. Hence welding is an efficient process where two materials whether same or different composition are joint together permanently. By considering design point of view the strength and fatigue life are the main issue. Hence load generated during the assembly may cause significant levels of stress in the component. The main component of wheel is rim and disc. Rim is part where tyre is installed. And disc is part of the wheel rim where it is fixed to the axle hub of vehicle. Offset is a distance between wheel mounting surface where it is bolted to hub and the centerline of rim. The flange is a part of rim, which holds the both beads of the tyre. Bead seat comes in contact with the bead face and is a part of rim, which holds the tyre in a radial direction. An excellent weld is that which have adequate tensile strength and ductility so that the joint which is formed to the welding of materials will not fail.

Welding is a manufacturing process of creating a permanent joint obtained by the fusion of the surface of the parts to be joined together, with or without the application of pressure and a filler material. The materials to be joined may be similar or dissimilar to each other. The heat required for the fusion of the material may be obtained by burning of gas or by an electric arc. The latter method is more extensively used because of greater welding speed. In order to reduce costs, design for light-weight and limited-life is increasingly being

used for all vehicle components. In the actual product development, the rotary fatigue test is used to detect the strength and fatigue life of the wheel. Therefore, a reliable design and test procedure is required to guarantee the service strength under operational conditions and full functioning of the wheel. Loads generated during the assembly may cause significant levels of stress in components. Under test conditions, these high levels of stress alter the mean stress level which in turn, alters the fatigue life and critical stress area of the components as well. The inclusion of clamp load improves the prediction of the critical stress area and fatigue life of aluminum wheels for a new wheel, the failure probability of the dynamic radial fatigue test can be read directly from this probability contour drawn from the test data. In dissimilar welds, weldability is determined by crystal structure, atomic diameter and compositional solubility of the parent metals in the solid and liquid states. Diffusion in the weld pool often results in the formation of intermetallic phases, the majority of which are hard and brittle and are thus detrimental to the mechanical strength and ductility of the joint. The thermal expansion coefficient and thermal conductivity of the materials being joined are different, which causes large misfit strains and consequently the residual stresses result in cracking during solidification. as a gear tooth or to repair a worn surface such as a bearing surface.

Study of the mechanical properties of the weld is very important because the main purpose of the welding is to strongly join the two metals together as the application of the welded structure may be at sensitive place. It is important to check the tensile strength of the weld and the factors affecting the strength of the weld. The major problem occurs with dissimilar metal welds is formation of inter-metallic compounds at the interface which affect the properties and efficiency of the weld. In order to improve the strength of the dissimilar metals weld intermediate layers at the interface can be used. The trends of light weighting, higher performance and increased functionality are some of the drivers for multi-material, hybrid structures and the need for joining of dissimilar materials. Different material properties are utilized to achieve improvements not possible with a single material. This paper has reviewed selected joining processes suitable for the joining of dissimilar materials. Selection criteria, modelling and

inspection/testing of joints have been discussed.

II. LITERATURE SURVEY

Abid Ali Khan et al. (2018) studied that, welding process can be performed on similar or dissimilar metals. Welding of dissimilar metals involves different types of metals with distinct chemical composition. The two dissimilar metals involve in welding process have different mechanical properties and microstructures which in turn may affect welding parameters like weld current, hold time, weld force etc. When a structure or component of a machine is build or undergo any repair procedure this change in chemical composition of metals get prominent. The difference in chemical composition of metals may be due to several factors such as age hardening, oxidation etc. The study of mechanical properties of welding is important because welded structure may be installed at highly sensitive and risky place. Problem of formation of inter-metallic compound may arise which affect the weld quality. In this paper a brief review has been given on the work done on mechanical characterization, microstructure properties of welded joints [1].

Study of the mechanical properties of the weld is very important because the main purpose of the welding is to strongly join the two metals together as the application of the welded structure may be at sensitive place. It is important to check the tensile strength of the weld and the factors affecting the strength of the weld. The major problem occurs with dissimilar metal welds is formation of inter-metallic compounds at the interface which affect the properties and efficiency of the weld. In order to improve the strength of the dissimilar metals weld intermediate layers at the interface can be used [1]. **K. Martinsen et al. (2015)** says that, Emerging trends in manufacturing such as light weighting, increased performance and functionality increases the use of metamaterial, hybrid structures and thus the need for joining of dissimilar materials. The properties of the different materials are jointly utilised to achieve product performance. The joining processes can, on the other hand be challenging due to the same different properties. This paper reviews and summarizes state of the art research in joining dissimilar materials. Current and emerging joining technologies are reviewed according to the mechanisms of joint formation, i.e.; mechanical, chemical, thermal, or hybrid processes. Methods for process selection are described and future challenges for research on joining dissimilar materials are summarized [2]. The trends of light weighting, higher performance and increased functionality are some of the drivers for multi-material, hybrid structures and the need for joining of dissimilar

materials. Different material properties are utilized to achieve improvements not possible with a single material. This paper has reviewed selected joining processes suitable for the joining of dissimilar materials. Selection criteria, modelling and inspection/testing of joints have been discussed. There are, however still many challenges to be solved and need for further research. The authors wish by this paper to contribute to closer collaboration between the manufacturing research and joining research communities, and to raise the awareness of the importance of innovations in this area [2]. **Mr. Kapil Banker et al. (2014)** studied that, welding of dissimilar metals has attracted attention of the researchers worldwide, owing to its many advantages and challenges. There is no denial in the fact that dissimilar welded joints offer more flexibility in the design and production of the commercial and industrial components. Many welding techniques have been analyzed to join dissimilar metal

combinations. The objective of this paper is to review two such techniques – Laser welding and Friction stir welding. Laser beam welding, a high power density and low energy-input process, employs a laser beam to produce welds of dissimilar materials [3].

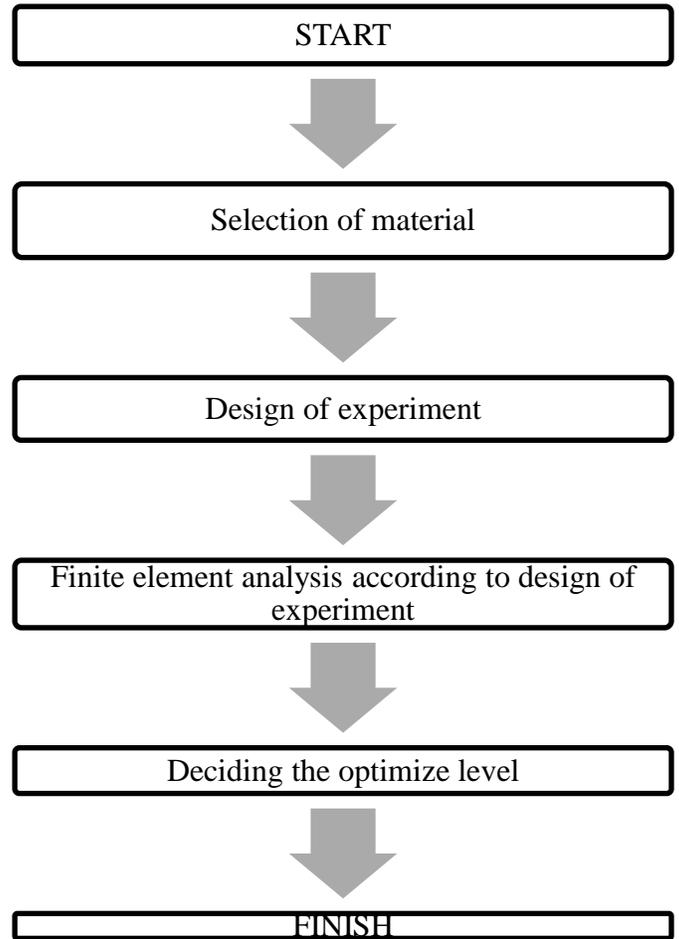
Friction Stir welding and Laser beam welding processes are widely used for the welding of dissimilar metals and alloys. Significant parameters in LBW are power of the laser source, welding/scanning speed, beam spot diameter and the focal length from the workpieces. The clamping of the workpieces is also considered important [3].

Paul Kah et al. (2014) studied that, the welding of dissimilar materials finds a wide variety of applications in the fields of industrial construction and manufacturing, where the characteristic the combination of steel and aluminum alloy has been increasing in fabricating vehicles features of the different materials are optimized for the desired application to result in cost effectiveness and value addition. Non-fusion welding methods such as solid state welding and high energy beam welding are more popular for welding dissimilar metal combinations, due to fewer complications, than fusion welding, which melts the base metal and forms brittle intermetallic compounds (IMCs) that may lead to failure. Various factors have to be considered when assessing the feasibility of welding dissimilar metals and producing a sound weld joint. This paper presents a broad classification of the most commonly

used welding processes for dissimilar materials, discusses some of the commonly used welding processes with examples of some common material combinations, critical factors for good welding, and practical difficulties arising from the physical and chemical properties of materials. From the findings, it can be inferred that continuous improvement and research is still required in the field of dissimilar metal welding, particularly in the light of increasing demand for tailored material for modern engineering and industrial applications [4]. The desire to integrate the various beneficial properties of different materials for the purposes of cost and weight reduction, improved resistance to high temperatures and corrosive environmental conditions, and better abrasive resistance resulting from a need for longevity in machine components has created a necessity to join dissimilar materials. Various joining methods such as welding, brazing, mechanical riveting, and soldering are used for joining dissimilar materials. Of the various welding methods available, methods that involve the least amount of melting, with only one of the metals turning into a liquid, minimum intermixing of dissimilar materials and reduced formation of IMC are to be favored in the welding of dissimilar materials [4]. **Raimo Suoranta et al. (2013)** studied that, Techniques for joining lightweight dissimilar materials, particularly metals and polymers, are becoming increasingly important in the manufacturing of hybrid structures and components for engineering applications. The recent drive towards lightweight construction in the aerospace and automotive industries has led to increased exploitation of lightweight metallic and non-metallic materials with the aim of achieving specifically optimized versatility. Hence, suitable joining methods are necessary in order to reliably join these dissimilar materials and to integrate them in engineering structures. Understanding of the various joining technologies that exist for multi-material metal-to-metal, polymer-to polymer, and metal-to-polymer hybrid structures is consequently important. The objective of this current study is to examine and summarize information and results from previous research and investigations on techniques for joining dissimilar materials. The findings presented serve to further understanding of the various joining techniques available and optimization of processes for metal-to-metal, polymer-to polymer and metal to-polymer hybrid joints [5]. This paper discussed joining methods for metal-to metal, polymer-to-polymer and metal-to-polymer hybrid components. Different joining techniques were presented and their advantages and disadvantages examined, along with adaptations of the processes. Mechanical joining guarantees a reliable joint and high joint resistance when

joining metal and polymer, typically with rivet joining. However, the process has limitations due to poor flexibility in terms of joint design, since the joint shape and position is usually fixed mechanically, and the production rate is therefore relatively slow. Adhesive joining techniques are undoubtedly the most used process for joining plastic to metal [5].

III.METHODOLOGY



1. Selection of material: Material selection is the step in the process of designing any physical object in context of product design, the main goal of material selection is to minimize cost while meeting product performance goals. The materials selected are C1008 and C1010 and their properties are as follows:

i. Chemical properties: -

Elements	C1008	C1010
Carbon, C	0.10% Max	0.08-0.13%
Manganese, Mn	0.30-0.50%	0.30-0.60%
Sulfur, S	0.050%	0.050%
Phosphorous, P	0.040%	0.040%

Table no. 1. Chemical properties of materials

ii.Mechanical properties: -

Properties	C1008	C1010
Tensile strength	340 Mpa	365 Mpa
Yield strength	285 Mpa	305 Mpa
Elongation	20%	20%
Reduction in area	45%	40%
Brinell Hardness	95%	105%

Table no. 2. Mechanical properties of materials

2.Design of Experiment: - The welding parameters for C1008 and C1010 are as follows

3. Finite Element Analysis according to design of experiment:

The practical experimentation is analyzed on the design software ANSYS. In this the stresses and deformation are calculated on the basis of same chemical and mechanical properties of the materials selected with same dimension.

4. Deciding the optimize level:

The two cases are analyzed for two filler materials i.e. C1008 and C1010. In first case the filler material is C1008 and in second case the filler material is C1010.

IV. FINITE ELEMENT ANALYSIS

Finite element analysis has been done in the case of this welding to predict stresses and the location where failure is most likely to occur. Analysis by using a finite number of elements is the latest method to analyze complicated shapes. Using simple analytical methods analysis of simple structures is done. But to analyze more and more complicated structures, we need to approximate the analytical methods and do various combinations of simple shapes to get the results of the machine member. This method is not accurate, and the errors in the analysis increase at every step. The entire continuum is divided into discrete elements. Analysis is performed on each element. This method is more accurate and gives good result. The process of solving design problems by using finite element methods is a tedious and confusing process, but the results are very much accurate. Analysis Process The analysis

process consists of designing, modeling and analysis.

The finite element analysis is done on wheel rim having 40% weld length and the material for rim, disc and weld is C1008, C1010 and C1010 respectively.

	Sr.No	Rim	Disc	Weld
40%	1	C1008	C1010	C1010
	2	C1008	C1008	C1008
50%	1	C1008	C1010	C1010
	2	C1008	C1008	C1008
100%	1	C1008	C1010	C1010
	2	C1008	C1008	C1008

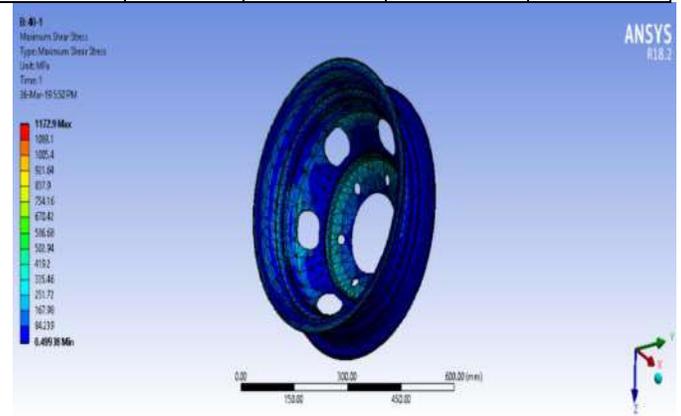


Fig 1. Equivalent stress for experiment 1(40-1)

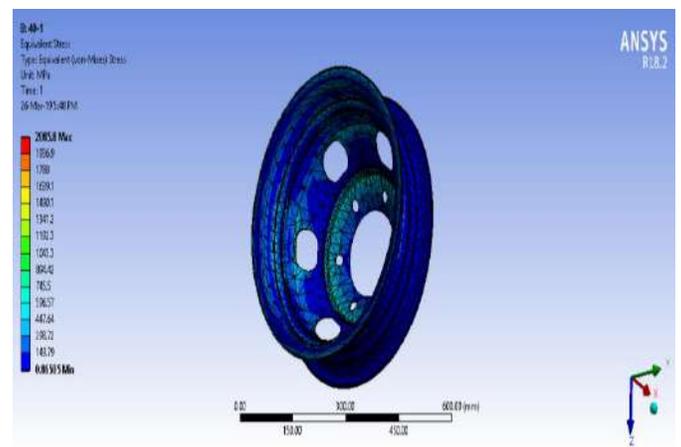


Fig 2. Maximum shear stress for experiment 1(40-1)

	Equivalent stress (Mpa)		Max shear stress(Mpa)	
	Minimum	Maximum	Minimum	Maximum
1	0.86505	2085.8	0.49938	1172.9
2	0.85738	2084.9	0.495	1172.3

The finite element analysis is done on wheel rim having 40% weld length and the material for rim, disc and weld is C1008, C1008 and C1008 respectively.

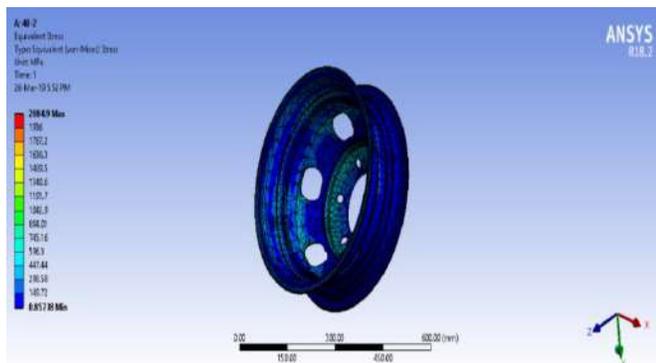


Fig 3. Equivalent stress for experiment 2(40-2)

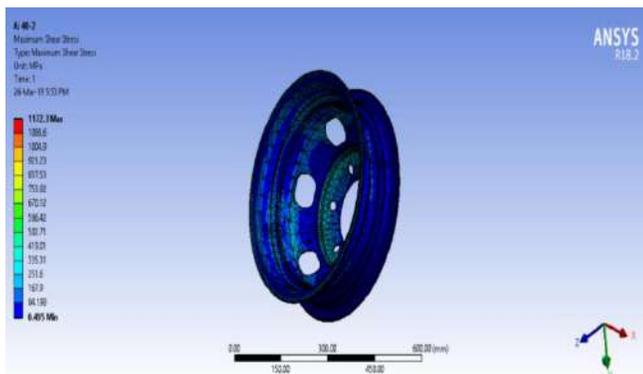


Fig 4. Maximum shear stress for experiment 2(40-2)

V.RESULTS

The following result were obtained from FEA analysis of wheel rim which consist of equivalent stress and maximum shear stress as follows :

VI.CONCLUSION

This research presents a study of equivalent stresses and maximum shear stresses in a dissimilar welding joint between C1008 and C1010, and the effect of welding on rim has been discussed. From the results above we arrive at the following conclusions:

- 1.As shown in results the case II have more accurate results than that of case I.
- 2.So we can consider the case II for FEA of the Rim.
3. The range of equivalent stress is between 0.86505 to 2085.8 Mpa for Case I and for Case II range is in between 0.85738 & 2084.9 Mpa.
4. The range of maximum shearstress is between 0.49938 to 1172.9 Mpa for Case I and for Case II range is in between 0.495 & 1172.3 Mpa.

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Design and Fabrication of Energy Efficient Treadmill

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Abstract— The current scenario in transportation is, we use vehicles that run on fossil fuels. Fossil fuels are non-renewable energy sources. The continuous use of these fossil fuels results in their depletion. These fuels are responsible for polluting the environment by emitting gases like carbon byproducts and nitrates which are responsible for global warming. So now it is a high time to come up with a new way to counter these issues. Electrical vehicle is one the solution to the scarcity of fossil fuels. These vehicles run on electrical energy supplied by a DC battery. Its initial cost is high but has low running cost as compared to conventional IC engine vehicles. Today's busy and fast like causes a huge toll on a person's life. People find very little time for exercising in their daily schedule. Also, the combined effects of an unhealthy diet and fast food causes serious issues like obesity, heart diseases etc. exercises are advised for health promotion and prophylaxis for many cardiovascular diseases.

The mobile treadmill is a new way of moving which is designed for exercising and it is also an eco-friendly mode of transportation. This equipment has a simple mechanism operated with gear chain, wheels, bearings, shaft and link arrangement. In this equipment, the conversion of linear motion into rotary motion is done by gear and wheel mechanism the rotary motion is again converted into linear motion through mechanical linkages. This mechanism helps to convert mechanical energy into electrical energy which, can further be stored in the form of batteries.

Keywords— *Fossil fuel, Non-renewable energy sources, Global warming, Electrical vehicle, Health problems, Treadmill bike.*

I. INTRODUCTION

The Mechanical devices globally used for running and walking at a stationary position is 'Treadmill'. This fascinating device was introduced in the 19th century to harness and convert human as well as animal efforts into mechanical energy. Treadmills are not just used to harness power but as stationary exercise equipment. Rather than the user powering the mill while exercising, the machine provides a moving platform with a wide conveyor belt driven

by an electric motor and a flywheel. The belt moves to the rear, requiring the user to walk or run at a speed matching that of the belt. The rate at which the belt moves is the rate of walking or running. Thus, the speed of running may be controlled and measured. The more expensive, heavy-duty versions are motor-driven (usually by an electric motor). The simpler, lighter, and less expensive versions passively resist the motion, moving only when walkers push the belt with their feet. The latter is known as manual treadmill.

II. HISTORY & BACKGROUND

First models of electric bicycles appeared in the late 19th century. US Patent office registered several e-bike patents from 1895 to 1899. Ogden Bolton patented battery-powered bicycle in 1895. Models with torque sensors and power controls became available during the late 1990s. One of the first commercially successful e-bike models appeared in 1997 with the name "Select". Year after that there were over 49 different e-bike models available on the market. In the early 2000s, two big Japanese companies Yamaha and Panasonic became their worldwide mass producers.

Treadmills were introduced before the development of powered machines, to harness the power of animals or humans to do work, often a type of mill that was operated by a person or animal treading steps of a treadwheel to grind grain. In later times, treadmills were used as punishment devices for people sentenced to hard labor in prisons. The terms treadmill and treadwheel were used interchangeably for the power and punishment mechanisms. In the 1960s, Dr. Kenneth Cooper demonstrated the health benefits of aerobic exercise. After that treadmill was commonly used for exercising purpose.

In this project we referred various research papers and scientific journals of various authors who had contributed their share of work in treadmill bike.

Kirtish Bondare et.al [1] The authors described the methodology for conversion of conventional bicycle into treadmill bicycle in the year 2016. They had completely modified the bicycle frame and place a treadmill in between

the two wheels on which the user could walk. As the user walks or jogs on the treadmill it causes the belt to slide over the roller. At the rear roller a RPM sensor is attached which can sense the speed of roller and it can signal the motor accordingly. The drive of motor is transmitted to rear wheels, it causes the rear wheels to rotate, in turn propels the vehicle forward. A manufacturing technique called DFM i.e. Design for Manufacturing was used which helps in designing the product in such a way that it eases the manufacturing process. DFM describes the process of designing the product for facilitating the manufacturing process and reducing its manufacturing cost. In DFM, the potential problems are fixed in the design phase, which is the least expensive place to address them. Other factors that may affect manufacturing are: type of raw material, the form of raw material, dimensional tolerance and secondary processing such as finishing.

Juned Barade et.al [2] stated that the treadmill is completely new way of moving designed for people who love exercising outdoor. Typically use of a treadmill is similar to running, hiking or walking. The use of treadmill indoors can be quite boring at times and people may feel the urge to walk outside. Also the problem faced while riding a bike are different type of terrain, potholes and speed bumps. The treadmill bicycle significantly over comes these problems as the treadmill bike is an equipment to be used outdoor and it gives the same the result as using a treadmill, also treadmill bike would provide the rider a well-balanced position the entire time. Since it uses no fuel it is a very conventional option for people in their busy schedule to take care of their health.

Sourabh Borchate et.al [3] This work is focused on generating electricity by use of manual treadmill. Due to ever-increasing demand for energy and to come up with a solution for this, an attempt was made to build a small equipment which could be used as power source for household application. The idea was to modify a manual treadmill as a power generating unit. For the purpose of generating electricity a controller display circuit was used to indicate parameters like timer, speed, distance, pulse rate and calories. With the provision of AC motor attached to manual treadmill and a series of gear mechanism for transmission of motion, the power is harnessed from motion of user performing exercise and transmitted to AC motor. The electrical power generated is to be stored in battery by converting AC current into DC by rectifier circuit. The manual treadmill which can only rotate when the user push the belt with his feet while running or walking. But the addition is that there is an installation of AC motor to harness electrical power whose moving parts are mechanically coupled or connected with the moving parts of machine (roller) which moves when belt of treadmill is moving. When the rotor of AC motor starts moving or rotating it will produce EMF across its output terminals. This generated EMF can be used for charging of battery and other purposes.

III. DESIGN

3.1 Research Philosophy:-

Our project is based on the generation of electricity by using conventional modes of traveling along with health benefits for the people. The model of the energy efficient treadmill is designed in UG-annex software. The model is designed considering all the aspects like the height of users, road conditions etc.

3.2 Design Procedure:-

Steps to be involved in fabrication of Treadmill bicycle are as follows;

Step 1:-

Selection of material for frame we use CRC pipes of dimension 50*20, cut this into 900*500 mm size.

After that drill the 15 holes of diameter 12mm on crc pipe.

For belt we used high strength Canvas cloth of length 1500mm.

Step 2:-

Selection of appropriate motor and battery

Motor: we use 24V, 250W, 9.78N-m geared motor of std. speed 750 rpm and 350 rpm actual rpm.

Battery: For this we used 12V(x2) batteries of 15 Amph.

Step 3:-

Chain and chain sprocket

For transmitting the power from motor to rear wheel.

We used 5 number of sprocket. Smaller sprocket having 18 teeth and larger wheel consist of 22 no. of teeth.

We use two chains for transmission.

Step 4:-

Selection of rollers and bearings

Here we use U-pvc pipes for rollers ,as they give good performance with light weight.

For rollers dimensions of Upvc pipe is 36mm ID and 43mm in length.

After considering the load which is fully acted upon bearings we use Ball bearing 6301 (12*36*12).these bearings are good on load bearing capacity.

Step 5:-

We used two wheels of different diameters, front wheel is 26mm in diameter and rear wheel is 20mm in diameter for better equilibrium condition,

For handle we use bicycle handle assembly.

Step 6:-

Joining all the parts and install all the components to make a complete assembly of Treadmill.



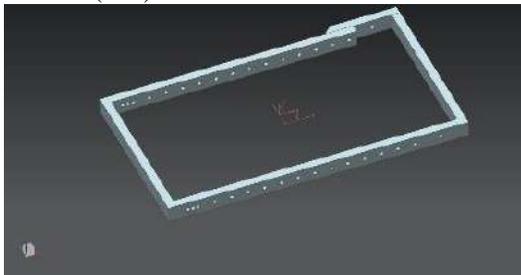
Fig. 1. Cad model of Treadmill Bicycle

Components

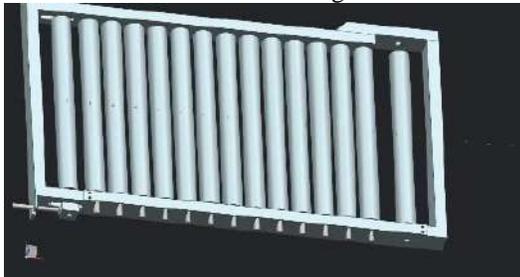
For design of treadmill bicycle methodological approach was adopted.

Design components

- a) Treadmill chassis – Rectangular frame of 900*500(mm) of CRC material



- b) Rollers – Total 15 rollers of UPVC pipe. First roller of dia.42mm & length 432mm, Last roller of dia. 42mm & length 457mm.



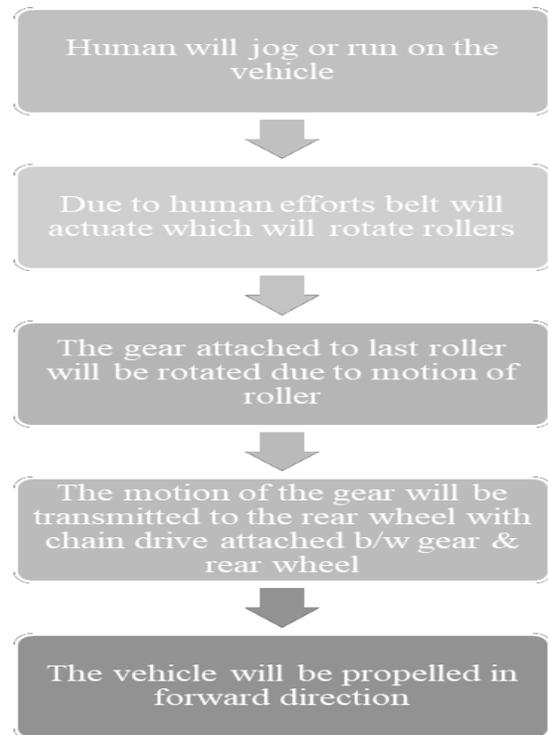
IV.WORKING

When someone walks/runs on the walking belt, flywheels run at 200 rpm. This flywheel rotation is used to generate electricity. For mounting, the Electricity Generator support is welded on the left upright.

An Electricity Generator is mounted on this support and a v-pulley is fixed on the generator shaft. A walking belt is wrapped around roller 1 and roller 2. Roller 1 is mounted on the left and right upright and roller 2 is mounted on the lower end of the base frame. A V-grooved flywheel is mounted on the left side of the roller 1 and another flywheel is mounted on the right and of the roller 1. The V-Grooved Flywheel is connected with the V-Pulley mounted on Generator shaft through a V-belt. When someone walks/runs on the walking belt roller 1 and 2 rotate. As the V- grooved flywheel is

Use

mounted on roller 1 and there is no relative motion between the flywheel and roller 1. Thus V-grooved flywheel rotates with roller 1. The diameter of the V-grooved flywheel is kept 5 times more than the diameter of the v-pulley mounted on the shaft of the generator. If flywheel rotates at 200 r.p.m. the generator shaft will rotate at 1000 r.p.m. and electricity will be generated which may be used to charge the battery or it may be used to run the portable MP3 player, low voltage CFL etc.



V.RESULT AND ANALYSIS

After carrying out simulations on the model we got the following results:-

- i. Range/charge : 25 km per charge
- ii. Speed : 12 km/hr
- iii. Loading Capacity : 80-100 kg
- iv. Charging Time : 12 hours
- v. Power : 250 Watts
- vi. Torque : 9 N-m

VI.CONCLUSION

Exercise

Treadmill bicycle helps in maintaining proper physique. Physical fitness is of utmost importance in day to day life. People often get bored while exercising in a closed room such as gym. By using treadmill bicycle one can exercise outdoors in fresh air.

Fuel saving

People often use vehicle for travelling over short distance. This causes unnecessary wastage of fuel. Due to

treadmill bicycle over short distance a large amount of fuel can be saved. **Travelling** Treadmill bicycle can be used for travelling over short distances. One can also exercise while travelling over short distance.

Eco- friendly

Treadmill bicycle does not require any fuel. Therefore it does not emit any pollutants. So it is an eco-friendly vehicle.

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Design and Manufacturing of Yoke Crane

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Abstract —The project deals with finding the solution in the industry. The present project focused on improvements in internal materials handling management, approaching the case of a large company in the automotive industry. Material handling systems is used for continuous movement of material from one point to another. Material is conveyed everywhere in a factory or warehouse before, during, and after processing. Material handling work should be minimized without compromising production or the level of quality required of the operation. The yoke shaft having weight approximately 25kg worker handling manually. This problem is trying to solve by providing automation.

Automation will improve operational efficiency, increase reaction, improve uniformity and unavoidability, decrease operating costs, and eliminate recurring or potentially unsafe manual labor, operation time near about 70% will be save.

Keywords-Mini electric hoist, Machine, gripper, manufacturing, cost

I. INTRODUCTION

Mitesh auto ancillary private limited provides engineering service. Mitesh auto is mainly manufacturing automobile parts, spares and accessories components in mass quantities as per customer requirement by using highly automatic machinery. In company material handling process is manual. Need of the present day, equipment to handle heavy loads with fast speed, reliability, safety, economy etc. So the crane is used. Crane is one of the most important equipment used in the industries. It works as a material handling equipment or device.

Material handling (MH) involves "short-distance movement that usually takes place within the confines of a building such as a plant or a warehouse and between a building and a transportation agency." It can be used to create "time and place utility" through the handling, storage, and control of material, as distinct from manufacturing (i.e. fabrication and assembly operations), which creates "form utility" by changing the shape, form, and makeup of material.

It is often said that MH only adds to the cost of a product, it does not add to the value of a product. Although MH does not provide a product with form utility, the time and place utility provided by MH can add real value to a product, i.e., the value of a product can increase after MH has taken place.

Applications of material handling device is a prime consideration in the construction industry for the movement

of material, in the manufacturing industry for the assembling of heavy equipment, in the transport industry for the loading and unloading and in shipping etc. This device increase output, improve quality, speed up the deliveries and therefore, decrease the cost of production. The utility of this device has further been increased due to increase in labor costs and problems related to labor management.

Crane is a combination of separate hoisting mechanism with a frame for lifting or a combination of lifting and moving load. There is very much useful to pick up a load at one point and be able to transport the object from one place to another place to increase human comfort.

II. PROBLEM STATEMENT

The relevance of materials handling stems from the intrinsic relationship that it has with production flow. When it presents an imbalance, there is formation of extra stock or rupture in supply. When the flow does not have enough velocity, transit time is long and the system is not capable of serving the customers when they need it.

Company is mainly manufacturing automobile parts, spares and accessories components in mass quantities as per customer requirement by using highly semiautomatic machinery. Material handling process in company is manually. Manually material handling use of the human body to lift the load due to this human suffering caused by injuries, fatigue, pain in shoulder upper back, lower back and knee and it's also effect on less production rate, more labor work required, production cost.

This problem is trying to solve by providing automation. Crane is one of the most important equipment used in the industries. Crane helps to handle heavy loads with fast speed, reliability, safety, economy etc. Automation will improve operational efficiency, increase reaction, improve uniformity and unavoidability, decrease operating costs, and eliminate recurring or potentially unsafe manual labor.

III. METHODOLOGY

The project work start with identification of problem. Hoisting is the process of lifting something or some load from lower position to higher position with the help of some device or mechanism. The Electric Overhead Traveling Crane consists essentially of a girder, or girders, supported at each end on

tracks capable of traveling on elevated fixed tracks. And a trolley equipped with hoisting and other mechanism, capable of traversing from end to end of such girder or girders. Such cranes vary in lifting capacity from about 2 tons to 400 tons, and in span from 20 ft. to 150 ft., or more. For capacities of 10 tons and upwards an independent auxiliary hoist rated at 1/5 to 1/3 that of the main hoist is frequently provided. The computer Aided Design facilitates gives alternative parameters and thus calculates the unknown parameter which speeds up the design process. In the computerization the scope for providing cabins fixed to bridge is eliminated thus reducing the cost and space.

IV. PRINCIPLES OF MATERIAL HANDLING

Although there are no definite "rules" that can be followed when designing an effective MHS, the following "Ten Principles of Material Handling," as compiled by the College-Industry Council on Material Handling Education (CIC-MHE) in cooperation with the Material Handling Institute (MHI), represent the distillation of many years of accumulated experience and knowledge of many practitioners and students of material handling:

Planning:

Define the needs, strategic performance objectives and functional specification of the proposed system and supporting technologies at the outset of the design. The plan should be developed in a team approach, with input from consultants, suppliers and end users, as well as from management, engineering, information systems, finance and operations.

Standardization:

All material handling methods, equipment, controls and software should be standardized and able to perform a range of tasks in a variety of operating conditions.

Work:

Material handling processes should be simplified by reducing, combining, shortening or eliminating unnecessary movement that will impede productivity. Examples include using gravity to assist in material movement, and employing straight-line movement as much as possible.

Ergonomics:

Work and working conditions should be adapted to support the abilities of a worker, reduce repetitive and strenuous manual labor, and emphasize safety.

Unit load:

Because less effort and work is required to move several individual items together as a single load (as opposed to moving many items one at a time), unit loads—such as pallets, containers or totes of items—should be used.

Environment:

Energy use and potential environmental impact should be considered when designing the system, with reusability and

recycling processes implemented when possible, as well as safe practices established for handling hazardous materials.

Automation:

To improve operational efficiency, responsiveness, consistency and predictability, automated material handling technologies should be deployed when possible and where they make sense to do so.

Life cycle cost:

For all equipment specified for the system, an analysis of life cycle costs should be conducted. Areas of consideration should include capital investment, installation, setup, programming, training, system testing, operation, maintenance and repair, reuse value and ultimate disposal.

V. DIMENSION ANALYSIS OF YOKE SHAFT

Note: All dimension in meter

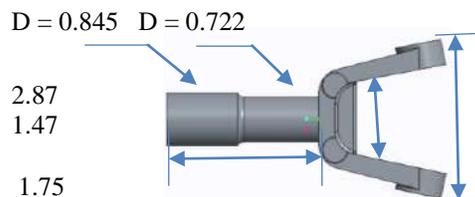


Fig. 1: Yoke shaft drawing

VI. REASONS FOR SELECTING MINI ELECTRIC HOIST



Fig. 2: Mini electric hoist

- High mobility
- High capacitive strength
- Custom heights
- Less cost than other automation material handling equipment
- Work on electricity hence it is automatic
- Working speed is more than other material handling equipment

VII. REASONS FOR SELECTING MECHANICAL GRIPPER

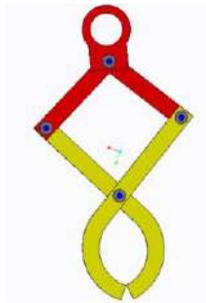


Fig.3: Gripper design

Simple in construction.
 Less power required.
 Easy to handle.
 Cost effective.
 Less number of moving parts as compared to pneumatic and hydraulic.
 Wide varieties available.
 Moderate maintenance.

VIII. DESIGN AND ANALYSIS OF MACHINE COMPONENTS

A. Gantry Crane Structure

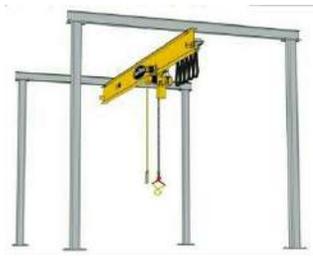


Fig. 4: Gantry crane structure

The above fig shows the gantry Crane structural design for mini electric hoist. The assembly includes I section beam, electric hoist, mechanical gripper. From these components the mechanical gripper material is weakest thus it is become a necessary to carry out the structural analysis on the I section beam to avoid the failure during the operation.

B. Structural Analysis of I Section Beam

Boundary conditions
 Force on punch holder = 0.785 KN vertically upward
 Hoisting speed = 1 m/min

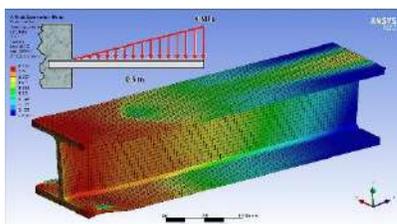


Fig. 5: Stress induced in the material with extreme boundary conditions

The above structural analysis is carried out on the ANSYS 18.2 for the I section assembly which is undergoing through the cyclic force due to continuous reciprocating motion and loading of electric hoist during lifting operation this is responsible for the maximum stress generation into the end of the I section.

- Mild steel
- Ultimate tensile strength = 841 Mpa

The maximum stress induced due to extreme boundary condition is 423.22Mpa which is less than the ultimate tensile strength of the cast iron which is 841 Mpa. The above design is safe as far as maximum stress induced in the material due to extreme boundary condition is concern.

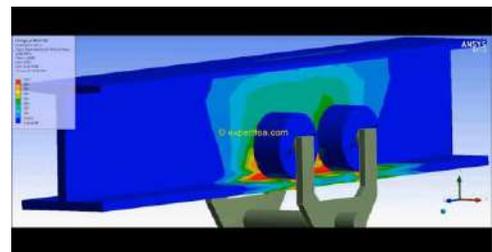


Fig. 6: Deformation due extreme boundary conditions

This is the second step of the of the structural analysis where we calculated the maximum deformation due to extreme boundary condition after evolution of the results from the ANSYS workbench 18.2 we come to know that the maximum deformation due to extreme boundary conditions is 14.588 micrometer. The deformation of 14.588 micrometer is almost negligible in this case thus the design for the electric hoist is safe as far as the maximum deformation due to extreme boundary condition is concern.

IX. CONCLUSION

After implementation of this technique there will be 70% time saving in material handling, as manual material handling takes too much time for placing the work piece and then removing it to the inspection table. Also the ergonomics factor for human whose working on machine will be reduced. Due to this automation continuous jobs will be produced which will give desired output. It will increase the overall productivity. Due this automation there are less possibilities of accidents.

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Experimentation to Analyze the Effect of Coating on Gauge and Tool Materials

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Abstract— Although many coating methods and material are available for tools, very few are available on gauges. Different types of coating materials and methods of coatings can be tested to investigate the performance analysis on gauge materials. Present work aims to analyze the coating material and method of coating for tool material like HSS M2 grade and gauge materials like HSS M2 grade, OHNS or D2 material. So Improvement in performance of cutting tool for high speed machining of hard and difficult to cut material has remained a problem for quality and economy of production. Hard coatings are well known to improve the performance of cutting tools in machining applications. Physical and chemical vapor deposition techniques have found increasingly wider use in such applications in recent years. To improve the lifetime of a tool for which it functions properly, the cutting tool has to be protected, often by coatings that are specifically designed to prevent certain damage modes that occur in particular applications. In fact, over 90% of all cemented carbide inserts are currently coated using Chemical Vapor Deposition (CVD), Physical Vapor Deposition (PVD), or their combination.

Keywords—TiN Coating, PVD, HSS, OHNS, D2

I. INTRODUCTION

In applications, like tools and gauges using coatings is an effective and relatively economical measure to reduce friction and protect the substrate surface from wear. However, selecting the appropriate coating for a given application is still difficult and complicated because the response of a coating system depends on many factors (coating properties, counterpart, substrate, interface and running conditions). Additionally, many new deposition techniques and new coatings are being continuously developed, which provides a wide range for the selection of coatings. One of the most revolutionary changes in the metal cutting industry over the last 30 years has been thin-film hard coatings and thermal diffusion processes. These methods find ever increasing applications and brought significant advantages to their users. Today, 50% of HSS, 85% of carbide and 40% of super-hard tools used in industry are coated. A great number of coating materials, methods and regimes of application on substrates or

whole tools and multi-layer coating combinations are used. Carbides are excellent substrates for all coatings such as TiN, TiAlN, TiCN, solid lubricant coatings and multilayer coatings. Coatings considerably improve tool life and boost the performance of carbide tools in high-productivity, high speed and high-feed cutting or in dry machining, and when machining of difficult to-machine materials. Coatings: (a) provide increased surface hardness, for greater wear, (b) increase resistance (abrasive and adhesive wear, flank or crater wear), (c) reduce friction coefficients to ease chip sliding, reduce cutting forces, prevent adhesion to the contact surfaces, reduce heat generated due to chip sliding *etc.*, (d) reduce the portion of the thermal energy that flows into the tool, (e) increase corrosion and oxidation resistance, (f) improve crater wear resistance and (g) improved the surface quality of finished parts. Common coatings for carbides applied in single-or multi-layers are shown in Figure.3. TiN: general-purpose coating for improved abrasion resistance, Colour-gold, hardness HV (0.05) – 2300, friction coefficient – 0.3, thermal stability– 600°C.

II. HISTORY & BACKGROUND

It was pointed out that there are basically four major groups of coating materials on the market. The most popular group is titanium based coating materials as TiN, TiC and Ti(C,N). The metallic phase is often supplemented by other metals such as Al and Cr, which are added to improve particular properties such as hardness or oxidation resistance.

The second group represents ceramic-type coatings as Al_2O_3 (alumina oxide). The third group includes super-hard coatings, such as chemical vapor deposition (CVD) diamond. The fourth group includes solid lubricant coating such as amorphous metal-carbon. Additionally, to reduce extensive tool wear during cut-in periods, some soft coatings as MoS₂ or pure graphite are deposited on top of these hard coatings. The basic physical vapor deposition (PVD) coatings are listed in Table 1. D2 steel is an air hardening, high-carbon, high-chromium tool steel. It has high wear and abrasion resistant properties. It is heat treatable and will offer a hardness in the range 55-62 HRC, and is machinable in the annealed condition.

D2 steel shows little distortion on correct hardening. D2 steel's high chromium content gives it mild corrosion resisting properties in the hardened condition. Recently Oil Hardened Non Shrinkable (OHNS) steel finding many applications in Manufacturing parts like Shaft, Gears, Dies, Tooling due to their excellent Mechanical properties.

III. RESEARCH METHODOLOGY

In this project work, we are going to prepare specimen for Pin on Disc apparatus according to the requirement of dimensions. After preparing specimens on CNC, these specimens were sent for the heat treatment process. The process which was used for heat treatment is vacuum hardening. The next step was to sent the specimens for sub zero treatment process, the soaking time used was 120 minutes. After receiving the specimens from the process we had to do surface finishing of specimens which was in microns, so we had to use buffing wheel for finishing of the specimens. When these specimens were properly finished, we sent the material for Titanium nitride (TiN) coating. The process that will be used for coating is physical vapour deposition method (PVD) as shown in fig.1. The material to be deposited is converted into vapour by physical means. The vapor is transported across a region of low pressure from its source to the substrate. Vapor undergoes condensation on the substrate to form the thin film. The flowchart of the process is shown in fig.2.

FIGURES AND TABLES

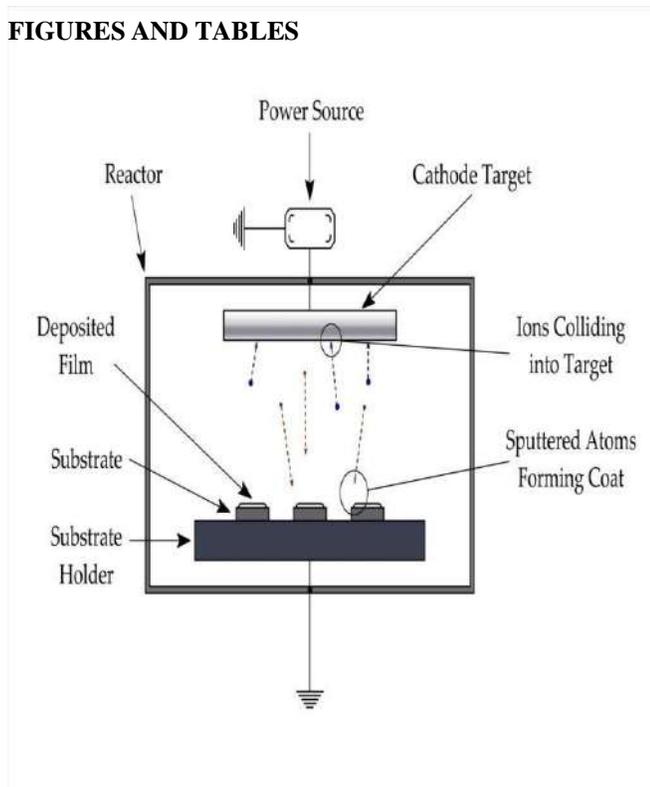


Fig.1 PVD Process

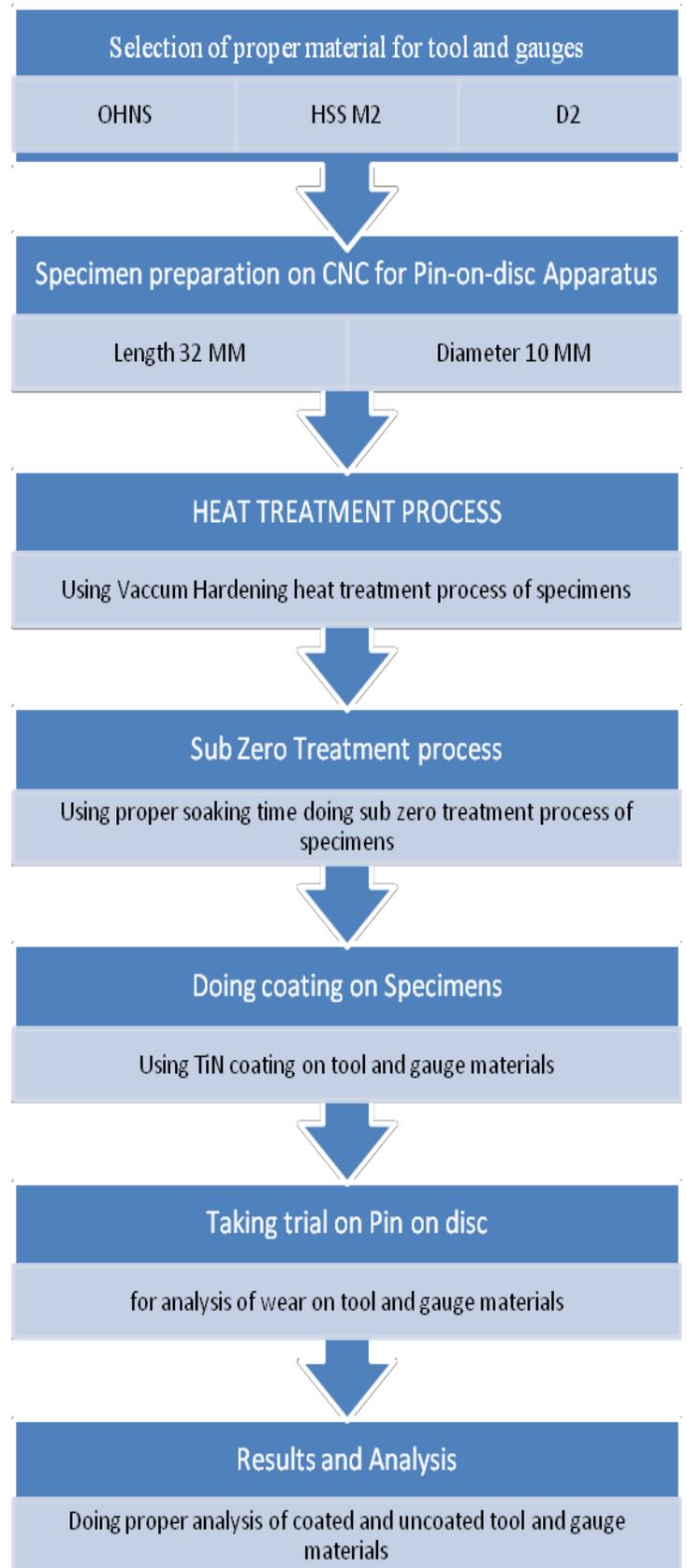


Fig.2 Flowchart

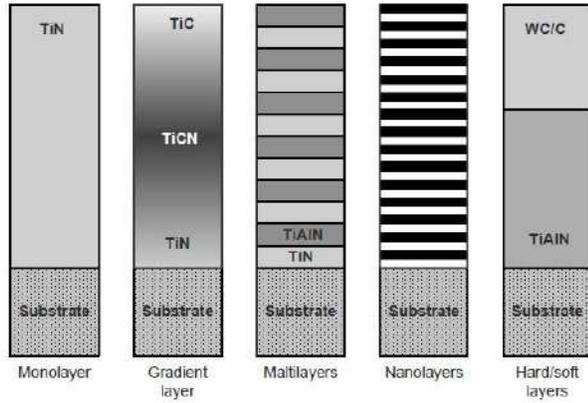


Fig.3 Modern Coatings

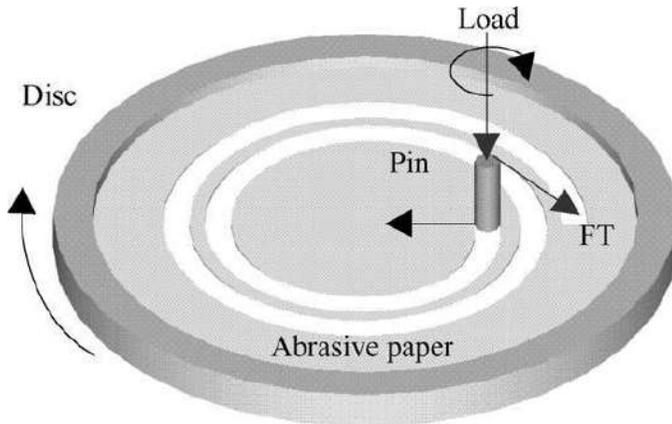


Fig.4 Pin on Disc Apparatus



Fig.5 Heat Treated Samples of OHNS, D2 and HSS M2

Table 1. Basic PVD Coatings

Coating	Characteristics
Titanium nitride, TiN	This gold-coloured coating offers excellent wear resistance with a wide range of materials, and allows the use of higher feeds and speeds. Forming operations can expect a decrease in galling and welding of workpiece material with a corresponding improvement in the surface finish of the formed part. A conservative estimate of tool life increase is 200–300%, although some applications see as high as 800%.
Titanium carbonitride, TiN(C,N)	Bronze-coloured Ti(C,N) offers improved wear resistance with abrasive, adhesive or difficult-to-machine materials such as cast iron, alloys, tool steels, copper and its alloys, Inconel and titanium alloys. As with TiN, feeds and speeds can be increased and tool life can improve by as much as 800%. Forming operations with abrasive materials should see improvements beyond those experienced with TiN.
Titanium aluminium nitride, (Ti,Al)N	Purple/black in colour, (Ti,Al)N is a high-performance coating which excels at machining of abrasive and difficult-to-machine materials such as cast iron, aluminium alloys, tool steels and nickel alloys. (Ti,Al)N's improved ductility makes it an excellent choice for interrupted operations, while its superior oxidation resistance provides unparalleled performance in high-temperature machining.
Chromium nitride, CrN	Silver in colour, CrN offers high thermal stability, which in turn helps in the aluminium die casting and deep-draw applications. It can also reduce edge build-up commonly associated with machining titanium alloys with Ti-based coatings.

