



Proceedings of 2nd World Conference on
Applied Science Engineering and Technology
(WCASET – 16)

Goa

29th - 30th December' 16

Institute for Engineering Research and Publication

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Editorial:

We cordially invite you to attend the **2nd World Conference on Applied Science Engineering and Technology (WCASET - 16)** which will be held at Hotel **Delta Residency, Goa** on **December 29th – 30th , 2016**. The main objective of **WCASET** is to provide a platform for researchers, engineers, academicians as well as industrial professionals from all over the world to present their research results and development activities in relevant fields of Science, Engineering and Technology. This conference will provide opportunities for the delegates to exchange new ideas and experience face to face, to establish business or research relationship and to find global partners for future collaboration.

These proceedings collect the up-to-date, comprehensive and worldwide state-of-art knowledge on cutting edge development of academia as well as industries. All accepted papers were subjected to strict peer-reviewing by a panel of expert referees. The papers have been selected for these proceedings because of their quality and the relevance to the conference. We hope these proceedings will not only provide the readers a broad overview of the latest research results but also will provide the readers a valuable summary and reference in these fields.

The conference is supported by many universities, research institutes and colleges. Many professors played an important role in the successful holding of the conference, so we would like to take this opportunity to express our sincere gratitude and highest respects to them. They have worked very hard in reviewing papers and making valuable suggestions for the authors to improve their work. We also would like to express our gratitude to the external reviewers, for providing extra help in the review process, and to the authors for contributing their research result to the conference.

Since October 2016, the Organizing Committees have received more than 120 manuscript papers, and the papers cover all the aspects in Electronics, Computer Science, Information Technology, Science Engineering and Technology. Finally, after review, about 37 papers were included to the proceedings of **WCASET - 2016**.

We would like to extend our appreciation to all participants in the conference for their great contribution to the success of **WCASET 2016**. We would like to thank the keynote and individual speakers and all participating authors for their hard work and time. We also sincerely appreciate the work by the technical program committee and all reviewers, whose contributions made this conference possible. We would like to extend our thanks to all the referees for their constructive comments on all papers; especially, we would like to thank to organizing committee for their hard work.



Editor-In-Chief
Dr. Nalini Chidambaram
Professor
Bharth University

Acknowledgement

IFERP is hosting the **2nd World Conference on Applied Science Engineering and Technology** this year in month of December. Technical advantage is the backbone of development and nanoelectronics has become the platform behind all the sustainable growth 2nd World Conference on Applied Science Engineering and Technology will provide a forum for students, professional engineers, academician, and scientist engaged in research and development to convene and present their latest scholarly work and application in the industry. The primary goal of the conference is to promote research and developmental activities in Electronics, Computer Science, Information Technology, Science Engineering and Technology and to promote scientific information interchange between researchers, developers, engineers, students, and practitioners working in and around the world. The aim of the Conference is to provide a platform to the researchers and practitioners from both academia as well as industry to meet the share cutting-edge development in the field.

I express my hearty gratitude to all my Colleagues, staffs, Professors, reviewers and members of organizing committee for their hearty and dedicated support to make this conference successful. I am also thankful to all our delegates for their pain staking effort to travel such a long distance to attain this conference.



Er. R. B. Satpathy
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Institute for Engineering Research and Publication (IFERP)

2nd World Conference on Applied Science Engineering and Technology – 2016

Keynote Speakers



Jitendra Narayan Gangwar
Assistant Professor,
Department of Mechanical Engineering,
Motilal Nehru National Institute of Technology Allahabad.

Biography:

Jitendra Narayan Gangwar is working as an Assistant Professor in Department of Mechanical Engineering, Motilal Nehru National Institute of Technology Allahabad. He had obtained his master degree from IIT Kanpur and Ph.D. from MNNIT Allahabad. He has published five papers in the area of renewable fuel, toxicology and energy management in International referred Journals like Inhalation Toxicology and Atmospheric Environment. He received best faculty award in year 2009 from Uttar Pradesh Technical University Lucknow. His research area includes biofuels, renewable energy and engine tribology. He has guided more than 10 M. Tech thesis till date.

JITENDRA NARAYAN GANGWAR



**Dr. Sangeeta Ahuja Ph.D.(Computer Science),
University of Delhi, Delhi, Senior Scientist,
IASRI (ICAR), New Delhi.**

Biography:

Dr. Sangeeta Ahuja is a senior scientist at IASRI (ICAR), New Delhi. She has been involved in Software Development particularly Statistical Software Development, Information and database system, engineering optimization and agricultural research system from last so many years. She has so many patents and copyrights for the software developed by her. Most of the software developed by her is commercialised and going to 12 international countries. It is generating lot of revenue for ICAR system. She has published more than 40 papers in national and international journals. She has expertise in teaching advance courses to M.Sc. and Ph.D. students and involved in organizing training programmes. She has organized many sessions and special sessions in various national and international conferences. She has editorial board members of number of journals.