IV. FUTURE SCOPE

After taking trial on pin on disc test setup we can conclude the wear analysis of the TiN coated and uncoated Tool and gauge materials. To analyze the effect of coating on life of tools and gauges after the whole experimentation is carried out.

V. CONCLUSION

Increase the tool and gauge life by using TiN coating on commonly used materials i.e. HSS M2, D2, OHNS grade using PVD coating method. To recommend appropriate gauge material with TiN coating from the available materials used for gauges such as HSS M2, OHNS and D2 material. To compare the characteristics of coated and uncoated tool and gauge materials.

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Design And Fabrication of Eddy Current Braking System

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Abstract— An eddy current brake is a new and revolutionary concept. The frequency of accidents is now-a-days increasing due to inefficient braking system. Electromagnetic braking system is a modern technology braking system used in light motor & heavy motor vehicles. This system is a combination of electro-mechanical concepts.

Keywords— *Brakes, Eddy current, Magnetic field, Electromagnetic brakes, Test rig.*

I. INTRODUCTION

Brakes are the device, which is used to retard the motion of moving vehicle for purpose of decreasing the speed and to avoid the accidents. Conventional brakes are not efficient in wet conditions. In conventional brakes, the kinetic energy converted into heat energy with the help of friction between the brake pads and brake disk. In this tremendous amount of heat is generated and lost to the environment, which in turns mitigate the life of brake pads, also they are prone to wear and tear, due to friction.

To avoid such energy losses and to make process more economical standard/conventional braking system is replaced by the more advance frictionless electromagnetic braking system, which works on the principal of electromagnets. There are many advantages of using electromagnetic controlled brake systems. The properties and behavior of the brake will be easy to adapt by simply changing software parameters and electrical outputs instead of adjusting mechanical components. This also allows easier integration of existing and new control features such as anti-lock braking system (ABS), vehicle stability control (VSC), electronic parking brake (EPB), etc., as well as vehicle chassis control (VCC) and adaptive cruise control (ACC).

II. HISTORY & BACKGROUND

In 1902 at the road in New York City called Riverside drive, Ransom E. Olds had arranged to test a new brake system against the tire brake of a four-horse coach and the internal drum brake of a Victoria horseless carriage. His Oldsmobile sported a single flexible stainless-steel band,

wrapped around a drum on the rear axle. When the brake pedal was applied, the band contracted to grip the drum. In the test, the Oldsmobile stopped in 21.5 ft. brake system, stopped in 37 ft. with the same speed of 14 mph. By 1903, most of other automotive manufacturer had adopted the car's braking system. And by 1904, practically all became all-dominant in the United State. meanwhile its rival, Victoria that use expanding car maker manufactured cars with an external brake on each rear wheel and -shoe internal drum design and the coach's tire

In Europe, during the „50s, particularly in Great Britain, the disk brake became more or less standard on the people cars. And only about 20 years, somewhere about year 1973, American car manufacturer adopted this kind of technology.

In 1902, a patent was issued to F. W. Lanchester for a nonelectric spot disk braking system that's similar in principle to what we have today but it use copper linings. Intense screech noise was produce when the linings make contact with the metal disk. By 1907, another Englishman named Herbert Froot, came up with the idea of lining pads with asbestos. With noise problem when braking is solved, car manufacturer quickly adapted this technology on both drum and disk brakes.

The application of hydraulic in braking emerged in 1918 from a young inventor named Malcolm Lougheed. This idea came because of the need of higher braking power due to fast driving behavior by community. He used cylinder and tubes to transmit fluid pressure against brake shoes, pushing the shoes against the drums. The Model ADuesenberg is the first passenger car to be equipped with fourwheel hydraulic brakes. Back in 1958, the new technology in braking system was developed by Road Research Laboratories in Great Britain called antiskid braking 7 system or as known as antilock braking system (ABS). The Jensen FF sports sedan was first applied with this ABS in 1966.

The braking technology still blooming and research are continuously made to achieve braking system that more reliable. Therefore, the braking-by-wire technology is now actively developed due to electric and hybrid cars that use

electric power. After year 2010, there is probability that automotive industry in the world will start to change the usage of the conventional hydraulic brake system to brake-by-wire, according to research study by Frost & Sullivan. With brake-by-wire, drivers have advantage over the vehicle in controlling the vehicle particularly in case of sheer emergency.

III. DESIGN ISSUES

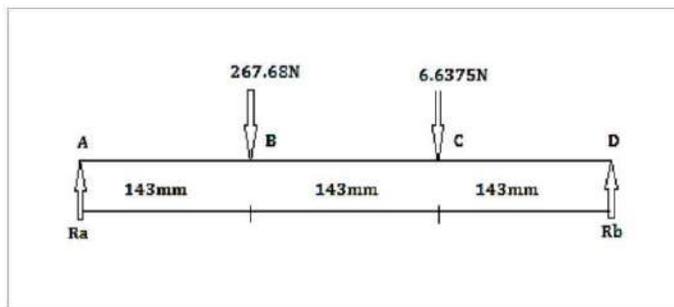
Design Calculations:

Design of shaft:

Firstly we have select the material for shaft is Mild Steel. Material selection for shaft is steel i.e., 1090

Table no.1 -Properties of shaft.

Designation	Yield Strength	Ultimate strength
1090	247 Mpa	841 Mpa



Asumptions,

Factor of safety(FOS)=2

Brinell hardness number(BHN)=255

Weight of pulley (Wp) =6.6375 N

Weight of Tyre (Wt) = 267.68 N

(Forces along Y direction) = reaction at bearing A - weight of tyre – weight of pulley + reaction at bearing B.

$$F_Y = R_a - W_t - W_p + R_b$$

$$= R_a + R_b = 274.31 \text{ N}$$

Moment about pt. A ,

$$M_a = (143 \cdot 267.68) + (6.63 \cdot 286) - (R_b \cdot 430)$$

$$\text{Reaction at B (R}_b) = 93.42 \text{ N}$$

$$\text{Reaction at A (R}_a) = 180.88 \text{ N}$$

$$\text{Resultant reaction (R)} = \sqrt{R_a^2 + R_b^2} = 203.58 \text{ N}$$

Maximum moment,

$$M = R_a \cdot 143$$

$$= 180.88 \cdot 143$$

$$= 25865.84 \text{ N. mm}$$

Maximum Torque,

$$T = F \cdot D_p / 2$$

$$= 274.3 \cdot 76 / 2$$

$$= 10423.4 \text{ N.mm}$$

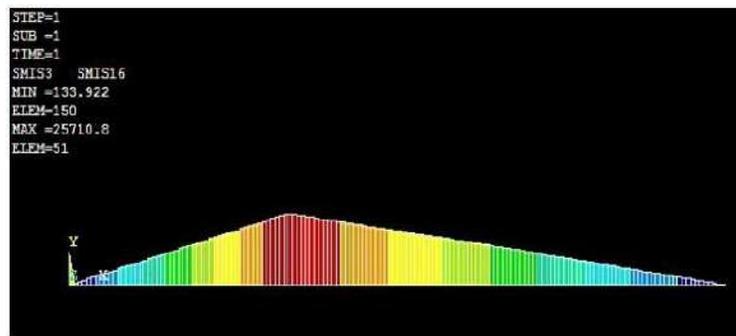


Fig - Bending Moment Diagram.

Table no.2-values of shock and fatigue factors.

SR. NO	Application	Kb	Kt
1	Load gradually applied.	1.5	1.0
2	Load applied with minor shock.	1.5-2.0	1.0-1.5
3	Load applied with heavy shock.	2.0-3.0	1.5-3.0

Select the value of shock and fatigue factors, i.e Kb and Kt for heavy shock

$$K_b = 2 \quad K_t = 1.5$$

Equivalent torque,

$$T_e = 54042.78 \text{ N.mm}$$

Allowable shear stresses,

$$= 0.3 S_{yt}$$

or (Whichever is smaller)

$$0.18 S_{ut} \quad \}$$

$$= 74.1$$

or

$$= 151.38$$

$$= 74.1 \text{ N/mm}^2$$

Maximum torque,

$$d = 15.48 \text{ mm}$$

Diameter of the shaft (d) = 15 mm

2 Design of Bearing:

According Diameter of shaft is 15 mm,

Table no.3 - dimensions and static and dynamic load capacities of bearing.

Dia of shaft	Outer Dia of bearing (D)	Inner dia of bearing	Dynamic load capacity (C)	Static load capacity (Co)	Designation
15	24	5	1560	815	61802
15	32	9	5850	2850	6002
15	35	11	7800	3550	6202
15	42	13	11400	5400	6302

Given: D=32 mm b= 9mm

Co=2.85 KN C=5.85 KN

Radial force (Fra) = 180.88 N

Axial force (Fa) = 90.44 N

Fa/Fra=0.5 Fa/Co=0.0317

Fa/Fr>e

Table no.4-X and Y factors for bearing.

(Fa/Co)	(Fa/Fra)>e	(Fa/Fra)>e	e
0.025	0.56	2.0	0.22
0.040	0.56	1.8	0.24
0.070	0.56	1.6	0.27

From Table,

X=0.0317 Y=?

X1=0.025 Y1=2

X2=0.0 Y2=1.8

So by

Interpolation, Y=1.910

X=0.0317

Equivalent dynamic load, Pe

= (XVFr+YFa)*Ka

=267.71 N.

Rated bearing life (in million revolutions),

L10=300 Million revolution.

Using Load Life Relationship

$L_{10}=(C/P_e)^a$

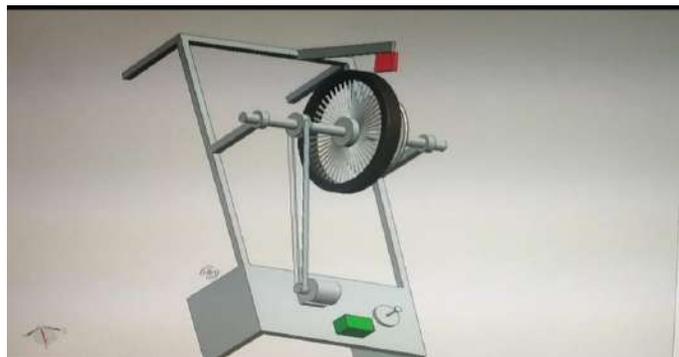
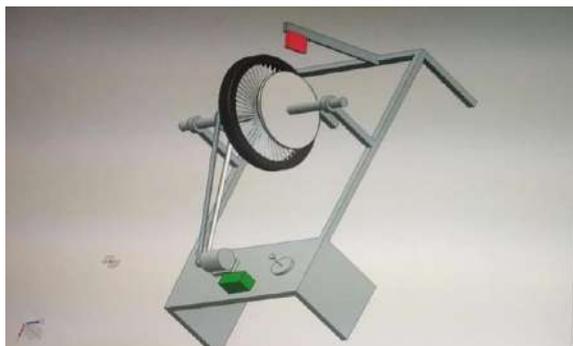
Here a=3(for Ball bearing)

$(300)^{1/3} * 267.71 = C$

=1.792

1.792 < 5.85

Hence, the design is safe.

FIGURE**IV. CONCLUSION**

In this paper we have presented the design of eddy current braking system. Eddy current brakes are non contact type frictionless brakes. We can conclude that it works effectively without wear and tear of brakes. Thus we studied the various magnetic forces responsible for braking and magnetic laws on which eddy current braking system works.

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Design, Fabrication and Performance Analysis of Solar Dryer with High Temperature Solar Collector

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Abstract— The solar air dryer used these days are heavy and bulky in nature. It also has low efficiency compared to its weight. Our project is to reduce the weight of the system and also achieve high temperature. For this purpose we have used DTH dish which has a single focal point about 10 cm in diameter. This dish is been covered with metalised polypropyln tephtheet film for optimum reflectivity. The use of dish type collector increases the heat flux at the receiver to get maximum temperature. the overall weight of the setup is very low and compact in size. We aim to dry food products like chillies dates, grapes etc. We have used a bolwer which vane type to circulate air through the system whose discharge is about 1.2 m³/min at 0.18HP. The chame used for drying has capacity of 0.46m×0.33m×0.59m Further we can also use a solar photovoltaic cell to reduce the power requirement of blower.

I. INTRODUCTION

The need for fossil fuel is increasing day by day so it is important to emphasis upon non conventional energy sources such as solar energy, wind energy, bio-gas. This paper focuses upon use of solar energy for drying purpose many researches were made in the field of solar drying but there efficiency as well as economy is low also they are bulky and heavy in construction. Over aim is to reduce the weight of system and also achive maximum temperature to dry food products like chillies, dates, grapes. We also emphasise upon use of parabolic dish instead of flat plate collector. Parabolic dish collector gives high heat flux at single focal point and it is compact and light in weight compare to flat plate collector.

Principle of drying-

Drying is basically a phenomena of removal of liquid by evaporation from a solid. Mechanical methods for separating a liquid from a solid are not generally considered drying. In the following section an attempt is made to provide a concise overview of the fundamental principles of drying process for

agricultural products. These principles are applied, in general, to mechanical conventional drying and here concerned mainly with solar drying. However in general, must be noted that conventional drying principles and phenomena are independent of the type of energy used. A major part of energy consumption during drying is for the evaporation of liquid water in to its vapour (2258 kJ/kg at 101.3 kPa). The water may be contained in the solid in various forms like free moisture or bound form which directly affects the drying rate. Moisture content is expressed either on dry or wet basis, e.g. moisture content in wet (???) basis is the weight of moisture per unit of wet material

II. HISTORY & BACKGROUND

Decades ago people use to dry food product in direct sun light. The drawback of this process is that controlled drying can not be achieved. Researches were made for control drying of food products at initial stage flat plate collector came in existence, the efficiency of flat plate collector in concentrating sun-light is also low, it also suffered from scarcity of sun light in winter and mansoon season further researches were made.

Literature review

Development of a parabolic solar dryer for efficient solar energy use in the rural areas in Ghana-*Maame Tabuah Duah* A comparative analysis of the drying rate of the solar dryer and open sun drying concludes that the open dryer performed poorly.

Review of solar-energy drying systems II: an overview of solar drying technology- *O.V. Ekechukwu and B. Norton*

From this paper we studied different types of dryer and drying method also their comparative study.

Energy, exergy, economic and environmental (4E) analyses of flat-plate and V-groove solar air collectors based on aluminium and copper- *Ahmed Soliman*

This study was conducted to evaluate energy- exergy and economic environment performance of different type SACs in Manisa Province Turkey.

Mechanical study of metallized polyethylene terephthalate (PET) films-*Manasvi Dixit*
 This paper gives information about metallized film and its different reflective properties.

III. DESIGN ISSUES

The main key component of our system is Receiver, parabolic dish, pump and Drying chamber.

Parabolic Dish: It is a simple DTH dish with focal point at a distance of 300mm from the most shallow point from the dish. It is covered with Metallized polyethylene terephthalate (MPET) which is high reflective film and is readily available in market. DTH dish are available in two typer one is single focal which is eound in shape and second one is bi-focal dish which is elliptical in shape 700×500 mm . we have specifically used a bifocal dish so thst we could get more heat flux at the focalpoint.



Figure 3(A). Parabolic Dish (Actual)

Receiver: It is manufactured from Galvanised sheet metal. The thickness of sheet metal is 1mm. its specific heat is around 0.49 kJ/kg°C. The cross section is taper in shape with inlet to the lager end and outlet is to the smaller end. The larger diameter is 3 inches and small diameter is 1.5 inches. For heating purpose at the inlet, air is passed over over copper coil covered in galvanized steel mesh which is placed exactly at the entry of receiver. The receiver is covered with foam insulation of optimum thickness to avoid any heat transfer due to convection.

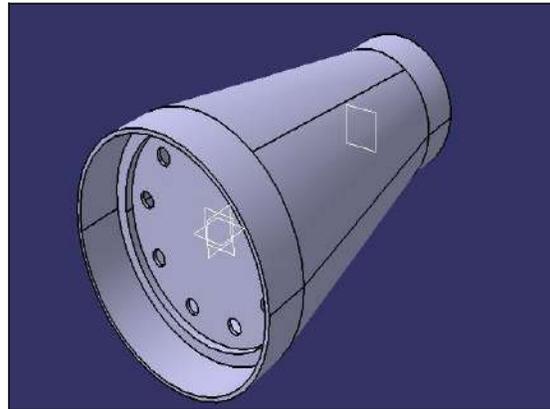


Figure 3(B). Model of Reciever

Pump: It is centrifugal pump which is run by electric motor, 0.18 HP, 2800rpm, 220V.

It suck the hot air from receiver and discharges it to the drying chamber.

Drying chamber: The drying chamber is the place where the drying function takes place. It is fabricated with plywood to minimize heat loss. The material has been chosen since plywood is a poor conductor of heat and it has smooth surface finish and also heat loss by radiation is minimum. The outer portion of the drying chamber is black

Description	Specification
Dimensions	0.46m×0.33m×0.59m
Material	Plywood
Number of doors	1
Number of Trays	3
Chamber Capacity	10Kg
Number of air vent	1

Working: The soul Objective of over project is to heat the air for drying food products using solar energy. To achive this we have used parabolic diah coated with MPET, this dish focuses the solar radiation on the receiver where the copper coils at the inlet of receiver gets heated. By using pump we draw air from the receiver which get heated due to the coils. This air is pumped to the drying chamber via air drying unit. Air drying unit removes moisture from the air which may deteriorate the food products After this the air is exhausted to the atmosphere.

III. Result and analysis

Sr.No	Time	Temperature(°C)				
		T1	T2	T3	T4	T5
1	11.30	103	70	63	61	31
2	12.00	110	73	65	63	32
3	12.30	113	78	69	65	33
4	1.00	117	80	70	66	36

Where, T1- Temp. at Focal point.
 T2- Temp. at Pump Inlet. T3-Temp. at Pump Outlet.
 T4- Temp. in Drying Chamber. T5- Ambient Temperature.

3.For a given tempature our system is much efficient considering the weight and size as compere to flat plate collector.

Future scope-

- 1.Tracking system can be integrated for more efficient working.
2. System can be scaled for various capacity.
- 3.Higher temperature can be obtained by increasing the number of dishes

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IV. FIGURES

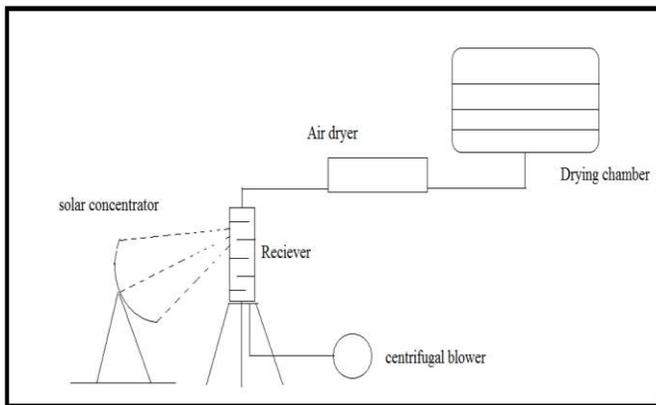


Figure 4. Setup Diagram.

V. CONCUSION

- 1.Parabolic dish collector of small size gives same heat flux as that of large flat plate collector.
- 2.The temperature achive at the drying chamber is higher than that of flat plate collector system.

Study of Anti-reflection Coating

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Abstract—An antireflection coating is type of optical coating applied to the surfaces of lenses and other optical elements to reduce reflection. It improves efficiency since less light is loss due to reflection. The primary benefit is elimination of reflection itself. Many coatings consist of transparent thin film structure with alternating layers of contrasting refractive index. Antireflection coating vastly improves efficiency by increasing transmission. The antireflection coatings are especially important if the system contains many transmitting optical elements also many lowlight systems incorporate antireflection coated optics to allow the efficient use of light. Antireflection coating method is conventional method use to form the layer on the glass surface to enhance its reflection properties. The antireflection layers decrease the reflection of light over a broad spectrum. These films are generally deposited on an outermost surface of an image display device. Anti-reflection coatings are developed to obtain the better refractive index to improve the performance. Antireflection coatings are used in wide variety of applications where light passes through an optical surface, and low loss or low reflection is desire. The antireflection coating widely implements on corrective lenses, camera lens elements and solar cell, which is used to reduce loss due to reflection. This coating is useful in situation where high transmission through a surface is unimportant or undesirable but low reflectivity is required. It produces very low reflectance.

Keywords—anti-reflection coating, improve efficiency, refractive index.

I. INTRODUCTION

Light reflection is an undesirable phenomenon in various optical instruments such as eye wears lenses sensors. The idea of antireflection coating was quite incidentally constructed by Lord Rayleigh in 19th century when he observed that the tarnishing on glass increasing its transmittance instead of reducing it this lead to strategy of achieving anti-reflectivity by gradually varying the refractive index Researchers are trying to reduce these undesirable lights by using different strategies, etching methods or patterning the surface with a film known as antireflection coating to lessen the reflectance and enhancing the transmission. Anti-reflective coating is

coherent layer formed from single or multiple application of a coating material to substrate. A coating material in liquid, past or powder which, when applied forms a protective decorative coating. it includes complex chemical subsequent, improving in enhancing the light transmittance and reducing the reflective light has been achieved by appropriate AR coatings. The transmission properties of coating are dependent upon wavelength of light being used, the substrates index of refraction, the index of refraction of coating, the thickness of coating and the angle of incident light. Destructive interference between two reflected beams occurs, cancelling the both beam before exit of the surface. The optical thickness of coating must be of odd number of quarter wavelength.

As light passes through an uncoated glass substrate, approximately 4% will be reflected at each interface. This results in a total transmission of only 92% of the incident light. Applying an AR coating on each surface will increase the throughput of the system and reduce hazards caused by reflections travelling backwards through the system.

To reduce the reflectance rate is to gradually reduce the refractive index of the film from refractive index of substrate to the refractive index of air. The refractive index of a material is a dimensionless number that describes how fast light propagates through the material.

II. LITERATURE REVIEW

"Ozlem DUYAR, H'useyin Zafer DURUSOY, had studied and design the antireflection and optical coating. He used to deposit the both side of glass substrate were deposited a two-layer coating of MgO/MgF₂ via electron vapor deposition to produce an antireflective coating in the visible and near infrared region. The order of high and low indices of film layer is crucial parameter for designing highly reflective optical coating. Quartz glasses were taken as substrate for simulation of multilayer film. TiO₂ and MgF₂ increases high refractive index. The reflectance rapidly approaches to increasing number of layers. This increases

the efficiency but in order to this will increase the number of layers [1]

Khuram Ali*, Sohail A. Khan, M. Z. Mat Jafri, Studied the effect of double layer SiO₂/TiO₂ antireflective coating on silicon solar cell. Silicon based solar cell have been fabricated for single layer SiO₂ and double layer SiO₂/TiO₂ antireflective coating using rf sputtering technique. a reflection spectrum of DLAR was measured which shows minimum reflection of 2.3% of 630nm. Double layer of SiO₂/TiO₂ coating could be valuable in achieving highly absorbent surfaces in opt electron devices and producing high efficiency low cost silicon solar cell. It prepared using 3-5 Ω cm boron doped monocrystalline Si wafer with one side polished. Si substrate initially removed by RCA method. Deionized water rinse and N₂ blow emitter region was fabricated by thermal diffusion of phosphorous atom in a quartz tube furnace at 1000C. it may difficult to achieve desire film thickness so it possesses low efficiency. This can make the environment more toxic and also the encountered the base material properties [2]

Feng Zhan, Zhipeng Li, Xiaoming Shen, Huan He, Jianmin Zeng designed the multi-layer antireflection coating for terrestrial solar panel cell. The reflectivity at normal incident SiO₂/ZnS double layer anti-reflection coating is typically implement on the Al film. It implements by the transfer matrix method to models the reflectance of the system as this approach to analyses the multilayer film. In this method the refractive index and thickness can be determined by using interference matrix to each layer analyzed. In these two different layers of SiO₂ and ZnS are deposited by the or the optimized by EAR [effective average reflectance] and WAR [weighted average reflectance]. This study shows that the optimization of antireflective coating by effective average reflectance is more convenient and more feasible. This method gives the uniform thickness on the base surfaces. This will not hammer the subject [3]. Vikas, Surya Narain Dikshit studied the antireflection coating for highly efficient solar cell. He used different technique to obtain better result for this. Antireflection coating are applied to photovoltaic cells to ensure gradual increase of refractive index as incident photons transverse from the air through to absorber to reduce backward reflection losses. application of the thin film of SiO₂ and TiO₂ using Sol-gel process where it utilized as antireflection coating on monocrystalline silicon wafer. sol-gel process is the method for producing small solid material from small molecules. Sol-gel provides uniform distribution of antireflection material on substrate than the plasma enhances chemical vapor deposition. Solar cell efficiency reduces because of reflection of light from surface silicon surface reflects light about 30% and gas reflects 32.58% [4].

Sajjadi, Seyed Pooyan studied durable thin films with a variety of properties can be deposited on a substrate by spin-coating or dip-coating. When the "sol" is cast into a mould,

a "wet gel" will form. With further drying and heat treatment, the "gel" is converted into dense materials. If the liquid in a wet "gel" is extracted under a supercritical condition, a highly porous and extremely low-density material called "aerogel" is obtained. The sol gel process is most promising technique to produce the uniform coating of the nanomaterials. One of disadvantages of the sol-gel process is its moisture sensitivity, which results in short shelf life of the solutions, viscosity and coating thickness variations with ambient conditions. Polycondensation may continue during storage, which is dependent also on storage temperature [5].

Medugu D. W., Adisa A. B., Burari F. W. and Abdul'Azeem M. A, studied the correlation between measured and predicted values of solar radiation was made. A series of daily measurements of the global solar radiation on a horizontal surface was recorded in Mubi with the aid of a constructed pyranometer. The monthly average value was determined. The monthly average daily solar radiation on horizontal surface was also determined using sunshine duration. These parameters were input in some radiation models to compute the solar radiation. Finally, a prediction of the global solar radiation from climatological data has been attempted. The predicted values have been compared with the corresponding measured values. Predictions and measurements were found to be in rather good agreement. These results indicate that the pyranometer developed may be used satisfactorily for the measurement of solar radiation in the world" [6].

C. K. Pandey and A. K. Katiyar presents a brief account of the general introduction, principle, experimental technique, measurements of solar radiation data, and review of literature of solar radiation models and describes present trend of solar energy modelling which is of major interest to solar energy engineers, architects, designing building, and thermal devices for optimum and efficient utilization of this nonconventional energy resource [7].

Che-Chun Lin, Dong-Sing Wu, Jung-Jie Huang, to improve the silicon nanowires solar cell of conversation efficiency is one of the most important and challenging problems, the antireflection coatings and surface passivation technique were very important. In this investigation, aluminium oxide coatings were deposited on silicon nanowires by using liquid phase deposition. The deposition solution of aluminium sulphate and sodium bicarbonate were used for aluminium oxide deposition. The Al₂O₃ film can cause different surface passivation at different annealing temperatures, allowing the Al₂O₃/SiNWs interface to form different amounts of negatively charged AlO₄ and positively charged SiO_x, that the mutually suppressing action of the two oppositely charged structure. Under the

optimal condition, the reflectance and effective minority carrier lifetime of liquid phase deposited aluminium oxide film were 0.97% and 31 μ s, respectively. The aluminium oxide films were used herein to fabricate antireflection coating and passivation film to ensure low cost, good uniformity, favourable adhesion, mass producibility, and the formation of large-area thin film; thus, the liquid phase deposition-antireflection coating film was highly favourable for silicon based solar cells [8].

Jogender Singh, Farhat Quli, Douglas E. Wolfe, J. T. Schriempf and Jason Singh, metallic and ceramic coatings including chromium, molybdenum, titanium carbide (TiC), and yttria partially stabilized zirconia (YSZ) coatings deposited by electron beam-physical vapor deposition (EB-PVD) will be presented along with their potential applications. Coatings are often applied on a variety of materials to extend the life of components under severe thermal, corrosion, wear, and oxidation environments. Interest in replacing chromium electroplating has sparked the use of EB-PVD technology for the repair of navy landing gear due to the high deposition rates of the EB-PVD process. The surface morphology, microstructure, and texturing of TiC films produced by reactive ion beam-assisted, EB-PVD will also be discussed for wear resistant applications in the cutting tool industry. [9]

Vikas kumar, Surya Narain Diksit, efficiency of solar cell is a big issue in the present time. Anti-Reflection Coating plays very important role in improving the efficiency of solar cell. Anti-Reflection coating is typically specified by either the maximum allowable reflectance at a single wavelength or by the average allowable reflectance over a specified wavelength range. Anti-Reflection coatings intended for a single wavelength or a single angle of incidence and very high performance can be obtained less than 0.1% reflectance per surface at visible wavelengths on glass substrates. A single layer of thin film of thickness around 100nm of Silicon Dioxide (SiO₂) and Titanium Dioxide (TiO₂), increases solar cell efficiencies by 3-4% and a triple-layer coating can improve its efficiency by 39-40%. The reflectance of solar cell can be reducing up to 3.2% by using Anti-reflection coating. So, multilayer coatings of SiO₂ and TiO₂ can be used for highly conversion of solar spectrum into electrical energy" [10].

uniformity, so according to field of application the material for antireflective coating and suitable method is used to develop these coatings.

III. CONCLUSION

We have studied the various methods to fabricate the anti-reflective coating. Antireflective coating has evolved into highly reflectance and glare reducing components for various optical and optoelectrical equipment. The different types of AR coating were studied and their fabrication techniques were described. Some methods are used to increase the strength where as some method increases the

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DESIGN & FABRICATION OF GREASE FILLING MACHINE FOR UNIVERSAL JOINT CROSS

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Abstract— To Improve the efficiency, increase the accuracy, reduce the cycle time, increase productivity and reduce the fatigue load caused to the worker while filling grease manually in the universal joint cross which is the most use in propeller shaft used in truck & other four wheeler vehicles. As the grease filling in Universal joint cross is done by manually in the industries we design & fabricated a machine which would semi-automatically filling the amount of grease required in the universal joint cross. The result would be accurate amount of grease being filled in universal joint cross and the fatigue load on worker would be reduced significantly.

Keywords: Grease, UJ cross, Linear Guide, Ultrasonic Sensor, Ball screw.

III. INTRODUCTION

Grease is the semi-solid substance used for lubrication in various fields in the industries. It is used in part where friction occurs so as to avoid friction, wear and tear. In many applications it plays such a vital role that its accurate use can cause or lead to severe damages. In this concept grease is filled manually in UJ cross. This manual practice is carried out since a very long time. UJ is used in propeller shaft, where axes of the shaft in vehicle are inclined to each other by some angle, to transmit torque and rotational motion from one shaft to another. While doing this work manually many complications occur we got to know about these complications while doing the survey company - Mahindra Sona Limited which is situated in MIDC Nashik Maharashtra 422002. In this company the grease filling in UJ cross is done by workers manually. 8 hours work shift is done, cycle time of each job is 35 sec to fill grease in all four holes. Expected outcome manually by each person per shift 714 jobs. But considering the

fatigue load on workers and the pace of work only 610-620 jobs are achieved by one

person. Thus it indicates that something is needed to be done for reducing/eliminating the fatigue load and even reducing the cycle time. So, here we will be concentrating on the following

Factors:-

- 1) Reducing/eliminating fatigue load on workers
- 2) Increase Efficiency and Accuracy
- 3) Increase Productivity

4) Reducing Cycle Time

We will be making a semiautomatic machine which will consist of a microcontroller, 2-DC Motors, Grease tank power supply, Two Channel Relay module Quick Connector, Ultrasonic Sensor, single ferrule Coupling, Linear Rail guide, Flexible bushings and a mechanism to bring the nozzles towards and away from center. In this Machine the UJ cross will be set at a position after which the sensor will sense if the job is placed well and then the grease will be dispensed in all four holes with the help of nozzles. The movement of nozzle will take place with the help of a D.C motor which will be controlled by the microcontroller for storing grease a tank will be used a mechanism controlled/worker with the help of a D.C motor will provide the pumping flow of grease in the supply lines. Even this motor will be controlled by the microcontroller with the help of C++ language we will be programming code/instructions & feeding that to microcontroller which will control the systematic working of the machine

Below are a few companies in which the manual working of grease filling in UJ cross is currently done

1-Mahindra Sona Limited, Nashik.

2-Hindustan Hardy Spicer Limited, Nashik.

A visit to Mahindra Sona Limited which is situated in MIDC Nashik Maharashtra, 422007 for a survey we observe the following conclusion. One JOB requires about 35sec to fill required (6grams) of grease in each of four holes. Thus, in one hour about 102 jobs approximately can be achieved.

The current Scenario is time consuming as the cycle time required for a single job is approximately 35sec which ultimately according to the calculations completes hardly 100jobs. The manual process is carried out in such a manner that the UJ is held by the worker in left hand and then the grease pouch is pricked from one end and then it is pressed and the grease is filled inside the hole. BUT, this practice involves uneven filling of grease at times excess or at times less. This may lead to losses or damage of the UJ in working conditions.

In order to avoid this damage at the customer end we have planned a machine which will tend to satisfy 6grams of exact proportion perfectly and also increase the productivity.

PROBLEM STATEMENT

The universal joint used in propeller shaft is held together using UJ cross. Since UJ cross is a continuously moving sub component of the main assembly of propeller shaft, it needs to be greased before assembly. The greasing process currently is carried by hand i.e. the grease is filled in pouches and filled in the cross manually. The problem occurring during this manual fill is uneven amount of grease is dispensed. As per ASME standards for propeller shafts 6 gms of grease should be present in one hole of UJ cross.

I. Indentations And Equations

Axial force

$$\begin{aligned} \text{Axial force} &= (\pi/4) * 100^2 * 40 \text{ Mpa} \\ &= 314159.26 \text{ N (Blind area)} \end{aligned}$$

(1/4) BSP Thread OD = 13mm

$$\text{Area} = (\pi/4) * 13^2 = 132.73 \text{ mm}^2$$

4 no. of couplings:

$$\begin{aligned} \text{Total area} &= 4 * 132.73 \\ &= 530.92 \text{ mm}^2 \end{aligned}$$

$$\begin{aligned} \text{Projected area} &= ((\pi/4) * 100^2) - 530.92 \text{ mm}^2 \\ &= 7853.98 - 530.92 \text{ mm}^2 \\ &= 7323.06 \text{ mm}^2 \end{aligned}$$

As per SKF shaft seat catalogue 0.34 Mpa pressure for cylinder design pressure for:

Force

$$\begin{aligned} \text{Force} &= P * A \\ &= 0.34 * 7323.06 \\ \text{Force} &= 2486.4404 \text{ N (Axial)} \end{aligned}$$

Cylinder operating height

(h) = 150 mm

Volume:

$$\begin{aligned} &= (\pi/4) * 100^2 * 180 * 10^{-9} \\ &= 1.178 * 10^{-3} \text{ (m}^3\text{)} \end{aligned}$$

Mass:

$$\begin{aligned} &= 1.178 * 10^{-3} * (980 \text{ Kg/m}^3) \\ &= 1.1191 \text{ Kg (For Prototype cylinder)} \end{aligned}$$

Design of cylinder Rod:

Material: AISI 1018 CS

Sut = 410 Mpa

Syt = 370 Mpa

Axial compressive load = 2486.44

FOS = 2

$$\begin{aligned} \text{Allowable stress (compressive)} &= 370/2 \\ &= 185 \text{ Mpa} \end{aligned}$$

$$\begin{aligned} \sigma = F (\text{axial}) / \text{Area} &= 2486.44 / (\pi/4) * (d)^2 \\ 185 &= 2486.44 / (\pi/4) * (d)^2 \\ d &= 4.136 \text{ mm} \end{aligned}$$

As this value is not practical to manufacture a rod, we have to consider the rod dia. As 20 mm

BALL SCREW SELECTION:-

-From PMI ball screw catalogue

- Ball screw size

IN KGF = 254.9291

Required screw size is OD = 14 mm

But

Standard Available screw size is 16 mm so we are ordered 16mm lead = 5mm standard Length is 300 mm.

Torque Required for Rotation of Screw:-

$$T = (F_a * l) / (2\pi * \eta)$$

Here:

F_a = Axial load

l = lead of screw

η = efficiency of ball

screw

$$T = (2486.44 * 5) / (2\pi * 0.9)$$

$$= 2198.04956 \text{ Nmm}$$

$$= 2.198 \text{ N-m}$$

IN Kg-cm

$$T = 22.4133 \text{ Kg-cm}$$

Standard available grease motor torque = 105 Kg-cm

Selection okay

PISTON & DISPLACEMENT FOR 24 gm:-

For 24 gm (6 * 4 no's)

2.5263 * 10⁻⁵ m³ for 24 gm

25263 mm³ is required displacement required height to be displayed is

$$25263 = (\pi/4) * (100^2) * (h)$$

$$h = (25263 * 4) / (\pi * 100^2)$$

$$h = 3.216 \text{ mm}$$

Linear guide Selection:-

FOS = 2

$$M = (2486.44) * (200)$$

$$M = 497288 \text{ N-mm}$$

M=0.745 KN-m

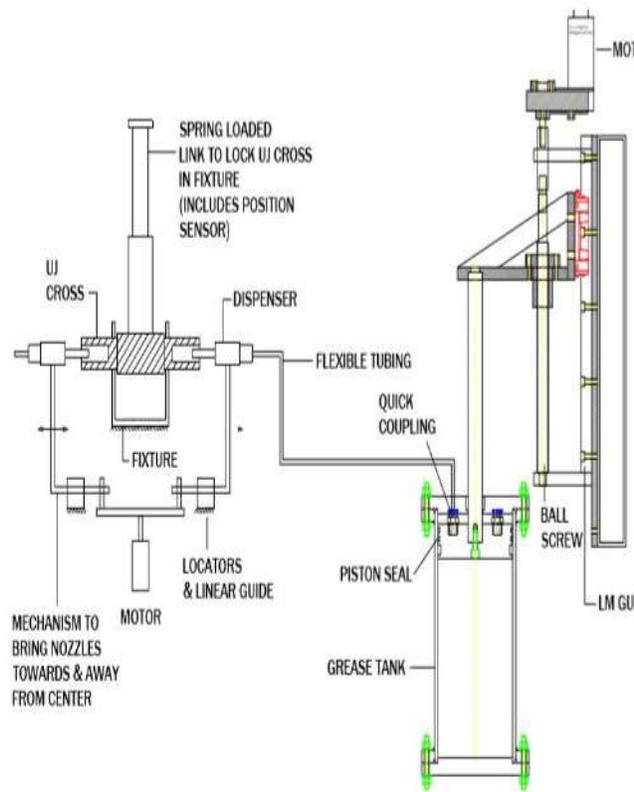


FIG:-Grease Filling Layout.

CONCLUSION

Thus we conclude that the cycle time is reduced for filling grease in single Universal Joint-Cross. As we see while filling the grease in Universal Joint-Cross manually the time required for a single piece is 35 seconds, while the same piece requires only 15 seconds by using machine. Thus 20 seconds are reduced to complete one piece. Hence reducing the cycle time. The time required to complete one job manually is more than twice the time required to complete one job by using machine. As a result the production will be more than double. Thus increasing the efficiency. Accurate metered quantity of grease is filled leading to minimizing the errors and also minimizing the variations. As there is very less human interference operator fatigue is also reduced significantly.

Acknowledgements

The authors of this paper sincerely thank our honorable Prof.S M Mahajan to support and guide for the project.

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- <https://shankar9119.files.wordpress.com/2013/07/dome-bhandari.pdf>
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- DESIGN, DEVELOPMENT AND STRUCTURAL ANALYSIS OF UNIVERSAL JOINT (Dhananjay S Kolekar, 2Abhay M. Kalje, 3Swapnil S Kulkarni).
- Research on the Lubrication Mechanism of Grease for High Speed Bearings. (Takayuki kawamuras.)

HYDRATE BASED REFRIGERATION SYSTEM

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Abstract:

A novel refrigeration system called hydrate-based refrigeration system was proposed, The system consisted of five parts, compressor/pump, hydrate formation tank, hydrate dissociation tank, expander and gas/liquid separator. Compared with conventional compression refrigeration cycle, hydrate-based refrigeration system uses hydrate formation tank to replace condenser to achieve heat release; hydrate dissociation tank for evaporator of achieve refrigeration. Methyl fluoride, cyclopentane/monofluoro cyclopentane and water were used to form hydrate as the working fluids.

some researchers begun to utilize hydrate to change the cooling cycle. Hydrate was mainly applied on cool storage air conditionings design, flow performance, thermodynamic and capability of cold storage. Douzet et al. designed a real size air-conditioning system using a tetrabutyl ammonium bromide (TBAB) semiclathrate hydrate slurry as secondary two- phase refrigerant. Delahaye et al. studied the rheological properties of tetra-n-butyl phosphonium bromide (TBPB) and carbon dioxide (CO₂) worked as the cold storage media. Lin et al.] made research on the thermodynamic properties of semiclathrate.

1 INTRODUCTION

HBRS Cool supply was achieved through hydrate dissociation at 278–282 K. Heat release was achieved by hydrate formation at 303 K. Difluoromethane and cyclopentane mixture can used as the working medium of hydrate refrigeration system. Air conditioning power consumption occupied a large proportion nowadays. A refrigeration system is proposed which called hydrate-based refrigeration system. HBRS, instead of evaporation and condensation of conventional air conditioner, cooled space through hydrate formation and dissociation. In recent years

2.LITERATURE REVIEW

- Author - Wenxiang Zhang, Yanhong Wang, Xuemei Lang, Shuanshi Fan.
- Year of published – 2017
- Description - Air conditioning power consumption occupied a large proportion nowadays. A refrigeration system is proposed which called hydrate-based refrigeration system. HBRS, instead of evaporation and condensation of conventional air conditioner, cooled space through hydrate formation and dissociation.

2.1 HYDRATE-BASED REFRIGERATION SYSTEMS

HBRS Cool supply was achieved through hydrate dissociation at 278–282 K. Heat release was achieved by hydrate formation at 303 K. Ohmura et al. found that the difluoromethane and cyclopentane mixture hydrate can form at 280.45–299.75 K and

0.027–1.544 MPa through thermodynamic model calculation and experimental test, which means difluoromethane and cyclopentane mixture can be used as the working medium of hydrate refrigeration system. Imai et al. reported the pair of difluoromethane and cyclopentane was one of the promising guest candidates suitable for a hydrate-based refrigerant. Mori et al. verified hydrate could work as cool supply medium in the air conditioning system through gas and water reacting to form hydrate on high ambient temperature, 303–308 K. The hydrate-based refrigeration system achieved cool supply directly. In this paper, three kinds of the hydrate-based refrigeration system were proposed, HBRs-A is multiphase compressor system, HBRs-B is single phase compressor with single phase pump (mixed cooling), and HBRs-C is single phase compressor with single phase pump (separated cooling).

2.2 HBRs-A. (MULTIPHASE COMPRESSOR SYSTEM)

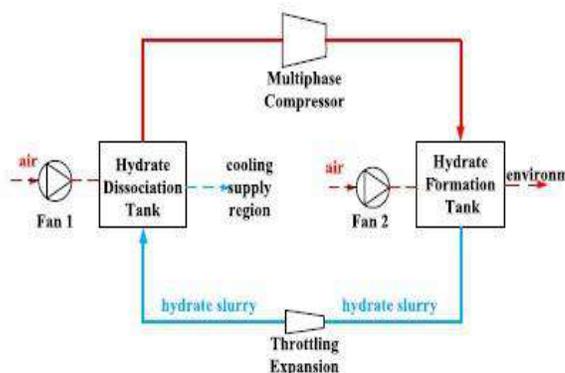


Fig. showed the flow sheet of HBRs-A. Hydrate dissociation tank worked as evaporator. Hydrate formation tank worked as condenser. Both of the gas and liquids were compressed by multiphase compressor. After multiphase compressor, mixture of pressurized gas and liquids flow into hydrate formation tank. Hydrate formed and heat was released to the environment. Then

decompression, it flew into hydrate dissociation tank for refrigeration. Hydrate dissociation occurred in dissociation tank to absorb heat from cooling region and achieve refrigeration. And the cycle was achieved.

2.3 HBRs-B.

(SINGLE PHASE COMPRESSOR WITH SINGLE PHASE PUMP- MIX COOLING)

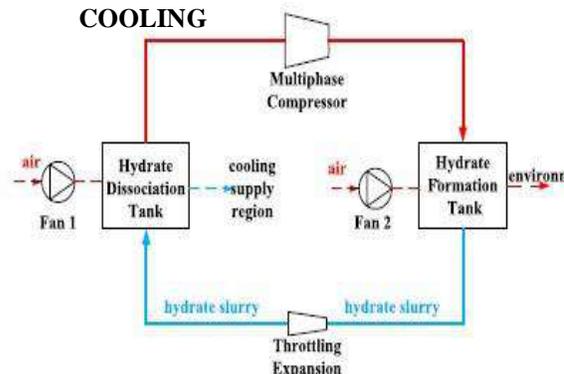
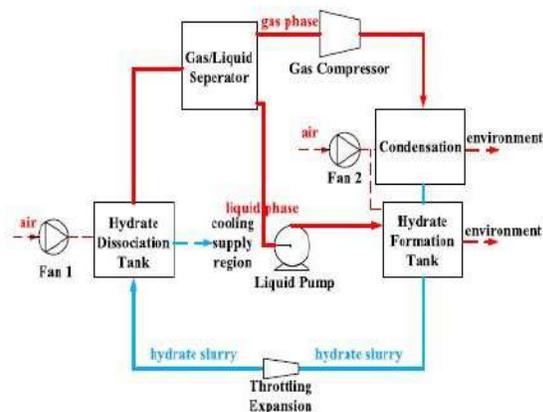


Fig. showed the flow sheet of HBRs-B. Hydrate dissociation tank and hydrate formation tank also worked as evaporator and condenser respectively. Low pressure gas and liquids flow each own tubes. Gas compressor flow the gas and liquid pump flow the liquids separately. Pressurized gas and liquids mixed into the hydrate formation tank to form hydrate, heat release achieved. Formed hydrate flow into hydrate dissociation tank through decompression. Hydrate dissociated with heat absorption, and cooling was achieved. Gas and liquids after hydrate dissociation was separated through gas-liquid separator. Gas came into the

2.4 HBRs-C.

(SINGLE PHASE COMPRESSOR WITH SINGLE PHASE PUMP- SEPERATED COOLING)



HBRS-C was similar to HBRS-B, shown in Fig.. The difference was that gas and liquids released heat divided. Pressurized gas flowed into condenser to release the heat to the circumstance. Then it flowed into hydrate formation tank, mixed with liquids to form Hydrate.

3.1 WORKING MEDIUM

phase equilibrium on methyl fluoride (CH₃F/R41), cyclopentane (CP)/monofluoro cyclopentane (FCP) and water (H₂O). Experimental data was showed in Fig. With the additive of CP or FCP, it could moderate hydrate formation condition. Hydrate formation pressure was relatively lower under high temperature. In view of the experimental data, 4 points was selected, (305.9 K, 2.988 MPa) and (293.0 K, 0.336 MPa) for the system of R41, CP and H₂O, (306.2 K, 2.051 MPa) and (293.3 K, as hydrate formation condition and dissociation condition of the HBRS performance simulation. The dissociation enthalpy of hydrate was calculated through the Clapeyron equation. The dissociation enthalpy of R41 + CP + H₂O system under the condition of (305.9 K, 2.988 MPa) was 269.6 kJ/kg, while for R41 + FCP + H₂O system under the condition of (306.2 K, 2.051 MPa) was 247.2 kJ/kg.

The dissociation enthalpy of this hydrate was higher than some other energy storage materials, such as

organic phase change materials, inorganic phase change materials and eutectics. And hydrate had a sufficient long term stability, while many phase change material had poor stability during thermal cycling. Mass concentration of CP or FCP was set to be 50 wt%, and hydrate crystal presented type II. It was 16 small cages, 8 big cages and 136 water molecules. Big cages involved 28 water molecules, the rest formed small cages. molecular structure of hydrate was 8C₅H₁₀_28H₂O_16CH₃F_108H₂O.

0.206 MPa) for the system of R41, FCP and H₂O. It was selected.

4.1 COEFFICIENT OF PERFORMANCE

- COP was the main index to reflect the capacity of refrigeration systems.
- The effect of temperature and unit on the COP of HBRS was as follow.

$$COP = \frac{Q_{cc}}{W}$$

- for hydrate-based refrigeration systems find that coefficient of performance was three or four times of the conventional compression refrigeration.
- In hydrate-based refrigeration systems, the large proportion in total power consumption is used in compressing fluids, which hinders the improvement of the coefficient of performance of the hydratebased refrigeration system.
- Coefficient of performances of different types of hydrate-based refrigeration systems are changed with the ambient temperature.
- The highest coefficient of performance was 8.01–8.97, which is HBRS using methyl fluoride, monofluoro cyclopentane and water.

5. CONCLUSION

- The large proportion in total power consumption is used in compressing fluids, which hinders the improvement of the coefficient of performance of the hydratebased refrigeration system.
- For hydrate-based refrigeration systems find that coefficient of performance was three or four times of the conventional compression refrigeration.
- Highest coefficient of performance was 8.01–8.97.

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ELECTRONIC STABILITY CONTROL

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Abstract:

ESC (Electronic Stability Control) was introduced on the mass market in 1998. Since then, several studies showing the positive effects of ESC has been presented. In this study, data from crashes occurring in Sweden during 1998 to 2004 were used to evaluate the effectiveness of ESC on real life crashes. To control for exposure, induced exposure methods were used, where ESC-sensitive to ESC-insensitive crashes and road conditions were matched in relation to cars equipped with and without ESC. Cars of similar or in some cases identical make and model were used to isolate the role of ESC. The study shows that the positive and consistent effects of ESC overall and in circumstances where the road has low friction. The overall effectiveness on all injury crash types except rear end crashes was 16.7 +/- 9.3 %, while for serious and fatal crashes; the

effectiveness was 21.6 +/- 12.8 %. The corresponding estimates for crashes with injured car occupants were 23.0 +/- 9.2% and 26.9 +/- 13.9%. For serious and fatal loss-of control type crashes on wet roads the effectiveness was 56.2 +/- 23.5 % and for roads covered with ice or snow the effectiveness was 49.2 +/- 30.2%. It was estimated that for Sweden, with a total of 500 vehicle related deaths annually, that 80-100 fatalities could be saved annually if all cars had ESC. On the basis of the results, it is recommended that all new cars sold should have ESC as standard equipment.

Key Words :Electronic stability control, Vehicle behaviour, Wheel force, Understeer, Oversteer.

1.INTRODUCTION

Electronic Stability Program (ESP) is an in-vehicle active control system which acts in loss of control situations to stabilise the vehicle. ESP technology has surpassed both Antilock Brake Systems (ABS) and traction control systems in enhancing the ability of in-vehicle technology to reduce the likelihood of unintended or unsafe vehicle behaviour. In simple terms, ESP uses a combination of

systems and sensors to monitor four aspects of vehicle dynamics and intervene to prevent vehicle spin (loss of control) through selective braking and acceleration (Dang, 2004; van Zanten, 2002).

This Preliminary Regulatory Impact Analysis examines the impact of the proposal to establish Federal Motor Vehicle Safety Standard (FMVSS) No. 126, Electronic Stability Control Systems

(ESC). ESC has been found to be highly effective in preventing single-vehicle loss-of-control, run-off-the road crashes, of which a significant portion are rollover crashes.

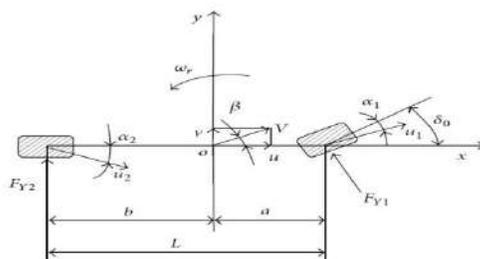


Fig 1:- DOF of Vehicle(Hindwadi Publication corporation)

In recent years, the benefits of ESP technology have received much attention in the media and many road safety experts and advocates have recognised the likely benefits to road safety in Australia. Several international studies have evaluated the crash reduction abilities of ESP. Table 1 presents a brief summary of some of the related research

and their findings. As can be seen, the crash reduction ability of ESP is well supported, with every study finding a

substantial reduction, most notably for single vehicle crashes and those involving SUVs.

2. LITERATURE REVIEW.

There are some points worth considering which may limit the real world applicability of some of this research, particularly to the Australian context.

Much of the research is based on comparisons between the crash rates of specific vehicle models before and after the introduction of standard and optional ESP technology (for example, Aga & Okada, 2003; Dang, 2004; Page & Cuny,

2006). According to Farmer (2004), there is currently insufficient evidence to take into account differences in the effectiveness of ESP technologies between different manufacturers.

Author	Region	Scope	Findings
<i>Dang (2004)</i>	U.S. All states	1997-2003 Fatal crash data	<ul style="list-style-type: none"> - Passenger Cars: 30% reduction in single vehicle crashes - SUVs: 63% reduction in single vehicle crashes
<i>Lie, Tingvall, Krafft, & Kullgren (2006)</i>	Sweden	1998-2004 Crash data	<ul style="list-style-type: none"> - All crashes excluding rear-end: 16.7 (± 9.3%) reduction - Serious/fatal crashes excluding rear end: 26.9 (± 13.9%)
<i>Aga & Okada (2003)</i>	Japan	1994-2000 (5 year vehicle life spans in this period) Crash data	<ul style="list-style-type: none"> - Single car accidents: 35% reduction - Head-on collisions: 30% reduction - Severe damage crash: 50% reduction - Moderate damage crash: 40% reduction - Casualty rate, single and head-on accidents: 35% reduction.
<i>Farmer (2006)</i>	U.S. 10 states	2001-2003 Crash data	<ul style="list-style-type: none"> - Passenger Cars: 33% reduction in single vehicle crashes - SUVs: 49% reduction in single vehicle crashes
<i>Page & Cuny (2006)</i>	France	2000-2003	<ul style="list-style-type: none"> - 44% reduction in relative risk of being involved in an ESP pertinent accident for ESP-equipped cars than compared to other cars

the desired wheel. The best way ABS is utilized is on slippery surfaces. There are three primary objectives of ABS: reduction in stopping distances, improvement on stability, and steer ability during braking.

ESC

Today, drivers rely on much more technologically-advanced systems to help them while in motion, Antilock Brake Systems (ABS) are the first of braking technology developments, This is a four-wheel system that prevents wheel locking by modulating the brake pressure when the driver makes an emergency stop.

Traction Control System (TCS) is the second technology. It deals with front to rear loss of friction between the tyres and the road during acceleration. [6] Electronic Control System (ECS) forms by incorporating the first two technologies, ABS and TCS, with additional capabilities. These are stability enhancement systems that have been designed to improve the car's lateral stability by electronically correcting and automatically assisting drivers in critical situations like under steer and over steer and in unfavorable conditions like rain, snow, sleet, ice. ESC systems have sensors that monitor the speed, the steering wheel angle, the yaw rate, and the lateral acceleration of the vehicle.

Data from the sensors are used to compare a driver's intended course with the vehicle's actual movement to detect when a driver is about to lose control of a vehicle and automatically intervene in split seconds by applying the brakes to individual wheels and possibly reducing engine torque to provide stability and help the driver stay on course.

3. HISTORY

Electronic Stability Program was invented by Bosch in 1995 and launched in the market with Mercedes Benz S600 coupe (ESP) and BMW 7 series E38 (DSC). At first, only luxury cars came with this feature. Many studies have reported the positive effects of ESC, also referred to as electronic stability program (ESP) or Dynamic Stability Control (DSC). Name of this technology varies with companies for example BMW refers to its system as Dynamic Stability Control (DSC), Mercedes calls it Electronic Stability Program (ESP), Toyota calls its Vehicle Stability Control (VSC), Ford calls it Advance Trac, and General Motors uses the name StabiliTrak, Active Handling, and Precision Control, Honda call its Vehicle Stability Assist. In this paper we would use the term ESC for sake of uniformity throughout the paper.[6] D. ESC: Past, Present, and Future

Three technologies have been major in the realm of vehicle stability control: anti-lock braking (ABS), traction control(TCS), and electronic stability Control (ESC).The development of ESC began in 1978 when Bosch introduced the world's first Anti-lock Braking (ABS). ABS was the first step in vehicle stability control. With the help of an electronic controller and brake hydraulic modulator, this system increased vehicle stability during heavy braking by preventing the wheels from locking. This system is very helpful while braking on slippery surfaces. ABS functions by using the wheel speed sensors to monitor each wheel and send that information to the central Electronic Control Unit (ECU). If the ECU detects an indication of any wheel locking up from the speeds of other wheels, it will use the hydraulic modulator to adjust the braking force applied to

The next step in the development of vehicle stability control was Traction control system (TCS) by Bosch in 1987. The goal of traction control is to stabilize the vehicle during acceleration by preventing the wheels from spinning

out of control. TCS seeks to improve traction of the wheels while accelerating. TCS uses all of the same components as previous ABS systems with the addition of engine management. By selectively applying the brakes to wheels that are slipping, TCS is able to increase the amount of traction for that wheel. This is especially important when the wheels are on surfaces with varying levels of friction. In addition to using the brakes to control the wheels while accelerating, TCS also uses engine management to control the vehicle.

By communicating with the engine controller, the TCS system is able to control the amount of torque that is sent to the wheels. If the system detects that a wheel has almost no traction with the road and is simply spinning, the TCS system reduces the torque delivered to that wheel. The engine management system adjusts the amount of torque by controlling airflow to the engine, fuel injection, and spark timing. By adjusting all of these elements, TCS is capable of greatly increasing or decreasing the amount of torque delivered to a wheel. Engine management greatly has reduced the dependence on braking systems, thus the amount of wear and tear on the brakes as well as the size of brakes necessary on the vehicle are reduced.

4.1 Understeer & Oversteer.

Understeer occurs when you go around a corner too fast and the front wheels don't have enough traction. As a result you end up going forward instead of turning. Understeer is common on front wheel drive cars.

Oversteer is the opposite, the car turns more than the driver intended to causing the rear wheels to slide out and the car to spin. Oversteer is common on rear wheel drive cars.



Fig.2 Understeer & Oversteer

4.2. Yaw

Yaw describes the rotation of the car about the z-axis. Yaw angle is the angle between a line pointing in the direction the car is moving and the car's x-axis (which is the direction the car is pointed).

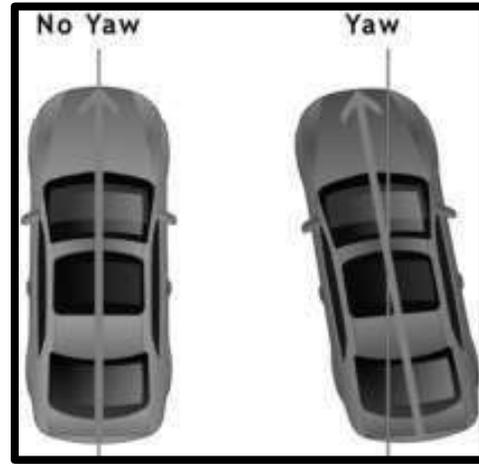


Fig 3: Various Car axes and alignments

5. SENSORS USED:-

5.1 Hydraulic unit with attached control unit .

The hydraulic unit executes the commands from the control unit and regulates, via solenoid valves, the pressure in the wheel brakes. The hydraulic modulator is the hydraulic connection between the master cylinder and the wheel cylinders. It is located in the engine compartment. The control unit takes over the electrical and electronic tasks as well as all control functions of the system.

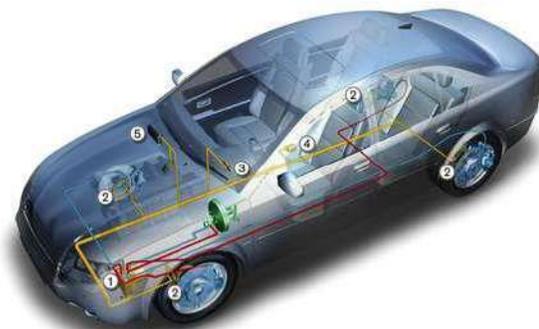


Fig.4 Various Sensor Used In Cars

5.2 Wheel Speed Sensor

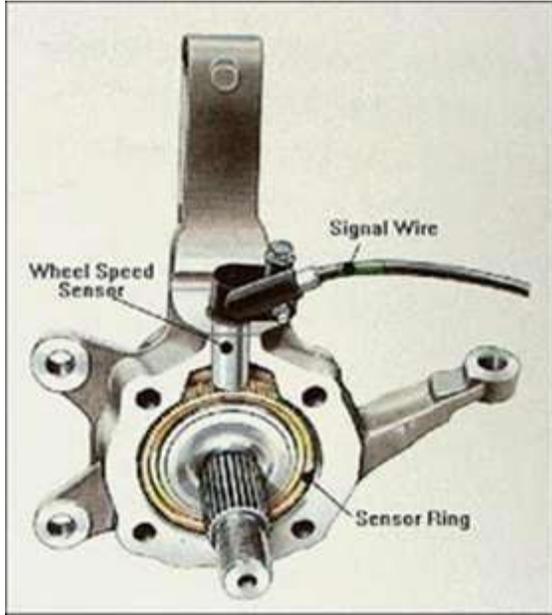


Fig 4. Wheel Speed Sensor.

The control unit uses the signals from the wheel-speed sensors to compute the speed of the wheels. Two different operating principles are used: passive and active wheel-speed sensors (Inductive and Hall-effect sensors). Both measure the wheel speed in a contact-free way via magnetic fields. Nowadays active sensors are mostly employed. They can identify both the direction of rotation and the standstill of a wheel.

5.3 Steering angle sensor.



Fig 5. Steering Angle Sensor

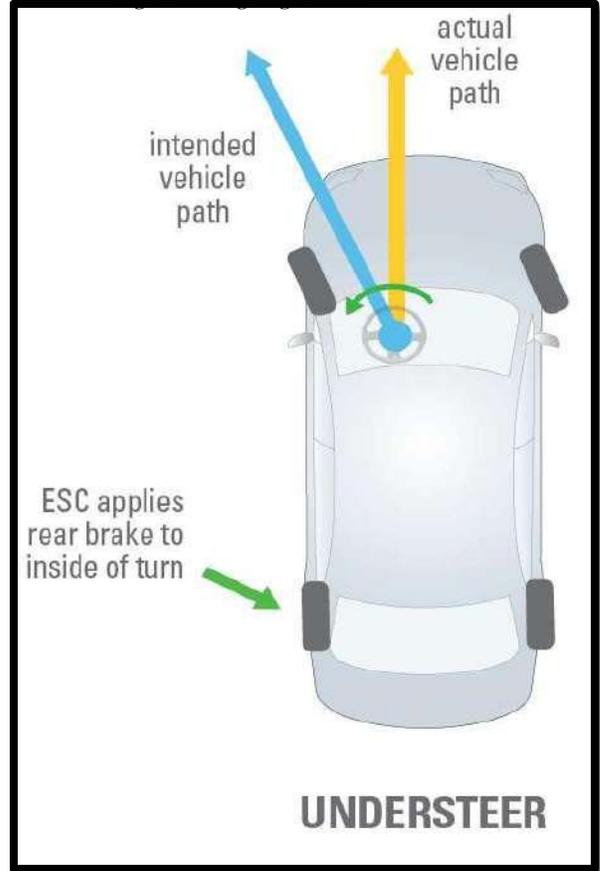


Fig 5. Steering Angle Sensor

The task of the steering-angle sensor is to measure the position of the steering wheel by determining the steering angle. From the steering angle, the vehicle speed and the desired braking pressure or the position of the accelerator

pedal, the driving intention of the driver is calculated (desired state).

5.4 Yaw Speed Sensor



Fig 6. Yaw Speed Sensor

A yaw-rate sensor registers all the movements of the vehicle around its vertical axis. In combination with the integrated lateral-acceleration sensor, the status of the vehicle (actual state) can be determined and compared with the driver's intention.

5.5 Communication with engine management ECU.

Via the data bus, the ESP control unit is able to

communicate with the engine control unit. In this way, the engine torque can be reduced if the driver accelerates too much in certain driving situations. Similarly, it can compensate for excessive slip of the driven wheels provoked by the engine drag torque.

6. WORKING

ESC is an always active system. A microcomputer or Electronic Control Unit monitors the signals from the ESC sensors and checks 25 times a second, whether the driver's steering input corresponds with the actual direction in which the vehicle is moving. If the vehicle is moving in a different direction, ESC detects the critical situation and responds instantly, independent of the driver. It uses the vehicle's braking system to "steer" the vehicle back on the intended path. With these braking interventions, ESC generates the desired counteracting force so that the car reacts as the driver intends. ESC can also intervene on the engine side to accelerate the driven wheels, so that the car is kept safely on the desired track. ESC utilizes speed sensors to monitor the road wheels, as well as a yaw speed sensor to detect its level of movement through the z axis (spinning) and a steering wheel angle sensor. It also uses traction control and anti-lock braking systems as it can't work all on its own. Traction Control is used in order to drop acceleration from the wheel that is deemed to be slipping. ESC also uses ABS to activate the brakes on individual wheels at the required level to prevent the driver from losing control.

6.1 Oversteer

You are approaching an obstacle unknowingly, as the obstacle becomes visible you steer hard in the other lane and to regain control you steer back to get into your lane. This creates a moment across the z-axis of the car and the rear wheels start, under forces of inertia, skid off and slide causing the condition of oversteer. This can even lead to Rollover if the speed



Fig 7. Oversteer

If ESC is switched on, this condition can be completely avoided. ESC measures the changes in Yaw and communicates this data to ECU. The ECU uses the steering input that shows the intended direction of the driver, yaw that shows the direction the car is going in and applies brakes to the outer front wheel to compensate the yaw torque which was oversteering the car. This braking of outer front wheel creates a counter torque to bring the car back to the intended course/path and the crash is avoided all together.

6.2 Understeer.

You are approaching a turn at a higher speed than the turning friction at your front wheels allow, now if you turn hard in your intended direction, the car will not be able to steer adequately and keep going in the direction it was going before due to inadequate friction at front wheels.

7.2. Hydraulic Brake Assist

In critical driving situations, drivers often brake too hesitantly. The Hydraulic Brake Assist identifies a possible emergency braking situation by monitoring the pressure on the brake pedal as well as the pressure gradient. If the driver does not brake strongly enough, the Hydraulic Brake

Assist increases the braking force to a maximum. The stopping distance is hence reduced.

7.3. Load Adaptive Control

The volume and position of a commercial vehicle's load can vary considerably from trip to trip. The load has an important impact on the braking, the traction, the cornering ability and the roll-over tendency. The ESC Load Adaptive Control identifies changes in the vehicle mass and center of gravity along the longitudinal axis of the vehicle and adapts the interventions of the safety systems ABS, TCS and ESC to the vehicle load. In this way, Load Adaptive Control optimizes braking effectiveness, traction and stability. In addition, it reduces the risk of roll over via the improved utilization of Roll Over Mitigation and minimizes brake- pad wear by optimizing the distribution of braking forces.

7.4. Roll Over Mitigation

The loading and the higher center of gravity of light commercial vehicles make them reach a critical lateral acceleration faster than passenger cars. The risk of roll

Fig 8. Understeer

If ESC is switched on, this condition can be completely avoided. ESC measures the changes in Yaw and communicates this data to ECU. The ECU uses the steering input that shows the intended direction of the driver, yaw that shows the direction the car is going in and applies brakes to the inner rear wheel to compensate the yaw torque which was understeering the car. This braking of inner rear wheel creates a counter torque to bring the car back to the intended course/path and the crash is avoided all together.

7. Features

7.1 Hill Hold Control

Hill starts are difficult when the vehicle is heavily loaded.

The driver has to operate brake, accelerator and clutch pedals very fast in order to prevent the vehicle from rolling

backwards. The ESC Hill Hold Control facilitates a hill start by keeping the brakes applied for about two more seconds after the driver has already released the brake

pedal. The driver has enough time for switching from brake to accelerator pedal without using the handbrake. The vehicle drives off comfortably and without rolling backwards.

over is thus considerably higher. The Roll Over Mitigation function constantly monitors the vehicle behavior with the help of the ESC sensors and intervenes when the vehicle threatens to roll over. Roll over Mitigation brakes

individual wheels and reduces the driving torque to prevent roll over and to stabilize the vehicle.

7.5 Tyre Pressure Monitoring System

A loss of tyre pressure leads to a deviant rotation speed of

the wheel concerned. By comparing the wheel speeds a potential tyre deflation is detected. This value-added function permits tyre pressure monitoring without the use

of pressure sensors in the tyres.

7.8 Trailer Sway Mitigation

Trailers sway easily. A minor steering error, a gust of wind

or a bump on the road surface can cause a critical increase in the swaying movement. The counter steering and the acceleration of the towing vehicle make the critical situation even worse. With the help of the ESC sensors, Trailer Sway Mitigation identifies these swaying movements of the trailer and intervenes by braking individual wheels of the towing vehicle.

The vehicle and trailer are slowed down to an uncritical speed and stabilized.

8. BENEFITS & ADVANTAGES.

1. At least 40 percent of fatal road accidents are the result of skidding. Studies show that Electronic Stability Control (ESC) would reduce skidding accidents by up to 80 percent. In the European Union it is estimated that ESC could prevent more than 4,000 deaths and 100,000 injuries each year. In the US, these figures could raise to 10,000 deaths and 240,000 injuries.

2.If ESC is installed in a car, the risk of a fatal accident is decreased by 25%. The risk of accidents in which serious injuries occur are reduced by 11%, and overall, all accidents are reduced by 7%.

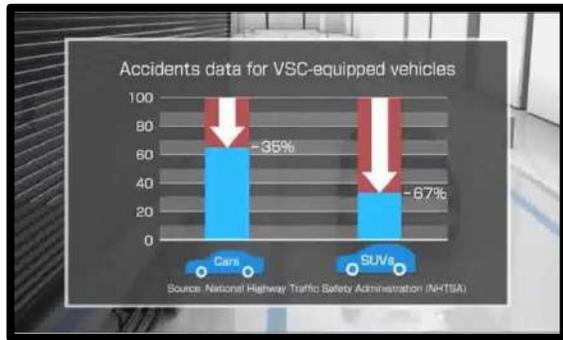


Fig 9. Reduction of accidents with ESC

3.ESC is particularly effective at preventing crashes in slippery conditions, with 20% less risk of a crash in icy conditions, 9% in wet conditions, and 5% in dry conditions.

4.If 10% of cars were to be fitted with ESC, 779 crashes could be prevented every year, saving £96 million. This saving would rise to a total of 7800 prevented crashes, which would save £959 million per year.

5.Studies of the effects of ESC show differing levels of benefit for different countries. For instance in America, a report by the Insurance Institute for Highway Safety suggested that the risk of overturning a car would reduce by 77%. Similarly, a University of Michigan report suggested that ESC could reduce the likelihood of non-fatal crashes on wet ,snowy, or icy roads by 75% for cars, and 88% for SUVs, along with a reduction on dry roads of 40% forcars and 53% for SUVs.

9. CONCLUSIONS.

- ESC was found to reduce crashes with personal Injuries, especially serious and fatal injuries.
- The effectiveness ranged from at least 13% for Car occupants in all types of crashes with serious or Fatal outcome to a minimum of 35% effectiveness For single/oncoming/overtaking serious and fatal Crashes on wet or icy road surface.

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Needle Filling Machining

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Abstract— Needles plays an important role in various types of bearings. Needles facilitate easy and smooth joint movement. Needles are the integral part of bearing cups used in universal joints. These bearing cups consist of a metallic cup, needles, rubber washer and an oil seal at the top. There are various manufactures of bearing cups in India. The needle filling process is one of the tedious and time consuming process. This process requires a lot of man power and manual work. In this process an empty cup is taken and then grease is applied to the bearing cup at its inner periphery. Once grease is applied needles are placed one by one manually. This paper aims to develop a mechanism for the above stated process. This mechanism will reduce the human efforts and time. The concept behind development of mechanism is using the adhesive nature of grease. Since grease has high viscosity the needles get stick to it. We are developing mechanism in which the needles will get stick to the bearing cup in one stroke. Also we are planning to develop a mechanism for automatic refilling of needle in the fixture used for sticking needles in the bearing cup. The expected outcomes of this idea are to decrease the cycle time required for needle filling, to reduce human efforts which are currently wasted, to increase the productivity and to increase the profit of the company.

Keywords— bearing cups, Needles, automatic refilling, cycle time, human efforts etc.

I. INTRODUCTION

1.1 Problem Statement-

Universal joints used in propeller shafts generally has a sub assembly in both ends. This sub assembly consists of flange, stub, UJ cross bearing cups etc. The bearing cups used have a sub assembly too. The sub assembly of bearing cup consists of a metallic cup, a layer of grease, needles & oil seal. There is a standard procedure of bearing cup sub assembly. Initially the inner side of bearing cup is applied with grease. After applying grease the needles are placed in the bearing cup one by one by hand. After placing the needles, the bearing is fitted with an oil seal in order to retain the grease and needles. This oil seal is pressed using a hand press. The above stated process is very tedious and time consuming. Also it requires a lot of man power as the production requirements are high.

Hence we are planning to develop a machine which will make the process of needle filling easy and less time consuming.

1.2 Objectives-

- To reduce the time required for needle filling into the bearing cups.
- To reduce the human efforts wasted in tedious job of needle filling.
- To increase the productivity of the assembly line.
- To help in improvement in OEE i.e. Overall Equipment Efficiency of the line.

II. History & Background

2.1 Paper no 1: Failure Analysis of Bearing Cup

Power transmission system has different constructive features according to the vehicle's driving type which can be front wheel drive, rear wheel drive or four wheel drive. In rear wheel drive system, elements of the system include clutch, transmission system, propeller shaft, joints, differential, drive shafts and wheels. Each element has many different designs and construction properties depending on the brands of vehicles. The carden shaft also called drive shaft is used to transmit motion from gear box to differential. The problem identified after critical analysis of the drive shaft assembly. In that bearing cup assembly was getting cracked during assembly operation in universal joint assembly. This was highest rejection, hence it was decided to eliminate bearing cup failure in drive shaft assembly with cost effective solution. This paper will highlight the methodology adopted for finalizing the solution to this problem by means of the FEA analysis supported by logical reasoning. Various Heat Treatment processes are compared and it was found that Carbonitriding process is the optimum solution which will reduce the failure of bearing cup as well as reduce the overall manufacturing cost.

III. DESIGN ISSUES

3.1 Design Of Shaft:

3.1.1 Shear Stress in a shaft

$$\text{Shear stress, } SS = \frac{16 T}{\pi D^3}$$

Where,

T = torque= Force x Radial distance.

Force= power of motor= 1kW

1 kW= 1000 N

Therefore,

Torque T= 1000 N x 0.008 m

T= 8 Nm

Now,

SS= 3.125x10⁷ N/m²

$$D = \sqrt[3]{\frac{16T}{\pi SS}}$$

D = diameter of the shaft =

D= 0.005 m

i.e. D= 5 mm

Considering FOS as 1.5

Final Dia. D_F = D x FOS

Therefore,

D_F= 5 x 3.1 = 15.5 mm ≈ 16 mm (AT ROCKER END)

Table for Factor Of Safety:

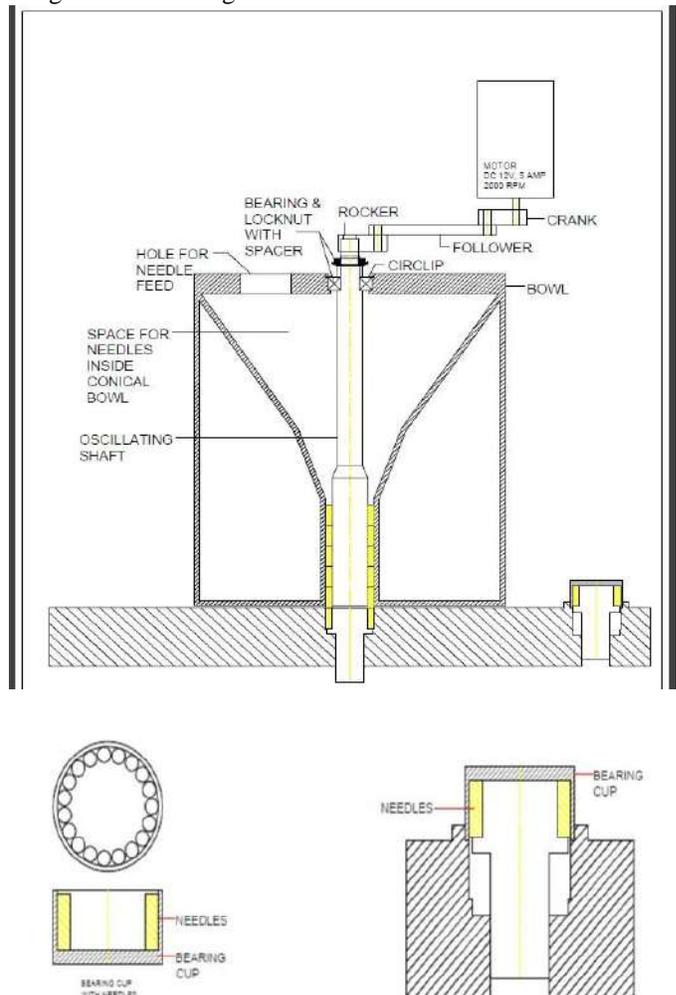
Equipment	Factor of Safety - FOS -
Aircraft components	1.5 - 2.5
Boilers	3.5 - 6
Bolts	8.5
Cast-iron wheels	20
Engine components	6 - 8
Heavy duty shafting	10 - 12
Lifting equipment - hooks ...	8 - 9
Pressure vessels	3.5 - 6
Turbine components - static	6 - 8
Turbine components - rotating	2 - 3
Spring, large heavy-duty	4.5
Structural steel work in buildings	4 - 6
Structural steel work in bridges	5 - 7
Wire ropes	8 - 9

General Recommendations:

Applications	Factor of Safety - FOS -
For use with highly reliable materials where loading and environmental conditions are not severe and where weight is an important consideration	1.3 - 1.5
For use with reliable materials where loading and environmental conditions are not severe	1.5 - 2
For use with ordinary materials where loading and environmental conditions are not severe	2 - 2.5
For use with less tried and for brittle materials where loading and environmental conditions are not severe	2.5 - 3
For use with materials where properties are not reliable and where loading and environmental conditions are not severe, or where reliable materials are used under difficult and environmental conditions	3 - 4

FIGURE AND TABLE

Rough CAD Drawing of Shaft to be used:



IV. RESULT AND ANALYSIS

After implementing this mechanism we have reduced the needle filling timing from 56 secs to 18 secs. This has improved the efficiency of the process by 135.74 %. This mechanism has saved manpower and improved the OEE (Overall Equipment Efficiency)

V. CONCLUSION

From this paper we successfully conclude that the mechanism has effectively reduced the cycle time with increasing the productivity by 135.74 %.

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Sensing and Control of Temperature, Humidity and Water Level in a Poultry Farm

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ABSTRACT - The chicken production in the world has been increasing gradually because of standardized farming management and good manufacturing practices.

According to world's agricultural produce survey, chicken is the most favourite produce, since it is a nutrient rich food providing high protein, low fat and low cholesterol, and lower energy than other kinds of poultries. Nowadays automation plays very important role in our life. Here we concentrate on the combination of wireless sensors and mobile system network to manage and remotely monitor environmental parameters in poultry farm.

The environmental parameters like temperature, humidity and water level are monitored and controlled automatically. The person in-charge can able to get the knowledge regarding the interior atmosphere of poultry farm by receiving a message on his mobile number. Based on the message received the owner can take appropriate action to control the parameters. In addition we have also designed to control and monitor the food valve so that sufficient food is always available in the plate.

The environmental conditions monitoring and control's ability is crucial and demands a good level of research in fields ranging from the change in climatic conditions in agriculture and zoology. According to world's agricultural produce survey, chicken is among the most favorite produce, since it is a nutrient rich food providing high protein, low fat, low cholesterol, and low energy than other kinds of poultries.

INTRODUCTION

In the growth of the chicken climate plays a vital role. Smart poultry farm is designed in such a way that the climate can be changed by ventilation, cooling fan and exhaust fan. The parameters temperature, humidity, and water level are monitored and controlled with the help of PIC microcontroller. In contemporary world automation plays a vital role. Automation of poultry farm by using wireless sensor network and mobile communication system. Chicken is the most favourite produce in today's world because it is a nutrient rich food with high protein, low fat and low cholesterol than other poultries. Environmental parameters of a poultry farm such as temperature, humidity and water level are monitored and controlled automatically to increase the productivity of chicken. Food valve also controlled and monitored with the help of DC motor without human interference. By connecting all the sensor modules to the microcontroller all sensor values are acquired then using Wi-Fi module it will be uploaded to the web page. The person in-charge of the poultry farm can get the internal environmental situation of poultry farm through PC or mobile phone using internet. This system will control temperature, ammonia gas and intensity of light with the help of respectively cooling fan, ventilation window and light ON/OFF without human interference. Based on the threshold values it will switch on the devices. System design provides automated poultry, reduces man power and increases production of healthy chicken.

From the last few decades, around the globe, there has been an increased level of awareness regarding the food safety and there has been a high demand for better quality food. This has forced many countries to adopt new protocols to change all manual farms into automated farms. In this way, smart poultry farms have a great impact on increasing the productivity of chickens. This paper focuses on modern technologies for poultry farming to control all environmental parameters which affect the growth of the chickens. If environmental conditions are not up to the mark then there may be harmful effects on the digestive, respiratory and behavioural changes in the chickens. If chickens get a suitable atmosphere and proper water then they may grow rapidly and their health will be good so their weight will increase. In the growth of the chicken, climate plays a vital role. Smart poultry farms are designed in such a way that the climate can be changed by ventilation, cooling fans and exhaust fans. Environmental parameters are monitored and controlled with the help of microcontrollers. Monitored sensor values can know the internal environment of the poultry farm through mobile. Poultry farming is the process of raising domesticated birds such as chickens, ducks, turkeys and geese for the purpose of farming meat or eggs for food. This research focuses on modern technologies for poultry farming to control all environmental parameters like temperature, humidity, ammonia gas that affect the growth of the chickens. If the environmental conditions are not up to the mark then there may be harmful effects on the digestive, respiratory and behavioural changes in the chickens. If chickens get a suitable atmosphere and proper food then they may grow rapidly and their health will be good so their weights will increase. Climate plays a quite important role in the growth of the chicken.

LITERATURE SURVEY

Archana M P1, P.G. Student, Department of Computer Science and Engineering, P.E.S. College of Engineering, Mandya, Karnataka, India. The system

could work on the application of smart phones helping the owner to monitor real-time environmental contexts such as temperature, humidity, ammonia gas, light intensity etc. It describes an Integrated Solution for Smart Poultry Monitoring Using WSN. [1]

Eric Hitimana, Gaurav Bajpai, Louis Sibomana. Department of Computer and Software Engineering, Richard Musabe PhD student. Control mechanism helps to provide time-to-time water supply to the chickens as well as help to avoid the wastage of water. Usage of IoT helps the farmer to monitor the internal environment of the poultry farm and also get all details about the farm from anywhere and anytime. [2] Siwakorn Jindarat, et al.. To solve the problem, authors utilized Raspberry Pi and Arduino Uno. This framework should screen the encompassing parameters of poultry conditions counting moisture, temperature, atmosphere quality and the channel fan switches. This framework is discovered exceptionally basic and valuable for farmers, as they can successfully control the poultry cultivation whenever and from anywhere [3].

Rupesh I. Muttha, et al. With the assistance of present-day strategy, it is additionally conceivable to screen the ecological conditions like moisture and temperature. For an entire care of chicken, it is essential to screen and control the earth of poultry for the better development of chickens [4].

Boopathy S, et al. has elaborated the performance of a poultry farm using an embedded automation. This system discussed the measurement of different environmental

parameters of the poultry farm such as temperature, humidity, level of water and valve control [5].

Rupali B. Mahale, et al. The system highlights the technology-based solution for low cost, asset saving, quality-oriented and productive management of poultry farming. This system intended to explore utilizing an intelligent system using an embedded framework for design of smart farm [6].

O. M. Olaniyi, et al. has studied Associate in Nursing Intelligent Poultry Feed and Water Dispensing System victimization mathematical logic management Technique. Fuzzy logic system able to provide feed and water for birds during specific interval of time. System reduces workload of poultry workers, cost benefits has increased [7].

Sneba. M. et al proposed an integration of wireless sensors and mobile system network to control and monitor following environmental parameters: temperature, relative humidity, air impurity levels in a poultry farm. They used DHT22 sensor module for temperature and relative humidity, MQ135 sensor module for air pollution level all of those measurements are remotely monitored through the internet. [8].

Mohannad Ibrahim, et al described an approach to build a cost-effective standardized environmental monitoring device using the Raspberry-Pi (R-Pi) single-board computer. The system was designed using Python Programming language and can be controlled and accessed remotely through and Internet of Things. It's also designed to detect earthquakes through an assembled seismic sensor [9].

Ms. Minal Goswami, Kirit Bhatt presented the design and development of CC3200-based Cloud IoT for measuring

humidity and temperature. CC3200 is the first SimpleLink WIFI internet-on-chip LaunchPad developed by Texas instruments, USA in 2014. The HRT393 sensor is used for measuring humidity and temperature. Measured parameters are sent to the Cloud servers of AT&TM2X Cloud technology (HTTPS) [10].

Gerard Corkery et al discussed about using smart sensing technologies into the poultry industry to monitor critical environmental parameters which are relevant to poultry production include inter alia air temperature, relative humidity, light, air speed and air

quality (in particular CO₂ and NH₃ concentrations).[11]

METHODOLOGY

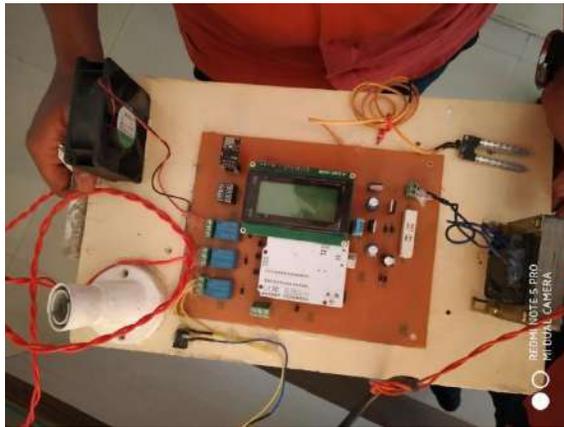
PIC has been used as a controller and ESP8266 is used as wifi module. DHT11 has been used as a temperature sensor, which can monitor and observed the environmental temperature and send the information to the microcontroller which can send the current data and perform action according to that.

When temperature goes beyond threshold value then automatically cooling fan will be ON to control the internal temperature of poultry. The threshold value of temperature is 40.6 degree to 41.7 degree Celsius. Once, the temperature is below the threshold value cooling fan will automatically turn OFF. Similarly, DHT11 is used as a humidity sensor. This can monitor and observed the environmental humidity and send the information to the microcontroller which can sense the data and perform action according to current value of humidity in a poultry farm. When humidity goes beyond threshold value then to control that humidity Exhaust fan will automatically ON. Once, internal humidity of poultry farm is under control then fan will automatically turn OFF.

Water level control mechanism for a poultry farm has been designed. It has been able to provide water to the chickens as per the requirement. So water should not get waste and health of the chicken will automatically monitor. Similarly, Level Sensor has fixed in a water tank to

measure the level of water. The threshold value of water level has fixed. Once, the water level goes beyond that fix level then water may fill in that the tank. All the environmental data should be display on the LCD display. It displays the data like temperature, humidity, and water level as in the signed language which helps workers of poultry farm to know the details of internal environment of poultry farm easily. Acquired all the

sensor values are uploaded to the web page. The person incharge of poultry farm can see these data to their mobile phone or personal computer using internet from anywhere at any time.



CONCLUSION

The embedded system is an innovative technology for chicken farming, which changes a traditional farm to a “Smart Farm” or “Intelligent Farm”. In addition, the system could work on the application of the smart phones helping the owner to monitor real time environmental contexts such as temperature, humidity, water level etc. It describes an Integrated Solution for Smart Poultry Monitoring Using WSN (wireless Sensor Network). Monitoring environmental parameters in a real time industry are crucial. Various environmental parameters for effective growth of chickens have been identified and defined. It also explains the method of Food Control Mechanism for a poultry farm.

Threshold values of temperature, lighting, and food are monitor and control by the microcontroller. As well as remote monitoring is done and with the help of this facility, the person in-charge can observe the situation of

internal structure of poultry by sitting in a one room as data will be display on a web portal. The intelligent system can reduce cost, time, and labour is highly user friendly to the farmers. This ideal system will improve the human food requirements by improving quality and quantity of chicken. This

system will also help in decreasing environment pollution and improving health of poultry labour and chicken consumer.

RESULT Temperature Reading

Time (min)	Temperature (deg.celsius)
15.45	29
16	31.9
16.15	33

Humidity Reading

Time (min)	Humidity (%)
15.45	45
16	32
16.15	29

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A REVIEW ON FLY ASH SLOPE STABILITY

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Abstract: Fly ash is a by product of coal based thermal power plant and it's disposal causes several environment and ecological problems. Proper utilization of flyash is major concern in India. Fly ash can be used as backfill material for low lying area. The laboratory model tests can be conducted with and without reinforcement in flyash to check strength and stability of fly ash slope . Fly ash is used as filling material and plastic scraps and different geo-synthetics are used as reinforcement materials. The square and different footings are rest at various position on steep slope of different angles .From experimental works load carrying capacity, settlement and deformations of flyash slopes are determined and from the data, load –settlement curves have been reported. It is concluded that load carrying capacity is high in case of reinforced flyash slopes to unreinforced flyash slopes and numerical analysis is carried using PLAXIS 2D software .

Keywords: Fly ash ,slope stability, Plastic scraps, Geo synthetic, Steep slope, PLAXIS 2D.

I. INTRODUCTION

Most of the thermal power plants in India are facing difficulty for disposal and utilization of fly ash. The effective uses of the industrial wastes which are used as a substitute for natural soil in the construction not only solve the problems of disposal and environmental pollution but also help to preserve the natural soil. One of the industrial wastes used as a construction material is the fly ash.

In India utilization of Fly ash is less than 25% of the total fly ash produced. In this direction over the past few years many researchers have attempted to convert this waste into useful civil engineering construction material. Hence, the proper utilization fly ash is major concerned in India. It may be used in embankment. Steepened slopes can reduce the cost up to 50 % as compared to retaining walls. Fly ash can be utilized as a fill material in many civil engineering applications, mainly in the construction of roads and embankments. Fly ash provides an economical and suitable alternative to good earth for construction of embankments. The performance of such materials can substantially improved by introducing reinforcing element such as geo grid. Reinforced soil slopes have broad applicability in the construction of highways.

The objective of the study is to check the feasibility of using Plastic recycled polymers with fly ash in construction of steep slopes so that a innovative methodology could be adopted for its utilization. The experimental analysis and validation using finite element method for the methodology

II. LITERATURE REVIEW

The study of effect on stability of slope observed in various literatures. Several experimental, analytical and numerical analyses were performed with different reinforcement materials and geo-synthetic materials of the slope stability and bearing capacity by various authors.

S.Adhana et.al(2011): The model tests were conducted in the laboratory without and with reinforcement in fly ash steep slopes on soft foundation to check the stability of steep slope. In this two types of reinforcement were used: (a) Three dimensional circular Geocell strip made from waste plastic bottles and (b) polyester geo grid strip, with test box of 70*50*40cm were used. From the experiments, load and settlement have measured. From these data, load -settlement curves have reported. It has been observed from test results that load carrying capacity of geo-cell is more than that of geo grid strip. The deformation of geo cell is slightly more than that of geo grid strip. Using PLAXIS 2D the failure pattern, deformations and factor of safety are reported based on analytical programme. The results from experimental data and analytical programme compared and reported.[5]

K.S. Gillet.al(2012) : There is difficulty due to poor load-bearing capacity of fly ash, when footings rest on the top of the fly ash fill slope; but inclusion of polymeric reinforcements as horizontal sheets within the fill may be advantageous in improving the load-bearing capacity of reinforced fly ash slope. The aim of present investigation is to find out the efficacy of multi layer reinforcements in improving the load-bearing capacity when incorporated within the body of fly ash embankment. In model slope there is increase in load bearing capacity was observed in the laboratory. The experimental results were compared with the numerical findings obtained from the finite element analysis using software PLAXIS 2D [6]

Tushar Vasant Salunkhe et.al (2014):The model tests were conducted in laboratory without and with Plastic Recycled Polymer (PRP) in fly ash steep slopes on soft foundation soil (fly ash) to check the stability of slope. In this experiment fly ash was used as a slope filling material and Plastic Recycled Polymers made from waste plastic products (lower grade plastic products). From the experimental investigation, load and settlement were measured. From these data, load-

settlement curves have been reported. It has been observed from test results that load carrying capacity of fly ash mixture with plastic recycled polymers slope is more than that of fly ash slope. The deformation of Plastic Recycled Polymers slope is slightly more than that of fly ash slope. The experimental results were validated with a Finite Element Software (PLAXIS 2D version). The failure pattern, deformation and factor of safety are reported based on analytical program (Bishop’s simplified method) and Finite Element Method (FEM). The results from experimental data and analytical programme are compared [7]

Tarun Kumar Rajak(2016): In this shear strength parameters of the soil stabilized with fly ash. The soil has been mixed with 10%, 20%, 30% and 40% fly ash by dry weight for conducting compaction test and direct shear test. The experimental results indicate that the dry density and cohesion value of soil decreases whereas the angle of internal friction increases with increase in the percentage of fly ash. The analysis is done by using FLAC slope software. Parametric study has been done to calculate the factor of safety by considering different slope height at constant slope angle. The addition of fly ash enhances the strength and provides resistance to slope instability. It has been found from the analysis that the factor of safety increases with increase in percentage of fly ash at a particular height. 30% fly ash is obtained as optimum amount as stabilizer for a slope of certain height [9]

Dr. A.I.Dhatrak et.al(2016): The laboratory model tests were conducted with and without reinforcement in fly ash to check the strength and stability of fly ash slope. Geogrid is used as reinforcement to improve the bearing capacity of slope. The square footing is rest at various position on steep slope of 60° and bearing capacity is checked. From the experimental study, load and settlement were measured. For optimum configuration the same test were conducted on circular footing. From test results it is observed that the load carrying capacity of fly ash slope reinforced with geogrid is more than that of unreinforced slope.[10]

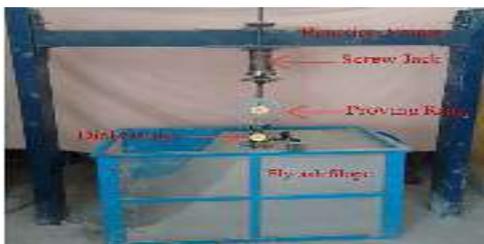


FIG 1: EXPERIMENTAL SET UP

Karthik.S(2016): Soil is a peculiar material. Some waste materials such as Fly Ash, rice husk ash, pond ash may be used to make the soil more stable. Addition of such materials will increase the physical as well as chemical properties of the soil. Some expected properties to be improved are CBR value, shear strength, liquidity index, plasticity index, unconfined compressive strength and bearing capacity etc. The objective of this study was to evaluate the effect of Fly Ash derived from

combustion of sub-bituminous coal at electric power plants in stabilization of soft fine-grained red soils. California bearing ratio (CBR) and other strength property tests were conducted on soil. The soil is in the range of plasticity, with plasticity indices ranging between 25 and 30. Tests were conducted on soils and soil–Fly Ash mixtures prepared at optimum water content of 9%. Addition of Fly Ash resulted in appreciable increases in the CBR of the soil. For water contents 9% wet of optimum, CBRs of the soils are found in varying percentages such as 3, 5, 6, and 9. We found optimum CBR value of the soil is 6%. Increment of CBR value is used to reduce the thickness of the pavement and increase the bearing capacity of soil.[11]

Summary Of The Literature Survey

It is concluded from the literature review that a significant number of studies have been carried out on the footing located on the fly ash slope with reinforcement layer using numerical, analytical and experimental procedures, but the very few studies are reported on the footing located on the fly ash slope with different proportions of soil and plastic scraps and geosynthetics using as reinforcement layer

III. Case Study

Jindal Power Open Cast Coal Mine is almost flat with small undulations from surface. The lithological section comprises about 3-4 m unconsolidated loose soil/alluvium. Below the top soil there is weathered shale/sandstone up to 6–8 m depth. The weathered shale and sandstone are comparatively loose in nature and can be excavated without blasting. Below the weathered zone (which varies from 3 – 10 m), the rock is hard, compact and massive in nature and can be excavated only after blasting. Thus the average depth of the excavation of these excavations, which can be removed, is about 16 m. In the sub-block IV/2 & IV/3 only lower groups of Gondwana sediments have been deposited, and almost uniform throughout the block. JPL admixture with OB, design of dump geometry, filed application and field monitoring for more than three years for the first time in India.

Jindal Power Limited, Tamnar has already have captive thermal power plants of 1000 MW and generating fly ash, a solid coal combustion residue form due to the burning of coal, of nearly 16000 tons per day. Therefore, quantity of fly ash generated requires large area for its dumping. In last two decades it was realized that fly ash is no more a waste.



Fig 2: Decks with Fly ash as admixture in overburden material after compaction



Fig 3: A view of ash in OB site at JPL mines

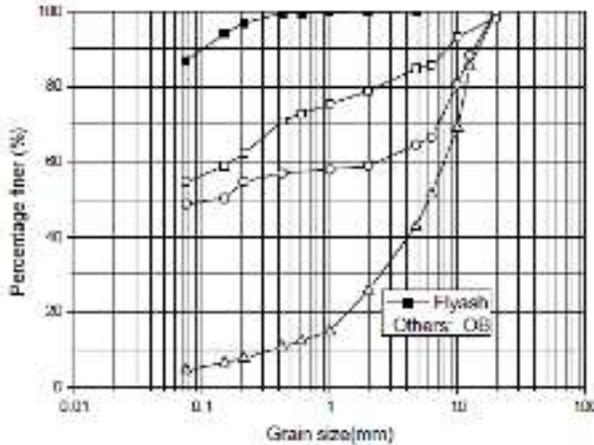


Fig 4: Grain size distribution of typical overburden (OB) and fly ash

Sample type	Cohesion (kN/m ²)	Angle of internal friction(Φ), Degree
Overburden	41.8	28.5
Fly ash + OB	89.6	22.9
Soil	78.2	20.5

Table1:Shear parameters for the overburden, soil and Mixture of fly ash and OB

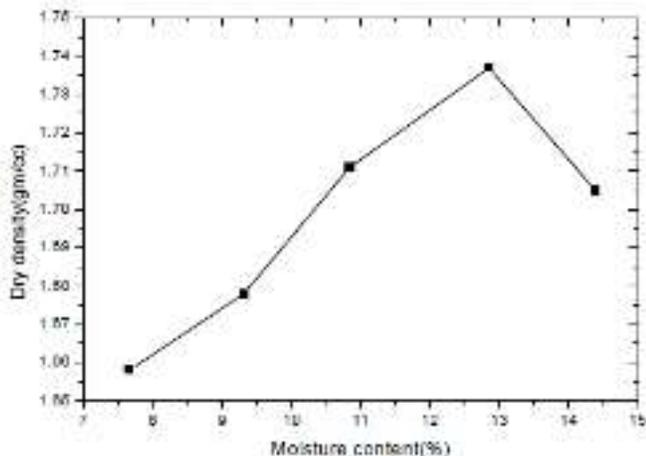


Fig 5:Compaction characteristics of mixture of overburden and fly ash (25%)

• **Slope stability Analysis of JPL Mines**

The stability of dumped slope is analyzed by PLAXIS software, Version 9 using the geotechnical parameters. Finite element program for geotechnical applications in which Mohr-Coloumb models are used to simulate the behavior of dump material. Its implementation consists of three stages, known as input stage, calculation stage and post processing (curves) stage. Input stage contains model design, assigning the material parameters, boundary conditions, loading and meshing. In the present analysis 15-node triangular element is considered for meshing which contains 12 stress points. In the calculation stage, analysis type is chosen such as Plastic, dynamic, consolidation and phi-c reduction. The assigned loads are activated in this stage and analyzed. In the post processing stage, curves are plotted between various calculated parameters such as load Vs displacement. In PLAXIS *Phi-c reduction* method is used to compute factor of safety (FOS) for dump slope stability. The total multiplier ΣMsf is used to define the value of the dump material strength parameters at a given stage in the analysis.

$$\Sigma Msf = \frac{\tan \Phi}{\tan \Phi_r} = \frac{c}{c_r} \quad \text{--- (1)}$$

The safety factor is then defined as the value of ΣMsf at failure, provided that at failure more or less constant value is obtained for a number of successive load steps. Different trials were made with overburden and mixture of overburden and fly ash with overall slope angle of 27°. The compaction control may be periodically checked for proper compaction of overburden and fly ash mixture. Slope stability of the overburden dump after mixing of fly ash, it was observed that on the application of 25% fly ash mixture safety factor has increased to 1.78, which was only 1.32 with 8% fly ash mixture with overburden.