DR. SANGEETA AHUJA

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Dean/ Mechanical ,Christ College of Engineering and Technology, Pondicherry

Intelligent Fire Control System

Mrs. Megha Ainapurkar
Department of Computer Engineering
Padre Conceico College of Engineering,
Goa University
meghav786@gmail.com

Abstract: The proposed system architecture presents a fire control system using a distributed mobile agents. In recent years, mobile agents have attracted considerable interest in distributed systems. In mobile agent technology, a program, in the form of software agent, can suspend its execution on the host computer and transfer it on the agent enabled host and continue its execution. In this paper the multi mobile agent system is presented to reduce the time delay and loss of resources as compared to the traditional fire control system.

Keywords— Mobile Agent , BAS, Intelligent Agent

I. INTRODUCTION

The emergence of distributed intelligent systems and smart fire detection systems has changed the traditional fire control system. Building Automation Systems (BAS) are concerned with the automatic control of building services, key areas being Heating, Ventilation and Air Conditioning (HVAC), lighting and shading. Mobile agent technology offers a new computing paradigm in which a program, in the form of a software agent, can suspend its execution on a host computer, transfer itself to another agent-enabled host on the network, and resume execution on the new host. The use of mobile code has a long history dating back to the use of remote job entry systems in the 1960's. Today's agent incarnations can be characterized in a number of ways ranging from simple distributed objects to highly organized software with embedded intelligence. Agents comprise a powerful technology for the analysis, design and implementation of autonomous intelligent systems that can handle distributed problem-solving, cooperation, coordination, communication, and organization in a multiplayer environment. It's also a promising computing paradigm for dealing with system complexities such as openness, distribution, human involvement, societal characteristics, and intelligence emergence. In this paper I am presenting an automated approach for a Fire control System using Autonomous Intelligent Agents.

II. INTELLIGENT AGENT

Artificial intelligence (AI) is the intelligence of machines and the branch of computer science that aims to create it. AI textbooks define the field as "the study and design of intelligent agents" where an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success. John McCarthy, who coined the term in 1956, defines it as "the science and engineering of making intelligent machines."

The most widely used accepted definitions for this term is "an agent acts on behalf of someone else, after having been authorized". An agent is a physical or virtual entity, which runs approximately as follows: which is capable of acting in an environment, which can communicate directly with other agents, which is driven by a set of tendencies, which possesses resources of its own, which is capable of perceiving its environment, which has only a partial representation of this environment, which possesses skills and can offer services, which may be able to reproduce itself, whose behaviour tends towards satisfying its objectives, taking account of the resources and skills available to it and depending on its perception, and the communications it receives. The definition given by Wool ridge & Jennings is as follows: "An agent is a computer system that is situated in some environment, and that is capable of autonomous action in this environment, in order to meet its design objectives." Agent is the birth and development of AI technology and network technology development in the inevitable result of the artificial intelligence knowledge in the field of engineering, Expert systems, decision-making theory and methods, such

as the development. Direction has made the development of intelligent applications possible.

III. EXISTING FIRE CONTROL SYSTEMS FOR (BAS)

Building Automation Systems (BAS) use computerbased monitoring to coordinate, organize and optimize building control sub-systems such as security, fire/life safety, elevators, etc. Common applications include equipment scheduling (turning equipment off and on as required). Tremendous advances in computer technology are reflected in the sophistication and falling costs of Direct Digital Control (DDC) systems for buildings. DDC systems are now affordable for all but the smallest and simplest of buildings, and allow much finer control and energy savings than pneumatic controls. Besides flexible control of lighting and HVAC systems, DDC can also integrate fire and intruder alarms, security and access systems and local and wide area computer networks. The following figure will explain the design of BAS.

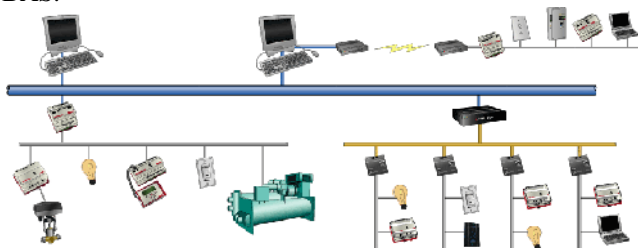


Fig. 1 BAS Design

IV. ARCHITECTURE OF NEW BAS SYSTEM BASED ON EXISTING BAS SYSTEM

Agent generally refers to calculation entity with characteristics, such as independence, duration, sociality and acting as agent under certain environment. Multi-Agent system (MAS) is a system composed of a lot of Agents, and generally these Agents exchange information through network infrastructure. In order to succeed in communicating, a certain Agent needs to cooperate and consult with other Agent. In MAS, the ability of an individual Agent is limited, but multi-Agent can finish a lot of complicated tasks through cooperation. The existing Fire Control System can only turn on/off the appliances and generate the alarm signals. The architecture (Fig.2) proposed in this paper will extends the existing Fire Control system functionalities by making use of intelligent mobile agents. The Fig.2 represents the flow of system for the improved BAS. This new design contains following entities.