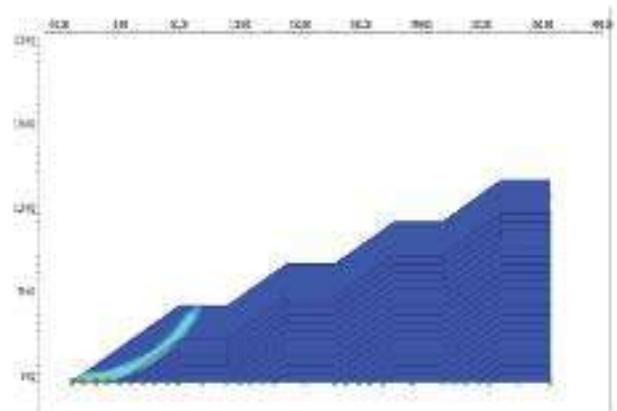


Fig 6:Failure surface with factor of safety 1.75 as per PLAXIS analysis



Fig.7. A view of the plantation over the admixture of OB and Fly ash at Jindal Power Limited, Tamnar

• Conclusion Of The Case Study

Field measurements conducted using total station monitoring system in a typical coal mine for the first experimental trial in India with admixture for fly ash and Overburden material indicated stability of dumps over one year period and also unwrapped the scope of new areas of application of research introducing wireless sensor Networks for evaluation of slope stability. Dump with alternative layer of overburden and overburden mixed with fly ash (only 25%) are found to be stable with safety factor more than 1.2 for total height of the dump. Displacement pattern of the monitoring stations during one-year period indicated no significant displacement in the Overburden dumps with fly ash ensuring stability of the dump near majority of the stations. Wireless Network system along with Time Domain Reflectometry (TDR) is also recommended, and attempts are being made for online and real-time monitoring of stability of slope in other opencast mines as sponsored by the Ministry of Mines, Government of India.[12]

• Transitioning from state of the art to state of the practice

Fly ash is waste material, it can be used as back filling material. Using fly ash model slope the stability and settlement can be checked using unreinforcement and reinforcements as plastic scraps and geo synthetic materials and experimental values are compared with PLAXIS 2D software.

IV. Conclusion

Based on study the conclusions are made

- Fly ash can be used successfully as an embankment fill material.
- Fly ash will solve the problem of its disposal leading to a better utilization of the product which does not decompose with time.

- Bearing capacity of square footing on Fly ash slope is more than circular footing on slope.
- The MDD of the sample decreases whereas OMC increases with increase in the percentage of fly ash. It may be due to the lower density and lower specific gravity of fly ash

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A Review on Contaminant Transport through layered Soil

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Abstract— Analytical and experimental methods help the civil and geotechnical engineering to understand the physical and chemical process in contaminant transport through layered soil. For analysis, the two-dimension advection dispersion equation can be used. Using finite element method modeling of contaminant transport based on Geo-studio international Ltd-CTRAN/w software can be utilized to study soil properties. For better prediction of the results comparison of experimental and numerical/analytical studies of layered soil which helps in understanding contaminant flow in soils. Based on the literature review there is a need for development of MS excel program/sheet for obtaining analytical solutions of two dimensional transport of contaminants in layered soil which fastens the process of understanding the behaviour of layered soil.

Keywords—Contaminant transport, Advection, Dispersion, Finite element method, Geo-studio international Ltd-CTRAN/w

I. INTRODUCTION

Groundwater is found in the voids of the saturated zone of the earth's crust. Engineers and scientists study groundwater for a variety of reasons. Groundwater makes up only a tiny fraction, just 0.06 %, of the Earth's available water. However, this very small volume is critically important because it represents 98% of the fresh water readily accessible to humans. In many parts of the world, groundwater resources are under increasing threat from growing demands, wasteful use and contamination. To face this challenge, good planning and management practices are needed. A key to the management of groundwater is the ability to model the movement of fluids and contaminants in the subsurface environment. The contamination of subsurface resources has been and still a major issue all over the world. The transient sources of groundwater and soil contamination include: agricultural infiltration (Nitrogenous fertilizer, pesticides), leachate from chemicals stored above ground, infiltration from pits, ponds and lagoons, landfill leachate (municipal, industrial) and infiltration, leaks from underground storage tanks, septic tanks or sewer lines, spills (Jet fuels, industrial chemicals, waste oils, etc.), hazardous industrial waste in buried drums or landfills (petrochemicals, chlorinated solvents, manufactured gas plants etc.) and nuclear waste. When groundwater pollution occurs, the restoration to the original, non-polluted state is more difficult. It is obvious that the contaminant source activities cannot be completely eliminated and perhaps our water bodies

will continue to serve as receptors of vast quantities of waste. This goal can be achieved only if control and management is based on definitive knowledge of the transport and fate of pollutants in the aqueous environment. Numerical modeling of contaminant transport is indeed of particular relevance in this regard. In recent years, numerical methods have been used extensively to simulate the movement of contaminants in soil and groundwater.[6]

1.1 Contaminants

Contamination of groundwater has become a key environmental issue particularly with the ever increasing demand for energy and resource development. Geotechnical engineers as result are more and more faced with the difficult task of designing waste management facilities that prevent the contamination of groundwater. To design such facilities requires an understanding of processes that govern tile transport of contaminants. The complexities of designing these structures are compounded by the lengthy required de-sign life which may be hundreds or even thousands of years. The purpose of this paper is to review and discuss the mass transport phenomenon from a geotechnical point of view and to demonstrate the significance of the processes by analyzing the contaminant migration from a uranium tailings management facility. CTRAN/W is a finite element software product that can be used to model the movement of contaminants through porous materials such as soil and rock. The comprehensive formulation of CTRAN/W makes it possible to analyses problems varying from simple particle tracking in response to the movement of water, to complex processes involving diffusion, dispersion, adsorption, radioactive decay and density dependencies. Currently, CTRAN/W does not deal with air phase transport.

1.2 Typical applications

CTRAN/W can be used to model many groundwater contaminant transport problems. This section pre-sents examples of the types of problems that can be analyzed using CTRAN/W. It should be noted that CTRAN/W is designed to use the seepage flow velocities computed due to flow in both the saturated and unsaturated zones. The next section provides a review of contaminant transport processes to facilitate the later discussion of the applications for which CTRAN/W can be used.

1.3 Contaminant Transport Processes

The factors which govern the migration of a contaminant can be considered in terms of transport processes and attenuation processes. The transport processes can be mathematically represented by equations based on flow laws. These equations can be combined into a mass balance equation with those processes causing the attenuation of the contaminant; this yields the general governing differential equation for contaminant migration. Transport processes The two basic transport processes are advection and dispersion. Advection is the movement of the contaminant with the flowing water. Dispersion is the apparent mixing and spreading of the contaminant within the flow system. The advection and dispersion transport processes can be illustrated by considering a steady flow of water in a long pipe filled with soil.

II. LITERATURE REVIEW

The study of effect on contaminant transport by different type of soils and different layered soil is observed in various literatures. Several experiment, analytical and numerical analyses were performed on contaminant transport through layered soil by various author.

Robert D. (2001) he studied the effects of investigate the effects on saturated hydraulic conductivity of the interactions between soil type (sand, clay loam) and anionic surfactants. Saturated hydraulic conductivities of two sand and clay loam were measured in constant-head laboratory columns. Results indicate that potential surfactant assisted hydraulic conductivities losses should be considered prior to in-situ surfactant remediation.[1]

P.R.Kumar (2006) he studied the calibration was done for soil contaminant detector. They use the 2 type of soils, silty soil and kaolin soil then corresponding mixed with 2 solutions are distilled water and sodium hydroxide solution of different concentration. For modeling the contaminant transport through the soil mass in the centrifuge tests. They prepared the three detachable concentric Perspex cylinders. Cylinder size was inner cylinder is 60mm inner diameter and middle cylinder is 94mm inner diameter are 150mm length outer cylinder is 112mm diameter is 50mm long. Then cylinder is also help for preparing the 75mm long soil sample. By using centrifuge tests fabricated for detection and movement of contaminant in the soil mass noticed very efficiently. While increasing centrifugation time and acceleration level the sodium hydroxide concentration at given point will increases the particular prototype length[2].

ZHANG Hong-mei (2007) study was carried to fluorine transport solutes in soil and ground water. The soil is mainly sandy soils. To test soil a consider the fine sand, a mixture of kaolin and fine sand in the ratio 1:6.25 and a mixture of kaolin and course sand in the ratio of 1:10. they determined the distribution of grain size test. soil column is made of organic glass, inner diameter was 23cm and height of volume 50cm, perforated plate at the bottom of the soil column covered with a single sheet of thin geotechnical fabric prevented the soil

from leaching. Bottom of the soil column was linked to a tapered funnel connected to an outflow tube. For each layered geosynthetic fabric where used is of 3cm. The first part of the breakthrough curve fitted better than the second part. The main reason is that fluorine does not always exist in the form of fluorine ions in groundwater. Given the long test time, fluorine ions possibly react with other ions in the soil solution to form complex water-soluble fluorine compounds. Only the retardation factor and source-sink term have been considered in our numerical model, which may leads to errors of computed values. But as a whole the migration rules of fluorine ions are basically correct, which indicates that the established numerical model can be used to simulate the transport rules of fluorine contaminants in unsaturated stratified soils.[3]

P.K.Sharma (2014) he used the soil column experiment is used to study the solute transport through saturated multilayer soil. Sodium chloride was used as a conservative chemical and sodium fluoride as a re-active chemical use in experiment. For numerical analysis they use finite different method was used to get the solution of advection dispersive transport equation for solute transport through multi-layered soil. The results were the water saturated multilayered soil column regardless of soil water and solute characteristics, the order of soil layering does not affect the effluent concentration distributions. The developed numerical model can be used for simulating the migration of contaminants through the landfill sites/ subsurface porous media.[7]

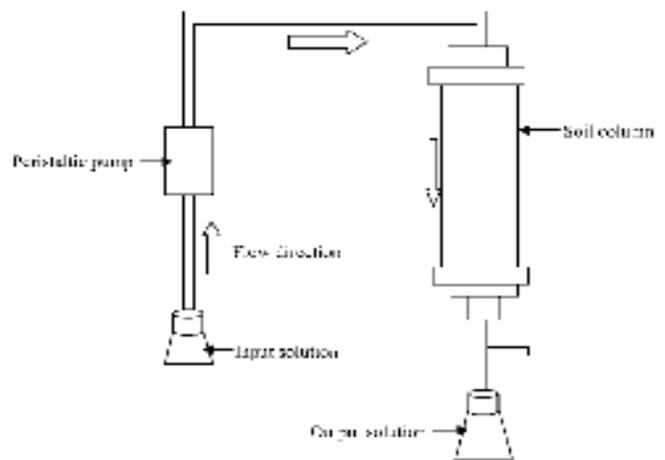


Figure 1. Details of one-dimensional soil column experiment

The experimental set-up consists of a column, made up of an acrylic pipe with a wall thickness of 6 mm, 100 mm diameter, and 600 mm length. The cross-sectional area of pipe was 78.50 cm². A schematic sketch of the experimental set-up of the soil column is shown in Fig.1. Sand was collected from Bahadarabad near Haridwar, India. The natural soil and silt were collected from depths of 50 and 150 cm, respectively, below the ground surface in the campus of Indian Institute of Technology, Roorkee, India. The particle-size distribution curves of sand, silt, and natural soil other properties of these

soils are reported in Different combi-nations of soil were used in the soil column during the experiment.

Anand M. Hulagabali, G.R.Dodagoudar (2014) The study was carried to understand the two-dimensional contaminant transport through satu-rated porous media using a finite difference meth-od and finite element method. For analysis, the two-dimensional advection dispersion equation with sorption is considered. MATLAB code is de-veloped to obtain the numerical solutions. CTRAN/w is also used for modeling of contami-nant transport based on finite element method. Results of FEM and FDM is compared and it is found that they agree well.[6]

Rupali S.S (2015) He studied a numerical mod-el of two-dimensional contaminant transport through stratified saturated porous media has been analyzed using mesh free method called element free galerkin method. For analysis two dimension-al form of advection diffusive transport equation for a multi-layered soil. For numerical solution A FORTRAN program has been used. Result where validated with result in the literature. After studying of parameter, the effect of change in the parameter concentration of contaminant has been observed. The parameter including change in dispersion, velocity, porosity, distribution co-efficient and thickness of layer.[8]

III. CASE STUDY

Performance of compacted clay liner portion in a composite landfill liner.

The lagoon under study was situated in a landfill located in Ontario, Canada (Lake and Rowe 2005). Non-hazardous industrial, municipal and commercial wastes were being placed in this multi-cell landfill that is lined with a compacted clay liner and leachate collection system. Below the landfill lies the Rochester Shale Formation, consisting of thin beds of aphanite shale and shale duotones. Schematic cross-section of the landfill is shown in Figure 3.47. The original location of the lagoon was temporary and served the landfill for 14 years at which time a new lagoon was constructed and the original lagoon decommissioned. Lagoon storage capacity was approximately 2500 m3 (side slopes of 3:1) and were lined with a 1.5 mm high density polyethylene (HDPE) geomembrane over a compacted clay liner (2.9 m thick) situated above the quarry’s shale floor. Leachate heights in the lagoon averaged 3 m above the bottom of the lagoon. The water table in the shale was estimated at approximately 3 m below the bottom of the compacted clay. Lysimeters have been installed under the clay liner of the lagoon and landfill to

Table 3.11 Data Used for Case Study of the Keele Valley Landfill

Parameter	Value	
	Chloride	Sodium
Hydraulic conductivity (m/year)	0.0015	0.0015
Length of the reach (cm)	80	80
Dispersion coefficient (cm ² /year)	205	47
Retardation coefficient	1.0	1.46
Total duration of simulation (years)	4.25	4.25
Time step (Δt) (year)	0.85	0.85
Number of divisions in length direction	20	20
Initial concentration (mg/L)	50	–
Concentration at source boundary (mg/L)	4500	1600

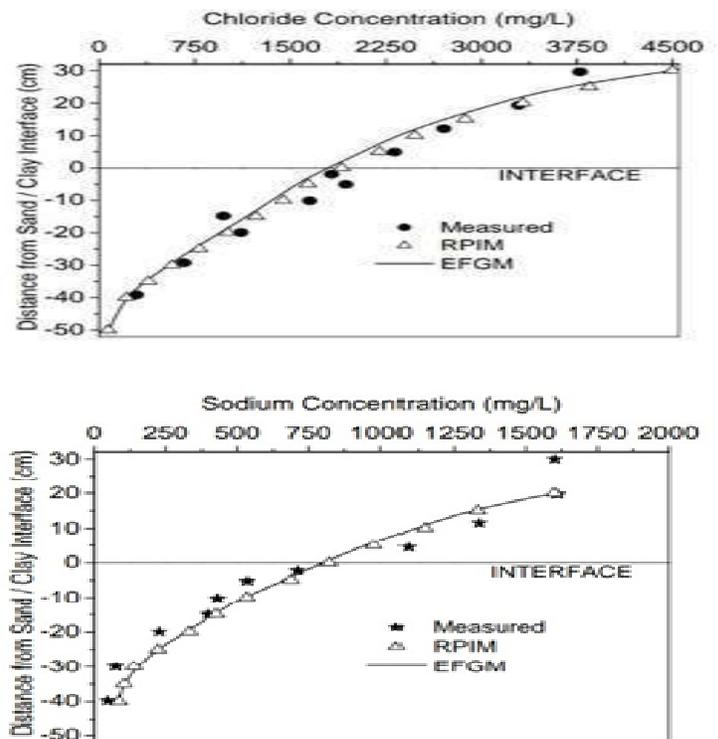


Fig 3.11 Pore Fluid Concentration Profiles for Chloride and Sodium ions at 4.25 years, Keele Valley Liner: Mesh free Methods and Field Data

monitor leachate constituents migrating through the liners Investigation of the geomembrane revealed 82 cracks, holes and patches over a total area of 1350 m² (600 defects per hectare for the 14 year period of operation of the lagoon) after decommission. Even though the majority of the holes, cracks and patches were above the leachate levels in the lagoon, the defects below the leachate level appear to have been sufficient to allow leachate to migrate between the geomembrane and clay under low effective stress conditions. Continuous, 75 mm diameter soil samples were taken of the compacted clay liner at the base of the lagoon at five locations with sampling depths ranging from 1.1 - 2.1 m.

The soil was visually classified as light brown clay of low plasticity during sampling with no indication of fractures present. Pour water samples for each borehole (at various depths) were obtained using a pneumatic pore squeeze apparatus by applying 25 MPa pressure to the selected soil samples. Pour water obtained from the samples was analysed for sodium, potassium, magnesium and calcium using an atomic absorption spectrometer and chloride using a specific ion electrode. Illustrate the pore fluid concentration profiles for chloride and sodium through the compacted clay liner at each borehole. When comparing boreholes data, there is some scatter, possibly the result of non-uniform distribution of defects found on the geomembrane liner (holes, tears, wrinkles) occurring at different time periods, producing differences in ionic pore water concentrations between boreholes. Also of note is the apparent back diffusion of chloride and sodium and possibly calcium, potassium and magnesium from the compacted clay into the lagoon. For contaminant migration through the compacted clay liner, the bottom boundary condition was considered infinitely thick for modeling purposes. The top boundary condition of the leachate in the lagoon was assumed to be a constant concentration over each of the three different time periods, i.e. 0-4.5 years, 4.5-9.5 years and 9.5-14 years.

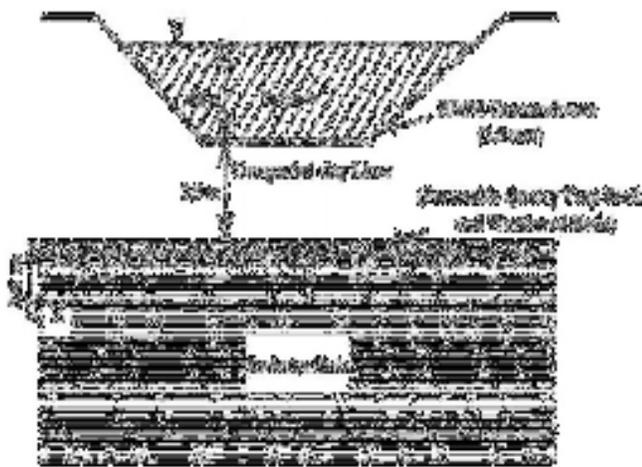


Fig 3.12 Schematic Cross-section of Leachate Lagoon

Geometric mean values of chloride and sodium concentrations in leachate lagoon for three time periods are presented in Table 3.12 along with the other parameters considered in the

analysis for calculating the concentrations in the compacted clay liner (CCL). To evaluate the effectiveness of the geomembrane, contaminant transport modeling using the EFGM and RPIM is performed for five different time periods i.e. 0, 4, 6, 8 and 10 years, assuming that the geomembrane ceased to be effective and allowed leachate into direct contact with the clay liner. To account for back-diffusion of ions for the one month prior to the field investigation, it was assumed that dilution of the small amount of liquid at the bottom of the lagoon during this time caused a linear decrease in leachate concentrations of 20% over this time period. In the mesh free model, the domain [0, 2.5] is discretized into 20 cells. A time step (Δt) of 0.5 year is used in the simulation. The spatial solute distribution curves obtained from the mesh free methods are compared with the pore fluid concentrations obtained from the field investigation. A comparison of the observed chloride and sodium profiles with the mesh free results, assuming that the geomembrane is ineffective at different times after construction suggests that the geomembrane ceased functioning effectively somewhere between 0 and 4 years after construction, which is in concordance with the findings of Lake and Rowe (2005).

Table 3.12 Data Used for Case Study 3: CCL

Parameter	Value	
	Chloride	sodium
Darcy velocity (m/year)	0.13	0.13
Porosity		
0.00-0.25 m	0.48	0.48
0.25-0.50 m	0.42	0.42
0.50-2.50 m	0.38	0.38
Dry density (g/cm ³)		
0.00-0.25 m	1.4	1.4
0.25-0.50 m	1.5	1.5
0.50-2.50 m	1.7	1.7
Leachate lagoon concentration (mol/m ³)		61.95
0-4.5 years	7.17	150
4.5-9.0 years	17.37	46.86
9.0-14.0 years	14.57	0.013
Effective dispersion coefficient (m ² /year)	0.022	0.2
Distribution coefficient (cm ³ /g)	0	2.5
Total duration of simulation (years)	2.5	14
No.of divisions in length direction	14	20
Time step (Δt) (year)	20	0.5

IV. SUMMARY OF LITERATURE

Most of the study reported in literature is based on analytical, experimental and numerical modeling of contaminant transport through the layered soil. Experiment and numerical analysis simulation study are given to understand the physical and chemical processes that influence contaminant transport through layered soil. Soil column experiment has been developed for the experiment solutions of a contaminant movement through soil layers. The modeling of contaminant migration through landfill liners and natural soil deposits in Geoenvironmental engineering is an important task, as the landfills have to contain the waste till their design life. A few case studies dealing with contaminant transport through the landfill liners are also reviewed and presented in the chapter. A CTRAN/w software based on finite element method has been developed for the numerical solution of a contaminant movement through a soil layers.

TRANSITIONING FROM STATE-OF-THE-ART TO STATE-OF-THE-PRACTICE

Black cotton soil is collected from the quarry near vidyagiri, Bagalkot. That is having some contaminants, using soil column experiment contaminant transport through the layered soil is checked in that sand also used to strength the soil property with different percentage. Two types of contaminants is used, these are sodium chloride and fluoride with varying concentration. This experiment result is compared with CTRAN/w software.

V. CONCLUSIONS

The above study has examined the modeling of contaminant transport through the saturated and unsaturated homogeneous porous media and landfill liners using mesh free techniques. The applicability and performance of the mesh free methods have been studied through numerical investigations using a few numerical examples and case study. The following conclusions are drawn from the study:

- A new methodology based on mesh free techniques, such as EFGM and RPIM has been developed for modeling contaminant transport through the saturated and unsaturated homogenous porous media.
- Computer implementation of both the mesh free methods has also been made and validated against analytical solutions, experimental results and field investigation data. The results of the mesh free methods are also compared with the finite element solutions. A very good agreement is obtained between the results of the mesh free methods, analytical and finite element solutions for the numerical examples considered.
- Three case study examples, involving the contaminant transport through the compacted clay liners of landfills are considered to test the practical applicability and performance of the EFGM and RPIM. A good agreement is obtained between the results of the meshfree methods and the field investigation data. It is concluded that both the meshfree methods perform well in predicting the concentration values in the case of real world contaminant transport problems.

- The proposed mesh free methods — EFGM and RPIM generated stable and convergent results for advection-dominated transport problems; because these methods do not depend on spatial and temporal discretization thus they are insensitive to Peclet and Courant constraints.
- Based on the convergence analysis, it is concluded that for the EFGM, the scaling parameter d_{max} gives convergent results for the range $1 \leq d_{max} \leq 1.5$ and for the RPIM the parameter q 1.25 produces convergent results. \cong
- The mesh free methods provide an attractive alternative to the finite element method for contaminant transport problems wherein the advection dominates. In such cases, the FEM requires alternative stabilization techniques in the form of mesh and time step refinement to obtain the stable and accurate results.

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Use of Steel Slag To Increase Bearing Capacity of Soil In Road Construction

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Abstract— Roads are an integral part of the transport system. A country’s road network should be efficient in order to maximize economic and social benefits. Roads are built up in several layers, consisting of sub-grade, sub-base, base and surface layer. There are formation of cracks, settlement of road and potholes due to heavy vehicular traffic and bad climatic condition. Weak foundation soils subgrade are a common problem in road construction. Whether it is a temporary access road or a permanent road built over soft subgrade, a large deformation of the subgrade will lead to deterioration of the paved or unpaved surface.

To avoid these problems steel slag is used. The steel slag shows good technical and ecological properties, thus being used for the manufacturing of aggregates required by road construction. The reuse steel making slags for road construction must comply with an essential requirement, namely their volumetric stability. The high stability of steel slag mixes offers a distinct advantage where rutting resistance is required and this has been demonstrated in industrial areas.

The aim of this work is to study the effect of addition of steel slag on bearing capacity of soil & its variation according to percentage of steel slag. Also to check if the steel slag replace natural materials, there by resulting in protection of natural, non-renewable resources and a reduction in energy requirements. As well as to reduce environmental pollution due to changes in current practice. and to study the utilization of steel slag in road construction as sub-grade material along with black cotton soil. Different tests on soil should perform like – Specific gravity, liquid limit, plastic limit, proctor test, CBR test. And tests perform on steel slag are – specific gravity, fineness test. Test perform on soil and steel slag with different percentage are proctor test and CBR test.

Keywords— *Steel Slag, Soil Bearing Capacity, CBR Test etc.*

I. INTRODUCTION

Engineers are often faced with the problem of constructing roadbeds on or with soils, which do not possess sufficient strength to support wheel loads imposed upon them either in construction or during the service life of the pavement. It is, at times, necessary to treat these soils to provide a stable subgrade or a working platform for the construction of the pavement. Use steel slag is one of the methods used to improve performance of soil subgrade. Steel slags play a significant part in modern pavement design and maintenance techniques. The growth in their use worldwide for transportation applications in particular, has been nothing short of phenomenal. Steel slag used in subgrade has proven to be among the most versatile and cost-effective ground modification materials.

Roads play a significant role in achieving national development and contributing to the overall performance and social functioning of the community. It is acknowledged that roads enhance mobility, taking people out of isolation and therefore poverty.

The steel slag shows good technical and ecological properties, thus being used for the manufacturing of aggregates required by road construction. Slags are by-products of metallurgical processes. Steel- and iron making industries generate different types of slags.

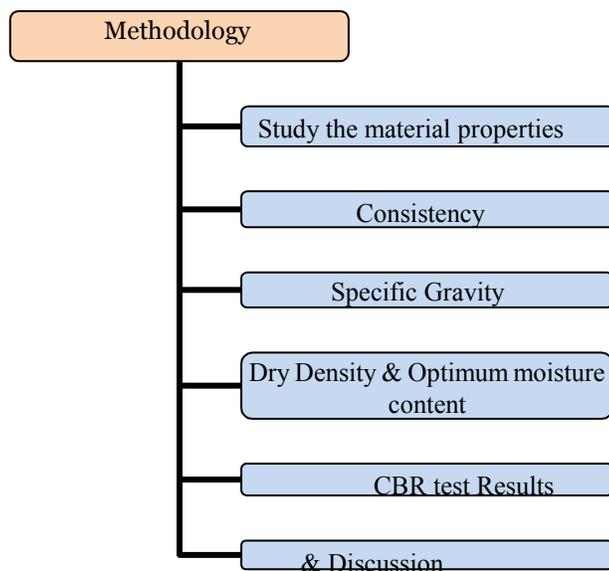
Civil engineers require large quantities of free draining material to raise the load bearing capacity of the sub-strata for new structures. Coarse graded steel slag, in the size range of 300 mm to 50 mm is also ideal for this application particularly on or near the surface where good mechanical interlock and mud free characteristics prevent pumping and inhibit lateral movement.

II. METHODOLOGY

Keeping in mind the gap in the research area, the objective of this study was to improve the bearing capacity of soil by partial adding steel slag in road base. For this purpose following methodology were adopted.

Combination of steel slag and black cotton soil for subgrade is taken. So different samples of different proportions of steel slag and black cotton (b.c.) soil were taken as follows:

Sample 1-0% steel slag and 100% b.c soil
 Sample 2-10% steel slag and 90% b.c soil
 Sample 3-20% steel slag and 80% b.c soil
 Sample 4-30% steel slag and 70% b.c soil
 Sample 5-40% steel slag and 60% b.c soil
 Sample 6-50% steel slag and 50% b.c soil



Consistency Test Results:

Sr. No.	Type of Test	Perform on	Result
1	Liquid limit	Subgrade Soil	39.60%
2	Plastic limit	Subgrade Soil	18.78%
3	Specific Gravity	Subgrade Soil	2.023
4	Specific Gravity	Steel Slag	3.51

Dry Density & Optimum moisture content Result:

Sr. No.	Sample Type	MDD (gm/cc)	OMC (%)
1	0% steel slag and 100% b.c soil	1.71	16.51
2	10% steel slag and 90% b.c soil	1.86	11.051
3	20% steel slag and 80% b.c soil	1.89	18.002
4	30% steel slag and 70% b.c soil	2.134	8.668
5	40% steel slag and 60% b.c soil	2.141	13.026
6	50% steel slag and 50% b.c soil	2.307	11.358

Effect of steel slag addition on California Bearing Ratio for subgrade soil:

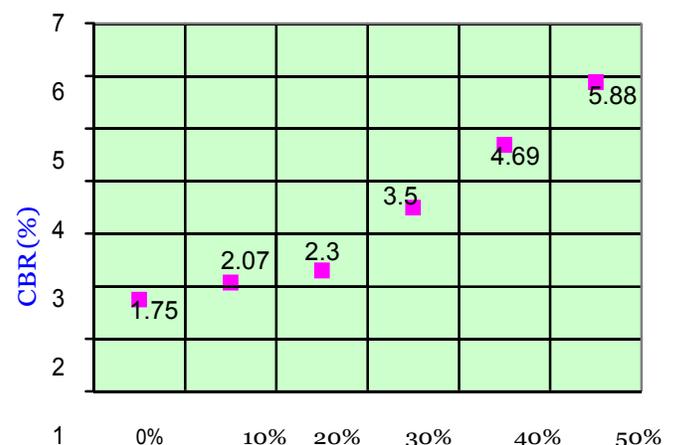
Sample Type	Steel slag Proportion (%)	California bearing ratio (%)
1	0	1.75
2	10	2.07
3	20	2.30
4	30	3.50
5	40	4.69
6	50	5.88

III. RESULT & DISCUSSION

Sieve Analysis Result:

Sieve Size (mm)	Weight Retained (gm)	% weight retained	Cumulative % weight retained	% finer
12.5	73	2.43	2.43	97.57
10	66	2.2	4.63	95.37
4.75	506	16.86	21.49	78.51
2.36	504	16.8	38.29	61.71
1.18	586	19.5	37.79	42.21
600 μ	467	15.56	73.35	26.62
300 μ	285	9.50	82.85	17.18
150 μ	341	11.36	94.21	6.79
75 μ	128	4.26	-	-
Pan	8	1.33		
Total =			355.04	
Fineness Modulus = 355.04/100 = 3.55				

Graphical Representation of Effect of steel slag addition on California Bearing Ratio for subgrade soil



IV. DISCUSSION

The main aim of this work was to study the utilization of steel slag in road construction as sub-grade material along with black cotton soil. Different tests on soil were performed like – Specific gravity, liquid limit, plastic limit, proctor test, CBR test. And tests performed on steel slag were – specific gravity, fineness test. Test performed on soil and steel slag with different percentage were proctor test and CBR test. The combinations of steel slag – soil were – 0% - 100%, 10% - 90%, 20% - 80%, 30% - 70%, 40% - 60%, 50% - 50%.

The Conclusions made from the experimental analysis are as follows.

The CBR value obtained for the Sample 1 having combination 0% steel slag and 100% soil is 1.75% for 2.5 mm penetration and 1.69% for 5 mm penetration.

The CBR value obtained for the Sample 2 having combination

10% steel slag and 90% soil is 2.07%, for 2.5 mm penetration and 2.01% for 5 mm penetration.

The CBR value obtained for the Sample 3 having combination 20% steel slag and 80% soil is 2.30% for 2.5 mm penetration and 2.28% for 5 mm penetration.

The CBR value obtained for the Sample 4 having combination 30% steel slag and 70% soil is 3.5% for 2.5 mm penetration and 3.39% for 5 mm penetration.

The CBR value obtained for the Sample 5 having combination 40% steel slag and 60% soil is 4.69% for 2.5 mm penetration and 4.56% for 5 mm penetration.

The CBR value obtained for the Sample 6 having combination 50% steel slag and 50% soil is 5.88% for 2.5 mm penetration and 5.83% for 5 mm penetration.

It can be seen from the test results that as we increase the percentage of steel slag in the soil, the CBR ratio is increasing. That means as we increase percentage of steel slag in soil, the bearing capacity of soil goes on increasing. Moreover the graph plotted % of steel slags to cbr % also shows that the bearing capacity goes on increasing.

V. CONCLUSION

Tests carried and the report studied concluded that the steel slag can be successfully used for increasing bearing capacity of soil. It is effective method that can be adopted for construction of road pavement in a area having low bearing capacity like black cotton soil region, marshy land etc. Also by using this method effective use of waste product can be achieved; similarly

it helps to obtain zero waste criteria for steel industries & steel related workshops.

As we increase % of steel slag in soil, the bearing capacity of soil goes on increasing. But as steel slag is added above 30- 33% some technical as well as economical problems are observed. The cost of project increases as we increase the percentage of steel slag in soil as compared to other methods of soil stabilization. When we go beyond a this limit the steel slag creates different problem like corrosion of steel slag, thermal expansion etc.

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Seismic Vulnerability Assessment of RC Structure Using Incremental Dynamic Analysis

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Abstract— Incremental Dynamic Analysis (IDA) is a powerful and more accurate method for evaluating the seismic performance of structural systems. While performing IDA, ground motion records are scaled in accordance with a certain seismic intensity level up until the limit of collapse of the structure is reached.

Present study deal with existing RC Moment resisting frame located in Zone III. 12 storey structure, symmetric in plan is used to study Incremental Dynamic analysis using seismostrut-2018. Finite element program used for the analysis is SEISMOSTRUCT 2018. IDA curves are developed with respect to spectral acceleration (S_a (T_1 , 5%)). Performance stages of the buildings such as yielding and collapse are defined with respect to S_a (T_1 , 5%) of the considered earthquake from the IDA curves.

Sixteen real ground motion pairs were selected and scaled, then applied to the buildings to perform the Incremental Dynamic Analysis (IDA). For the development of fragility curves, guidelines given by HAZUS MH MR-4 technical manual have been used. The Fragility Curves are plotted considering Spectral acceleration for IDA.

Keywords— *Seismostruct-2018, Nonlinear Time History Method, Incremental dynamic analysis, Fragility curves, HAZUS MH MR4 etc.*

I. INTRODUCTION

Developing mega cities leads to increase population in the city and there are not sufficient spaces provided by large number of buildings to accommodate the increasing population. High-rise buildings address this challenge as one of the solutions for the developing countries and mega cities. In addition, high-rise buildings give aesthetic to cities and they are signs of modern development. High-rise buildings exhibit far more complex dynamic properties that require careful study and a complete understanding before they can be confidently resided in. Reinforced Concrete (RC) is a common building material which have been used to construct high-rise buildings for several decades. Earthquakes are one of the most hazardous natural disasters that attacks human and cause large damages especially in regions where defined as high-seismic zone by geologists.

Various seismic analysis approaches were proposed including both static and dynamic methods. Although seismology has been continuously advancing during the century, it is impossible to predict future earthquakes' severity and time of attacking. Therefore previous earthquake data are still widely used to analyze buildings resulting in robust buildings for future earthquakes.

In addition to uncertainties in seismic loads, uncertainties associated with building material, design process, building geometry, and construction will also lead to the use of probability to predict building responses. Fragility curve assessment is one of the probabilistic methods which shows the conditional probability of exceeding a certain damage level. Fragility assessment has been widely adopted in earthquake engineering to understand the seismic performance of different building

To prevent the seismic risk, it is necessary to assess the vulnerability of existing structures. To do that, several methods have been proposed, starting from different approaches. One of the tool used to evaluate the performance of structures against seismic actions is the Incremental Dynamic Analysis (IDA) proposed by Vamvatsikos & Cornell.

The main purpose of IDA is to obtain a measure of damage in the structure by increasing the intensity of the action record, in this case the peak ground acceleration. IDA allows obtaining the dynamic response of a structure for increasing seismic actions.

The main result of this work is the quantitative assessment of the expected randomness of the structural response, defined by its fragility curves.

II. LITERATURE REVIEW

Vamvatsikos D. and Cornell C(2010) studied application of Incremental Dynamic Analysis to Performance-Based Earthquake Engineering (PBEE) and used it to define limit states such as immediate occupancy, collapse prevention.

Gaikwad et al. studied performance of incremental dynamic analysis of structures using SAP 2000 subjected to several scaled ground motions scaled using SEISMOMATCH 2018.

Marra et al. used discrete rigid blocks interacting through nonlinear elastic damageable interfaces to model the global behavior of a medieval masonry tower under seismic actions. The seismic vulnerability assessment is carried out by nonlinear static analysis (NSA) and incremental dynamic analysis (IDA), whose results are compared.

Rojit Shahi et al presents findings from an investigation which was aimed at determining what ground motion parameters are most suitable for use as IM whilst allowing the frequency content of the earthquake to vary in an IDA.

Hosseinpour et al. studied aim to overcome previous limitations and derive fragility curves for three RC (reinforced concrete) buildings with different number of stories under multiple earthquakes.

Melani et al. determined financial risk assessment on the basis of results of incremental dynamic analysis (IDA) of reinforced concrete frames analyzed using nonlinear time history analyses on IDARC platform with a suite of 20 ground motion records used by Vamvatsikos and Cornell (2002) for mid-rise buildings Seung -Wori Lee et al. proposes the procedure to estimate seismic fragility curves using an incremental dynamic analysis (IDA) rather than the method adopting a Capacity Spectrum Method (CSM). These is because IDA method can properly capture the structural response beyond yielding rather than the CSM and can directly calculate higher mode effects

XLII.SYSTEM DEVELOPMENT

3.1 Steps involved in Incremental Dynamic Analysis

1. Appropriate modeling of the building
1. Selection of intensity measure of earthquake like peak ground acceleration
2. Selection of response measure like interstorey drift ratio, base shear
3. Selection ground motions according to zone the building is situated in.
4. Generation of IDA curves by interpolation
5. Plotting of Fragility Curves.

3.2 Incremental Dynamic Analysis of G+11 story building

a) Building Description

Floor Height = 3.06m
 Column Dimension = (700x700) mm
 Beam Dimension = (300x500) mm
 Slab thickness = 110 mm
 Building Location = Zone III
 Boundary Condition = fixed on ground
 Material properties = M25, Fe415
 Size of Column 700X700 steel 4#20,
 Size of Beam 300X500 steel 3#16 at top, 3#16 at bottom

b) Material used

SEISMOSTRUCT has eleven material models ranging from concrete, steel, fibered reinforced plastic to shape memory alloy. In this research, the nonlinear steel and nonlinear concrete models were used to model the RC buildings.

c) Load Applied on building

1. Live Load = 2KN/m²
2. Floor Finish = 1 KN/m²

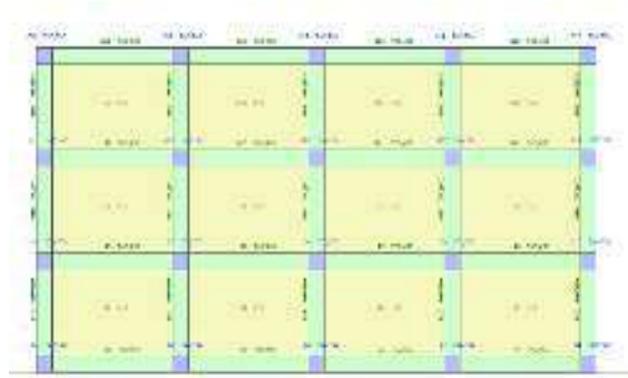


Fig 3.1 Plan of G+11 building(SeismoBuild Model)

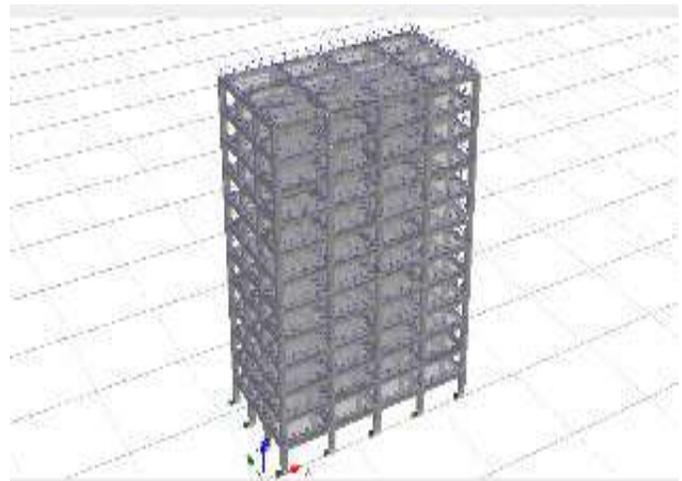


Fig. 3.2 Model of the building SeismoStruct model

3.3 Incremental Dynamic Analysis

In this chapter, building capacity is found out by using incremental dynamic analysis. Graph of spectral acceleration to maximum inter-storey drift from incremental dynamic analysis is plotted.

Time History used for analysis are listed below

Table 3.1: 16 Ground Motion Record

Earthquake Name	Year	Station Name	Magnitude	PGA
Helena Montana	1935	Carroll College	6	0.505
Humbolt Bay	1937	Ferndale City	5.8	0.245
Northern Calif-01	1941	Ferndale City	6.4	0.336
Borrego	1942	El Centro Array	6.5	0.237
San Francisco	1957	Golden Gate Park	5.28	0.328
Hollister-01	1961	Hollister City Hall	5.6	0.262
Parkfield	1966	Cholame - Shandon Array	6.19	0.341

Lytle Creek	1970	Castaic - Old Ridge Route	5.33	0.301
Managua Nicaragua-01	1972	Managua ESSO	6.24	0.24
Hollister-03	1974	Gilroy Array	5.14	0.29
Oroville-01	1975	Oroville Seismograph Station	5.89	0.23
Friuli_ Italy-01	1976	Barcis	6.5	0.36
Santa Barbara	1978	Cachuma Dam Toe	5.92	0.22
Norcia Italy	1979	Bevagna	5.9	0.238
Coyote Lake	1979	Coyote Lake Dam	5.74	0.286
Imperial Valley-07	1979	Bonds Corner	5.01	0.21

3.4 IDA Curve

IDA curve visualizes the structural responses and shows structural behavior subjected to ground motions. Buildings have different IDA curve shapes depending on their capacities (i.e. strength, stiffness, ductility) to resist seismic loads. In addition, researchers choosing different IM and DM values based on their research objectives, will resulting in different IDA curves.

Collapse of the IDA curves having hardening property is calculated from end part of the curve which become flat line. Finally, the IM values at collapse and different damage values indicates the seismic capacity of a building model. For example, curve (a) has the lowest value of IM and curve (d) has the highest value of IM among the four curves shown in Fig 3.2

Performance level or limit state of the IDA curves is an important part in assessing building seismic response. Buildings are usually evaluated at the limit states of the IDA curves and the fragility curves are constructed based on those limit states. Limit states are defined as collapse, immediate occupancy or other limit states depending on the performance type.

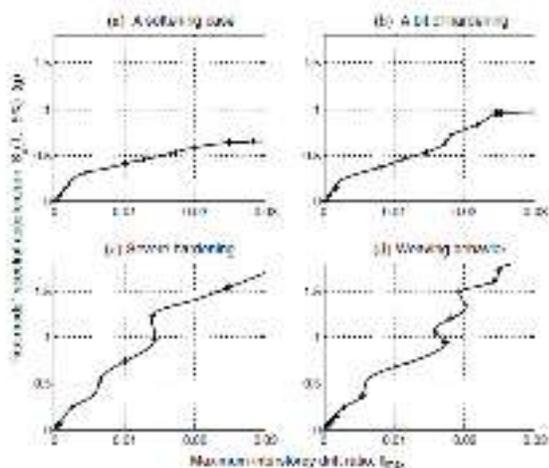


Fig 3.3 Four different behavior of IDA curves (Vamvatsikos and Cornell,2005).

3.5 Fragility Curve

Fragility curve is defined as the conditional probability which exceeds a specified limit state and evaluates seismic vulnerability of the structure. Fragility curve shows the probability of structure damage as a function of ground motion intensity measure (IM) such as Peak Ground Acceleration (PGA), spectral acceleration at the fundamental building period with 5% damping 1 (T1,5%) or any other intensity measures. Fig 4-1 shows an example of a fragility curve. Fragility curve can be expressed as:

$$f_{DS}(IM) = P(DS/IM)$$

where,
 IM = the ground motion intensity measure.
 DS = the damage state.
 P= the probability of exceeding a damage level.

In this study, the analytical fragility curve method was used to develop fragility curve using IDA.

Procedure for Creating Fragility Curve

In this study, the following procedure was used to create the fragility curves

1. Analyze the building models using the IDA and create the IDA curves for the sixteen ground motions in both directions. Determine the value of IM which are Sa(T1,5%) of the building responses from the IDA curves of the 16 ground motions and these values are used as the ground motion parameters in the fragility curve (i.e. horizontal axis).
2. To obtain the fragility curve assumption (i.e. all variables log normally distributed), natural logarithmic shall be taken Ln(X) for ground motion parameters.
3. Calculate the mean and the standard deviation for Ln(x)

$$\lambda = \frac{\sum_{i=1}^n \ln(x_i)}{n}$$

$$\xi = \sqrt{\frac{\sum_{i=1}^n (\ln(x_i) - \lambda)^2}{n - 1}}$$

Where,
 λ = mean of Ln(x).
 ξ = standard deviation of Ln(x).
 x = ground motion parameters could be Sa(T1,5%), base shear or any IM of IDA curve.

4. Calculate s of the lognormal data

$$s = \frac{\ln(x) - \lambda}{\xi}$$

5. Apply the standard normal distribution for the probability function and CDF which is denoted as Φ
 P(≤ D)=Φ(s)

6. Plot fragility curve between probability as vertical axis and IM as horizontal axis.

3.6 Summary

IDA of G+11 building is carried out in SeismoStruct. IDA curves are plotted for applied time histories. Generalized graph of both the buildings is also plotted. Yielding stage and collapse stage with respect to peak ground acceleration are determined for both the buildings.

Lastly, fragility curves denoting the extent of yielding and collapse with respect to peak ground acceleration is plotted.

XLIII. Result and analysis

In this study, incremental dynamic analysis is used to study the performance based analysis of the structure. First, the buildings are designed in SEISMOSTRUCT. Load combinations given in IS 1893-2000 are considered for the earthquake resistant design of building. While carrying out incremental dynamic analysis, number of time histories are applied. Response of the structure like interstorey drift ratio, base shear is found out for the scaled time histories. IDA graph of spectral acceleration to interstorey drift ratio (%) is plotted for every time history applied.

Given below are some Single Record IDA curves and Multi Record IDA curve where multi-record IDA curve is a collection of single-record IDA curves for a single building obtained from different ground motions, which are all parameterized on the same IM and DM

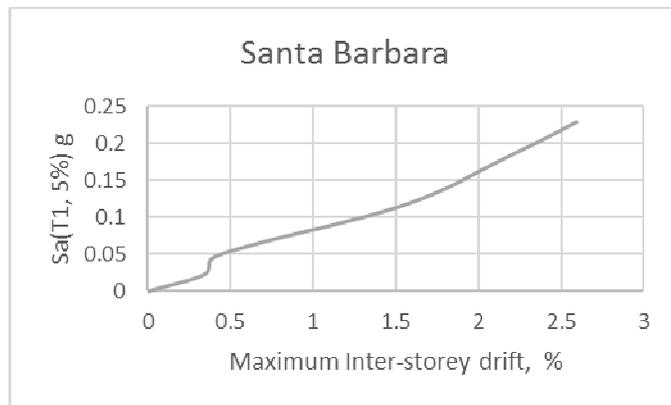


Fig 4.1 Single Record IDA curve of Santa

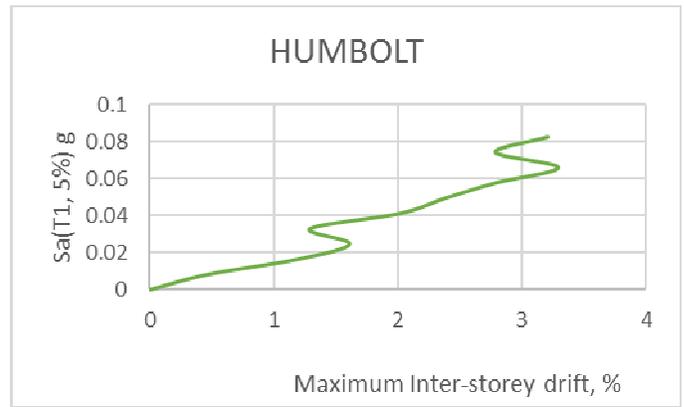


Fig 4.2 Single Record IDA curve of Humbolt

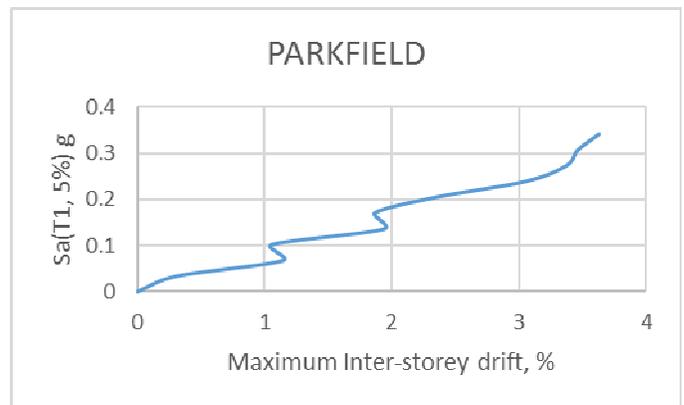


Fig 4.3 Single Record IDA curve of Parkfield

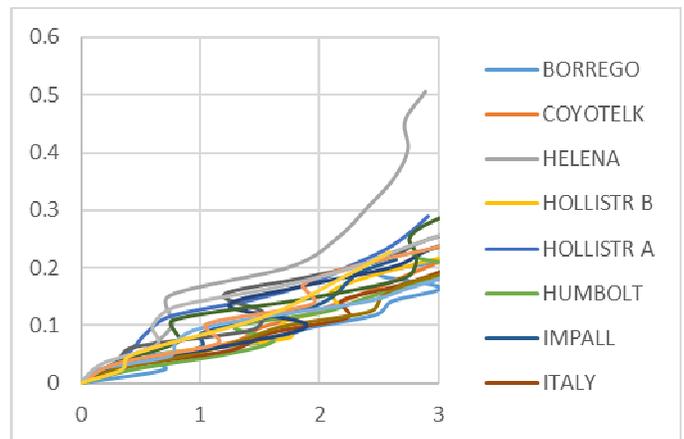


Fig 4.4 Multi-record IDA curve of 16 ground motions

Softening case means building collapses at smaller value IM and it has larger DM i.e. maximum inter-story drift. In contrast, hardening means that IDA curve in the nonlinear region weaving which means DM value increased and decreased by increasing IM.

In above plot of Multirecord IDA curve, curves are weavy in nature in non linear region which clearly shows that hardening is reached by building

Fragility curves denoting the extent of yielding and collapse with respect to spectral acceleration are also plotted. Building susceptibility i.e. whether the building can sustain the considered earthquake or nor is found out using IDA.

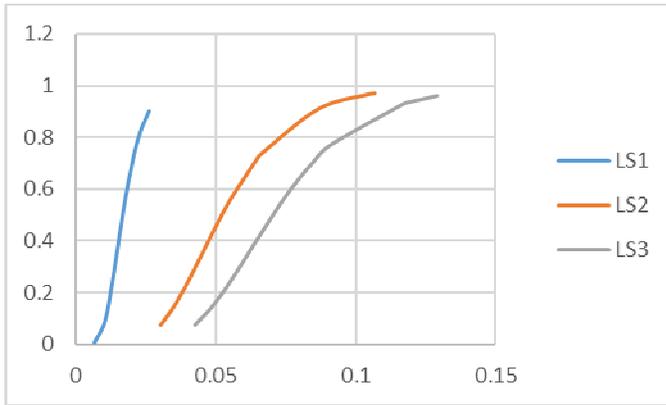


Fig 4.5 Fragility curves of 12 storey RC Building at different Limit states.

Following are the observations and conclusions that can be drawn from the study

4.1 Observations

1. IDA curve helps in studying the behaviour of building under a particular earthquake and define the performance stages of the structure such as yield and collapse.
2. In this study; G+11 building sustains all the earthquakes. For the G+11 building considered in this study, building is safe from all the earthquakes. If the yield and collapse acceleration of the structure for the considered earthquake is more than the original un-scaled acceleration, we can say that building sustains the considered earthquake.
3. Next, serviceability criteria given in IS 1893:2000 is also taken into consideration in the analysis. G+11 building satisfies the serviceability criteria.
4. Fragility curves denoting percentage of yielding and collapse for G+11 building is plotted. These curves denote the percentage of yielding and collapse with respect to spectral acceleration of the considered earthquakes.

V. CONCLUSION

Building susceptibility can be easily studied using incremental dynamic analysis. We can find out whether the building can fail to the considered earthquake or not. If building is failing to the considered earthquake or failing to satisfy the criteria of serviceability, stiffness of the structure needs to be increased by increasing column dimensions. Incremental dynamic analysis is accurate than other analysis methods because response of the structure is plotted by

applying actual available earthquake data. So, response of the building from incremental dynamic analysis is actual response generated from the considered earthquake. If the structure is of much importance and high accuracy is needed, then only incremental dynamic analysis should be preferred as Incremental dynamic analysis is tedious and very much time consuming than other available methods.

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Seismic Assessment of RC Frames with Various Bracing Systems

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Abstract— Steel bracing is one of the best way for enhancing earthquake resistance of RC frames. Steel bracing is viable solution as a lateral load resisting system to improve seismic performance of RC frame as it is economical and has ability to meet required strength. IS 1893 (Part 1):2016 mentioned same response reduction factor (R factor) for all special braced frames (SBF) and also increased the value of R factor in recent revision. In this present study, R factor of RC frame with different bracing systems have been evaluated. The symmetrical four storey RC frames having three bays with X bracing, V bracing and chevron bracing have been modelled in SAP2000 as per IS codes. Pushover (nonlinear static) analysis is performed on the models and response reduction factor has been calculated by using static pushover curves obtained in SAP2000.

Keywords— RC frame; bracing; pushover analysis; nonlinear static analysis; response reduction factor; special braced frames

I. INTRODUCTION

Special concentric braced frames (SBF) are one of the most economical lateral load resisting systems used in buildings worldwide to improve seismic performance of RC frames. These frames provide adequate lateral strength and stiffness to the structural systems so that they meet the serviceability and operability criteria for small frequent earthquakes and failure criteria for high infrequent type earthquakes. Steel bracings provide adequate energy dissipation and ductility to the structural system through their inelastic deformations to resist the earthquake forces effectively.

The response reduction factor (R) represents the ratio of the maximum lateral force (V_e) which would develop in a structure if structure remains elastic under the ground motion, to the lateral force (V_d) which it has been designed to withstand. R factor depends on the perceived seismic damage performance of the structure, characterized by ductile or brittle deformations, redundancy in the structure, or overstrength inherent in the design process [6]. R factor for building with SBF having concentric braces is given as 4.5 in IS 1893:2016 and it is 4.0, common for SBF and ordinary concentric braced frame (OBF), in IS 1893:2002 [7]. The R factor is expressed as a function of various parameters of the structural system, such as strength, ductility, damping and redundancy as shown in fig. 1 and can be calculated from equation 1:

$$R = R_s R_r R_\mu R_\zeta$$

.....(1)

Where,

R_s is the overstrength factor,

R_r is the redundancy factor,

R_μ is the ductility factor,

R_ζ is the damping factor.

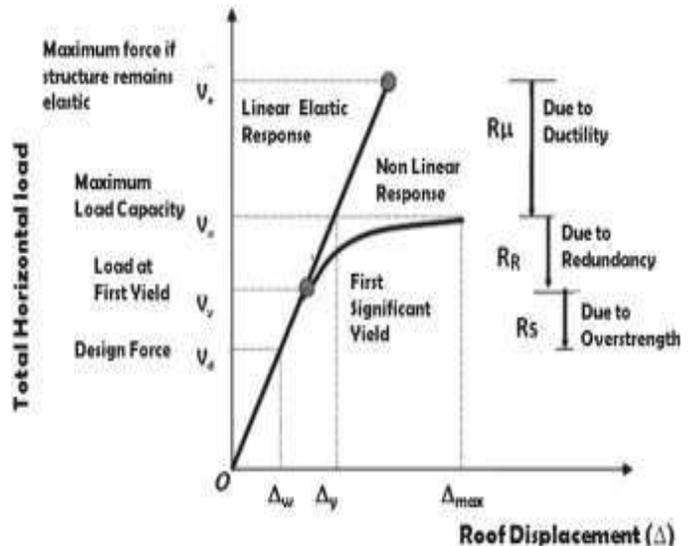


Fig. 1. Concept of response reduction factor [13]

Parameters of R factor are explained in detail as follows:

The damping factor, R_ζ , is generally assigned a value equal to 1.0 for structures, not provided with supplemental energy dissipating devices, for 5% damping and is excluded from the explicit components of R factor [13].

From nonlinear static pushover curves, overstrength, redundancy and ductility factor can be calculated by using definitions and equations given in FEMA P695 [5] which are stated in the following equations:

Overstrength factor, R_s , can be calculated using equation 2:

$$R_s = \frac{V_y}{V_d}$$

.....(2)

Redundancy factor, R_r , can be calculated using equation 3:

$$R_r = \frac{V_e}{V_y} \dots\dots\dots(3)$$

Ductility factor, R_μ , also called as period-based ductility and can be calculated using equation 4:

$$R_\mu = \frac{\Delta_{max}}{\Delta_y} \dots\dots\dots(4)$$

Where,

V_y is the actual, maximum strength of fully-yielded system,

V_s is the seismic base shear required for design,

V_e is the force level that would be developed in the seismic-force-resisting system, if the system remained entirely linearly elastic for design earthquake ground motions,

Δ_{max} is the maximum absolute relative displacement,

Δ_y is the displacement at first significant yield point.

II. HISTORY & BACKGROUND

In previous few years, researches have been carried out on bracing systems. Maheri et. al. [9] presented results of pushover experiments conducted on 1:3 scaled models of ductile RC frames, directly braced by steel X and knee braces which indicate that the yield capacity and the strength capacity of a ductile RC frame can be increased and its global displacements can be decreased to the desired levels by directly adding bracing system to the frame. Metre et. al. [10] analyzed 25 storey steel frame for the rectangular plan of 25m x 15m by considering Z-II and Z-V for soil type-II. They concluded that bracing structures gives more resistance to lateral deflection and also it suitable in earthquake prone areas and effectively reduces the lateral displacement and drift. Upreti and Mallik [12] concluded that the position of bracing is found to best when bracings are placed at corners. Hence, steel bracing is one of the best way for enhancing earthquake resistance of RC frames.

Mirando [1] evaluated strength-reduction factors that are used to reduce linear elastic design spectra to account for the hysteretic energy dissipation of the structure. The paper recommended that strength-reduction factors to be used in design be specified as a function of the period and inelastic capacity of the structure and of soil conditions and simplified expressions to compute strength-reduction factors are proposed. Hirde and Nakhate [11] performed pushover analysis on symmetrical frames with 3, 5 and 7 numbers of storey with four bays are designed and detailed as OMRF and SMRF. They concluded that both the OMRF and SMRF frames achieve the respective target value of R factor recommended by IS1893 and R factor changes with change in storey of building.

In the sixth revision-IS 1893 (part I):2016, IS 1893 increased value of R factor for SBF from 4.0 to 4.5. Hence, this paper presents evaluation of R factor for RC frames with

different bracing systems and checked for recent revision of IS 1893.

XLIV. BUILDING MODELLING AND DETAILS

Four storey RC frame having three bays in X direction and three bays in Y direction with X bracing (as shown in fig. 3.1), V bracing (as shown in fig. 3.2) and Chevron bracing (as shown in fig. 3.3) modelled in SAP2000 for the analysis. K braces increases shear demand on column and can cause brittle shear failure. Therefore, some design codes prohibit use of K braces in earthquake resistant design [2]. OBF shall not be used in seismic zone V and while designing SBF, the maximum slenderness ratio of the braces is checked not to exceed 160 [8]. Bracings are placed at corners of frame [12]. Plinth beams are provided at periphery of RC frames for supporting V braces.

All the details regarding modelling of four storey RC frame with bracing is given in table I:

Table I: Modelling details

Sr. No.	Parameters	values
1	Total height of building	12m
2	Height of each storey	3m
3	Typical bay width	3m
4	Size of beam	300mm X 450mm
5	Size of column	450mm X 450mm
6	Depth of slab	150mm
7	Grade of concrete	M25
8	Grade of reinforcing steel	Fe500
9	Size of bracing	ISMB225
10	Grade of steel	Fe250
11	Support condition	Fixed

Seismic data used for analysis is given in table II [6]:

Table II: Seismic details

Sr. No.	Parameters	values
1	Seismic zone	V
2	Zone factor	0.36
3	R factor for SBF	4.5
4	Importance factor (I) for Residential buildings	1.2
5	Soil type: Medium soil	II
6	Damping	5%
7	Fundamental period (T_a)	0.516 sec

Loading data is given in table III:

Table III: Loading details

Sr. No.	Type of Loading	Loads (kN/m ²)
1	Live load on floors	3
2	Live load on roof	1.5
3	Floor finish	1.5

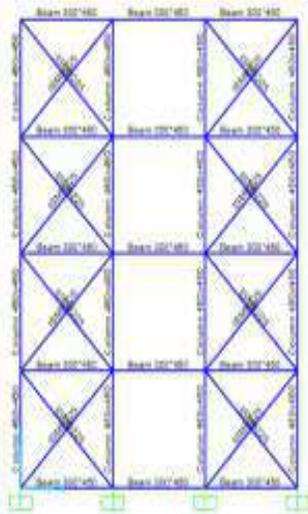


Fig. 3.1.A. Elevation

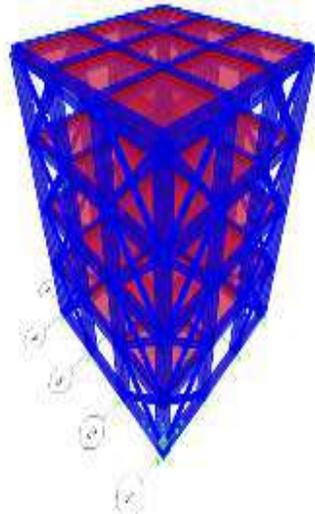


Fig. 3.1.B. 3D view

Fig. 3.1. Four storey RC frame with X bracing system

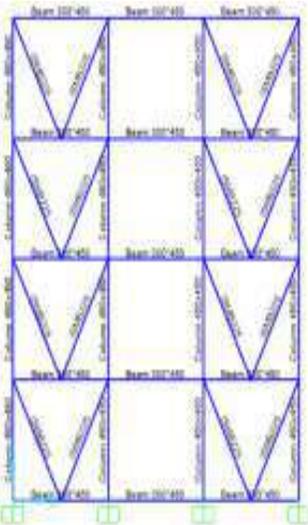


Fig. 3.2.A. Elevation

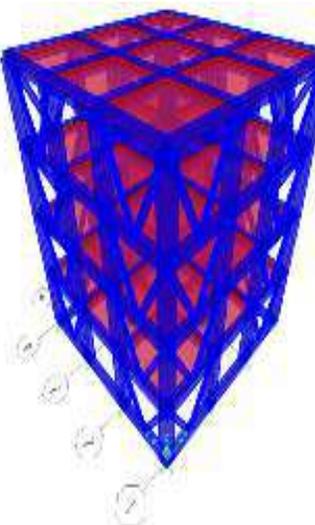


Fig. 3.2.B. 3D view

Fig. 3.2. Four storey RC frame with V bracing system

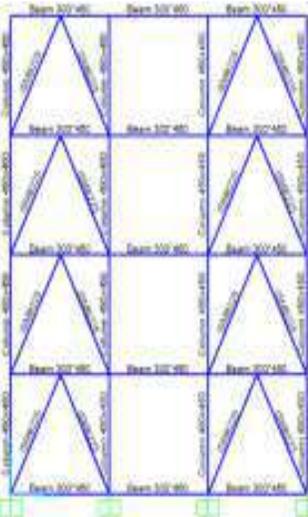


Fig. 3.3.A. Elevation

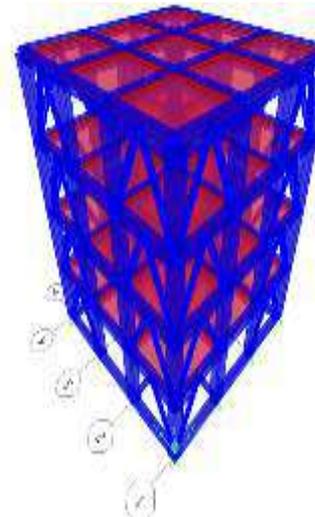


Fig. 3.3.B. 3D view

Fig. 3.3. Four storey RC frame with chevron bracing system

XLV. RESULTS AND ANALYSIS

First, each model of four storey RC frame with bracing is analyzed and design base shear (V_B) is obtained by response spectrum method in SAP2000 and then design base shear (\bar{V}_B) calculated using a fundamental period T_a , equivalent static analysis manually. As V_B is less than \bar{V}_B , values of base reactions shall be multiplied by \bar{V}_B / V_B [6].

After that, each model is subjected to nonlinear static load cases in which P-delta effect is taken into consideration and each model is then analyzed by pushover (nonlinear static) analysis [3] in SAP2000. After carrying out analysis, static pushover curves for X bracing, V bracing and chevron bracing are obtained as shown in fig. 4.1, 4.2 and 4.3 respectively.

Comparative graph upto target displacement is plotted for static pushover curve of four storey RC frame with X, V and chevron bracing system which is shown in fig. 4.4.

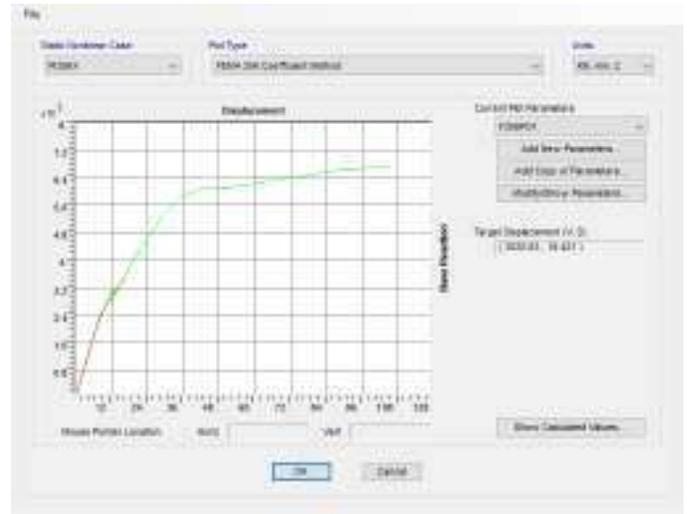


Fig. 4.1. Static pushover curve of four storey RC frame with X bracing system

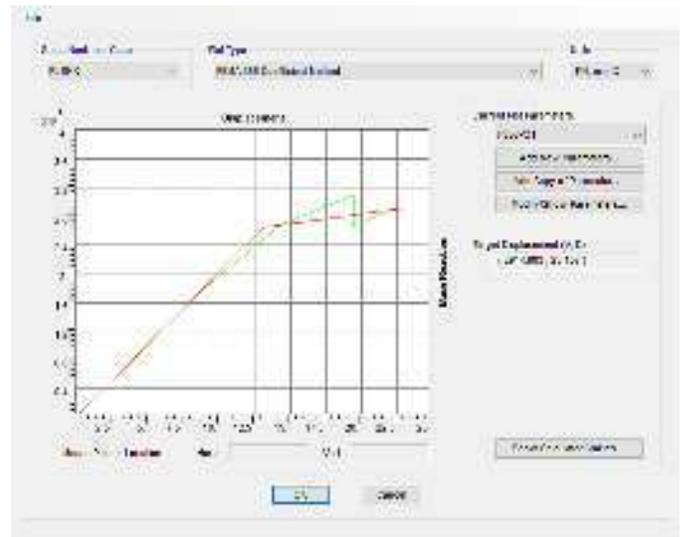


Fig. 4.2. Static pushover curve of four storey RC frame with V bracing system

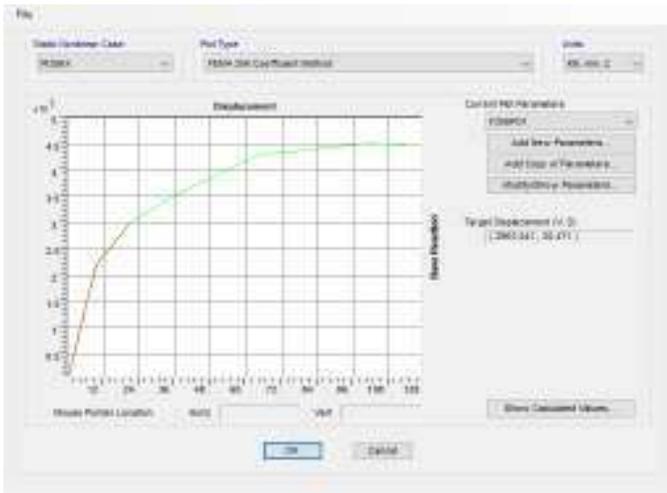
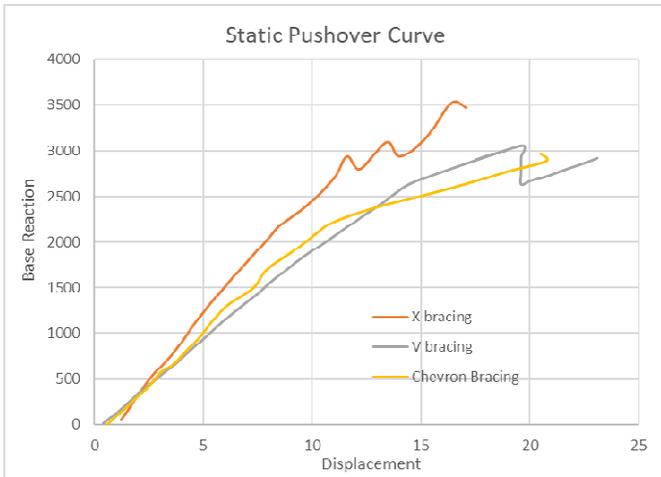


Fig. 4.3. Static pushover curve of four storey RC frame with chevron bracing system.

Fig. 4.4. Combined graph for static pushover curve of four storey RC frame with X, V and chevron bracing system. From static pushover curves.

V. CONCLUSION

Pushover (nonlinear static) analysis has been carried out on four storey RC frames with various bracing systems in SAP2000. From the study of static pushover curves and calculated R factors, following results were drawn:

1. R factor changes with change in bracing system as shown in fig. 5. Four storey RC frame having same member sizes, same support conditions, same seismic data just braced with concentric SBF- X, V and Chevron bracing gives different values of R factor.

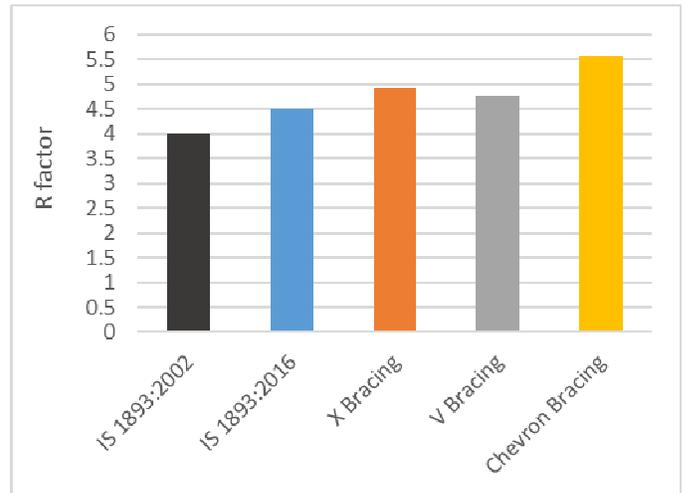


Fig. 5. Response reduction factor of special braced frames.

2. From fig 5, it is clearly seen that the R factor which is calculated from study of static pushover curves is greater than mentioned in IS 1893:2016 and IS:1893:2002. All three models satisfied IS 1893 criteria.

3. In general, it is beneficial for safety of structure that value of R factor is taken less than the actual value of R factor. However, it underestimates the reserved strength of structure. In the sixth revision of IS 1893, value of R factor increases from 4.0 to 4.5 for SBF and present study shows that this revision is good as analysis results are greater than and near to the value of IS 1893:2016.

4. Four storey RC frame having X bracing gives lesser displacements than V bracing and chevron bracing. Hence, X bracing is more effective than V bracing and chevron bracing in increasing the lateral stiffness of the ductile frame.

Table IV. Determination of R factor from static pushover curves.

Sr. No.	Bracing system	V_s (kN)	Δ_y (mm)	V_y (kN)	Δ_{max} (mm)	V_e (kN)	R_s	R_r	R_μ	R_ζ	R
1	X bracing	1946.66	7.918	2352.935	16.421	4622.78	1.209	1.965	2.074	1.0	4.927
2	V bracing	1733.33	13.174	2647.73	23.107	4699.52	1.528	1.775	1.754	1.0	4.757
3	Chevron bracing	1808.36 6	9.42	2180.06	20.471	4621.17	2.12	1.208	2.173	1.0	5.565

5. Four storey RC frame having chevron bracing gives maximum value of R factor than X bracing and V bracing. Chevron bracing gives 23.66% and 39.125%, X bracing gives 9.49% and 23.175% and V bracing gives 5.71% and 18.925% higher value of R factor than mentioned in IS 1893:2016 and IS 1893:2002 respectively.

Present study concludes that R factor is not same for various bracing systems as mentioned in IS 1893. Also, there is change in parameters of R factor with change in bracing system. In future, R factor can be evaluated for different height and aspect ratios of RC frame with chevron bracing.

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Performance Based Seismic Design of Open Ground Storey Building Considering Soil Effects

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Abstract— Open ground storey buildings are typical and unavoidable trend in modern construction practices. Past earthquakes have emphasized that RC framed buildings with open ground storey are extremely vulnerable under earthquake shaking. Generally, bare frame analysis is used to design open ground storey buildings with a multiplication factor which varies for different codes. The flexibility of the soil below the structure is often not considered while analyzing and designing a structure. The soil structure interaction alters the response of the structure including base shear, lateral displacement and storey drift. In the present study, an extensive computational study has been carried out on a five storied open ground storey RC framed building using performance based seismic design (PBSD) procedures and standards. Nonlinear time history analysis method has been adopted. The soil has been modelled using equivalent spring constants as per FEMA 356. Equivalent diagonal strut method has been used to model the infill masonry walls. Building has been designed for selected performance objective.

Keywords— *Open Ground Storey, Nonlinear Dynamic Analysis, Performance Based Seismic Design, Time History Analysis, Equivalent diagonal strut, Soil Structure Interaction.*

I. INTRODUCTION

In metropolitan cities especially, where land space is a major hassle, efficient utilization of space has become a major concern due to rapid urbanization and population growth. Many such buildings constructed in recent times have a special feature – the ground storey is left open for the purpose of parking. In such buildings, the ground storey is built without any infill walls. It allows easy movement of vehicles but the upper storeys are covered with infill walls. Such buildings are often called “Open Ground Storey” buildings or buildings on stilts. Open ground storey buildings have consistently shown poor performance during past earthquakes across the world (for example during 1999 Turkey, 1999 Taiwan and 2003 Algeria earthquakes); a significant number of them have collapsed.

As per IS:1893(Part-1): 2002, “A *soft storey* is one in which the lateral stiffness is less than 70% of that in the storey above or less than 80% of the average lateral stiffness of three stories above”. A *weak storey* is defined as one in which the storey’s lateral strength is less than 80 percent of that in the storey above.

Fig. 1 illustrates the behavior of an open ground storey building when subjected to seismic excitation. The OGS building behaves as an inverted pendulum due to drastic

change in the relative stiffness at the ground floor and the floors above.

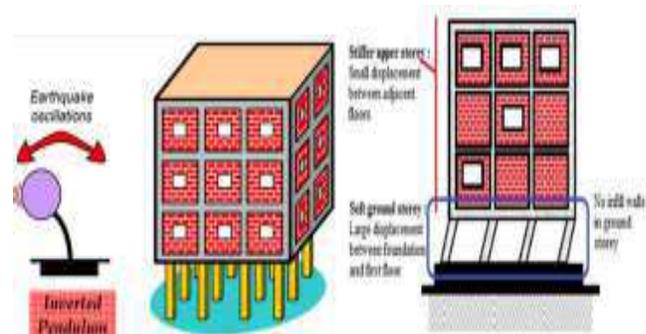


Fig. 1. Open ground storey building behavior. (IITK, Earthquake Tip)

Often, the buildings are designed and analyzed based on the bare frame considerations which is not appropriate as actual response of the building is completely different. Also it is a common practice to consider the supports as fixed while analyzing and designing the structure which may not match the actual foundation strata. The consideration is acceptable in case of hard rock soil but cannot be applicable in case of flexible soil underneath the structure.

The modelling of soil below the structure can be performed using two methods namely, *Direct method*, and *Substructure method*. The direct method requires to model the soil and the structure as a continuum using finite element method. It is a complex method and it may not be warranted for building structures. The substructure method is relatively simpler. In this method, soil material properties are used for incorporation of springs to represent the stiffness at the soil foundation interface. Sub-structure method is computationally more efficient than the direct method as regards complexity and time required. *Performance Base Seismic Design* (PBSD) is a relatively new concept. Performance based seismic design is a procedure for designing new buildings or seismic up-gradation of existing buildings, which includes a specific intent to achieve defined performance objectives in future earthquakes [4]. Performance objectives are Operational (O), Immediate occupancy (IO), Life Safety (LS), Collapse Prevention (CP), as per FEMA 356. Fig. 2 shows various building performance levels under seismic event as per FEMA 356.



Fig. 2. Building Performance Levels. [10]

In performance based design approach, performance levels are described in terms of displacement as damage is better correlated to displacements rather than forces. This is based on the idea that performance objectives can be related to the level of damage to the structure, which in term can be related to displacement and drift. Fig. 3 shows the typical process of design to be followed.

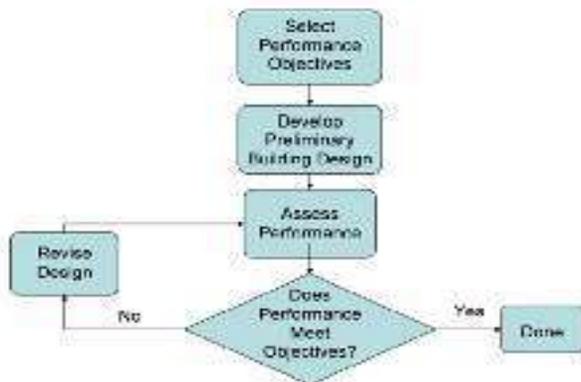


Fig. 3. Performance-based design flow diagram. [10]

II. HISTORY & BACKGROUND

Performance base design of buildings has been practiced since the early twentieth century. England, Australia and New Zealand had performance-based building codes in place for decades. The International Code Council (ICC) in United States had a performance code available for voluntary adoption since 2001. The contribution of infill walls in the structural response has been a topic of discussion. In an experimental study carried out at structural engineering laboratory of the Indian Institute of Technology Kanpur, it was observed that the masonry infilled frames have about 70% higher strength than the bare frames [1]. The IS Code provides a multiplication factor to incorporate the effect of open ground storey phenomenon but rather it was observed that the first storey was more vulnerable than ground storey as relative vulnerability of first storey increases due to strengthening of the ground storey [2]. Equivalent diagonal strut method has been used by researchers to model the infill walls. Around 14 popular methods are available to design equivalent strut element. A research observed that Holmes equation gave the closest results to the experimental test [3]. The PBSD tool was used by many researchers to analyze and design the building efficiently for a given performance objective. PBSD was carried out using various methods like Pushover analysis [4]

and time history analysis [5]. A number of studies suggested that as the height of the building increases, the soil underneath the structure also needs to be accounted. Hence, researchers used the equivalent spring stiffness for flexible soil conditions in order to get a realistic response of the building [6]. A very few of the researchers have accounted both soil flexibility and the infill wall stiffness in their analysis [7].

The present study evaluates the effect of soil with infill wall stiffness (bare frame case not considered) on the response of the building. Guidelines like FEMA 273 and FEMA 356 are used for designing a G+4 open ground storey RC building for Life Safety Performance objective.

III. SYSTEM DEVELOPMENT

A G+4 open ground storey RC frame building is taken for study purpose. The building is situated in zone III on soil type II (medium soil). The model consists of 3 bays in both “X” and “Y” direction spanning 4.5 m each. Total height of the building is 17 m. The bottom storey height of the building is kept 5 m and for all other stories, the storey height is 3 m. The building is modelled and designed as per IS 456-2000. The wall is modelled as “X” bracing compressive strut with pin end connections. The foundation of the building is assumed to be surface footing. Four cases have been considered for the study in accordance with the soil flexibility viz., (1) No Soil Structure Interaction (NSSI), (2) Hard Soil Structure Interaction (HSSI), (3) Medium Soil Structure Interaction (MSSI), and (4) Soft Soil Structure Interaction (SSSI). M3 hinges for the beams and P-M2-M3 hinges for the columns are assigned at both end of the members. P axial hinge is assigned at the center of strut member. Non-linear Time History Analysis is carried out and the structural responses like time period, lateral displacement, storey drift, and base shear are compared for all the cases. Time history data are extracted from the PEER Database web tool for the target response spectrum defined using the IS 1893:2016. Three time histories are applied to the model and the model is analyzed for the one which gives maximum response. The building is designed for Life Safety (LS) Performance objective. SAP2000 v20.0.0 software is used for analyzing and designing the structure.

The diagonal struts are modelled using *Holmes method*. Holmes states that the width of an equivalent strut should be one third of the diagonal of an infill frame, which results in the infill strength being independent of the frame stiffness [3],

$$W = \frac{1}{3} d_{inf}$$

Where,

W = width of the diagonal strut

d_{inf} = diagonal of infill wall

- Material Properties:
 - Grade of Concrete: M30
 - Grade of Steel: Fe500
 - E_c : 27.38×10^6 kN/m²
 - E_m : 3.6×10^6 kN/m²

• Sectional Properties:

- Beam: (a) first floor = 400*450
(b) second floor = 400*450
I other floor = 250*300
- Column: (a) ground floor = 400*450
(b) other floor = 300*450
- Slab thickness: 0.12 m
- Wall thickness: (a) External = 0.23 m
(b) Internal = 0.15 m
- Diagonal strut: (a) External = 0.23*1.8 m
(b) Internal = 0.15*1.8 m

• Load Consideration:

- Floor Finish: 2 kN/m²
- Roof Finish: 2 kN/m²
- Live Load: 4 kN/m²
- Response spectra: IS 1893(I) 2016

• Load Combinations:

In limit state design of RC structure, following 13 combinations are considered as per IS 1893:2016. Building is designed for maximum loading combination.

- 1) 1.5 DL+1.5 LL
- 2) 1.2 DL+ 1.2 LL + 1.2 Eqx
- 3) 1.2 DL+ 1.2 LL – 1.2 Eqx
- 4) 1.5 DL + 1.5 Eqx
- 5) 1.5 DL – 1.5 Eqx
- 6) 0.9 DL + 1.5 Eqx
- 7) 0.9 DL – 1.5 Eqx
- 8) 1.2 DL+ 1.2 LL + 1.2 Eqy
- 9) 1.2 DL+ 1.2 LL – 1.2 Eqy
- 10) 1.5 DL + 1.5 Eqy
- 11) 1.5 DL – 1.5 Eqy
- 12) 0.9 DL + 1.5 Eqy
- 13) 0.9 DL – 1.5 Eqy

• Seismic Properties:

- Seismic zone: III
- Response Reduction Factor: 5
- Importance Factor: 1.5

Fig. 4 gives the plan, elevation, and 3D view of the modeled OGS building.

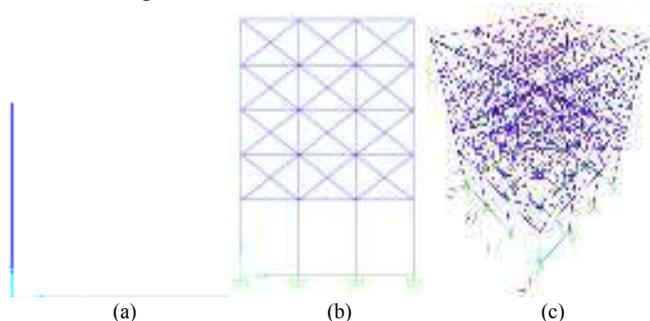


Fig. 4. (a) Plan of the building. (b) Elevation of the building. (c) 3D view of the building.

• Soil Idealization

In the present study, we will use the *Substructure method* to model the soil. Shallow isolated footing has been considered. The movement around three orthogonal directions have been considered and the interaction between the soil and the foundation is taken into account by equivalent spring stiffnesses. Three translational springs are applied in two horizontal and one vertical direction i.e., X-Y-Z direction, and three rotational spring stiffness are applied in X-Y-Z direction. Fig. 5 shows the translational and rotational spring stiffnesses.

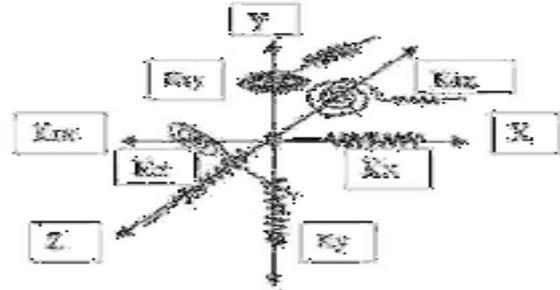


Fig. 5. Soil stiffness spring systems at the foundation. [9]

FEMA 356 (George Gazetas 1991) provides us with the soil spring stiffness equations for all the six degrees of freedom. Fig. 6 shows the equivalent spring equations for shallow isolated footing at the surface.

Degree of Freedom	Stiffness of Foundation at Surface	Note
Translation along x-axis	$K_{x, sur} = \frac{GB}{2-v} \left[3.0 \left(\frac{L}{B} \right)^{0.65} + 1.2 \right]$	
Translation along y-axis	$K_{y, sur} = \frac{GB}{2-v} \left[3.0 \left(\frac{L}{B} \right)^{0.65} + 0.4 \frac{L}{B} + 0.8 \right]$	
Translation along z-axis	$K_{z, sur} = \frac{GB}{1-v} \left[1.55 \left(\frac{L}{B} \right)^{0.75} - 0.8 \right]$	
Rocking about x-axis	$K_{xx, sur} = \frac{GB^3}{1-v} \left[0.4 \left(\frac{L}{B} \right) + 0.1 \right]$	
Rocking about y-axis	$K_{yy, sur} = \frac{GB^3}{1-v} \left[0.47 \left(\frac{L}{B} \right)^{1.4} + 0.034 \right]$	
Torsion about z-axis	$K_{zz, sur} = GB^3 \left[0.53 \left(\frac{L}{B} \right)^{1.45} + 0.51 \right]$	

Fig. 6. Equivalent Spring constants for shallow foundation. [9]

The soil parameters for all the considered soil profiles i.e., hard, medium, and soft soil are provided in Table. I.

Table. I. Soil parameters considered.

Soil Type	Shear Wave Velocity (m/s)	SPT	Mass Density (kN/m ³)	Poisson Ratio	Shear Modulus (kN/m ²)	S.B.C (kN/m ²)
Hard Soil	600	≥ 30	20	0.45	68965.51	250
Medium Soil	320	10 to 30	18	0.45	17241.37	160
Soft Soil	150	≤ 10	16	0.45	5172.41	120

Table. II give the values for different degrees of freedom for different soil conditions i.e., hard, medium, and soft soil.

These values are then provided in SAP2000 v20.0.0 to incorporate the soil effect for respective soil profile.

Table. II. Equivalent soil spring stiffness.

	Hard Soil	Medium Soil	Soft Soil
KX (kN/m)	295566.5	153503.8	23025.57
KY (kN/m)	295566.5	153503.8	23025.57
KZ (kN/m)	398530.2	221003	33150.446
KXX (kN/rad)	190785.7	105799.3	15869.89
KYY (kN/rad)	192312	106645.7	15996.85
KZZ (kN/rad)	242068.9	121034.4	18155.159

• Time History

Three time histories have been selected and scaled on the basis of defined target response from IS 1893:2016. Matching and scaling was done using MSE (Mean Squared Error) method on PEER web tool. Fig. 7 shows the X and Y direction component of the three selected time histories.

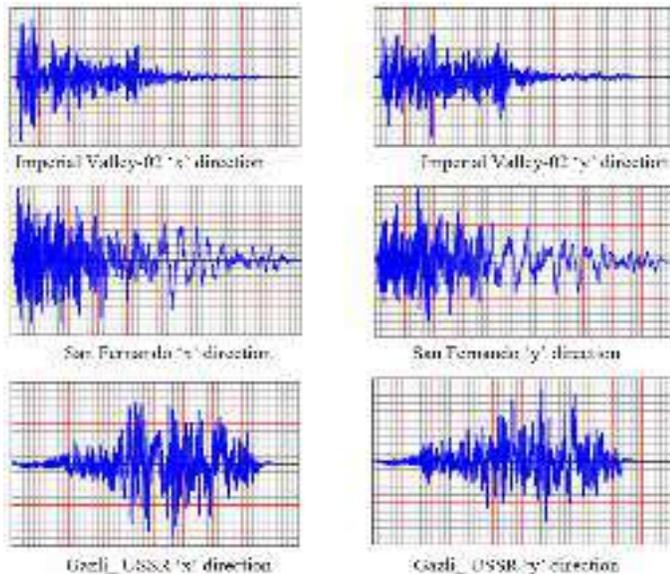


Fig. 7. Time histories considered for the analysis.

IV. RESULT AND ANALYSIS

The results in terms of natural time period, lateral displacement, storey drift, and base shear are presented for different soil profile models like NSSI, HSSI, MSSI, and SSSI. An effort is made to investigate the effect of soil flexibility on the structure. The OGS building is designed for LS performance objective.

• Lateral displacement

Lateral displacement of the G+4 OGS building was calculated for all the soil profiles (NSSI, HSSI, MSSI, SSSI) with initial sections being constant for all the cases. It was observed that as we go from rigid to soft base, the lateral displacement of the building increases. Fig. 8 shows the lateral displacement for all the soil types.

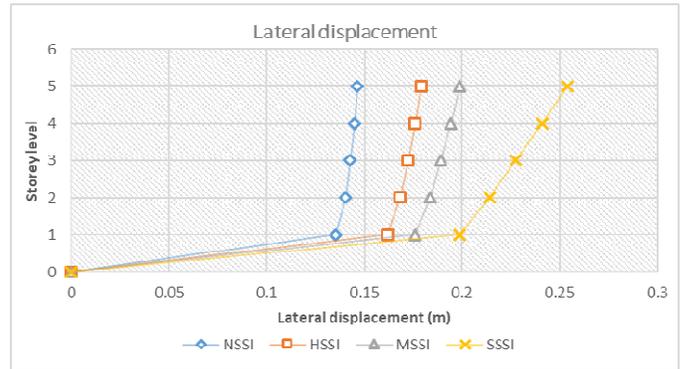


Fig. 8. Lateral displacement of G+4 OGS building.

• Time Period

It is observed that as the soil stiffness decreases, the time period of the building increases. Fig. 9 shows the time period variation for different soil profiles.

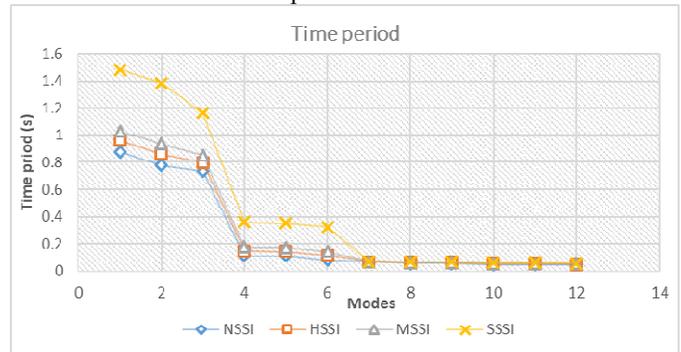


Fig. 9. Time period of G+4 OGS Building

• Storey drift

Storey drift is the relative displacement between the floors. Typically for OGS buildings, it is observed that the maximum storey drift is for the first floor where the stiffness irregularity occurs. Fig. 10 shows the storey drift for different soil profiles. It can be observed that as the soil stiffness decreases, the storey drift increases.

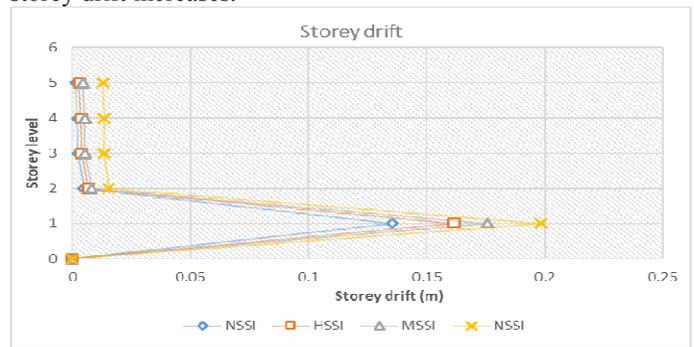


Fig. 10. Storey drift for G+4 OGS building.

• Base Shear

The base shear is a function of mass, stiffness, height, and the natural period of the building structure. The change in base shear with change in soil stiffness is plotted in Fig. 11. It can be observed that as we go from rigid to soft soil condition, the base shear decreases.

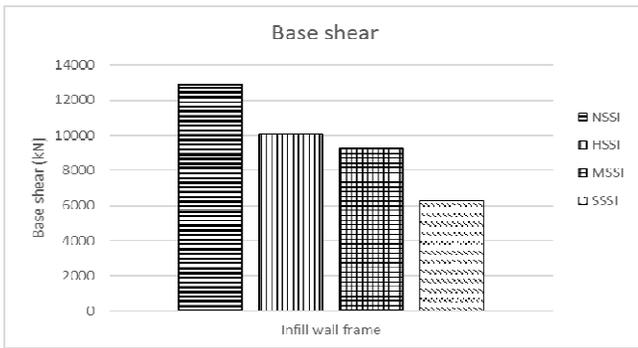


Fig. 11. Base shear for G+4 OGS building.

• Criteria for Performance Objective

FEMA 273 has made an effort in quantifying the damages and has laid down few criterias to categorise the performance of the building.

a) Storey drift.

FEMA 273 provides storey drift criteria to define the performance objective. Storey drift of given model should be within the prescribed limit. Table. III gives the storey drift criteria.

Table. III. Storey drift criteria. [8]

Performance Level	Operational	Immediate Occupancy	Life Safety	Collapse Prevention
Storey Drift	< 0.2%	< 0.5%	< 1.5%	< 2.5%

b) Plastic rotation.

The limiting value for given performance objective are provided by FEMA 273. If the plastic rotation values for a given performance objective goes beyond the prescribed value, then the sections need to be revised. Table. III gives the plastic rotation criteria.

Table. IV. Plastic rotation criteria. [8]

Structural System	IO	LS	CP
Beam	0.01	0.02	0.025
Column	0.005	0.015	0.02

• PBSD for Life Safety (LS) Performance Objective

Nonlinear direct time history analysis was carried out on G+4 OGS building for all the soil profiles. Initially, few members went beyond the LS objective. After a number of trials, the LS objective was attained. Fig. 12 shows the hinges formed for respective soil type at LS performance objective.

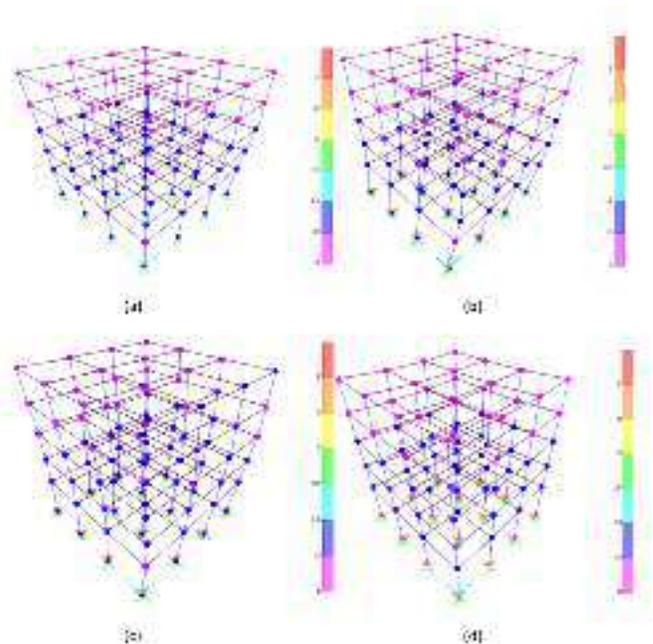


Fig. 12. Hinge results at LS for (a)NSSI (b)HSSI (c)MSSI (d)SSSI

Lateral displacement and storey drift of the OGS building for LS performance objective for all soil profiles are described in Table. V and Table. VI respectively.

Table. V. Lateral displacement for LS.

Storey	Lateral Displacement (m)			
	NSSI	HSSI	MSSI	SSSI
0	0	0	0	0
1	0.03180 8	0.04572 6	0.06714 3	0.07339 1
2	0.05695 4	0.07765 1	0.11231 1	0.11574 3
3	0.08940 1	0.09676 7	0.15796 8	0.15329 9
4	0.11245 3	0.11201 1	0.17807 8	0.18485 8
5	0.11753 4	0.11705 9	0.18298 8	0.18769 8

Table. VI. Storey drift for LS.

Storey	Storey Drift (m)			
	NSSI	HSSI	MSSI	SSSI
0	0	0	0	0
1	0.03180 8	0.04572 6	0.06714 3	0.07339 1
2	0.02514 6	0.03192 5	0.04416 8	0.04235 2
3	0.03244 7	0.01911 6	0.04465 7	0.03755 6
4	0.02305 2	0.01524 4	0.02011	0.03155 9
5	0.00508 1	0.00504 8	0.00491	0.00284

Table. VII gives the final sections and area of steel for the G+4 OGS building with different soil profiles i.e., NSSI, HSSI, MSSI, and SSSI for LS performance objective.

Table. VII. Final sections for all the soil profiles.

Section	Storey Level	Soil Profile											
		Section Size	NSSI		Section Size	HSSI		Section Size	MSSI		Section Size	SSSI	
			Area of Steel			Area of Steel			Area of Steel			Area of Steel	
Beam	1	400*600	704.13 7	Top	400*600	811.32 3	Top	400*600	874.39 8	Top	450*700	948.21 5	Top
			630.97 6	Bottom		630.97 6	Bottom		630.97 6	Bottom		828.15 7	Bottom
	2	400*500	525.81 4	Top	400*500	525.81 4	Top	400*500	525.81 4	Top	400*600	630.97 6	Top
			525.81 4	Bottom		525.81 4	Bottom		525.81 4	Bottom		630.97 6	Bottom
	3	350*500	460.08 7	Top	350*500	460.08 7	Top	350*500	460.08 7	Top	400*500	525.81 4	Top
			460.08 7	Bottom		460.08 7	Bottom		460.08 7	Bottom		525.81 4	Bottom
	4	350*500	460.08 7	Top									
			460.08 7	Bottom									
	5	250*400	262.90 7	Top									
			262.90 7	Bottom									
Column	1CC	500*650	2600		500*650	2600		500*650	2600		850*850	5780	
	1OC	500*600	2400		500*600	2400		500*600	2400		850*850	5780	
	2	450*550	1980		450*550	1980		450*550	1980		750*750	4500	
	3	350*450	1260		350*450	1260		350*450	1260		500*550	2200	
	4	300*450	1080		300*450	1080		300*450	1080		300*450	1080	
	5	300*450	1080		300*450	1080		300*450	1080		300*450	1080	

V. CONCLUSION

In this study, non-linear time history analysis is carried out on a G+4 OGS Building. Different soil profiles are incorporated with the OGS building and comparison is made. For all cases infill effect has been considered and no variation of infill has been incorporated. Also bare frame case has not been considered. PBSD is performed by following the guidelines provided by FEMA 273 and FEMA 356. The buildings are designed for Life Safety performance objective. Final section sizes and area of steel are provided for all considered cases.

Based on the results, following conclusions are drawn,

- 1) It is observed that the fundamental natural period of the building increases as the soil stiffness decreases. Maximum natural period is observed for building with SSSI.
- 2) Base shear is found to be decreasing as the soil stiffness decreases. Decrease in the base shear was observed to be 15.21%, 25.278%, 44.355% for HSSI, MSSI, and SSSI

with respect to NSSI respectively. Maximum base shear was observed for building with NSSI while minimum was observed for building with SSSI.

- 3) Lateral displacement of building was found to be increasing with decrease in soil stiffness. Increase in lateral displacement was observed to be 22.23%, 35.68%, 42.29% for HSSI, MSSI, and SSSI with respect to NSSI respectively. Maximum displacement was recorded for building with SSSI.
- 4) It is observed that the maximum storey drift of the open ground storey building occurs at first floor for all the considered cases. Increase in storey drift was observed to be 16.23%, 22.97%, and 31.82% for HSSI, MSSI, and SSSI with respect to NSSI respectively The storey drift increases with decrease in soil stiffness.
- 5) Soil Structure Interaction (SSI) cannot be ignored and must be accounted while analyzing and designing important structures like nuclear power plants, important buildings, dams, bridges etc. SSI should be incorporated

for structures in higher seismic zone and on medium to soft soil base.

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Use of Different Modified Dual Piezo Configurations on RC Beam using EMI Technique

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Abstract— Real time structural health monitoring along with damage detection and assessment of reinforced concrete members becomes essential since engineers often face the problem of detecting hidden damage. The Electromechanical Impedance (EMI) technique, which employs piezoelectric–ceramic Lead–Zirconate–Titanate (PZT) patches as impedance transducers, has emerged as a powerful non-destructive evaluation technique during the last few years. In conventional EMI technique employes the same piezo patch as the sensor as well as the actuator. A new versions of piezo configurations is used here it is called as Modified Dual Piezo Configuration (MDPC). It is applied in such a way that central patch acts as sensor and surrounding patches acts as actuator yielding to better results and larger sensing zone which was introduced by Adhikari & Bhalla [3]. In present work performance of different piezo configurations, namely, surface-bonded Single Piezo Configuration (SPC), surface-bonded Modified Dual Piezo Configuration (MDPC) and Embedded Modified Dual Piezo Configurations (EMDPC) are applied to reinforced concrete beams which are then subjected to destructive loading condition and tested. RMSD indices are calculated and their results are compared for effectiveness of all configurations using EMI technique. It is established that MDPC detects damage most effectively.

Keywords— *Structural Health Monitoring (SHM), Electro-mechanical Impedance (EMI), Single Piezo Configuration (SPC), Modified Dual Piezo Configuration (MDPC), Reinforced Concrete Beam.*

I. INTRODUCTION

Concrete structures have been used extensively in civil infrastructural systems. However, as compared with metallic or other composite structures, the Non-Destructive Evaluation (NDE) technologies of concrete structures are relatively undeveloped. Furthermore, due to their extensive and complex nature, conventional NDE methods might be very tedious, expensive, or unreliable. Therefore, more reliable and automated NDE techniques are being investigated for real-time health monitoring of concrete structures. The automated NDE techniques that enable continuous health monitoring of concrete structures while in operation require the

development of a built-in diagnostic system. Such a built-in diagnostic

system would be placed practically anywhere, even in remote and inaccessible locations to actively monitor the conditions of various types of structures. In particular, an impedance-based damage detection technique which uses a smart piezoelectric ceramic material Lead–Zirconate–Titanate (PZT) has emerged as a potential tool for the implementation of a built-in diagnostic system. This technique utilizes high-frequency structural excitations, which are typically higher than 20 kHz from the surface bonded PZT patches to monitor the changes in the structural mechanical impedance [6]. A basic principle of the impedance-based damage detection method is to track an electrical point impedance of the PZT patch bonded onto the structure. Physical changes in the structure may cause changes in the structural mechanical impedance, which may induce changes in the electrical impedance of the PZT patch. Those changes in the impedances of the PZT patches are used to identify incipient damage in the structure. The incipient damages, which are otherwise difficult to detect by various conventional techniques, can be successfully detected by the EMI technique [7].

II. HISTORY & BACKGROUND

The EMI technique was first invented by Liang et al [1]. In this technique, a PZT patch is bonded to the surface of the structure using high strength adhesive and subjected to an alternating voltage excitation from an impedance analyzer or Inductance Capacitance Resistance (LCR) meter, sweeping through a particular frequency range, generally 30 to 400 kHz, as shown in Fig. 1(a). At the given frequency, the patch actuates the structure and the response is sensed by the patch itself in terms of electro-mechanical admittance, which consists of real and imaginary components, the conductance and susceptance respectively. Any damage to the structure manifests itself as a deviation in the admittance signature, which is directly obtained in the frequency domain [8]. Due to the use of frequency in kilohertz range, the input signals have very small wavelength (typically of the order of few mm to cm). When any micro-crack appears in the structure, the path

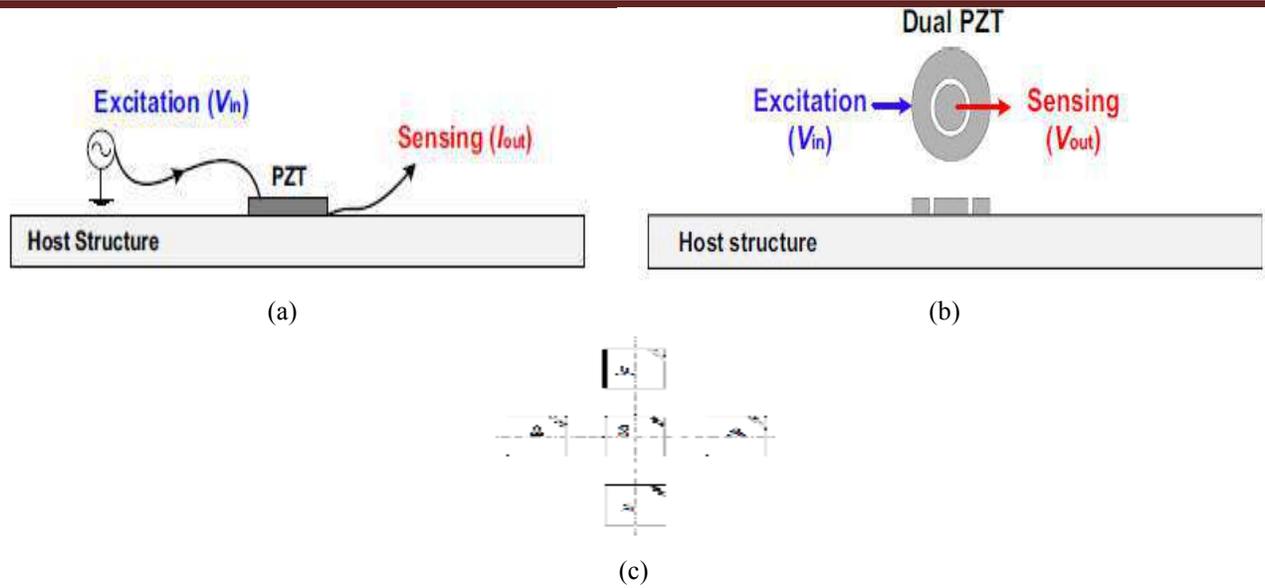


Fig. 1. (a) Conventional EMI technique (b) Dual piezo configuration (DPC) (c) Modified Dual Piezo Configuration (MDPC) [3]

of the waves is disturbed, which causes deviation in the signature, thereby giving a direct indication of damage. The governing one-dimensional wave equation for the generic system comprising one half of the patch and the structure, was solved by Liang et al. [1] for SPC using the impedance approach. The expression for electrical admittance as formulated by Liang can be further divided into two parts, active admittance and passive admittance, as given by

$$Y(\omega) = \bar{Y}_p(\omega) + \bar{Y}_a(\omega) = 2\omega j \frac{wl}{h} \left[\epsilon_{33}^T - d_{31}^2 \bar{Y}^E \right] + 2\omega j \frac{wl}{h} \left[\frac{Z_a}{Z_s + Z_a} \right] d_{31}^2 \bar{Y}^E \left(\frac{\tan kl}{kl} \right) \dots \dots \dots (1)$$

where, $\bar{Y}_p(\omega)$ is the passive component and $\bar{Y}_a(\omega)$ the active component of admittance, ω the angular frequency, w the width of PZT patch, l the half length of PZT patch, h the thickness of PZT patch, ϵ_{33}^T the complex electric permittivity of the PZT material at constant stress, Z_a the actuator impedance, Z_s the mechanical impedance of the structural system, d_{31} is the piezoelectric strain coefficient, \bar{Y}^E the complex Young's modulus of the PZT patch at constant electric field, $j = \sqrt{-1}$ and k the wave number given by $k = \omega \sqrt{\frac{\rho}{Y^E}}$

Despite having high sensitivity to locate the incipient damage, simultaneous excitation and sensing of the PZT patch makes it difficult to capture very small structural responses especially from the large and stiff host structures [2]. As can be observed from the equation (1), the passive component of the admittance solely depends on the properties of the PZT patch. During damage, the impedance parameters of the host structure get affected. Hence, only the active part undergoes change whereas the passive component is not influenced. This is because the mechanical admittance of the host structure

couple itself with mechanical admittance of the PZT patch in the active part only. Therefore, the active component of the admittance is recommended for the damage diagnosis. In the paper by Song et al [2] they developed the Dual Piezo Configuration (DPC), as illustrated in Fig. 1(b), on the contrary, strives to obtain the active component of the signature directly. For this purpose, the DPC employs two concentric PZT transducers, as shown in Fig. 1(b), which can be activated independently and simultaneously for excitation and sensing purpose. The outer segment (ring) is used for excitation and the inner (disc) is used for sensing. One can go for the reverse way also, but as the outer ring is bigger, it is more advantageous to use it for excitation. Song et al. derived an expression for the admittance of DPC as

$$\bar{Y}(\omega) = j\omega \frac{wl}{h} \left(d_{31}^2 \bar{Y}^E \frac{Z_a}{Z_s + Z_a + Z_b} \right) \dots \dots \dots (2)$$

where, Z_a is the mechanical impedance of the actuator PZT patch, Z_b that of the sensing PZT patch and Z_s that of the structure. From above equation, it is observed that the passive component of the conventional admittance (see equation 1) is no longer the part of the dual PZT admittance. Unlike the SPC, the passive component automatically filters out in case of DPC. Hence, the active admittance is directly measured, which leads to improved damage diagnosis, marked with higher sensitivity and larger zone of influence. The associated temperature fluctuations do not cause any disturbance to the admittance signatures. In addition, due to the use of dedicated actuator patch, DPC achieves a higher quality and better repeatability of admittance signatures even for large structures than the SPC.

However, lack of easy commercial availability of concentric PZT patches limits the practical application of DPC. Therefore, Adhikari and Bhalla [3] proposed to modify DPC by replacing the concentric PZT patches with four square PZT patches which are easily available as shown in Fig 1(c). They

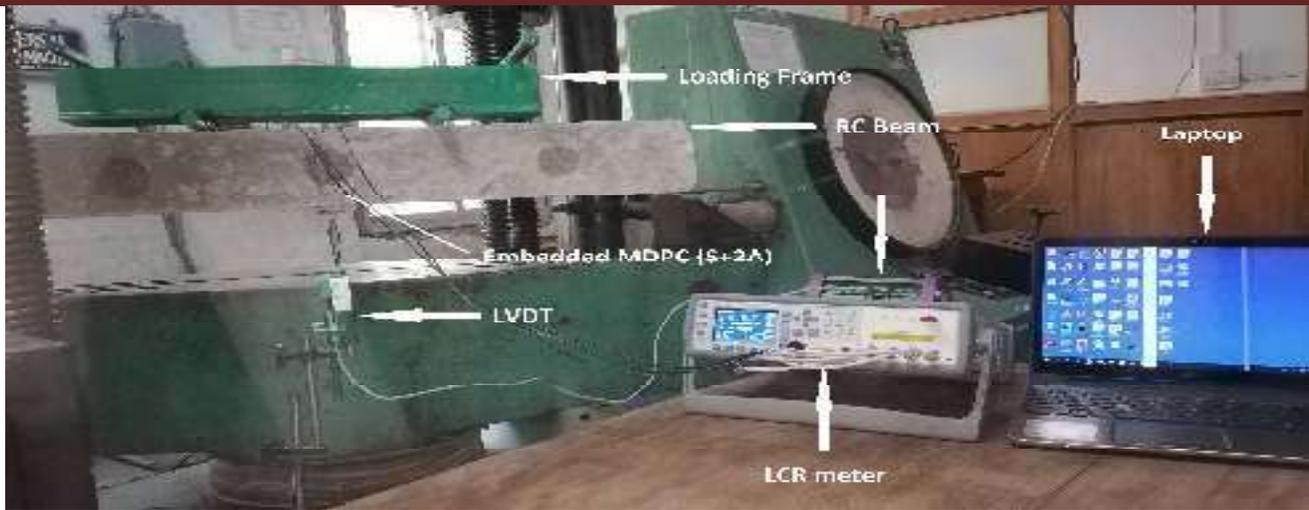


Fig. 2. Experimental Setup of RC beam of Universal Testing Machine

demonstrated improved SHM of a small aluminium block ($48 \times 48 \times 10 \text{ mm}^3$) via MDPC employing a surface-bonded single PZT patch for sensing and four PZT patches (connected in parallel) for actuation. Kaur and Bhalla [4] extended the application of the MDPC to a more practical scenario considering a real-life-sized simply supported RC beam with a set of five embedded Concrete Vibration Sensors (CVS), each encapsulating a square PZT patch.

The objective of this study is to investigate the performance of three different piezo configuration namely SPC, surface bonded MDPC and Embedded MDPC (EMDPC) for SHM of a RC structure.

XLVI. EXPERIMENTATION DETAILS

Detailed experiments were carried out in the laboratory to integrate and compare the different types of piezo configurations introduced above for SHM of an RC beam. The complete instrumentation detail is shown in Fig. 2 and the physical and mechanical properties of all beams are shown in Table 1. Three identical beams were casted in the lab and kept for curing period of 28 days. On the beam 1 three PZT patches were directly bonded on the surface of the beam (as SSPC) out of which two patches are attached at $L/6$ from either end and one at the distance of $L/2$, using two-part Araldite epoxy adhesive so that each patch will cover $1/3^{\text{rd}}$ of the beam as shown in Fig 3. One end of coaxial cable is attached to the electrodes of surface bonded PZT patch where the other end of the cable are kept free for inserting it into LCR meter to take the readings.

On beam 2 five set of commercially available square shaped PZT patches are surface bonded to beam at the center where center PZT patch acts as sensor and other four PZTs connected in parallel acts as a actuator making it modified version of SPC called as MDPC with one sensor and four actuators (S+4A) as shown in Fig 4, with cable connection given to each PZT patch.

Table 1- Properties of RCC Beam

Property	Value
Length (mm)	1000
Cross-section (b x d) (mm^2)	100 x 120
Characteristic Strength of Concrete (f_{ck}) (N/mm^2)	20
Yield Strength of Reinforcement (f_y) (N/mm^2)	500
Main Reinforcement	2 bars at top and bottom of 8 mm Dia
Stirrups	6 mm Dia @ 100 mm c/c

For the third beam total three no of CVS were first casted with dia of 30 mm and depth of 20 mm [5]. After 7 days of curing CVS were embedded inside the RC beam flushing at the distance of 30 mm from soffit near the center along the length of beam at the time of casting of RC beam. Out of which one CVS is placed at the centre acting as sensor (S) and two adjacent CVSs acting as actuators (A). This orientation is called as Embedded Modified Dual Piezo Configuration (EMDPC).

The complete experimental set-up is shown in Figure 2. It consisted of a simply supported laboratory sized RC beam of span 1 m. A two-point (290 mm apart) concentrated load was applied with the help of loading frame on the simply supported beam by Universal testing machine as shown in Fig 5. Commercial raw PZT patches procured from Central Electronics Limited (CEL) [10], were used in this experiment. The admittance signature of the PZT patches was obtained using conventional LCR meter, model E4980AL for the SSPC, MDPC and EMDPC. Two-point and four-point connections of LCR meter were used for SPC and MDPC respectively. The Undamaged/Healthy stage for RC beam has been taken as Day 28 after casting. The theoretical ultimate load for the RC beam under two-point concentrated load was computed to be 36 kN.

After the undamaged state signature or healthy signature of the beams are taken and recorded beams are loaded on UTM for

flexural loading. LVDT is used to measure the central point deflection of beam.

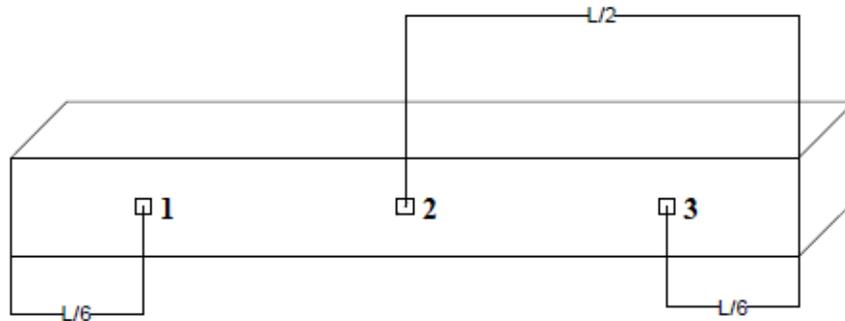


Fig. 3. Arrangement of PZTs on Beam 1 (SSPC)

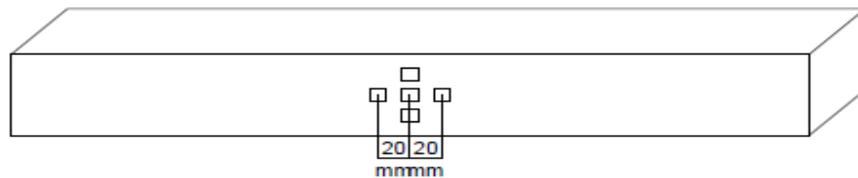


Fig. 4. Arrangement of PZTs on Beam 2 (MDPC)

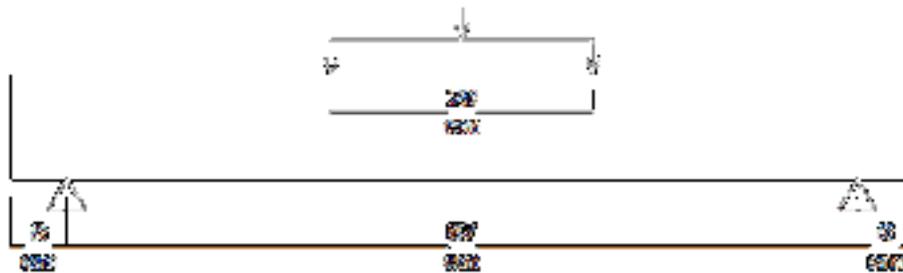


Fig. 5. Loading Arrangement of simply supported RC beam

IV. RESULT AND DISCUSSION

The performance of all three variants SSPC, MDPC, and EMDPC attached to RC beams under flexure test up to failure, was monitored experimentally by EMI technique. The readings of the beam at 28 days of casting were taken which are considered as healthy signature. After the application of the load cracks were developed at the bottom fibers and then extended towards top. The cracks appeared on the RC beam under the concentrated two-point loading in flexure. Most of the cracks were vertical flexural cracks varying from 1 to 8 cm in length. Minor cracks initiated at the lower part at load ranging between 20 to 25 kN and then gradually emerged and distributed to other parts of the beam; as the applied load increases further, the existing cracks propagated upwards and at the same time new cracks also appeared. During the final stage, the visible cracks at the mid-section reached near the top surface, restricting it to withstand further load and causing its ultimate failure due to concrete collapse in tension.

Load is gradually applied till the point where no more load was taken by the beam. The readings of conductance (G) and susceptance (B) signature of damaged beams were recorded using LCR meter and their graph is plotted. The signature of healthy and damaged condition is compared and for better comparison root mean square deviation (RMSD) indices is calculated using the following relation

$$RMSD(\%) = \sqrt{\frac{\sum (G_2 - G_1)^2}{\sum G_1^2}} \dots\dots\dots(3)$$

Here, G_2 is the conductance after the damage at any specific frequency and G_1 is the conductance at pristine state at the same frequency.

For all three beams maximum load at failure taken in flexure and the central point deflection in mm recorded by LVDT is given in table 2.

Table 2- Max. load at failure and deflection of RC beams

	PZT Configuration	Max Load Taken (kN)	Central point Deflection (mm)
Beam 1	SPC	41	16.3
Beam 2	MDPC	42.5	19.1
Beam 3	EMDPC	37	17.7

Damage detection of Beam 1

The conductance signature of healthy and damaged beam for beam 1 all three PZT patches (SPC) are shown by the Fig 6, 8, 10 respectively & their susceptance signature of the same are shown in Fig 7, 9, 11 respectively. From figures it can be observed that as most of major cracks appeared near the middle part of the beam, hence conductance of PZT 2 shows large shift in signature and comparatively less change of signature in PZT 1 and 3. Susceptance of all patches shows no significant change hence cannot be considered for damage detection.

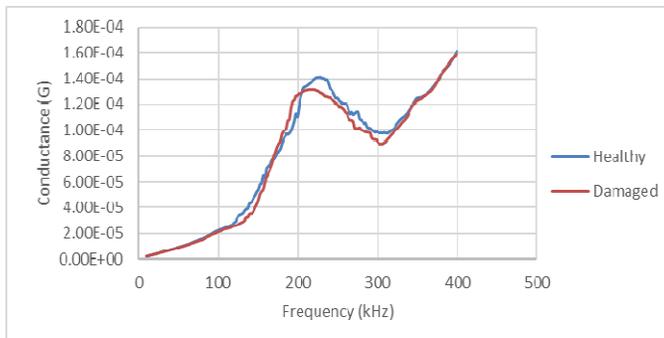


Fig. 6. Conductance signature of Beam 1 PZT 1

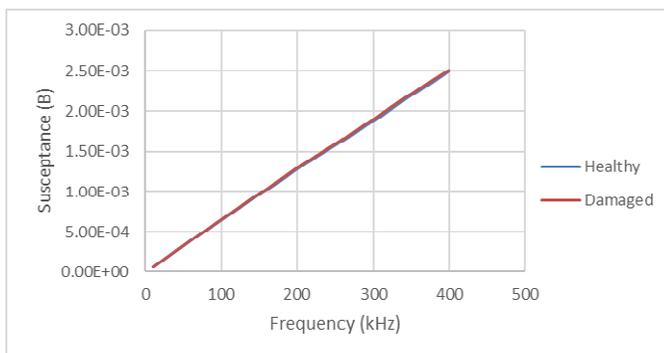


Fig. 7. Susceptance signature of Beam 1 PZT 1

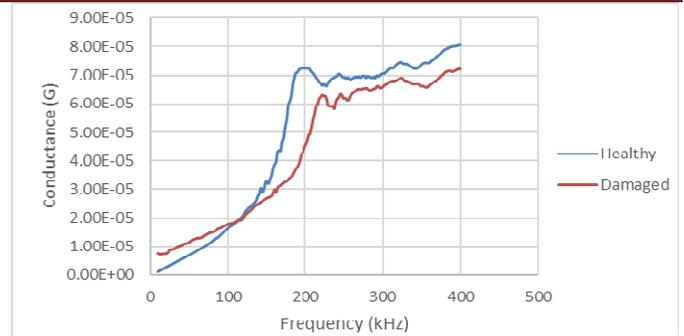


Fig. 8. Conductance signature of Beam 1 PZT 2

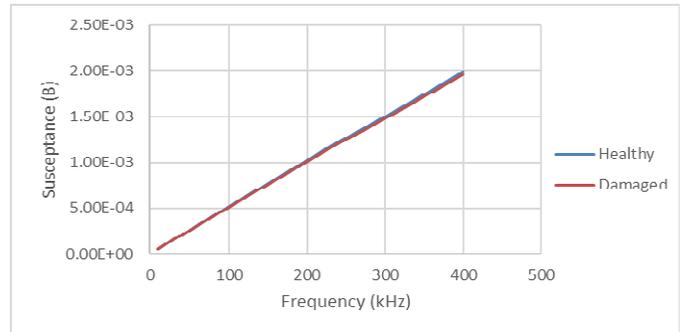


Fig. 9. Susceptance signature of Beam 1 PZT 2

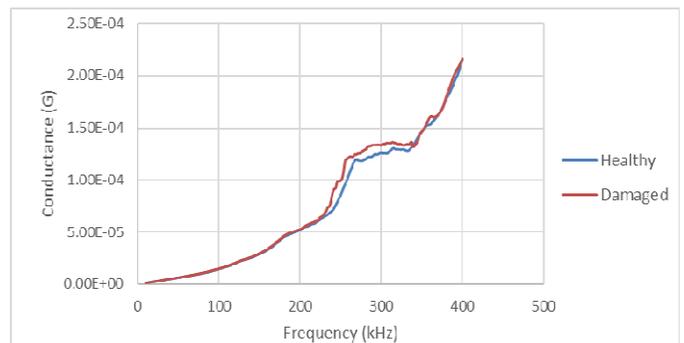


Fig. 10. Conductance signature of Beam 1 PZT 3

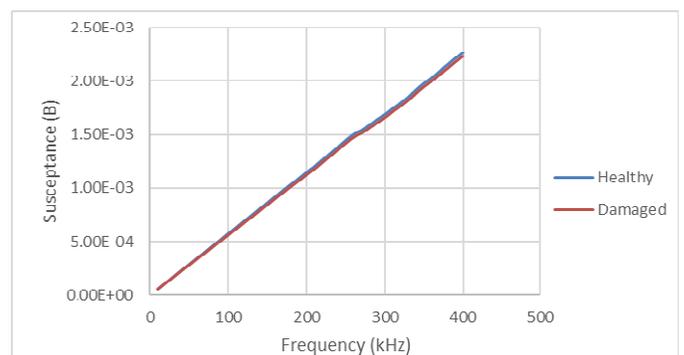


Fig. 11. Susceptance signature of Beam 1 PZT 3

Damage detection of Beam 2

From Fig 12 when compared to conductance signature of SPC of beam 1 most notable observation is that the conductance for SPC have a rising trend. However, for the MDPC the signatures are almost parallel to the frequency axis. This is because only the passive part largely contributes to the slope of the admittance. Since the passive component is absent in admittance equation of the dual piezo configuration (see equation (2)), the admittance signatures do not exhibit large slope. Same trend was also observed in the conductance signatures of the damaged specimen. The change in the signatures is more clearly observed in the MDPC due to induced damage. Also from Fig 13 it is clear that shift in susceptance signature is substantial which was not for SPC, hence susceptance can also be used to predict the damage.

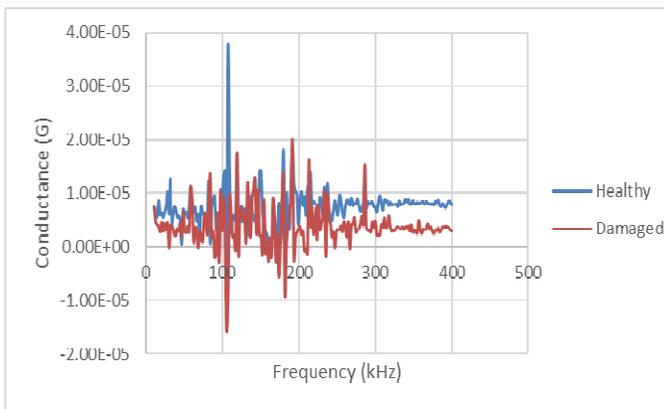


Fig. 12. Conductance signature of beam 2 (MDPC)

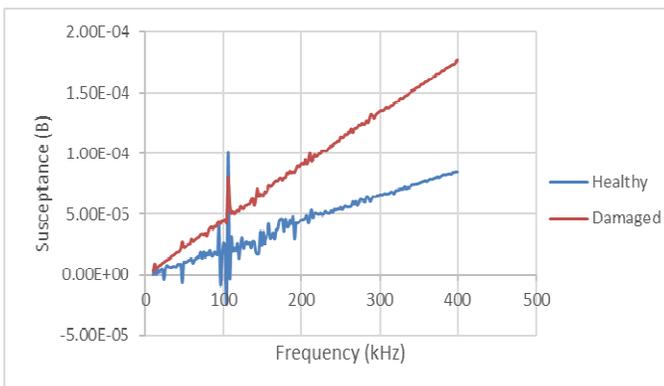


Fig. 13. Susceptance signature of beam 2 (MDPC)

Damage detection of Beam 3

By observing signatures of Fig 14 and 15, there is change in the major peaks as the damage progresses and graph shows similar trends as that of MDPC. It shows change in signature after damage for both conductance and susceptance. It appears that MDPC and EMDPC have much higher sensitivity than the SPC for the damage detection. This is due to the use of multiple distinct actuators in MDPC against a single one in the case of SPC.

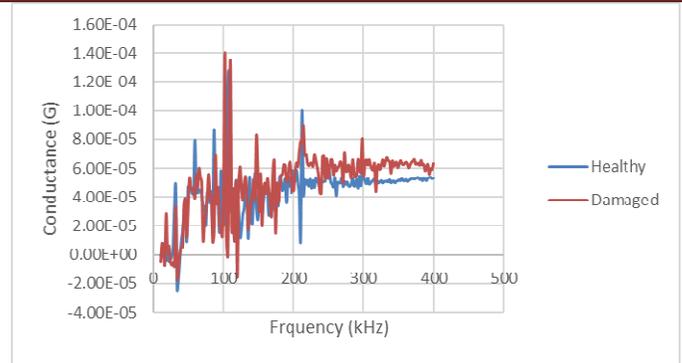


Fig. 14. Conductance signature of beam 3 (EMDPC)

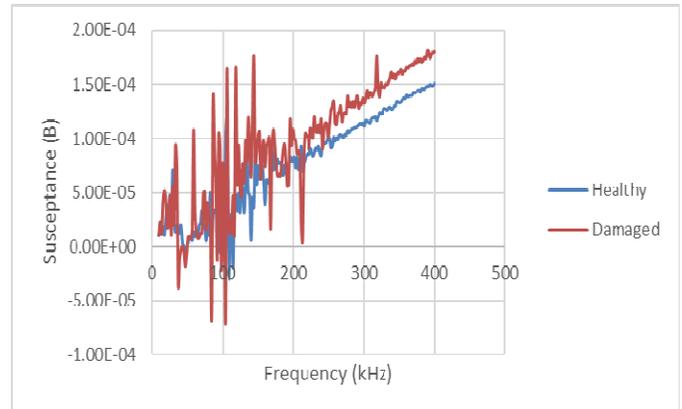


Fig. 15. Susceptance signature of beam 3 (EMDPC)

The combined RMSD indices for all three beams are shown in Fig 16. It is observed that the MDPC & EMDPC exhibits much higher RMSD for both conductance and susceptance than the SPC for the same nature of damage. Also, from the experimental signatures of MDPC, it was found that the susceptance signatures are equally strong as conductance signatures in detecting the damage. Otherwise, generally, the susceptance signatures are considered weak in detecting the damage. However, in the case of MDPC, the susceptance signatures also hold good amount of variation, which is in the comparable range of the RMSD indices. Surface bonded modified configuration yields higher RMSD indices than embedded modified configuration in conductance and susceptance as well.

During experiment it was observed that MDPC indicates the occurrence of surface cracks before EMDPC but prone to cumbersome installation and vandalism. Whereas EMDPC provides easy installation and gives protection against environment. Also it performs well in detecting the cracks initiating inside the beam, which are otherwise not visible to naked eyes and thus hidden underneath the surface. Embedding inside the concrete structure results in interface between the EMDPC and the host RC beam, which can possibly affect its sensitivity in detecting surface cracks. Therefore, giving less RMSD indices as compared to surface bonded MDPC.

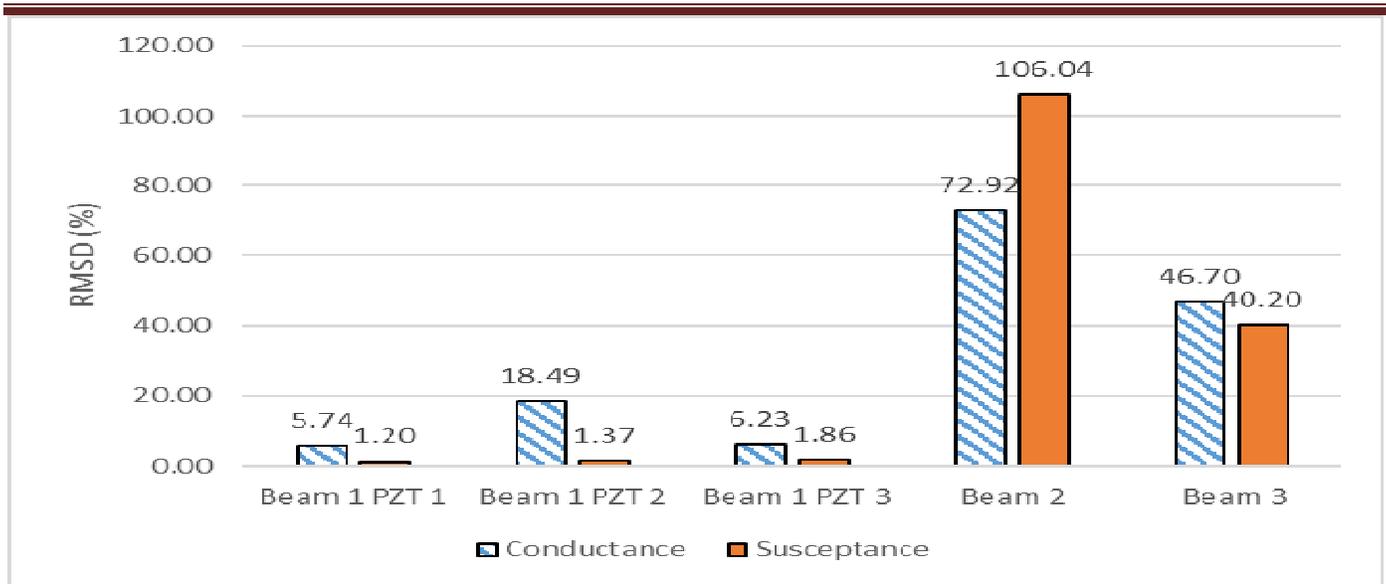


Fig. 16. RMSD indices for all Beam SPC, MDPC, EMDPC

V. CONCLUSION

In this study laboratory-based experimental study has been presented to compare various piezo configurations including SPC, MDPC, and EMDPC for 1 m span RC beam. From the results following conclusions can be drawn: -

1. For Beam 1 with SPC as major cracks are near center of beam i.e. near PZT 2 hence RMSD Indices of PZT 2 is maximum amongst all three patches.
2. MDPC and EMDPC are effective configurations when compared with conventional SPC.
3. MDPC by surface bonding rather than embedding gives higher value of damage index both in conductance and susceptance at the time of failure.
4. Remarkably, in the case of MDPC, both susceptance and conductance signatures can be used for damage detection.
5. During damage detection of the large structures, the variation of the admittance signatures, which is otherwise feeble in SPC, can be remarkably seen in MDPC. Thus, the MDPC can be used for the damage detection of the large structures.
6. The results obtained from the experiments clearly support the greater utility of the proposed MDPC and EMDPC in EMI technique than the conventional approach.

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Interconnection Protection for Wind Power Distributed Generation Based on Distance Relaying

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Abstract –

A new method based on distance relaying is proposed to analyze and improve the performance of interconnection protection for wind power Distributed Generation (DG) in distribution systems. A back-Electromotive-Force (EMF) model reference adaptive system (MRAS)-based sensor less control scheme is proposed for a grid-connected doubly-fed induction generator (DFIG). Based on the stator-side and the rotor-side dynamic models of the DFIG, both the reference model and the adaptive model of the proposed back-EMF-based DFIG are investigated. Of particular importance, distance protection that uses the concept of pre-fault voltages as reference quantities found to have issues with intermittent behavior of wind power DG. This concept is normally used in different distance protective relaying applications in order to increase the fault resistance coverage capability of the distance relays as well as ensure selectivity, dependability and security under extreme under voltages. Wind generation can have a significant impact on power flow, voltage profile, and stability and continuity of power. The increasing wind penetration would translate into more interconnections and longer lines, which would move the system closer to its limits unless expensive reinforcements are implemented. The main purpose of this paper is to analyze this issue and propose a method to enhance the performance of distance protection to overcome this issue.

Keywords- Power Systems, Distributed Power Generation, Distribution Systems, Power System Protection, Power System Faults, Wind Energy.

INTRODUCTION

The electric power system is rapidly evolving into a decentralized industry with competitive participants and high penetration of renewable energy. The assumptions once made for a centralized grid and radial feeder networks may not remain valid as distributed generation continues to increase. Wind power DGs are often connected to relatively weak distribution and sub-transmission system, which raise concerns regarding system load ability, stability, voltage regulation and post-fault disturbances. Over the past decades, wind energy has been acknowledged as a mature and cost-

effective way to integrate renewable energy resources into the bulk power grid [1], [2]. Among various existing wind-turbine-generators (WTG) systems, the variable-speed WTG using a doubly-fed induction generator (DFIG) has been recognized as the state-of-the-art technology due to its maximum power tracking ability, improved flexibility, and significant reduction in weight, size and the rated capacity of the required power electronic converter. As a result, numerous dynamic modelling and control strategies for DFIG systems have been proposed in the literature. Even though the traditional sensor-based control offers a straightforward solution, this approach suffers from reduced robustness and requires additional expenditures involved in maintenance and cabling between the speed transducers and the controllers. Consequently, a significant amount of research has been devoted towards sensor less control for grid-connected DFIG systems.

Open-loop methods are the most widely adopted techniques for sensor less control of grid-connected DFIG systems.

In summary, previous studies [1]–[7] indicated that: a) fault characteristics of wind power DGs have different behavior compared with synchronous based DGs, b) Wind power DGs do not provide sustained short-circuit currents during fault, c) short-circuit current is pertinent to wind speed, penetration levels and number and type of wind turbine generator, d) relay selectivity is difficult to obtain with source impedance variation and bidirectional fault currents, e) excessive fault-clearing times jeopardize distributed generator stability, and f) traditional protection schemes limit distributed generation connection capacity.

These characteristics could result in DGs interconnection protection issues including sensitivity, security, selectivity, and dependability. As a result, recent recommendations of using of distance relaying in DG interconnections can minimize the aforementioned issues by providing shorter fault-clearing times and allowing larger amounts of DGs to be connected to distribution system circuits. This paper introduces a methodology to

analyze and enhance the impact of penetration levels of wind power in distribution systems on the dynamic performance of distance relays that use the concept of pre-fault voltages (memory voltage) as polarizing (reference) quantities. This concept is normally used in different protective relaying applications in order to: a) increase the fault resistance coverage capability of the distance relays for close in faults and b) detect bus faults occurring behind the relay location.

LITERATURE REVIEW

The impact of distributed generation on power systems in general and distribution networks in particular has been of interest of many researchers. In particular, Distributed Generation (DG) impacts the distribution system protection depending on the DG technology, the penetration level and the nature of disturbances. Their effect on the protection systems is well studied [1]-[10]. Different techniques were reported to analyze and compensate the effect of wind power DGs on distance protection. Articles [2], [3] provide extended literature reviews which identify the impact of fault current contribution from different types of DGs on the protection performance. The disturbing factors for proper operation of distance protection and further the impact of fault currents on those factors are identified.

The research works in [4]- [8] discuss the impact of DGs and wind power characteristics on distance relays performance in distribution and sub-transmission networks. While addressing various challenges for wind generation facilities, the works in [4], analyzes the response of conventional protection schemes for Type 3 using real-time by hardware-in-the-loop simulation. [7] proposed a methodology for the application of distance relaying to feeders in distribution systems and how it can be assisted with embedded distributed resources.

The work in [8] presented 11kV distribution network protection scheme based on distance relaying. It has been indicated that the use of distance relaying can minimize selectivity issues and provide shorter fault-clearing times. The research work in [9] studied the impact of wind power integration on distance protection based on closed-loop protection relay with RTDS testing platform. Results showed that protection based on distance principles are impacted severely over differential protection schemes.

THE PROBLEM FORMULATION

The basic concept of the pre-fault voltage polarization is that it produces a short duration output voltage for low voltage faults at the relay location. The polarizing unit contains a memory that captures the pre-fault voltage long enough for the relay to make its correct decision. As a result, the dynamic characteristic of a distance relay expands as a function of the source impedance behind the relay location and then shrinks as the memory action decays.

In wind farms DGs, power sources are normally made up of the aggregation of a large number of small

wind turbines feeding a common bus that couples with the area electrical power system (AEPS). The equivalent source impedance of these turbines can have direct impact on the dynamic performance characteristics of these types of distance relays. The variations of this impedance can be related to the varying wind production patterns, the penetration levels and the configuration of wind turbine generators. These variations take place from the short-term (minutes) to the long-term (hours). The consequences of these variations on relays performance characteristics are reduction of the fault resistance coverage capability and miscoordination of protection schemes. For distance relays, the measured apparent impedance seen by a relay R1 is given by the following equation

—

The tripping characteristic for a Mho relay with a positive sequence voltage polarization can be expressed by a two-input comparator with the phasors S_1 and S_2 as follows

COMPENSATING THE EFFECT OF WIND POWER INTERMITTENCY

Wind power intermittency impacts the distance zone characteristics. In this section, we will develop an algorithm to compensate this impact. Fig will be used to show the proposed compensation and study the effect of wind power variations.

In the proposed algorithm, the polarization voltage S_2 will be dynamically changed according to the value of Z_{wc} so as to compensate for variations of wind power source impedance (Z_{sw}) in such a way that the dynamic characteristic of a distance relay would be independent of wind power intermittency. This requires modifying the polarization quantity S_2 by adding a compensating voltage proportional to the Z_{wc} according to (6).

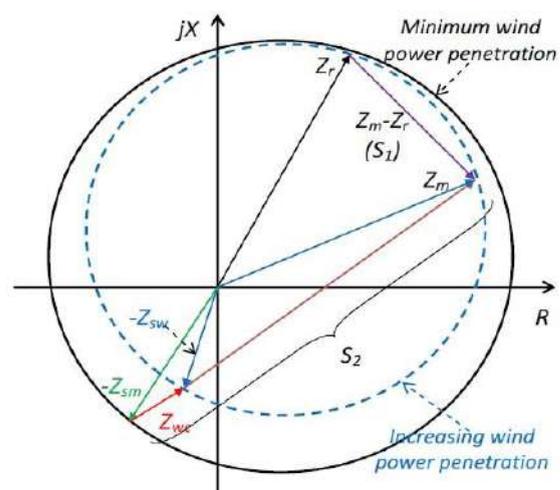


Figure 1. The concept of the proposed compensation impedance.

The required level of compensation Z_{wc} for any given value of wind penetration (wp) and wind speed (ws) is determined by substituting the value of SIR. The Z_{wc} value is updated online whenever there is change in wind penetration and/or wind speed

$$(\quad)$$

Where:

- is the desired maximum source impedance [Ω];
- is the source impedance due to variation in wind power penetration [Ω];
- is the required level of compensation impedance [Ω] due to variation in wind power penetration;
- is relay current [A];
- is the positive-sequence memory voltage;

SIMULATION AND RESULTS

A. Objective

The objective of this study is to investigate the impact of wind generation and to enhance the distance protection performance, at the relay R1 (in Fig. 2), under different fault types within a specified range of wind power penetration and wind speed.

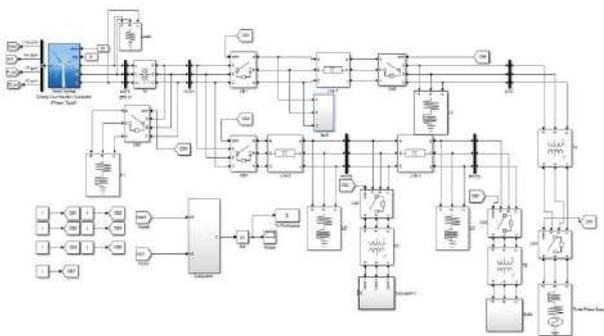


Figure 2. System simulation (distance relay)

B. Analysis of Relay Source Impedance Variations

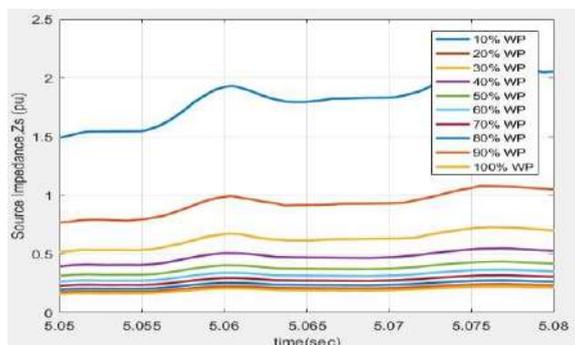


Figure 3. Source impedance variations of relay R1 under different wind power penetration levels operating at wind speed of 10m/s.

The Source impedances are estimated within 2 cycles of 3-phase short circuit at local bus of line 1. As indicated in the Fig. 3, source impedance decreases with increasing of the wind power penetration level. Normally, distance relay performance is defined in terms of reach accuracy and operating time. However, reach accuracy, in particular, depends on the level of the relay voltage under fault conditions which, in fact, depends on the System Impedance Ratio (SIR) at the relay.

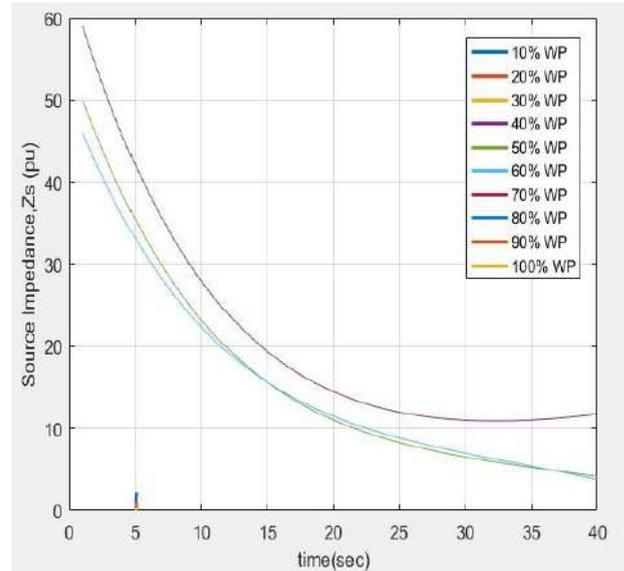


Figure 4. SIR of relay R1 versus wind penetration levels and wind speeds

From fig.4 one can observe the following:

- 1) The SIR is inversely proportional with the wind penetration level (WP). This is expected, and is due to the fact that as numbers of connected wind turbines within the wind farm increase, the equivalent source impedance behind the relay at R1 will, consequently, decrease. Fig.5. SIR of relay R1 versus wind penetration levels and wind speeds; where x in the fitting equations is the wind penetration level (WP).
- 2) The rate-of-change is decreasing exponentially and independent of wind speeds. The 6th order fitting equations are given in Fig. 5 for each wind speed.
- 3) The rate at which SIR decrease is higher (4.95 pu) for ($10\% \leq WP \leq 40\%$) compared with lower (0.498 pu) for ($40\% \leq WP \leq 100\%$).
- 4) There is a relatively small difference between responses at maximum and nominal speeds compared to minimum speed.

C. Impact on Dynamic Distance Relay Characteristics

Fig. 5 shows the R1 relay current behavior during the fault duration of three-phase short circuit at the relay location (F1).

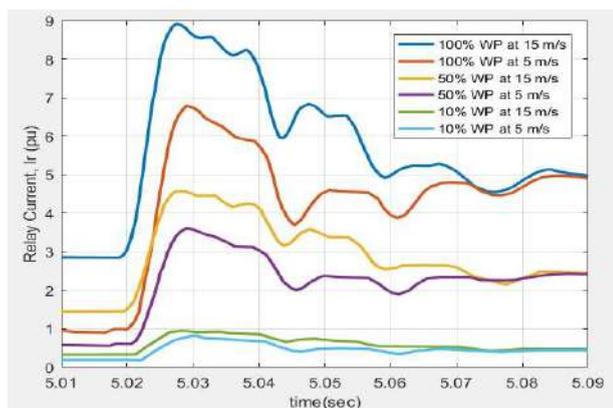


Figure 5. Relay current variation during three phase fault at the relay R1 location under various wind penetration levels and wind speeds.

From these results, the following observations can be realized: a) Type 3 wind power DGs do not provide sustained short-circuit currents during fault, and b) short-circuit current magnitude is pertinent to wind speed, penetration levels and number of connected wind turbine generator. In addition, the relay voltage would dip to lower voltages depending on penetration levels and wind speeds.

CONCLUSION

This paper introduced a methodology to analyze and improve the impact of wind power intermittency on performance of distribution system distance relays that use the concept of pre-fault memory voltage as polarizing quantities. It can be concluded from the presented results that increasing wind penetration in distribution systems would have a detrimental effect on the distance relay dynamic characteristics. The is inversely proportional with the wind penetration level and with rate-of-decrease independent of wind speeds. As a result, the dynamic characteristic of a distance relay expands and shrinks as a function of the wind penetration levels and wind speeds. In conclusion, distance relay dynamic characteristics are pertinent to wind speed, penetration levels and number of connected wind turbine generators.

In order to ensure the selectivity, security and dependability of the DG interconnection protection, an adaptive relay characteristic is proposed to compensate the effects of wind power intermittency due to variations of penetration levels, wind speeds, and DG topology. The proposed compensation scheme is dynamically changing as a function of the wind power intermittency and behavior.

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PLC Based Automatic Car Washing System

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Abstract--Currently necessity of man is to live life in automatic way so as to perform tasks at higher speed. Technology is best interconnecting channel in each part of world with means of transportation or communication or business which led to a highly increase in the number of cars. So how to maintain or clean those? using automated washing system? All peoples face big issue called as Time i.e. time consumption essential for cleaning these vehicles or cars etc. Time management is directly proportional to reduction of maintenance cost. So in short, automation is a need of era. Today in this present era, automation serves us to preserve time, expense as well as manpower. It is significant to have smooth and effective system for sustain the vehicles cleanliness. Our project concentrates on car washer system using PLC. Our car washer system has three capital processes namely wash, cleansing and drying, Hence the external of the car will be washed by detecting the car on conveyor belt and further controlled by PLC.

This mechanism serves us to use a conveyor belt on which patron stops the car. After that, inductive proximity sensor is used for detecting the car, then the conveyor belt begin running. Sensor plays essential role on conveyor belt for car detection. As early as car is sensed functioning of conveyor assembly invokes. After mention delay for all activities to accomplish conveyor get suspend. The main objective of this project is to perform exterior car washing automatically using Programmable Logic Controller integrated with PLC sends information like arrival or departure of vehicle. Car washing technique is collection of various things as spraying solution of detergent, cleaning with water and brushes, & then completing task with forced air drying fans.

Keywords--: PLC, Finer Motor, Conveyer Belt, Brushes, Inductive Proximity Sensors, Switch, Shower, Cleaner, Dry Fan, SMPS.

I. Introduction

Car washer is single activity done in mandate to keep the external of the car clean. Mostly it is done manually in locomotive garage, this manual way of cleansing car arise in more waste of water, manpower and time. The automatic car washer system diminishes the utility of water and also man power need. Our car washer system utilizes control

using PLC. There are three procedures involved in our car washer system namely wash, cleansing and drying. Cycles of washer includes wash with detergent, and then with water.

A PLC is a controller which can control most of the machines very easily. Installing a program and setting it up is very easy in a PLC. The programs written in ladder language can be authenticated and checked before ultimate installation and also it can be edited at any time without disturbing any physical apparatus of the project. The best part of using a PLC is that it does not need any typical wiring and rewiring if some changes are made in the previously installed program. A programmable logic controller performs mainly three functions which are continuously repeated in a proper sequence. The three main functions are (1) Testing the input (2) Execution of the program (3) Updating the output. In a PLC there is a provision of input terminals for connecting the input devices and output terminals for connecting the output.

II. Components Description

A. PLC:

A PLC (Programmable Logic Controller) is usually called as Programmable controller. It is a solid-state, digital, Industrial Computer. Upon first look, a PLC may seem to be no more than a black box with wires bringing signals in and other wires sending signals out.



Fig 1: Siemens Logo PLC

-Supply Voltage : 24V

-RPM : 200 rpm

PLC Specifications :-

- Manufacturer: Siemens
- Model: Logo PLC 8DI-4DO
- Input Power Supply: 230 V AC
- Number of digital inputs: 8
- Number of digital outputs: 4
- PLC to PLC Communication: Ethernet Cable
- Cable Length: 2 meters (6.5 ft)
- Display type: Digital
- Programming Language Used: Ladder logic
- Software Used: Logo Comfort

B. DC MOTOR:

A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. In this mechanism it is used for rotating the conveyor belt and also finers are connected to the motor which makes fuction of brushing



Fig 2: DC MOTOR

C. Solenoid Valve:

A solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid: in the case of a two-port valve the flow is switched on or off; in the case of a three-port valve, the outflow is switched between the two outlet ports. Multiple solenoid valves can be placed together on a manifold.



- Specifications:
- Operating Voltage:- 24 V DC
- Simple ON-OFF
- 2 Way Valve

D. Proximity Sensor:

Proximity Sensor includes all sensors that perform non-contact detection in comparison to sensors, such as limit switches, that detect objects by physically contacting them.



Fig 4: Inductive Proximity Sensor applications involving the transportation of heavy or bulky materials. Conveyor systems allow quick and efficient transportation for a wide variety of materials.

Proximity sensor convert information on the movement or presence of an object into an electrical signal. There are three types of detection systems that do this conversion: systems that use the eddy currents that are generated in metallic sensing objects by electromagnetic induction, systems that detect changes in electrical capacity when approaching the sensing object, and systems that use magnets and reed switches.

E. Dryer Fan:

A blow Dryer or Dryer is an electromechanical device designed to blow cool or hot air over wet or damp car, in order to accelerate the evaporation of water particles and dry the car. It is used to remove the water drops and make the car dry within less time. The supply required for dryer is 12v DC.



Fig 5: Dryer Fan

A conveyor system is an common piece of mechanical handling equipment That moves materials from one location to another. Conveyors are especially useful in



F. Conveyor:

III. Working Of Automatic Car Washing System

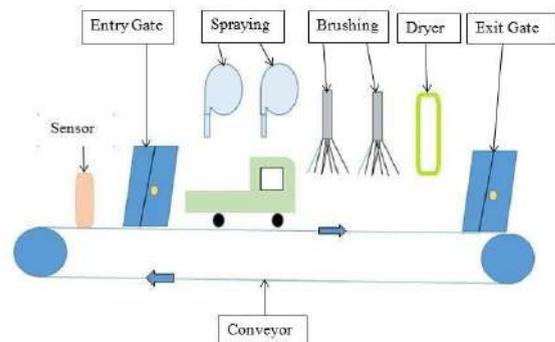


Fig 7: Block Diagram of Automatic Car Washing System

The figure shows the block diagram of Automatic Car Washing System. A 230V AC Supply is given as input to the SMPS for obtaining 24V DC, since PLC can operate at 24V DC. Terminal Block is used for multi inputs and outputs.

PLC is connected to PC through ethernet cable for downloading or uploading the program. Conveyor is used for shifting the car through various stages of washing. We use 30 rpm DC motors for driving the conveyor belt via pulley and for driving brushes. When conveyor's components are in good condition and well aligned, it will operate properly. Proper clamping of car wheels on the conveyor is needed in order to avoid displacement. Generally brushes are now either cloth (which is not harmful to a cars finish, as long as it is flushed with plenty of water to remove the grit from previous washes), or a brush, which does not hold dirt or water. Thus it does not harm any painted finish. It provides a gentle polishing effect to leave the paint much shinier. High pressure nozzles are pointed at various position for spraying soap solution and water to clean difficult to reach parts of the vehicle. At the end, hot steam air is generally used for drying the car. Construction of this system is depends upon the requirement. A visual programming language known as the Ladder Logic was used to program the PLC. An inductive proximity sensor is used which detects the metal object. Once the electromagnetic field is cut by the car an input

signal is given to PLC. As an input signal is received, PLC starts executing the Ladder Program.

First the conveyor moves by fixing a timer for few sec. After that, it stops at the stage of washing. In general process, Car is cleaned by spraying soap solutions, rinsing, brushing, drying, waxing, etc. depends on the requirement of customer. We have chosen spraying water, Brushing and finally drying for cleaning the car.

Each activity is carried out for a certain time period. Water is sprayed for few sec and nozzle is closed. Then four brushes rotate for few sec and stops. Now the conveyor starts moving to next stage. After few sec, it stops for drying. Two fans are used for drying the car up to few sec. Then the conveyor carrying car moves to the exit level. Again an IR sensor senses the car and sends an input signal to Programmable logic controller.

Timings are set by using timers in ladder programming. These timings can be varied depending upon the requirement.

V. Result Analysis

In Automatic Car Washing System, we can successfully performed operations required for cleaning the car by using PLC. By installing this system, car washing will be most effective, time saving, pollution free. By using this system we can clean car upto 90%.

A. Advantages:

1. Efficiently reduces the time for washing.
2. The System is easy to operate
3. Very less maintenance as PLC is more durable than other electro-mechanical systems
4. It reduces Man Power
5. Proper utilization of foam and water.

B. Disadvantages:

1. Primary cost is high
2. Use of chemical shampoos is harmful.

C. Applications:

1. In service stations
2. In car manufacturing companies, after final assembly of car.

VI. Conclusion

After studying whole automatic car washing system, one can conclude that the proposed prototype of controlling automatic car washing helps in eliminating the errors that exist in existing process which leads us to obtain error free and efficient washing. This prototype helps us in performing car washing automatically and results in high quality end product. It will also helps in saving water and pollution free operation.

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IOT AND CAN BASED INDUSTRIAL PARAMETER MONITORING AND CONTROLLING

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Abstract—The main objective of this project work is to design an automated system which is sensor based for smart monitoring and controlling of industrial applications. Automated system helps in reducing the human effort and provides better monitoring and controlling to reduce the faults in the system. In the Present project, a new solution is adopted for the traditional monitoring and controls of Industrial applications through the implementation of Internet of things (IOT) and CAN bus. IOT is a network of devices connected via communications technologies to form systems that monitor, collect, exchange and analyse data. In the industries fields many parameters like temperature, humidity, light, fire, water level needs to be monitor and control. For this purpose AVR controller interface with CAN. A Visual Basic application is included in the system which will be monitor and controlling all the activities of the system in user controlled mode or system controlled mode.

Key words: IOT, AVR Controller, CAN Bus, V.B. Software, ESP8266, SSR

I. INTRODUCTION

The industrial field monitoring requires more manual power to monitor and control the industrial parameters such as temperature, humidity, fire, water level, light etc. This is one of the most upcoming issues in the industrial sectors. If these parameters are not monitored and controlled properly, it leads to a harmful situations. Many industries are facing these kinds of situation because of some manual mistakes. And in that kind of harmful situations, again the manual power is required to control the parameters. Sometimes, if this control process not handled properly, it results in an occurrence of major accidents. With the implementation of upcoming technologies, it is very easy to overcome the greater issues in the industrial automation. In the industrial monitoring fields, the various sensors such as fire sensor, temperature sensor and light sensor are used for sensing the parameters and these sensed values are processed by the AVR microcontroller. The processed values are then displayed through V.B. on PC. Finally, with the help of CAN bus communication the overall industrial parameters are monitored through a single PC. The CAN bus communication is a wired communication and it is working under the priority of the message i.e., CAN is a message based protocol. The

speed of CAN controller MCP2515 is 1Mbps up to 420 meters and it will change with change or variation in length of system.

II. OBJECTIVE

The objective of this project is to design the monitoring and control system for industrial parameters by connecting sensor devices to AVR for detecting the errors and automatically correct the error using CAN bus communication and internet of things. This system helps in reducing the high manpower requirement in the industrial monitoring fields by monitoring the overall industrial parameters through a single PC (V.B.).

III. EXISTING SYSTEM

Olden methods, the industrial parameters are monitored through individual LCD displays. With the help of various sensors, the parameters are sensed and the values are processed by the controllers. Then, the processed values are displayed in the individual LCD displays which are connected to the controllers. But with existing system very few parameters can be monitored and controlled. That parameters are controlled through Arm controller, PIC controller and Raspberry pi controller. For monitoring the parameters in different locations, the individual microcontrollers and LCD displays are required. In some systems parameters are just monitored through 16x2 LCD display, without controlling actions. The parameters have to be monitored continuously. If the sensed parameter value exceeds certain value at the instant of monitoring, the control process will be handled by the workers of the industry.

IV. PROPOSED SYSTEM

In this system, various sensors are connected to AVR microcontroller. The implementation of CAN bus protocol with AVR microcontroller and generated data monitored and controlled through V.B. software and which can be observed

and visual basics. Since CAN bus is wired network so its use in limited areas but with help of IOT we increased its area of operation and control. The industrial database and servers have to be in safe zone for avoiding its misuse.



Fig. 2. Board for temperature sensor with CAN and AVR interfacing

VII. CONCLUSION

As a conclusion, the objective of this system to monitoring and controlling the temperature, humidity, light, fire and water level in several locations through a single Personal Computer can be possible with the help of various sensors, AVR microcontrollers, by the application of CAN bus communication, Visual Basics and IOT. Our project also eliminate the concept of huge control room, complicated wired network required for monitoring and controlling above parameters. This system also provides automatic control over the parameters increases safe value, so the harmful situation can be avoided through this project.

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INTELLECTUAL EARTHING SYSTEM

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I. ABSTRACT

This paper is a case study of an earthing system implementation, the associated error and how effectively they can be compensated. When resistance of earth is taken into account it is being realized that there are many factors that can influence the performance of system as well as earthing.

The fundamental aim of this project is to operate the relay with change in magnitude of current if the fault is occurring in three phase induction motor, transformer, transmission line. A low price and reliable protection scheme has been designed which monitors the parameter earthing system like soil moisture level, earth resistance, magnitude of fault current level of protection required. System measures these parameter by soil moisture sensor, display, controller, CT. The sensor and CT provide data to controller and then the collected data will calibrated with accuracy of system data through microcontroller. LCD will show the measurable value of soil resistance if the measured value will cross the given limit then valve will operated with allowable flow of water so the required value of resistance may be obtained.

Keywords:- LCD, CT, DC, ADC

II. INTRODUCTION

In Electrical power system Earthing is very important factor, since majority of faults are caused by poor earthing. The purpose of earthing is to minimize potential transient over voltage, in compliance with standard for personal safety requirements also to assist within the rapid detection and isolation in the fault areas. Earthing connection is accomplished by driving electrode in several places in the earth. Earth electrode is often a metal plate, material generally used for earth electrodes are copper, aluminium, mild steel and galvanized iron in order of preference as shown in fig. (a).

The factors that influence the earthing resistance of an electrode or group of electrodes includes the composition of the soil, the temperature of soil, the moisture content of the soil and the depth of electrode. Based on previous study by Megger researchers, two facts lead to the logical conclusion that an increase temperature will decrease resistivity and decrease the moisture content in the soil. Moreover the depth of electrode also influence the ground resistance due to soil layer in which the upper layer of the soil have higher resistivity than lower

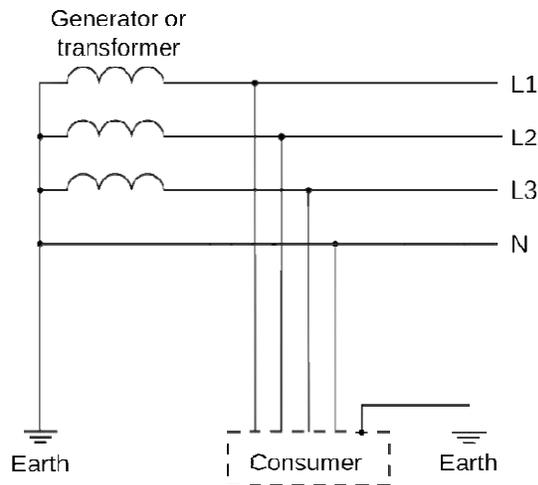


Fig. (a) Equipment earthing.

The soil types are very different in every part of the world and resistivity also differs compared to other. The resistivity of soil also depends on the type soil. Single rod installation may not be enough to decrease the resistivity to overcome this problem; another rod is connected in parallel. But it needs maximum area whereas spacing between the each rod is 6 foot away. The provision of good and effective electrical grounding system is necessary to safeguard living being as well as equipment from high magnitude current through earth. Besides this, this system also gives reliability in supply services, as it provides stability in voltage conditions preventing excessive voltage peaks, during disturbances and discharges lightning surges.

In recent years, many newspaper published report of substation equipment thefts and it is increasing day by day. This leads to disturbance in supply system, utilities are hugely affected due such activities. Usually ground electrode is made of copper. As we know copper is economically costlier and causes theft of copper electrodes. Therefore copper is replaced by galvanized iron rod which is cheaper than copper. Galvanized iron has good electrical characteristics.

III. OBJECTIVE

To ensure the working of earthing according for protection of electrical appliances required.

To provide continuous monitoring of conventional earthing system by implementing automation.

IV. RESISTANCE IN SOIL

Dimensional and grid electrodes are used for the measurement of ground resistance near a residential area. It is apparent that there is no uniqueness in the soil property. Below the data is given of resistance at different level of moisture in soil.

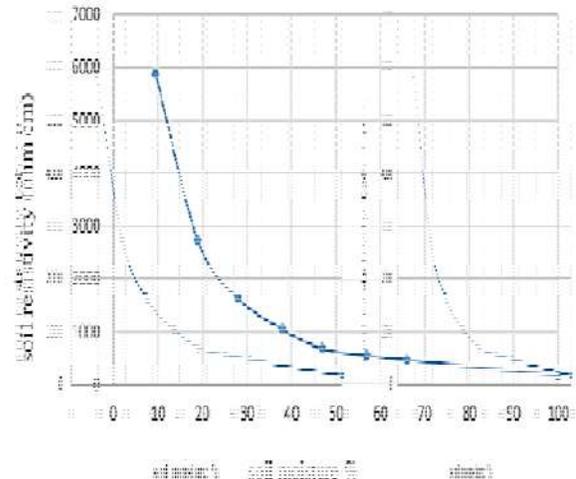


Fig. (b) Soil resistivity vs. soil moisture.

Type of soil	Resistivity(/m)	Calculated Electrode resistance()
Clay	40	7.99
Ground well & spring water	50	9.99
Clay & sand mix	100	19.98
Peat and mud	150	29.98
Lake & Brook water	250	49.96

To maintain moisture level by pouring water periodically so that resistivity in soil is as per IEEE norms.

Table:-Soil type and resistance [6]

V. MODELLING

1. Regulated power supply:-

The d.c.voltage available across the output terminals of a given power supply depends on load current. If the load current I_{dc} is increased by decreasing RL there is higher voltage drop in the power supply and hence lower D.C. output voltage will be obtained and vice-versa will happen if the load current decreases. In this kit Transformer of 9-0-9V regulated to get 12V supply.

2. Microcontroller ATMEGA328:-

This IC is the important part of project. It functions as memory of the project where different function such as input, output and controlling is performed. Input to the controller is 9v. Port B is an 8-bit bi-directional I/O port with internal pull-up registers (selected for each bit).If port pin is configured as an input pin and PortX as logic 1 than pull-up register is activated. If Port B pin is activated as output and PortX has logic zero then pull-up register is inactivated. If RESET condition is activated the port pins are tri-stated. The Port B output buffers have symmetrical drive characteristics with high sink and supply capability. A V_{CC} is the supply voltage pin for the ADC, PC3:0, and ADC7:6. It must be externally connected to V_{CC} , though ADC is not used, but if the ADC is used, it must be connected to V_{CC} with the help of low-pass filter. We need program Microcontroller according to our need. When soil moisture is reduced it will be displayed through microcontroller functioning. PD2 is connected to submersible motor. As soon as moisture reduces which is sensed by soil moisture sensor connected to

the pin no. PC3 motor will pump water in earth pit. Pin no.PD5 is connected to buzzer for periodic warning.

3. Soil moisture sensor:-

Soil moisture sensors measure the volumetric water content in soil. This is a simple low price soil moisture sensor or probe which can be used to find out the moisture in soil and gives proportional analog output. The sensor may be directly connected to Arduino or any controller within built Analog to Digital convertor (ADC). It can also be connected to an opamp as a comparator & gives digital output. It is Plug and play sensor. Operating Voltage: 3.3 - 5 Volts.

4. LCD display:-

A Liquid Crystal Display commonly abbreviated as LCD is basically a display unit built using Liquid crystal Technology. Here 16 Characters * 2 Lines LCD display is used. LCD will display the value of soil moisture and resistance of soil. This brings adequacy and accuracy in performing work at substation or in industry.

5. Motor:-

Ultra Mini DC 12V Brushless Motor Submersible Water Pump.

DC Voltage: - 12V

Maximum lift:-40-110cm / 15.75"-43.4"

Flow rate: - 80-120L/H

Outside diameter of water outlet: 7.5mm / 0.3"

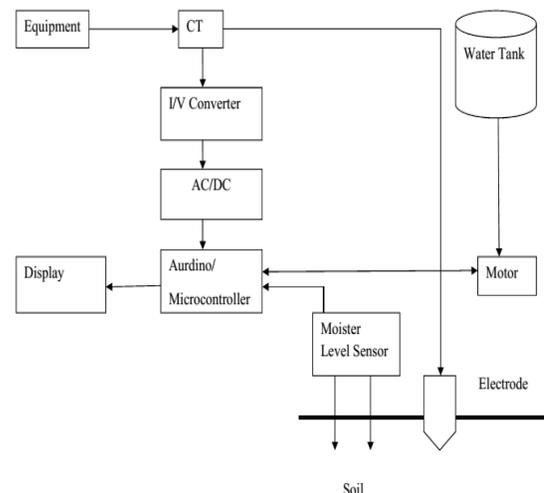
Inside diameter of water outlet: 5mm / 0.2".

Application of Project is,

Automatic Irrigation System,

Automatic Plant watering.

VI. BLOCK DIAGRAM



VII. CONCLUSION

In this paper we studied what is soil moisture sensing its types, operation. Using this system we are able to efficiently analyze soil moisture and resistance and smartly provide solution to the conventional problems. It is one of the efficient way and one can easily understand the working.

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Distance Protection Scheme for Series Compensated Transmission Line based on Mutual Impedance

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Abstract – Abstract: In conventional distance protection scheme, positive sequence impedance is used to protect a transmission line against short circuit faults. Due to the presence of series-compensation the positive-sequence impedance of the fault path is affected, due to this the distance relay mal-operate. In order to overcome this drawback of distance relay, the concept of mutual impedance-based relaying is proposed as a new protection scheme. Since mutual impedance does not get affected by presence of series-compensation. In this paper mutual impedance-based distance protection scheme is presented for series-compensated transmission lines. The mutual impedance between the relay and fault point is computed using the current and voltage at both the ends of the line. The protection scheme gives reliable results when it is tested against single- line-to-ground faults and double-line-to-ground faults. The performance of the proposed scheme is evaluated and compared with conventional distance protection scheme with computer simulations using MATLAB.

Keywords- Mutual impedance, distance protection, series-compensated transmission line.

INTRODUCTION

Series compensation mostly used for long transmission lines, such as those found in the Western United States, in South America, and other locations where the transmission distances are great and where large power transfers are required. Series-compensated transmission lines cancel a portion of the inductive reactance of the line by utilizing series capacitors, and improve the power transmission capability of the line. The use of series compensation increases the load-ability of transmission line and hence the power system stability also got improve. It also provides a better voltage profile along the transmission line [1]. The distance relays protect the transmission line and interconnected distribution networks [2]. The predefined positive sequence impedance is set as reference for the operation of distance relays. Due to series compensation reach and directionality of distance relays get affected. The major problems regarding the reach of distance relays are: 1) relay reliability get decreases because of the reduction in series inductance of line causes disturbance in the locus of fault impedance, and 2) sub-synchronous resonance introduce remarkable delays in the response of digital

phasor estimation methods [3]. The effects of series compensation on the performance of directional relay are examined in [4]. The metal oxide varistor (MOV) protects the capacitor against transient over voltages in series compensation, and the voltage drop along series compensation is used in [5], with some other parameters for making distance relay accurate and fast for zone one protection. For preventing malfunctioning of the main line and its adjacent line relays Pilot protection scheme are described in [6]. A new directional relaying scheme is presented in [7] which uses the phase difference between the pre-fault and post fault current. In this paper a new scheme of distance protection is proposed, which is based on the mutual impedance of line. The proposed scheme gives reliable results only for single line to ground and double line to ground faults. The positive sequence impedance gets affected by series compensation of line, but mutual impedance does not have any effect of series compensation hence this scheme gives reliable result for protection of series compensated line. The remaining paper is arranged as follows: Section III gives the effect of series compensation on the performance of distance relay. In section III computation of mutual impedance for the proposed scheme is given. Proposed protection scheme is presented in section IV. Simulation results are verified in Section V shows the. Finally, the paper is concluded in Section VI.

2. EFFECTS OF SERIES COMPENSATION ON DISTANCE RELAY

An uncompensated transmission line is shown in fig 1. where Z_a , Z_b and Z_c denote the self-impedances of the phases a , b , and c , respectively, while Z_{ab} , Z_{bc} , and Z_{ac} represent the mutual impedances between each of these two phases. The suffixes x and y represent the sending end and receiving end parameter respectively.

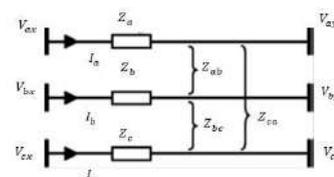


Figure 1: Simple transmission line

From Fig.1, we can write following equations in a three-phase system:

$$\begin{aligned}
 V_{a0} &= Z_{aa} I_{a0} + Z_{ab} I_{b0} + Z_{ac} I_{c0} + V_{a0} \\
 V_{b0} &= Z_{ba} I_{a0} + Z_{bb} I_{b0} + Z_{bc} I_{c0} + V_{b0} \\
 V_{c0} &= Z_{ca} I_{a0} + Z_{cb} I_{b0} + Z_{cc} I_{c0} + V_{c0}
 \end{aligned}
 \tag{1}$$

By using matrix representation,)1) can be represented as, $V_{012} = Z_{012} I_{012} + V_{012}$

$$\begin{bmatrix} Z_a & Z_{ab} & Z_{ac} \\ Z_{ab} & Z_b & Z_{bc} \\ Z_{ac} & Z_{bc} & Z_c \end{bmatrix}
 \tag{2}$$

Assume that all three-phase conductors are the same and the line is fully transposed, it can be stated that,

$Z_{aa} = Z_{bb} = Z_{cc} = Z_s$ and $Z_{ab} = Z_{ba} = Z_{bc} = Z_{cb} = Z_{ca} = Z_{ac} = Z_m$
Therefore,)2) is rewritten as,

$$\begin{bmatrix} Z_s & Z_m & Z_m \\ Z_m & Z_s & Z_m \\ Z_m & Z_m & Z_s \end{bmatrix}
 \tag{3}$$

The sequence impedance matrix of Z_{012} is denoted by Z_{012} and is given by,

$$\begin{aligned}
 Z_{012} &= [Z_s \ Z_m \ Z_m]^T \\
 &= A^T Z_{abc} A \\
 \begin{bmatrix} Z_s & 2Z_m & 0 & 0 \\ 0 & Z_s & Z_m & 0 \\ 0 & 0 & Z_s & Z_m \end{bmatrix}
 \end{aligned}
 \tag{4}$$

Where, $Z_0, Z_1,$ and Z_2 denote zero, positive, and negative-sequence impedances, and A is given by,

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1240 & 1120 \\ 1 & 1120 & 1240 \end{bmatrix}
 \tag{5}$$

From)4), the zero-sequence is given by $Z_0 = Z_s + 2Z_m$ and similarly positive-sequence impedances is given by

$Z_1 = Z_s - Z_m$ Now, the mutual impedance between phases is given by,

$$Z_m = \frac{Z_s - Z_1}{3}
 \tag{6}$$

Now consider the case for a series compensator where Z_{com} is compensating impedance, located at the beginning of the transmission line as shown in Fig. 2. Using relations from)1)-)4) results

$$\begin{bmatrix} Z_{com} & Z_s & Z_m & Z_m \\ Z_m & Z_{com} & Z_s & Z_m \\ Z_m & Z_m & Z_{com} & Z_s \end{bmatrix}
 \tag{7}$$

$$\begin{bmatrix} Z_{com} & Z_s & 2Z_m & 0 & 0 \\ 0 & Z_{com} & Z_s & Z_m & 0 \\ 0 & 0 & Z_{com} & Z_s & Z_m \end{bmatrix}
 \tag{8}$$

From above equations the zero and positive-sequence impedances are given by

$$Z_0 = Z_{com} + Z_s + 2Z_m
 \tag{9}$$

$$Z_1 = Z_{com} + Z_s - Z_m
 \tag{10}$$

From)10) we can observe that the positive-sequence impedance depends on compensating impedance and its value get changed because of the presence of the series compensation. And conventional distance relaying uses positive-sequence impedance for trip setting. Hence, the relay will do malfunctioning. Therefore, this impedance is not reliable for relaying.

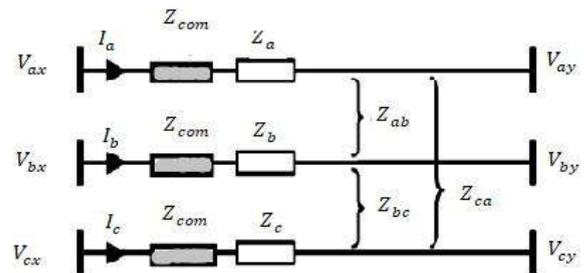


Figure 2: Series-compensated transmission line

3. COMPUTATION OF MUTUAL IMPEDANCE FOR DISTANCE RELAYING

From)6) the mutual impedance of the series-compensated line is calculated. Consider a series-compensated transmission line as shown in Fig. 3)a) where XY is to be protected. As shown the relay is located at the bus X. Using synchronous measurements and high-speed communication between the two buses, the measured

voltage and current signals at the receiving end Y are available in the sending end X. Fig. 3)b) shows the

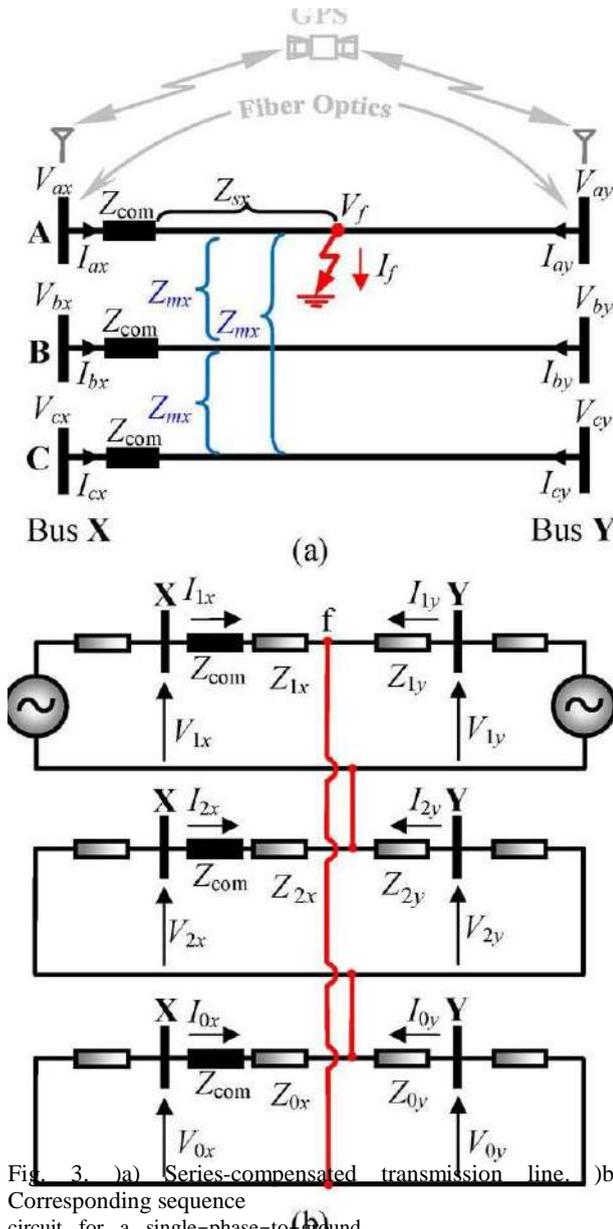


Fig. 3. a) Series-compensated transmission line. b) Corresponding sequence circuit for a single-phase-to-ground fault

sequence circuits for a single line to ground fault in the phase a. Where, the suffixes 0, 1 and 2 stands for the zero, positive and negative-sequence components respectively. Using Fig. 3)b), we can write the following equations.

$$V_{0x} = V_{0y} - I_{0y}Z_{0y} + I_{0x})Z_{com} + Z_{0x} \quad (11)$$

$$V_{1x} = V_{1y} - I_{1y}Z_{1y} + I_{1x})Z_{com} + Z_{1x} \quad (12)$$

Relay R_y measured the positive-sequence impedance to fault i.e. Z_{1y} which is by the and is given by

$$Z_{1y} = \frac{V_{ay}}{I_{ay} - mI_{0y}} \quad (13)$$

Where, $m = (Z_{0y} - Z_{1y})/Z_{1y}$. Hence $Z_{0y} = KZ_{1y}$. Where $K = m + 1$. Hence (11), can be written as

$$V_{0x} = V_{0y} - K I_{0y} Z_{0y} + I_{0x})Z_{com} + Z_{0x} \quad (14)$$

$$Z_{0x} Z_{com} \frac{V_{0x} - V_{0y} - K I_{0y} Z_{1y}}{I_{0x}} \quad (15)$$

Now,

From (12), we get

$$Z_{1x} Z_{com} \frac{V_{1x} - V_{1y} - I_{1y} Z_{1y}}{I_{1x}} \quad (16)$$

$$Z_{1x} Z_{0x} \frac{V_{0x} - V_{0y} - K I_{0y} Z_{1y}}{I_{0x}} \frac{V_{1x} - V_{1y} - I_{1y} Z_{1y}}{I_{1x}} \quad (17)$$

Subtracting (15) from (16) results

Comparing (16) and (17) we get that the mutual impedance between phases of the series-compensated line XY is given by

$$Z_{mx} = \frac{V_{0x} - V_{0y} - K I_{0y} Z_{1y}}{3I_{0x}} \frac{V_{1x} - V_{1y} - I_{1y} Z_{1y}}{3I_{1x}} \quad (19)$$

4. PROPOSED SCHEME

The calculated mutual impedance is proportional to the distance between the relay and fault point similar to the positive sequence impedance. Hence, similar to the conventional distance protection, the concept of protective zone can be applied to the proposed protective scheme. Since mutual impedance is mainly inductive in nature, relay characteristics similar to the reactance relay can be used. Fig. 4 shows a typical relay characteristic where $X_{pick-up}$ is set at 85% of mutual reactance of the main protected line which gives first zone of protection. By setting the mutual reactance according to reach of the relay the second and third zones of protection can be achieved. The proposed scheme can protect the 85% of the line length instantaneously if relay pick-up value $X_{pick-up}$ is set to 85% of mutual reactance of the line. While remaining line length is protected in zone 2 with a definite time delay. At normal operating conditions, all three phases are symmetrical. Hence only positive sequence network is present and zero and negative-sequence networks are open circuited, i.e. zero and negative-sequence impedance is zero. Hence according to (17) and (18), is not possible to calculate mutual impedance during

normal operating conditions. The mutual impedance calculation is done only in faulty conditions. For this purpose, conventional fault detection methods can be applied. Similarly, this method fails during three-phase faults and phase-to-phase faults, since the zero-sequence network will not present in such cases. Hence the proposed scheme cannot be used under these conditions.

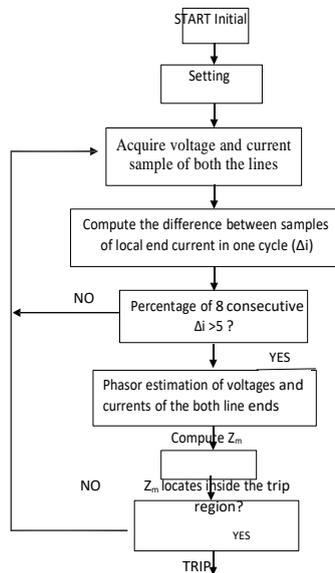


Fig 4. Flow chart of proposed scheme

This scheme can protect the transmission line against single line to ground faults and double line to ground faults only. Practically the proposed scheme is used against single line to ground fault, because most of the faults are single line to ground fault. Hence it is better to use proposed scheme as backup protection since it fails to protect the transmission line against three phase and phase-to-phase faults. The proposed scheme is used for zone 1 protection and it can be easily implemented for zones 2 and 3.

5. SIMULATION RESULTS

The simulated system is shown in Fig. 5. The corresponding system data are given in Table 2. The proposed scheme relay is shown by Rx. It is assumed that transmission line XY have a length of 100 km.

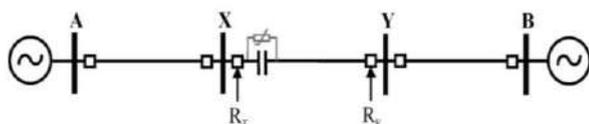


Figure 5: Simulated system

As shown in Fig. 10 (a) and (b), when the line is not compensated, both methods operate correctly and detect the internal fault. However, Fig. 10 (c) shows that in the series-compensated line, the conventional distance

protection may fail to operate for close-in faults and the dependability may be lost, while Fig. 10 (b) and (d) implies that the proposed scheme remains dependable in series-compensated lines.

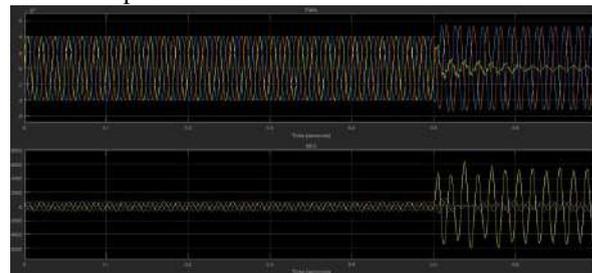


Fig 6 Three-phase voltages and Three-phase currents

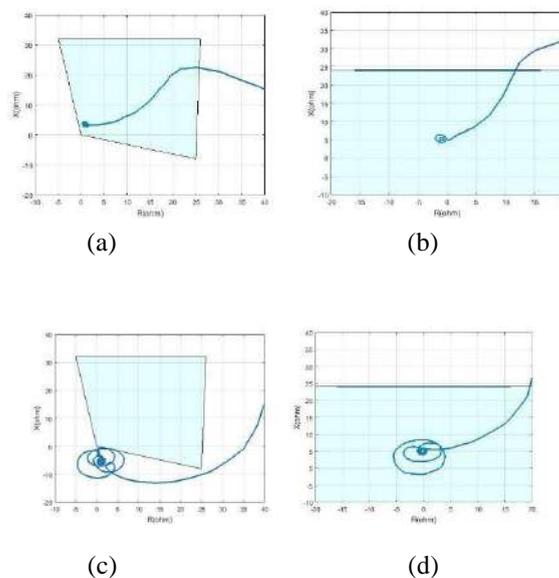


Fig 7. Simulation results for an internal fault.)a) Distance protection without SC.)b) Proposed protection without SC.)c)Distance protection with SC.)d) Proposed protection with SC.

Table 2
Simulated System Data

Parameter	Value
System Voltage	500 kV
System Frequency	50 Hz
Lines Positive Seq. Series Impedance	0.0185 + j0.3766 Ω/km
Lines Positive Seq. Capacitive Reactance	0.2279 MΩ-km
Lines Zero Seq. Series Impedance	0.3618 + j1.2277 Ω/km
Lines Zero Seq. Capacitive Reactance	0.34513 M Ω-km
Sources Positive Seq. Impedance	1.43 + j16.21 Ω
Sources Zero Seq. Impedance	3.068 + j28.746 Ω
MOV Reference current	10 kA
MOV Reference Voltage	338 kV

6. CONCLUSION

A new backup distance protective scheme is proposed for series-compensated transmission lines, which uses the mutual impedance between phases and independent on positive-sequence impedance for relaying operation. This scheme gives protection against single phase and double-phase-to-ground faults. Hence it can be used as back up protection of transmission system. Performance of the proposed scheme is evaluated by various simulation studies. It is shown from obtained result that this scheme performs more reliably than conventional distance protection in series-compensated transmission lines.

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Logistic Management In Fuel Tankers

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Abstract-The paper develops the system for the secure distribution of fuel through tankers. Fuel security refers to the connection between fuel market and national security in the production, transmission and use of fuel. Security of the fuel in tankers is done through locking and unlocking of the valve by some means of security code. The fuel indicator in the tanker will help to know the exact amount of fuel available. Source and destination is used for the transportation of fuel. In between source and destination, if any other user tries to unlock the valve then the owner will be notified and the alarm will be raised. When the tanker reaches the destination then the message will be sent to the owner and how much fuel is being withdrawn. During this process, the driver is continuously notified about the level of fuel in the tanker after every short duration via LCD. The owner is informed about the same via wireless module. Fuel oils are mainly a blend of oils and other components. Fuel mixing results in calculation errors in product quantities resulting in incorrect blends. Mixture of components in the fuel tankers can be detected through comparator. The comparator compares two signals coming from the power supply and chip on board amplifies that signal and process it. In our work, the system locks or unlocks the tank valve of the tanker from petrol owner to destination.

Keywords-Microcontroller, keypad, level measuring system, power supply, LCD, LED, DC motor, smart phone, buzzer.

1. INTRODUCTION

1.1 Logistic Management

Fuel is one of the most essential thing in today's world. We can see number of petrol pumps around us. Our aim is to develop the system for the tankers of petroleum company.

The aim of the system is to open and close the tank valve of the tanker from DC motor. One unit of the system is placed at the tanker which will monitor the fuel level in the tank. The amount of fuel filled at particular petrol pump and petrol pump ID will be send to central office.

Our aim is to develop the system for the secure distribution of fuel through tankers. Fuel security refers to the connection between fuel market and national security in the production, transmission and use of fuel. Security of fuel in the tankers is done through locking and unlocking of the valve by means of some security code. The fuel indicator in the tankers will help to know the exact amount of fuel available. Source and destination is used for the transportation of fuel. In between the source and destination, if any other user tries to unlock the valve then the owner will be notified and an alarm will be raised. When the tanker reaches the destination then the message will be sent to the owner and how much fuel is being withdrawn. During this process, the driver is continuously notified about the level of fuel in the tanker after every short duration via LCD. The owner is informed about the same via wireless module. Fuel oils are mainly a blend of oils and other components. Fuel mixing results in calculation errors in product quantities resulting in incorrect blends. Mixture of components in the fuel tankers can be detected through comparator. The comparator compares two signals coming from the power supply and chip on board amplifies that signal and process it, In our work, the system locks or unlocks the tank valve from petrol owner to the destination.

1.2 Literature Survey

Prof. Chandrakant Umarani et al. [1] Prof. Vivek Gandhewar et al. [2] had proposed that there are many ways to determine the fuel stock in a vehicle’s tank, there are contact less techniques and contact based techniques. Now a days, at many petrol pumps, we don’t get the exact amount of petrol as shown by the filling machine. The amount of petrol we get is somewhat less than the amount we should actually get. So, to avoid this problem the fuel indicator in the vehicles is made digital, then it will help us to know the exact amount of fuel available/filled in the tank. The above fact is considered in the project. The exact amount of fuel available in the tank will be displayed digitally by making the use of sensor.

Kunal D. Dhande et al. [3] had proposed that there is a major problem of fuel thefting all over the world which includes removal of fuel pipe in the absence of owner and misusing the fuel from the vehicle. The vehicle owner is unaware of the fuel theft and will come to know about it only when he/she rides the vehicle on the next time. Previously due to absence of burglar alarm or buzzer the people were not aware of fuel thefting. To overcome this problem microcontroller is used with alarm due to which whenever there is fuel thefting an alarm will be raised. Due to this to owner will be notified and he/she can be aware.

Mrs. Udayavalli V. et al [4] had proposed that precision is an important application in the field of automobiles to measure and verify the fuel present in the vehicle with degree of precision. The previous techniques used analog strip or capacitor sensor which is either inefficient to measure to too costly to install. In the proposed method, two flow sensors are placed linearly, one sensor to measure the amount of fuel entering the tank and another sensor to measure the amount of fuel leaving the tank. The difference between the above measures gives us the amount of fuel present in the tank and it is stored in the microcontroller. It actively keeps the record of the fuel entering the tank and the fuel present in the tank and it is displayed in the LCD. If the fuel is low it will be displayed in the LCD.

This system is designed to cut down the cost and increase the level of accuracy.

Paper	Author	Technique	Gap identified
Instrumentation of automated fuel stock digital display for vehicles.	Prof. Chandrakant Umarani, Prof. Vivek Gandhewar.	A digital liquid level transducer based on optical fiber.	Fuel level measuring system.
Fuel level measuring technique.	Kunal D. Dhande.	Thefting of the fuel in the vehicles and to overcome the problem.	Fuel thefting survey.
Embedded system based intelligent digital fuel gauge.	Mrs. Udayavalli V.	Study of exact amount of fuel in the fuel gauge.	Stuy of fuel gauge system.

1.3 Objectives of the work

The objectives of the paper are important to ensure the research will fulfill the solution to the problem research. The objectives of the work are given below:

To determine the level of fuel in the tankers.

To provide security code in the tankers during its transport.

To operate opening and closing of the tanker doors via security code.

To detect presence of impurities in the fuel.

1.4 Problem statement

In India, fuel management is one of the sectors that gives profit to the economy sector of our country. Based on their motto which is fuel is business, the government has invested more money to develop the technology in order to increase the management of fuel during

transportation and its mixture avoidance. Management of fuel can be done by providing security during its transportation. The exact amount of fuel filled in the tanker is to be known to the owner and how much fuel is to be taken out at each station. This process can be successful by providing wireless module during transportation of the fuel. Fuel theft is the major problem during transportation. O, security is provided at the tanker doors via valves, which opens and closes when command is given via keypad. The owner also faces a major problem in mixture of fuel. So, mixture can be detected by providing comparator at the tanker which compares the values and then chip on board amplifies the signals and provides output by mixture detection.

1.5 Scope of the work

Data logging facility can be included in case of recording historical data, special data, special events and system data.

Computer can be interfaced for more complex and precise application.

System reliability can be improved.

Speed control of vehicle- Using this technique the vehicle can't exceed above predefined speed level.

Alcohol detector_ Due to that there should be safety transportation of fuel accomplish

1.6 Need of the work

Eliminates the continuously monitoring, it facilitates 24 hours a day, 365 days in a year communication between system and user.

Commands can be given through remote place, directly to the machine.

By further modification security system can be added.

Entire control is password protected.

Easy to install and simple in operation.

Low cost, high reliability and flexibility.

2. METHODOLOGY

2.1 Block Diagram

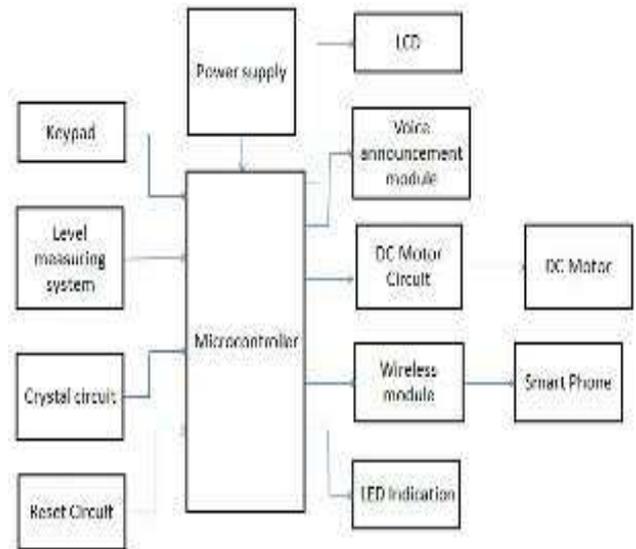


Fig 2.1: Block diagram of main station

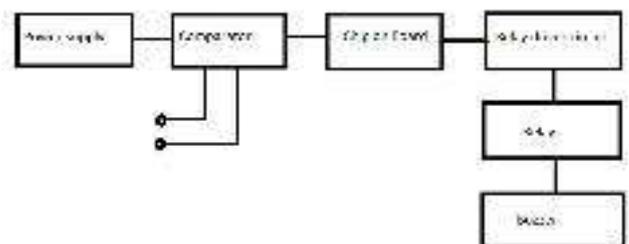


Fig2.2:Block diagram of tanker station

2.2 Working of the system

In this project we are mainly dealing with the transportation of fuel through the tankers. As we know that now a days, many thefting of fuel is going on. So we have made a system for the secure distribution of fuel through tankers. In this, when the fuel is filled in the tank and taken for distribution then the valves of the tanks are open and closed via a security code which is provided by the keypad. Keypad is placed at the tanker doors. When the correct security code is provided then the tanker doors is opened and closed with the help of DC motors. The DC motor will rotate forward and backward when the doors are open and closed. Level measuring system is used to determine the level of fuel in the tanker. LCD is used to display the amount of fuel after every short interval of time. When transporting the fuel form one place to other, if any unauthorized user tries to unlock the tanker door (valve) then an alarm will be raised by voice announcement module. Through wireless module the information of the tanker will be known to the owner after every short duration. LED determines the amount of fuel in the tank at each pre-defined level. For the mixing avoidance in the fuel comparator compares two values coming from the power supply which will be supplied to chip on board. The signals coming out from the chip on board will be given to relay and buzzer.

2.3 Description of the System

2.3.1 PIC16F877A- PIC 16F877A is most advanced microcontroller from microchip. This controller widely used in various experiment and application because of its low price, high quality, and ease of availability. The pic 16F877A features all the components which modern microcontrollers have.



Fig2.3:PIC16F877A

2.3.2 LCD- An LCD is used to display the status of entire work. The main idea is to make this project is cost-effective, a 16 by 2 LCD is sufficient enough. We have many bit LCD available but model we are using is HAD44780. This display is a dot matrix display which is used to display character, alphanumeric, symbol etc. The LCD unit receives character code from microcontroller, send the code to the display data RAM, transform each character code into 5*7dot matrix character pattern, display the character on LCD screen.



Fig2.4:LCD

2.3.3 LED- A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p-n junction diode that emits light when activated. When a suitable current is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons.



Fig 2.5 LED

2.3.4 Buzzer- Piezo buzzer is an electronic device used to produce sound. Its light weight, simple construction and low price make it usable in various applications. Piezo is based on inverse principle of piezo electricity discovered by Jacques and Pierre Curie. It is the phenomena of generating electricity when mechanical pressure is applied to certain materials and the vice versa is also true. Such materials are called piezo electric materials. Piezo electric materials are either naturally available or manmade.



Fig 2.6 Buzzer

2.3.5 Keypad- A keypad is a set of buttons arranged in a block or "pad" which bear digits, symbols or alphabetical letters. Pad which containing numbers are called a numeric keypad. Numeric keypads are found on alphanumeric keyboards and on other devices which require mainly numeric input

such as calculators, push-button telephones, vending machines, ATMs, Point of Sale devices, combination locks, and digital door locks. A computer keyboard usually has a small numeric keypad on the side, in addition to the other number keys on the top, but with a calculator-style arrangement of buttons that allow more efficient entry of numerical data. This number pad is usually positioned on the right side of the keyboard because most people are right-handed. Many laptop computers have special function keys which turn part of the alphabetical keyboard into a numeric keypad as there is insufficient space to allow a separate keypad to be built into the laptop's chassis. Separate external plug-in keypads can be purchased.



Fig2.7 Keypad

2.3.6 Digital Fuel Level Indicator- The sending unit is located in the fuel tank of the car. It consists of a **float**, usually made of foam, connected to a thin, **metal rod**. The end of the rod is mounted to a variable resistor. A resistor is an electrical device which control the electricity. The flow of current is inversely proportional to resistance. In a fuel tank, the variable resistor consists of a strip of resistive material connected on one side to the ground. A **wiper** connected to the gauge slides along this strip of material, conducting the current from the gauge to the resistor. If the wiper is close to the grounded side of the strip, there is less resistive material in the path of the current, so the resistance is small. If the wiper is at the other end of the strip, there is more resistive material in the current's path, so the resistance is large. When the float is near the

top of the tank, the wiper on the variable resistor rests close to the grounded (negative) side, which means that the resistance is small and a relatively large amount of current passes through the sending unit back to the fuel gauge. As the level in the tank drops, the float sinks, the wiper moves, the resistance increases and the amount of current sent back to the gauge decreases.



Fig2.8 Digital fuel level indicator

2.3.7 Bluetooth- Bluetooth is a wireless technology use for exchanging the data over a short distance (using short-wavelength UHF radio waves in the ISM band from 2.400 to 2.485 GHz^[3]) from fixed and mobile devices, and building personal area networks (PANs). Bluetooth is managed by the Bluetooth Special Interest Group (SIG), which has more than 30,000 member companies in the areas of telecommunication, computing, networking, and consumer electronics.^[5] The IEEE standardized Bluetooth as **IEEE 802.15.1**, but no longer maintains the standard. A manufacture must need to reach the bluetooth SIG standards to launch it as a bluetooth device in the market. A network of patents apply to the technology, which are licensed to individual qualifying devices.

2.3.8 Smart Phones-

A mobilephone, cellphone or handphone, sometime shorted to simply mobile, cell or just phone, is a portable telephone that can make and receive calls while user is moving within a telephone service area. Morden

mobile telephone services use a cellular network architecture, and, therefore, mobile telephones are called cellular telephones or cell phones. In addition to telephony, 2000s-era mobile phones support a variety of other services, such as text messaging, MMS, email, Internet access, short-range wireless communications (infrared, Bluetooth), business applications, video games, and digital photography. Mobile phones offering only those capabilities are known as feature phones; mobile phones which offer greatly advanced computing capabilities are referred to as smartphones.

2.3.9 DC Motor- A DC motor is a rotary electrical machine that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of dc motors have some internal mechanism either electromechanical or electronic, to periodically change the direction of current flow in part of the motor. . DC Motors could be powered from existing direct current lightning power distribution systems. A DC Motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC Motors are used in toys tools and appliances. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.



Fig2.9 DC Motor

2.3.10 Crystal oscillator- A **crystal oscillator** is an electronic oscillator circuit that use mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a precise frequency. This frequency is often used to keep track of time, as in quartz wristwatches, to provide a stable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitters and receivers. The most common type of piezoelectric resonator used is the quartz crystal, so oscillator circuits incorporating them became known as crystal oscillators, but other piezoelectric materials including polycrystalline ceramics are used in similar circuits.

A crystal oscillator, particularly one made of quartz crystal, works by being distorted by an electric field when voltage is applied to an electrode near or on the crystal. This property is known as electrostriction or inverse piezoelectricity. When the field is removed, the quartz - which oscillates in a precise frequency - generates an electric field as it returns to its previous shape, and this can generate a voltage. The result is that a quartz crystal behaves like an RLC circuit.

Quartz crystals are manufactured for frequencies from a few tens of kilohertz to hundreds of megahertz. More than two billion crystals are manufactured annually¹. Most are used for consumer devices such as wristwatches, clocks, radios, computers, and cell phones. Quartz crystals are also found inside test and measurement equipment, such as counters, signal generators, and oscilloscopes.

2.3.11 Reset Circuit- A power on reset generator is a microcontroller or microprocessor peripheral that generates a reset signal when power is applied to the device. It ensures that the device starts operating in a known state. In VLSI devices, the power on reset is an electronic device incorporated into the integrated circuit that detects the power applied to the chip and generates the reset impulse that goes to the entire circuit placing it into a known state. A

POR uses the charging of a capacitor, in series with a resistor, to measure a time period during which the rest of the circuit is held in a reset state.

One of the issues with using RC network to generate POR pulse is the sensitivity of the R and C values to the power-supply ramp characteristics. When the power supply ramp is rapid, the R and C values can be calculated so that the time to reach the switching threshold of the Schmitt trigger is enough to apply a long enough reset pulse. When the power supply ramp itself is slow, the RC network tends to get charged up along with the power-supply ramp up. So when the input Schmitt stage is all powered up and ready, the input voltage from the RC network would already have crossed the Schmitt trigger point. This means that there might not be a reset pulse supplied to the core of the VLSI.

3. RESULTS

In this project, due to the use of transistorised fuel level sensor exact amount of fuel can be detected by the use of digital process. Mixing of fuel can also be detected. If there is any theft of fuel, buzzer will be on. So, by using this system theft and mixing will be stopped. Opening and closing of valve is controlled by the DC motor. Wireless module like Bluetooth is also useful in sending the information to driver how much amount of fuel is detected. Android application is used which can lock or unlock the valve of the tankers. In this system, we provide security in the tanker and also provide good controlling for government and private sectors. Stilling of fuel like petrol, diesel etc. and unauthorized petrol selling by distributor is controlled by this process. Mixing of impure and improper items in fuel is overcome. It reduces manual interference and it is user-friendly process.

4. CONCLUSIONS

Hence in our project we have developed the system for the secure distribution of fuel through tankers. Mixing of impure and

improper items in fuel is controlled by this system. This process can be successful by providing wireless module during transportation of the fuel. Fuel mixing results in calculation errors in product quantities resulting in incorrect blends. In our project, the system makes lock or unlock the tank-valve of the tanker from petrol and also send tanker position to main position.

5. FUTURE SCOPE

Data logging facility can be included in case of recording historical data, special data, special events and system data.

Computer can be interfaced for more complex and precise application.

System reliability can be improved.

Speed control of vehicle-using that technique the vehicle can't exceed above predefined speed level.

Alcohol detector-Due to that there should be safety transportation of fuel accomplish

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Biometric Door Unlock Using Fingerprint sensor

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Abstract— Now a days security is a major concern of our life, and digital locks have become an important part of these security systems. There are many kinds of security systems available to protect our place. Some examples are RFID based Security System , Password based security system, bio-matrix systems. In this project, we will Interface a Fingerprint Sensor Module with Arduino and will build a Fingerprint based Biometric Security System with door locking. Finger Print is considered one of the safest key to lock or unlock any system as it can recognize any person uniquely and can't be copied easily.

Keywords— Arduino , fingerprint module(R 307) , solenoid lock , LCD Display

I. INTRODUCTION

This system focuses on the use of fingerprints for door opening and closing. The fingerprint recognition software enables fingerprints of authorised users to be enrolled in a database. Before any user want to open the door , his/her fingerprint image is matched against the fingerprints in the database while The users with no match in the database are prevented from unlock the door .A microcontroller stores the data equivalent of fingerprint of the master user. Comparison between this enrolled fingerprint and the fingerprint of the person who is about to unlock the door is done by the microcontroller. If both the fingerprints are identical control circuitry of the microcontroller sends appropriate signals to the solenoid valve through relay to operate unlock the door. If the fingerprints are not identical microcontroller sends signals to LCD Display “ Invalid User” and door remain closed.

II. Literature survey

Amuda F.A, Tennyson D.I

This research highlights the development of fingerprint verification system using Arduino. Verification is completed by comparing the data of authorized fingerprint image with incoming fingerprint image.

Martin Magdin , stefan koprd

Author proposed a system for protection against unauthorized access. The main goal was to create a system

that is capable of recognizing fingerprints from a user and then processing them. The main part of this system is the microcontroller Arduino Yun with an external interface to the scan of the fingerprint with a name Adafruit R305 (special reader)

Tintu Pious, Sujina K, Sneha K

An important and very reliable human identification method is fingerprint identification

Onyan AO, Enalume KO

The system is reliable in view of the fact that fingerprints are unique to each individual and fingerprint is always available for use unlike the mechanical key that is sometimes forgotten or even misplaced.

Subhankar Chattoraj, Karan Vishwakarma

The biometric finger print system provides good solution to the security. A novel architecture for an economic Finger print biometric technology is proposed and implemented in this paper.

Adeolu Afolabi, Oke Alice

This mechanism can be usefull / implemented on a door where there is restriction of access.

B. Anubala, M. Rahini, T. Bavithra

our system which makes it more comfortable to use than any other existing systems. Also it is built with open source hardware which makes it cheaper.

III. SYSTEM MODEL

Finger Print Sensor Module is a module which captures finger's print image and then converts it into the equivalent template and saves them into its memory on selected ID (location) by Arduino. Here all the process is instructed by Arduino like taking an image of finger print, convert it into templates and storing location etc.

In this Arduino based biometric door unlock Project , we have used Fingerprint Sensor Module to take finger or thumb impression as input to the system. Here we are used four push buttons to add/back, Delete/OK, UP/Match and Down/Match. Every key has dual features. Add key is used for adding new finger data into the system and back

function as well. Means when the user wants to add new finger then he/she needs to press add key then LCD asks for the ID or Location where user wants to store the finger print output. Now if at this time user do not want to proceed further then they can press add/back key again to go back (this time enroll key behave as Back key). Means add key has both adding and back function. Delete/OK key also has same dual function like when user add new finger then they need to select finger ID or Location by using another two key namely UP/MATCH AND DOWN/MATCH (which also has dual function) now user needs to press DEL/OK key (this time this key behaves like OK) to proceed with selected ID or Location. UP/DOWN keys also support Finger print match function.

IV. DESIGN

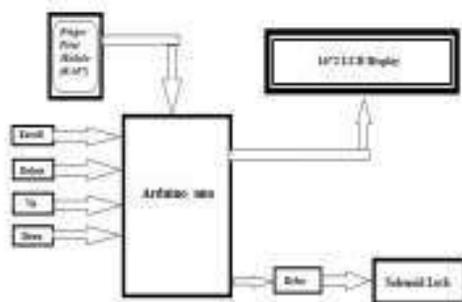


Figure 1. Remote Door Lock System Using Finger Print Module

In this project, we used solenoid lock that will be open when we placed stored finger at the fingerprint module. First of all, the user needs to enroll finger with the help of enroll button. To do this user need to press enroll button & then LCD ask for entering location ID where finger will be a stored. So now user need to enter ID by using up/down button. After selecting location ID user need to press OK (Delete button). Now LCD will ask for placing finger over finger print module. Now user need to put his finger over finger print module. Now finger print module take an image and convert it into templates and store it by selected location in finger print module memory.

V. RESULT AND ANALYSIS

First of all user is asked to enroll his fingerprint. After enrollment the user's identification is done. If the person is authorised, the door automatically opens. After a set time delay, the door automatically closes. This system focuses on the use of fingerprints for door opening and closing. The fingerprint recognition software enables fingerprints of valid users to be enrolled in a database. Before any user want to unlock the door, his/her fingerprint image is matched against the fingerprints in the database while users with no match in the database are prevented from unlocking the door. A microcontroller stores the data equivalent of fingerprint of the master user. Comparison between this enrolled fingerprint and the fingerprint of the person who is about to unlock the door is done by the arduino.

If both the fingerprints are identical control circuitry of the microcontroller sends appropriate signals to the relays operating the door lock.

VI. CONCLUSION

Fingerprint identification enhances the security of a door and makes it possible only for some selected people to used. Thus by implementing this relatively cheap and easily available system on a door, one can ensure much greater security and exclusivity than that offered by a conventional lock and key. It can be deduced that the use of biometric security systems offers a much better and fool proof means of restricting the uses by unauthorized users.

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DIGITAL FUEL LEVEL INDICATOR

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Abstract— The existing fuel indicators install in vehicles are having the petrol indication in the form of points and the analog meters which are leads to miscalculations to what distance vehicle can go with the present fuel in tank.

The precision is always being welcomed by the people all over the world. Precision is very important in the field of automobiles where exact value is to be known.

In our project we have found out a proper solution for indicating the accurate availability of fuel in the tank digitally. In this digitalized world where everything is becoming digital, if the fuel level indicator in automobiles is also made digital it will help to know the exact amount of fuel available in the tank. We are showing the measure of fuel in tanks in liters. This incentive in liters will be in numerical digits (ex. 1.2, 2.3,4.5)

In our work, we are using a float sensor which measures the exact amount of fuel present in the tank and it is stored in the Arduino uno micro controller. Further the measure of fuel stored in the Arduino is displayed using LCD display. We have used an LED and Buzzer connected to Arduino uno. It is used to indicate if the fuel is low in the tank, so the user will refuel it as soon as possible.

So, this issue is considered for our work of building up the computerized fuel level indicator. For bikes which indicates correct measure of fuel regarding liters and to increase the level of accuracy.

Keywords: Arduino uno micro controller, LCD, Float sensor, Fuel tank, Buzzer, Led.

I. INTRODUCTION

In recent times, petrol bunk frauds were very common. In many of the petrol bunks, the pumps were manipulated such that it used to display the amount as entered, but in reality the quantity of fuel filled in customers tanks were much lesser than displayed value. The pumps are cheated for the benefit of the petrol bunks owner. This resulted in huge profits for the petrol bunks but at the same time the customer was being cheated.

Now a days everything is digital in all over fields. The fuel meter which is implemented in two wheeler does not show the exact fuel level which is present in the tank. They show the amount of fuel in terms of bars which oscillates between

meter. This meter bar oscillates between three states of fuel which are empty, half and full. It does not give us the exact value of fuel present in the tank. Henceforth we cannot say the remaining fuel present in the tank. Due to this we can undergo into low fuel problem.

E(Empty) and F(Full) and not in numbers or digits like liters or milliliters. Due to this, we only get approximate level of fuel and not the exact value of fuel.

This fact is considered in our project. The goal of our work is to observe the level of the fuel in the fuel tank of the vehicle and to automatically show the level of fuel digitally through LCD. This helps in cross checking the quantity of fuel filled at the petrol bunk. And it will also help us to deal with common problems like petrol pumps theft cases and the misinterpretation of the amount of fuel left by the drivers.

II. LITERATURE SURVEY

Anirudha Mule, Ujwal Patil, Anil More, S.R.Kale published a paper with title "Study of Digital Fuel Meter and Fuel Theft Detection" in March 2016 (ISSN:2454-9665). In this paper author has given detail explanation of Digital Fuel Meter. The discussed system can be implemented using PIC16F Microcontroller and GSM module. The GSM system can be used for applications like SMS control, Data transfer, and remote control for wireless data transmission. [2]

Mrs.P.Geetabai, L.Deepika, M.Dharani, P.Haripriya, G. Lavanya proposed a "GSM based Digital Fuel meter & Fuel theft detection system" in IOSR Journal. This system shows the digital fuel level as well as gear level on LCD display. [3]

Mandar Milind Gijre, Ramchandra Gadade and Arjun Mane give the idea under title "Smart fuel level Indication System". This paper explains the various technique used for sensing and indicating fuel level. The whole system is built in Arduino uno and Ultrasonic Sensor. This paper was published on GRD Journals vol.2, Issue 6, May 2017 (ISSN: 2455-5703). [1]

III.BACKGROUND

The accuracy of the fuel level measurement has not been an important factor till now. In all over the world all the vehicles are having an analog fuel



Fig.1: Analog Fuel Meter

As considering previous analog system, we are going to implement the advanced system. In our system we are doing digital fuel level meter. In this the fuel level present in the tank will be displayed digitally that is in numerical digits in liters.

IV DESIGN:

In our project we have implemented Digital fuel level indicator. This system will increase the precise level of fuel. The system will also be capable of identification of threshold level and amount of fuel in fuel tank.

When ignition switch is turned on it will indicate that the vehicle is in the ON state, whenever some quantity of fuel is added then the total amount of fuel is displayed on the LCD display. And when the ignition switch is turned OFF it will indicate that the vehicle is stopped. Then the remaining amount of fuel will be stored in the Arduino memory. When the fuel level goes down at the time the Buzzer will be ON.

If the fuel level is below the threshold level then the Red LED will glow, which detects that the vehicle is in RESERVE condition.

FLOAT SENSOR: used for detecting or sensing the fuel level in the fuel tank.



Fig.2: Float Sensor

LED: used for the indication purpose.

Fig.3:
LED

1. Red LED: when the fuel level is below the threshold level then the red LED will glow.
2. Green LED: when the fuel level is above the threshold level then the green LED will glow.

BUZZER: It will turn on whenever there is low fuel in the



FIG.4: BUZZER

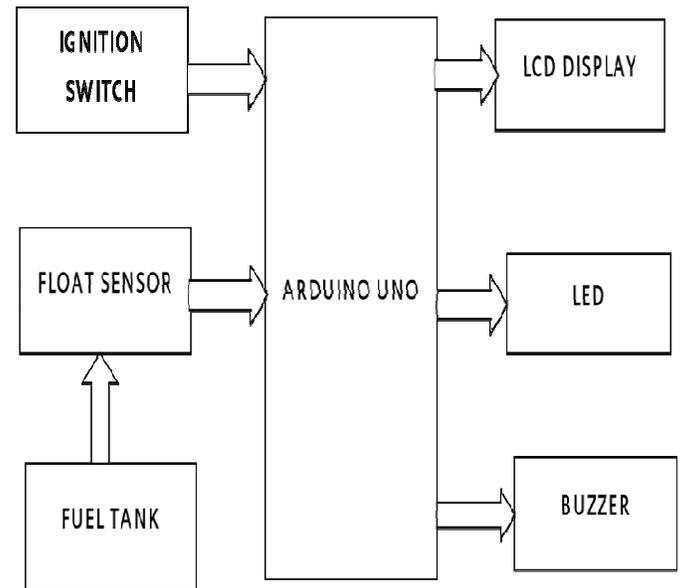


FIG.5: BLOCK DIAGRAM OF DIGITAL FUEL LEVEL INDICATOR

V CONCLUSION:

In this paper we have made digital fuel meter, which shows the level of fuel in exact numeric digits. It gives high accuracy than the analog meter. The precise value of fuel content in the tank is the advantage of this system. Thus, due to this we will now be able to judge that how long distance can be traveled by the remaining fuel in tank. Also fuel theft detection can be done.

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Cognitive Radio Spectrum Sensing with OFDM: An Investigation

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Abstract—Wireless communication applications are exponentially enhancing their utilization in the various streams. This huge technological development requires wide frequency spectrum availability with fast and secure wireless communication technology. In this approach bandwidth scarcity might creates an important obstacle in the progress of wireless communication applications. Cognitive Radio (CR) and Orthogonal Frequency Division Multiplexing (OFDM) are the two novel emerging technologies, enhancing the capacity of wireless communication applications. This paper explain, CR systems with their requirements of the physical layer are discussed. Orthogonal frequency division multiplexing (OFDM) technique also investigated as a premier candidate transmission technology for CR. The challenges that arise from employing OFDM in CR systems are identified.

I. INTRODUCTION

In this era, cognitive radio (CR) has been used as an effective method to compromise the conflict between spectrum scarcity and spectrum utilization. It has congenital ability to sense the wireless communication channels and immediately take the decision to adapt necessary requirements of the system [1], [2]. Intelligence, adaptability, awareness, reliability

, learning, and efficiency are the built in features of CR. Effective spectrum utilization and to provide highly reliable communications is the core principle behind cognitive radio, whenever and wherever needed [3].

Number of problems got the solutions by using a high speed, wideband multicarrier modulation data transmission technique, that can be used in Cognitive Radio systems. OFDM, has the capability to combat with multipath fading and mitigate inter-symbol interference (ISI) as well as inter carrier interference (ICI). OFDM becomes popular communication technology in current and next-generation communication systems, such as WiMAX, WiFi, and LTE. [1], [2], [3], [4], [5], [6].

This paper is organized as follows: Section I introduce to our paper. Section II briefly explains cognitive radio, with its importance. OFDM also discussed in section III. Section IV elaborate CR-OFDM technology with associated challenges in section V. Section VI concluded the paper.

II. COGNITIVE RADIO

Cognitive radio (CR) concept can be applied to many advanced and challenging communication as well as networking systems. The word cognitive means, pertained to cognition or the action or process of knowing. It also means, the mental

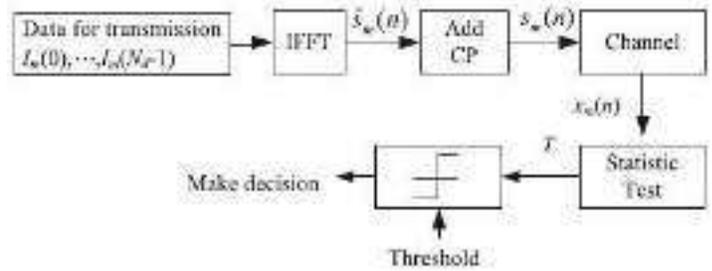
the radio with ability to sense reserved, idle communication spectra which can be utilized by secondary users for other applications during its idle period. CR performs dynamic spectrum allocation. CR unit continuously senses the unused licensed user (LUs) spectrum and make avail it to unlicensed user for a short time until licensed user become active to do transmission. This unused spectrum can be utilized for other applications of non licensed user [3], [4], [5], [6], [7], [8], [9].

III. OFDM

Orthogonal frequency division multiplexing (OFDM) is multicarrier, wideband modulation scheme to transfer the data at high rate and eliminate the inter symbol interference (ISI). The key advantages of OFDM that it, preserve scalability, robustness against narrowband interference (NBI), high spectral efficiency, and easy implementation using fast Fourier transform (FFT) [3], [4], [5], [6], [7], [8], [9].

$$x_m(n) = \sum_{k=-N_d/2}^{N_d/2} I_m(k) e^{j\pi nk/N_d}$$

$$y_m(n) = e^{-j\frac{2\pi f_d(n-\tau)}{N_d+\theta_0}}$$



process of getting knowledge through thought, experience and the senses. Thus, in communication systems CR defines

Fig. 1. OFDM Block Diagram

IV. CR WITH OFDM

The basic problem like time dispersion experienced by high bit rate communication can be overcome by multicarrier modulation technique OFDM. It reduces the need of complex equalizers [3], [4], [5], [6], [7], [8], [9].

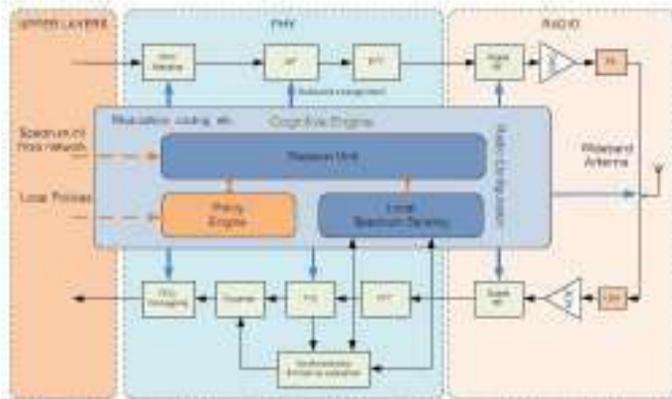


Fig. 2. OFDM based CR system

A. Spectrum Sensing and Awareness

Important elements of the CR concept comprises ability to measure, sense, learn, and be aware of important operating conditions including parameters related to the availability of spectrum, interference temperature, radio channel characteristics, and radios operational environments. This also includes available networks infrastructures and nodes, local policies and other operating restrictions. The system should be aware of user requirements and applications as well as CR should be able to identify and exploit the unused parts of the spectrum in a fast and efficient way [2].

In OFDM systems, using FFT time domain to frequency domain conversion is achieved. There is no need of extra hardware or computation scanning of all the points in the time-frequency grid of the done. Using simple hypothesis testing, the selection of bins that are available for exploitation (spectrum holes) can be carried out. FFT calculation of received signal in OFDM systems reduces the computational requirements of the spectrum sensing algorithm as it requires [2].

B. Spectrum Shaping

Spectrum shaping is the next step, after a CR system scans the spectrum and identifies available opportunities. As cognitive users are expected to be allowed freely to use available spectrum. It needs flexible spectrum mask and control over waveform parameters such as signal bandwidth, power level, and center frequency. OFDM signals can be masked adaptively to fulfill the requirement by disabling a set of subcarrier [2].

overcome by multicarrier modulation technique OFDM. The several splitted lower data rate symbol streams are modulated and transmitted through different carriers. This splitted stream appended with cyclic prefix (CP) to prevent ISI in result of increased symbol length.

Figure 3 shows using the output of FFT block the two LUs are detected and interfering subcarriers are removed from the spectrum. Then transmitter uses the unoccupied part of the spectrum for transmission. signal transmission.

C. Adapting to the Environment

CR can perform various task by using collected information and knowledge from existing system. CR has excellent adaption capabilities like It can adapt waveform to interoperate with

other communication devices, choose the most appropriate transmission network and channel to transmit cognitive user information. CR also compensate channel fading and nullify interfering signals. In this regard OFDM offers desired flexibility as it can adaptively change the transmit power, coding, and modulation order of each individual subcarrier based on user needs or the channel quality. This increases system throughput, reduces bit error rate (BER), limits interference to LUs, increases coverage or to prolong unit battery life. To reduce inter-carrier interference (ICI) or peak-to-average-power ratio (PAPR), OFDM system can adaptively change the subcarrier spacing [2].

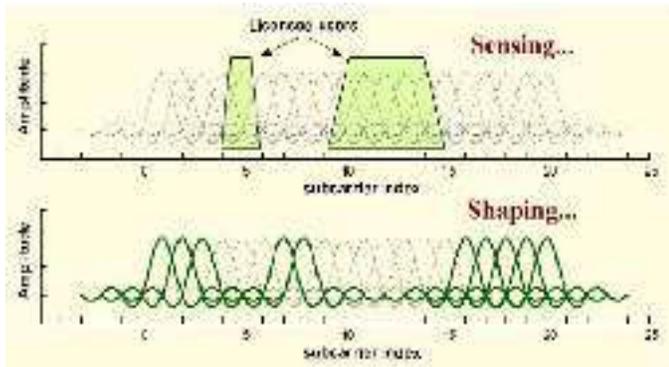


Fig. 3. Spectrum sensing and shaping using OFDM

challenges in addition with existing challenges associated with OFDM and CR. Some of the major challenges are defined as

A. Multiband OFDM System Design

Figure 3 shows single band CR-OFDM system in which available portion of spectrum occupied by single OFDM signal and CR system shapes the OFDM signal. For the systems utilizing wide band spectrum it is more advantageous to divided wider band into smaller bands. This approach simplifies the system design and processing. Multiband signalling reduces the hardware requirement as it separately process small portion of spectrum[2].

B. Location Awareness

Locationbased services can be enable by utilising geolocation information. This can be grouped in four ways i.e. locationbased services, network optimization, transceiver algorithm development and optimization, and environment characterization. To obtain the geolocation information in CR, OFDM signaling can be used with no need of any external positioning systems. OFDM signaling can be used to obtain the geolocation information in CRs without the need for any external positioning systems. Pilot sequences (preambles) used in OFDM systems can be utilised for acquisition and tracking of units locations[2].

C. Signaling the Transmission Parameters

D. Multiple Accessing and Spectral Allocation

Cognitive system shares the available resources among the users. To achiev this task several techniques can be utilized.

OFDM offer supports to time division multiple access (TDMA), frequency division multiple accessing (FDMA) and carrier sense multiple accessing (CSMA). Moreover, OFDM can be used together with code division multiple access (CDMA). It is called multi-carrier code division multiple access (MC-CDMA) or multicarrier direct spread code division multiple access (DS-CDMA) [2].

E. Interoperability

It is the quality of two or more systems or components to share information and to use the information that has been shared. CR systems deal with different cognitive users, its ability detect and encode existing users signals can improve adaption capability and performance of CR systems. OFDM is one of the best technique which offer interoperability. OFDM has been used in short range as well as long range communication systems. It has been successfully used in WiMAX, digital video broadcasting (DVB), digital audio broadcasting (DAB), IEEE 802.11a, IEEE 802.11g Wireless LAN standards [2].

V. OFDM-CR SYSTEM CHALLENGES

CR with OFDM offering future wireless communication techniques with promise resolve various communication problems. However this emerging technology introduces some

In a CR system, to improve communication link, communication units sense and collected useful surrounding channel information. This information is used to select various transmission parameters such as LU bands, spectral mask, operating frequency, coding, and modulation. Other than the local sensing, information distribution among communication units reduces the complexity and improves the performance of the system. So it is very important for successful transmission of CR[2].

To exchange the sensed and measured information among cognitive units one of the approach is to dedicate a communication channel for it. However this channel would be licensed. This will oppose the basic principle of CR to adaptively operate within any given unlicensed band. This distributed information creates the overhead which increases with the increase in quantity of communication units. It will increase the load on dedicated channel. This problem can be solved by reducing the overhead size

In OFDM systems, by turning off some subcarriers of scanned channel, it can exploits the available spectrum holes (figure 3). The receivers gets informed about detected spectrum holes information about deactivated subcarriers. It reduces the overhead by sending a vector containing infoamtion about disabled subcarriers, rahter than sending information about spectrum holes. The activation/deactivation of subcarriers is performed over a block of subcarriers instead of individual subcarriers which inturn reduces signaling overhead

by a factor of the block size. Tone boosting can also be used to reduce overhead size. CR unit send a tone with maximum power and of but very short time duration over the detected signal band as it detects a LU signal within the band. This informs to other users that a LU occupied this band to reduce the probability of interference with LUs.

D. Synchronization

Conventional synchronization methods become deficient to address OFDM with CR. To avoid interference, and to maintain orthogonality between subcarriers, all users should be synchronized to the receiver. It needs longer overheads rather than conventional systems. However this longer overhead may be cause of narrowband interference[2].

E. Mutual Interference

There is possibility of power leakage from OFDM signals to adjacent channels due to the large sidelobes of modulated OFDM subcarriers. This power leakage from the used subcarriers to nulled subcarriers known as mutual interference to LUs. To prevent the mutual interference, the time domain OFDM symbols can window to improve spectrum shape. However it needs longer OFDM symbol duration which reduces the spectrum efficiency of the system. One more approach in this way to increase quantity of nulled subcarriers to achieve lower interference levels to LU bands, but it also reduces spectral efficiency. There is a powerfull method to reduce mutual interference with high spectrum efficiency by subcarrier cancellation. To reduce subcarrier sidelobes inside

spectrum holes the cancellation subcarriers are pre-calculated. It gains substantial reduction in mutual interference. However calculation of cancellation carrier values for each symbol increase overall system complexity. This complexity increases with the increase in spectrum hole to keep the desired interference level[2].

VI. CR-OFDM APPLICATIONS

Recently developed standards are attracting more towards CR due to keen interest in dDynamic frequency selection (DFS), transmit power control (TPC), and spectrum sensing. These standards can be seems to future of CR-OFDM technology. Some examples are:

A. IEEE 802.16

IEEE 802.16 (WiMAX) is showing interest in both academia and industry. OFDMA PHY mode, in which users can be assigned transmit power, different bandwidths, received signal strength indicator (RSSI) or the available bandwidth, time durations, levels, and modulation orders based on various parameters such as user carrier-to-interference-plus-noise ratio (CINR), is the the most interesting mode supported by WiMAX [2].

B. IEEE 802.22

IEEE 802.22 standard is a CR standard possess cognitive features. These cognitive features admit DFS, LUs detection, TPC and channel sensing. IEEE 802.22 standard still not

finalized while proposal drafted for OFDM based CR technology. This standard is designed and developed for point-to-multipoint communication topology. Spectrum sensing strategy of IEEE 802.22 standard based on two stages: fast and fine sensing. A common algorithm like energy detector is employed in fast sensing, while the fine sensing stage is depends on the previous stage results [2].C. IEEE 802.11

IEEE 802.11 is the WLAN standard known as OFDM-based standard. This standard is designed to estimate channel characteristics and DFS with TPC. IEEE 802.11 standard also defines radio resource management. Measurements like noise histogram report, channel load report and station statistics report deines by this standard [2].

VII. CONCLUSION

Spectrum scarcity can be resolved using the CR-OFDM technology. It can be considered a reliable, promising and opportunistic way of wireless communication. CR-OFDM system offer adaptive, aware and flexible systems that can interoperate with current technologies. Various recently develop

wireless communication technologies are adopting CR-OFDM due to its inherent benefits.

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Utilisation of Spectroscopic Techniques for the Study of Structural, Spectral, Optical and Electrical Characterization of Polymers

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Abstract-The trend of using suitable polymers in the formation of various electrical devices is increasing nowadays and the considerable amount of the research work has been reported on electrical conduction in polymers. It has been observed after analyzing the various research reports that electrical conductivity and carrier mobility of polymers can be greatly affected and improved by impregnating the polymers with suitable dopants. For the selection of suitable dopant, the detailed study of various properties and microscopic analysis of internal structure of host polymer is required. In the present paper a theoretical approach has been made to discuss the introduction of polymer, preparation techniques of foil samples, analysis of optical, spectral and structural properties and complete characterization of host polymer by various spectroscopic techniques such as X-Ray Diffraction (XRD), Fourier Transform Infrared spectroscopy (FT-IR), UV –Visible Spectroscopy, Field-Emission Scanning Electron Microscope (FE-SEM), Atomic Force Microscope technique (AFM). The results of these spectroscopic techniques confirm that dopant molecules generally occupy the interstitial positions between the polymer chains and link them with some types of bonds due to charge transfer process. This reduces the interstitial barriers and increases the transition probability of hopping electrons across these barriers, thus improving the electrical properties of polymers. This paper explains about the importance of various spectroscopic techniques to understand the changes done in the internal structure of polymeric material at micro level, when dopant is introduced and also provides the information in the selection of proper dopant to modify the electrical storage property of polymers.

Keywords: XRD, UV-Visible Spectroscopy, FT-IR, FE-SEM, AFM,

I. Introduction

From the era of stones and metals, now the world has entered in the age of nuclear energy and polymers. The various applications of many polymers related to all aspects of human life are increasing day by day and hence scientists, technologists and engineers have declared this era as 'Polymeric age'. Our daily life can be scarcely envisioned without the polymers, as nearly all products that we use contain polymers in some form [1], [2]. The major advantage of using polymers over non polymeric materials in some technologies is that the polymers are cheap, easy to fabricate, and show some remarkable properties like good tensile strength, crystallinity, flexibility, charge storage capacity, charge transport properties, higher glass transition temperature etc.

A polymer is a material whose molecules contain a very large number of atoms linked in different conceivable patterns by covalent bonds, which makes polymers macromolecules. The unit forming the repetitive pattern is called a "mer" or "monomer" and these monomers are linked to form a big polymer molecule the process being known as "Polymerization" [3]. The non-polar polymers with low dielectric constant are very useful in the field of biology and medical due to their good chemical and mechanical properties but the Polar Polymers show extremely good charge storage properties as well as good dielectric properties. Hence, the polar polymers are used in solid state devices widely. The

miniaturization of solid state devices has opened up yet another field for use of polymer, which is very vast fascinating and promising [4],[5]. Polymers offer unique properties, application prospects, diversity, novelty and versatility which is not found in any other class of material. Today, the polymer industry has grown to be larger than aluminum, copper and steel industries combined. So Polymers are useful in all the fields related to human life. In this paper the application of polymers in the field of formation and improvement of efficiency of electronic devices have been considered, since polymers show extremely good charge storage capabilities. The electrical properties of polymers can be improved by doping the polymer with most suitable dopant of low molecular weight compound. Characterization of pure and doped polymeric sample is needed for the study of selection of suitable dopant and its effect on electrical properties of polymers through most advanced spectroscopic techniques, which are explained in this paper.[6],[7].

II. Preparation of Sample

The isothermal immersion technique will be utilized for preparing samples in foil form. The solution will be prepared in a glass beaker by dissolving known amount of polymer in chemically pure solvent and this solution will be kept for 24 hours to get a homogeneous and transparent solution. The solution thus prepared will then be poured onto an optically plane cleaned glass plate floating on mercury. The solvent will be allowed to evaporate in an oven at high temperature for 24 hours to yield the desired samples. This will be followed by room temperature out gassing at 10^{-5} torr for a further period of 12 hours to remove any residual solvent. The plate will be then drawn slowly out of the solution, leaving a uniform film on the plate. Samples thus obtained will be uniformly smooth and can be easily peeled from the glass surface. The same process will be followed to prepare the doped sample by introducing suitable dopant in polymeric solution as per required and calculated ratio. The thickness of the foil film depends upon concentration of solution, its temperature, nature of the substrate and the time for which the substrate is kept immersed in the liquid.

III. Spectroscopic Studies for the Characterization

Spectroscopic analysis is the study of interaction of electromagnetic radiation with a chemical substance or matter [8],[9]. The nature of the interaction depends upon the properties of the substances. When radiation passes through a sample, certain frequencies of the radiation are absorbed by the molecules of the substance leading to the molecular vibrations. The frequencies of absorbed radiation are unique for each molecule which provides the characteristics of a substance. Spectroscopy is the powerful tool for studying the structure, mechanism of action of molecule against electromagnetic radiation. Spectroscopic studies also includes, modification occurring in original structure of pure polymeric material after introducing the doping, copolymerization, substitution and blend formation etc. In order to obtain optimum benefit from this tool and to use it with perfection, a basic understanding of spectroscopy is needed. The most advanced and useful spectroscopic studies used for complete characterization of pure and doped polymeric material are explained below.

A.X-Ray Diffraction (XRD)

The X-Ray diffraction (XRD) is one of the most important nondestructive tool used to analyze internal atomic structure of all kinds of matter ranging from fluids, to powder, films and crystals. XRD is a versatile technique that reveals detailed information about the chemical composition and crystallographic structure of natural and manufactured materials. XRD is a rapid analytical technique primarily used for phase identification of a crystalline material and can provide information on unit cell dimensions. This technique generally leads to an understanding of material due to its authentic results which explain the molecular structure at micro level [10].

When an incident beam of monochromatic X-rays interacts with a target material is scattering of those X-rays from atoms within the target material. In materials with regular structure (i.e. crystalline), the scattered X-rays undergo constructive and destructive interference. This is the process of diffraction. The diffraction of X-rays by crystals is described by Bragg's Law [Fig.1], $n\lambda = 2d \sin\theta$. Bragg's law formulated the condition of constructive interference. The directions of possible diffractions depend on the size and shape of the unit cell of the material. The intensities of the diffracted waves depend on the kind and arrangement of

atoms in the crystal structure. For X-Ray diffraction only short wavelength X-Rays in the range of few angstroms to 0.1 angstrom are used as it should be comparable to size of atoms.

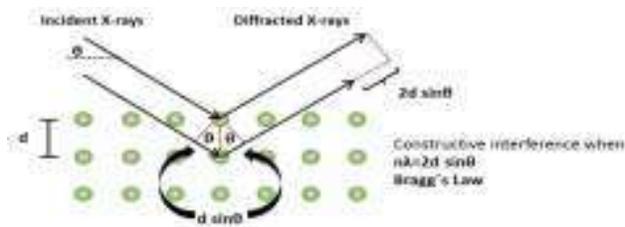


Fig.1 Bragg's Law

Copper is the most common target material for X-Ray diffraction, with $\text{CuK}\alpha$ radiation $=1.54 \text{ \AA}$. These X-Rays are collimated and directed into sample. As target and detector are rotated, the intensity of reflected X-Rays is recorded. [Fig-2]. A detector records and processes this X-Ray signal and converts it into a count rate; a graph between 2θ versus count is plotted and peak is visible if the reflected X-Ray satisfies the condition of constructive interference according to Bragg's law.

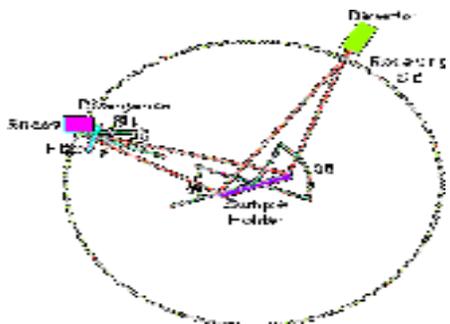


Fig. 2 Schematic diagram of beam path

The crystallite size is an important parameter, which can be determined from width of the Bragg's reflection and is given by Scherrer equation.

$$t = \frac{0.9\lambda}{\beta \cos \theta}$$

Where t is the crystallite size, λ is wavelength of X-Ray, β is full width at half maximum (FWHM), θ is the Bragg's reflection angle.

B.Ultra Violet -Visible Spectroscopy (UV)

UV- visible spectroscopy is the study of absorption and transmission of radiation produced by the material when electromagnetic radiation of UV Range (effectively from 2000 to 4000Å.U.) passes through it. It is the measurement of the attenuation of a beam of light with wavelength after it passes through a sample. When the Ultra Violet radiation passes through the material, the energy of radiation is absorbed by the electrons and these electrons (σ , π , n^*) are promoted from ground state to higher energy state. Thus, light radiation on leaving the sample after absorption will be either less intense or its intensity may be completely lost. A record of the amount of light absorbed by the sample as a function of the wavelength of light in $\text{m}\mu$ ($1\mu=10^{-4}\text{ cm}$.) or nm is called absorption spectrum which generally consists of absorption bands. The schematic diagram of UV spectroscopy is given in Fig.3.

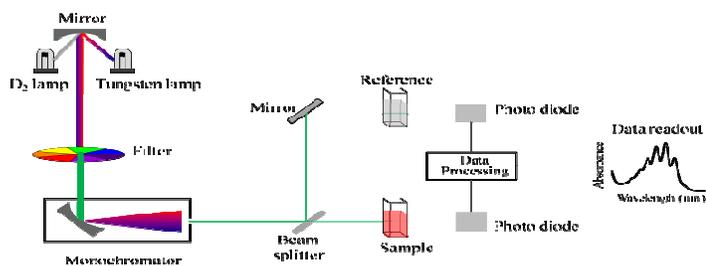


Fig. 3 Schematic diagram of UV spectroscopy

This spectroscopy is very useful to measure the number of conjugated double bonds and also aromatic conjugation within the various molecules. It also distinguishes between conjugated and non-conjugated system. This technique also provides information about detection of functional group available in material, identification of unknown compound, presence of impurity available, selection of suitable doping material etc.

C. Fourier Transform Infrared Spectroscopy (FT-IR)

Fourier Transform Infrared Spectroscopy (FT-IR) is an analysis technique that provides information about the chemical bonding or molecular structure of material, whether organic or inorganic [11]. It

provides information about the functional groups of an organic molecule and is used to identify unknown materials and material phases present in a specimen. The technique works on the fact that groups of bond of material vibrates at particular frequency of radiation when passes through sample. A molecule that is exposed to infrared rays absorbs infrared energy at frequencies that are characteristic to the molecule. Infra-red absorbance is due to the interaction between the electric field vector and the molecule dipole transition moments due to molecular vibrations. Functional groups found in polymers include hydroxyl, carboxyl, ester, double-bond, epoxy, phenol and aromatic ring etc. The absorbance is at a maximum when the electric field vector and the transition moments are parallel to each other, and zero when the orientation is perpendicular. The schematic diagram of FT-IR [Fig. 4] is shown bellow.

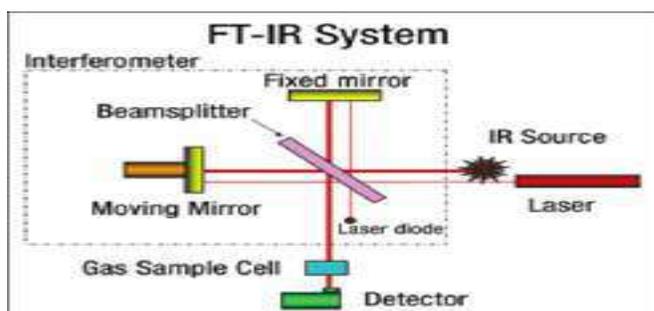


Fig.4 Schematic diagram of FT-IR

Hook's law states that the IR frequency at which a chemical bond absorbs is inversely proportional to the square root of the reduced mass of the bonded atoms and the equation is

$$\nu = \frac{1}{2\pi} \sqrt{\frac{k}{\mu}}$$

Where ν = frequency in cm^{-1} , μ = reduced mass, $\frac{m_1 m_2}{m_1 + m_2}$ (m_1 & m_2 are atomic masses of two elements of the bond), k = force constant.

The absorption bands for more organic and inorganic compounds are found in infrared region. Any absorption band can be characterized by two parameters: the wavelength at which maximum absorption occurs and the intensity of absorption at this wavelength. By measuring the specific frequency over time, changes in the character or quantity of particular bond can be measured. This is

especially useful in measuring the degree of polymerization in polymers and effect of blending or doping in pure material.

D. Field Emission Scanning Electron Microscope (FE-SEM)

FE – SEM uses electrons instead of light to form an image. Electrons are liberated from a field emission source and accelerated in a high electrical field gradient. Within the high vacuum column these so-called primary electrons are focused and deflected by electronic lenses to produce a narrow scan beam that bombards the object. As a result secondary electrons are emitted from each spot on the object. The angle and velocity of these secondary electrons relates to the surface structure of the object. A detector catches the secondary electrons and produces an electronic signal. This signal is amplified and transformed to a video scan-image that can be seen on a monitor or to a digital image that can be saved and processed further[12]. A sample analyzed in SEM should be conducting. If the sample is non conducting then coating of sample by conducting material can be done. The schematic diagram is shown bellow [Fig. 5].

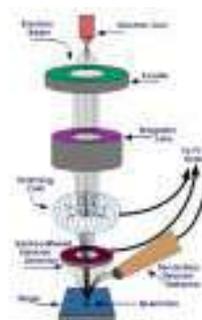


Fig. 5 The schematic diagram of FE-SEM

A FE-SEM is used to visualize very small topographic details on the surface or entire or fractioned objects. FE-SEM is widely used for revealing information about the microstructures and orientation of sample.

E. Atomic Force Microscopy (AFM)

AFM is a very high-resolution type of scanning probe microscopy, with demonstrated resolution on the order of fractions of a nanometer, more than 1000 times better than the optical diffraction limit. The

AFM is one of the foremost tools for imaging, measuring and manipulating matter at the nanoscale. The AFM principle is based on the cantilever/tip assembly that interacts with the sample; this assembly is also commonly referred to as the probe. The AFM probe interacts with the substrate through a raster scanning motion. The up/down and side to side motion of the AFM tip as it scans along the surface is monitored through a laser beam reflected off the cantilever. [13] This reflected laser beam is tracked by a position sensitive photo-detector (PSPD) that picks up the vertical and lateral motion of the probe. The deflection sensitivity of these detectors has to be calibrated in terms of how many nanometers of motion correspond to a unit of voltage measured on the detector. The schematic diagram is illustrated in Fig. 6.

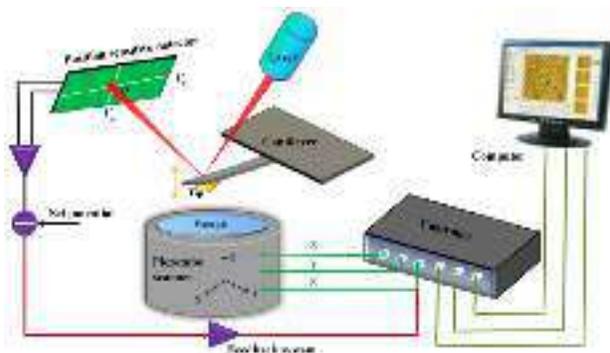


Fig. 6 The schematic diagram of AFM

The AFM provides a true three – dimensional surface profile . AFM do not require any special treatments (such as metal/carbon coatings) that would irreversibly change or damage the sample.

IV. Conclusion

For the polymeric material the characterization of its internal microstructure, chemical bonding, interactions of its molecule with electromagnetic radiation and electrons is a very essential step. The spectroscopic technique XRD produces the result about internal actual structure and modification done in the structure if doping or blending is done. The results of XRD consist of sharp and diffused peaks. Sharp peaks indicate towards crystalline nature and diffused peak indicate amorphous nature of material. The UV spectroscopy and FT-IR are used to produce absorption and transmittance spectrum. The results of UV and FT-IR explain variation in the transmittance due to particular

chemical bonds available in material. AFM and FE-SEM results describe the internal structure of polymer by scanning of each atom till nano-range (nm). So, for complete characterization of polymers all above techniques are used and on the basis of their results all properties of polymer can be studied at micro level. This process converts a polymer into useful products and hence the polymers are widely used in all important fields.

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An Investigation of Acoustical Resonance in Humans through Determination of Individual Natural Frequency

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Abstract — In the auditory channel, humans are highly attuned to emotional signals in speech and music that arise from shifts in the frequency spectrum and intensity of sound. In this study, responses of human beings from various age groups were observed by exposing them to sinusoidal tones of frequency within human hearing range. Similar to a mechanical resonant system, human body also has an internal cavity, which, when exposed to an external frequency equal to its natural frequency, vibrates with maximum amplitude. An attempt was made to estimate the resonant frequency of an individual. The study is expected to throw light on acoustic environment most suited for an individual to make him realize a state of contentment when he is in an enclosure meant for worship or meditation. The study may also support people from medical background to treat a person through acoustical techniques.

Keywords — auditory channel, frequency spectrum, sound intensity, resonance

I. INTRODUCTION

In technical sense, resonance is a relationship that exists between two bodies vibrating at the same frequency or a multiple thereof. In other words, the vibrations emanating from one body cause the other body to start vibrating in tune with it. A resonator may be defined as a second vibrator which is set into motion by the main vibrator and which adds its own characteristics to the generated sound waves [1]. Two kinds of resonance that may occur in human body are: the sympathetic resonance and forced resonance. Sympathetic refers to free resonance while forced resonance refers to conductive resonance [2].

II. METHODOLOGY

Thirty subjects, fifteen males and fifteen females, from various age groups were exposed to sound notes of

frequencies in the human audible range. A particular frequency at which an individual experiences maximum vibrations from within was noted. This

frequency could then be related to the resonant frequency of the human body's inner cavity.

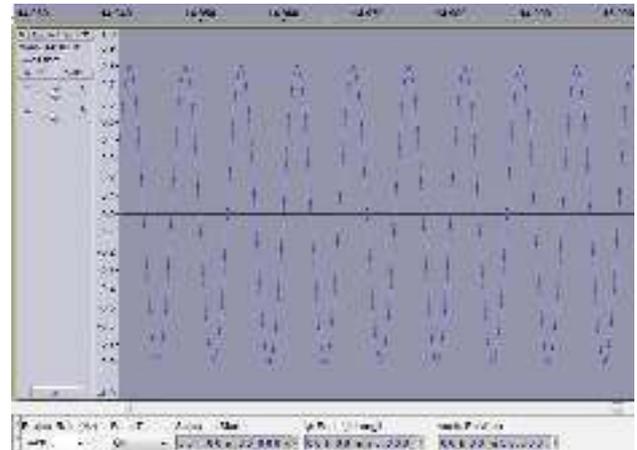


Figure 1: An illustration of the graphical representation of sound note used during experimentation

III. OBJECTIVE MEASUREMENTS

A. Vibrations within human body

The subjects were exposed to sinusoidal tones of frequency in the range starting from a frequency of 100 Hz. The sampling rate used was 44.1 kHz and lasting for 50 seconds. The subjects were asked to enchant the sound of 'OM' (or AUM). The acoustical significance of enchanting 'OM' lies in the fact that it results in stabilization of brain, removal of unnecessary thoughts and increase of energy [3]. Since subjects were asked to enchant the OM sound, the vibrations felt from within must be forced vibrations. The waves originated by the airflow modulated by the vibrating vocal folds travel along the bones, cartilages, muscles of neck and head, and upper chest, causing them to vibrate by forced resonance. These same forced

vibrations may serve as sensation guides for the person, regardless of their effect on external sound. These sensations may provide evidence to the enchanter that their vocal folds are forming strong primary vibrations which are being carried through the chest and head. Thus, these vibratory sensations can supply sensory feedback about the efficiency of the whole phonatory process to the person [6]. The inner cavity may therefore vibrate as a whole or in any of its parts. The vibrations may take place in several ways, all at once. The objective is to find a particular frequency at which maximum vibrations is felt by the subjects.

B. Factor affecting vibrations

There are many factors which may affect the vibrations in the human body. Few of them are age of the person, height, weight, physical and emotional condition, season, weather, time of the day, and temperature. Although these parameters are subjective and may not be controlled during experimentation, it has been tried to keep the ambient conditions as close as possible. For this purpose, all the observations were carried out during afternoon, 12.00 p m to 4.00 p m with subjects not suffering from any health ailment during experimentation. These factors would also affect the physical structure of the body cavity such as its shape, size, composition etc. The frequency of resonance may appreciably change by rather small variations in these conditions and parameters.

C. Vocal resonators in a human body

There are possible seven vocal resonators in a human body. These are the chest, the tracheal tree, the larynx, the pharynx, the oral cavity, the nasal cavity, and the sinuses [4]. The human vocal tract is a non-uniform tube about 175 mm long in man (this gives the distance between the glottis and the lips) [7]. Its cross-sectional area varies from 0 to 20 cm² under the control for vocalization. A nasal tract with a total volume of 60 cm³ is coupled to the vocal tract. Nasal sounds such as /m/ and /n/ are normally excited by the vocal cords and resonated in the nasal cavity. Nasal sounds are generated by closing the soft palate and lips, not to radiate air from the mouth, but to resonate the sound in the nasal cavity. The closed vocal tract works as a lateral branch resonator and also has effects of resonance characteristics to generate nasal sounds. Based on the difference of articulatory positions of tongue and mouth, the /m/ and /n/ sounds can be distinguished with each other [5].

IV. OBSERVATIONS AND CALCULATIONS

A. Estimation of resonant frequency of the body cavity

To estimate the resonant frequency of body cavity, a simplified version of the cavity in the form of a hollow tube, closed at one end (the glottis end - the part of the larynx consisting of the vocal cords and the opening between them. It affects voice modulation through expansion or contraction) and open at other end (the lip end) is approximated. The diameter of such a tube may be considered small compared to the wavelength of sound. Hence, sound through this tube will only propagate down the length of the tube, and any spherical propagation may be ignored.

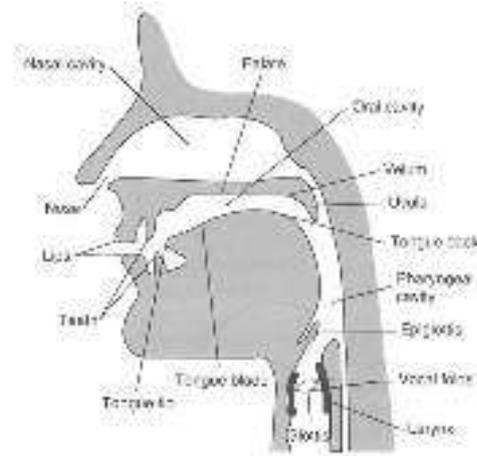


Figure 2 : Vocal resonating cavity of a human body

(Source

http://www.mtosmt.org/issues/mto.16.22.1/heidemann_examples.php?id=1&nonav=true)

TABLE I
RESONANT FREQUENCY MEASUREMENT IN FEMALES

Sr. No.	Age Group (in Years)	Height (m)	Weight (Kg)	Resonant Frequency (Hz)
1	15-20	1.5748	45	155
2	20-25	1.7018	57	145
3	20-25	1.5748	49	115
4	20-25	1.6764	51	152
5	20-25	1.5748	40	145
6	20-25	1.5748	39	155
7	20-25	1.55	55	114
8	25-30	1.5748	51	142
9	25-30	1.6764	55	122
10	30-35	1.5494	60	125
11	35-40	1.5494	63	137
12	35-40	1.6002	59	120
13	40-45	1.63	70	145
14	40-45	1.397	56	130
15	45-50	1.6002	55	125

Ht : Wt ratio	Ht : Rf	Wt : Rf	BMI
0.03	0.010	0.290	18.15
0.03	0.012	0.393	19.68
0.03	0.014	0.426	19.76
0.03	0.011	0.336	18.15
0.04	0.011	0.276	16.13
0.04	0.010	0.252	15.73
0.03	0.014	0.482	22.89
0.03	0.011	0.359	20.56
0.03	0.014	0.451	19.57
0.03	0.012	0.480	24.99
0.02	0.011	0.460	26.24
0.03	0.013	0.492	23.04
0.02	0.011	0.483	26.35
0.02	0.011	0.431	28.69
0.03	0.013	0.440	21.48

TABLE III
RESONANT FREQUENCY MEASUREMENT IN

Sr. No.	Age Group (in Years)	Height (m)	Weight (Kg)	Resonant Frequency (Hz)
16	15-20	1.651	57	130
17	20-25	1.778	70	144
18	20-25	1.7272	68	154
19	20-25	1.7272	71	127
20	20-25	1.71	61	152
21	20-25	1.8034	73	153
22	25-30	1.6256	87	145
23	25-30	1.8034	73	138
24	25-30	1.6764	72	144
25	25-30	1.6764	57	155
26	30-35	1.6764	63	145
27	30-35	1.7018	76	153
28	30-35	1.7018	90	155
29	35-40	1.7018	73	128
30	35-40	1.7272	66	141
Ht : Wt ratio	Ht : Rf	Wt : Rf	BMI	
0.03	0.013	0.438	20.91	
0.03	0.012	0.486	22.14	
0.03	0.011	0.442	22.79	
0.02	0.014	0.559	23.80	
0.03	0.011	0.401	20.86	
0.02	0.012	0.477	22.45	

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0.02	0.011	0.600	32.92
			22.45
			25.62
0.03	0.011	0.368	20.28
			22.42
			26.24
0.02	0.011	0.581	31.08
			25.21
			22.12

The relation between wavelength of sound and its frequency is given by, $\lambda = c / f$,

where c is the speed of propagation of sound in air (approximately 335 m/s). Approximating the cavity to be a tube closed at one end, that is a quarter-wavelength resonator [8], the frequency of resonance may be given by

$$f = c / \lambda = c / 4L = (33500 \text{ cm/s}) / 4 (17.5 \text{ cm}) = 478.57 \text{ Hz.}$$

However, the human vocal tract is a complex tube, and not a simple tube closed at one end. Its complexity in shape may be described as a series of cross-sectional area measurements. This can be modified in a variety of ways in humans.

V. RESULTS AND DISCUSSION

It is observed that, the resonant frequencies are different from the above calculated value. This frequency may be a harmonic to the resonant frequency actually obtained through subjective measurements. It is also noted that the frequencies obtained may be either fundamental or any harmonic of the fundamental. Due to limitation on the frequency response of the speakers used, frequencies lower than 100 Hz could not be checked. In case of consideration of closed tube at one end model, the harmonics are all odd multiples of fundamental.

It is also believed that females in particular, have a tonal frequency higher than males. However, such conclusion could not be drawn from the observations. The tables also show that height or weight and the BMI of a person do not correlate to the resonant frequency of an individual. More complex study is needed to develop any correlation between frequency and body size.

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