1. Interface Agent (On Home Machine)

This is a local agent which will keep on receiving information from all the sensors connected with the home electrical appliances. If there is an alarm or fire smoke is caught by the agent then it will put off all the appliances and immediately move to closest fire station to give the address, owner details etc. The interface agent will send a SMS alert to the owner of house.

2. MAS(Multi Agent System)

This is a collection of agents and they can communicate with each other to complete the task. After receiving the information from the interface agent, the MAS will activate the Database agent to check whether Fire Vehicle and Driver is available. On receiving details it will send the information to the Transfer Agent. The Transfer agent is suppose to send SMS alert to the driver and to the Vehicle agent to activate the system. Next the Vehicle agent is suppose to take out the vehicle from the parking slot and keep ready to go.

3. Master Controlling Agent

This agent is suppose to control all the agents as well as to activate the agents on all the machine with the network. Also this agent is suppose to check whether the driver and vehicle is available at the requested fire station , otherwise it will activate Selection agent , to select the next closet fire station and it will send the details to that station.

The proposed design is possible to implement in intranet but not in an open environment as the present technologies still working on security issues of mobile agents.

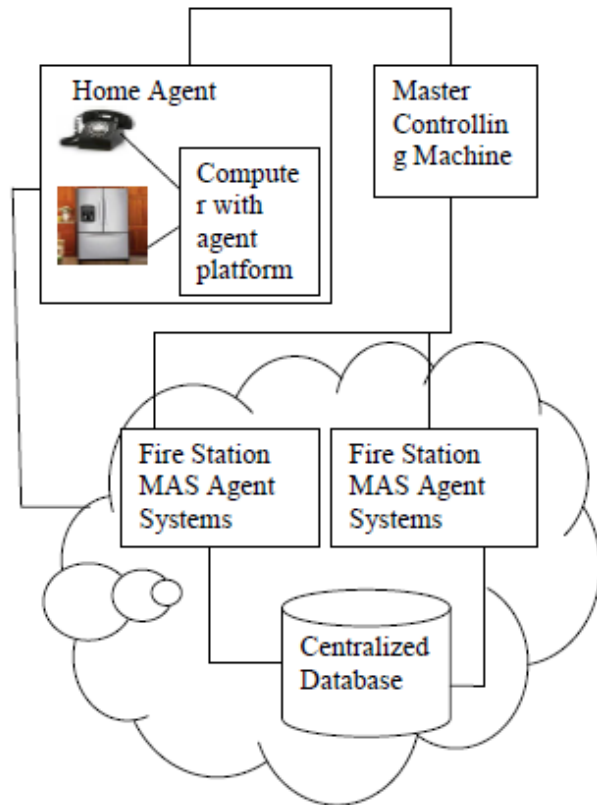


Fig. 2 Intelligent Fire Control System(Improved BAS Design)

V. THE WORK PROCESS OF SYSTEM

- 1) The Master Controlling agent will receive the request from home agent and register the agent Id in the database also the owner details and invokes the database agent from MAS.
- 2) The database will find out the available vehicle numbers and driver information and convey that information to the transfer agent.
- 3) The transfer agent is designed to send the message to the driver and activate the vehicle agent.
- 4) The Vehicle agent will check the status of the vehicle and it will take the appropriate actions to make the vehicle ready for the work. Also this agent will take out vehicle from parking slot.
- 5) When the task is completed, the driver is suppose to send the status sms back the fire station and accordingly the master controlling agent will update the database.

VI. ADVANTAGES OF NEW DESIGN

1. This system is fast as compared to the manual process.

2. This can reduce the loss by substantial amount and can save lot of life's
3. System is not restricted to any particular station, instead it can actually transfer the data to other stations as fast possible to reduce the loss.
4. This is an fully automated approach where there is hardly human interface, so the valuable time can saved.
5. This system records all the information causing the fire , so this information can be also used to minimize the fire causing reasons.

VII. CONCLUSIONS

The design will actually help to reduce the burden caused by manual working. The Intelligent mobile agent system can improve existing system by distributed the data across the network as fast as possible and connects to the closest fire station. The use of Artificial intelligence can actual taking the world into new era where most of the work will be handled by such intelligent systems.

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Design and Numerical simulation of Partial Flow Isokinetic Dilution Tunnel for Diesel Particulate Measurement

^[1] Jitendra N. Gangwar, ^[2] Samir Saraswati

^[1] ^[2] Assistant Professor,

Department of Mechanical Engineering,

Motilal Nehru National Institute of Technology Allahabad, Allahabad-211004

^[1] jgangwar@mnnit.ac.in, ^[2] samirsaraswati811@hotmail.com

Abstract:—Diesel engines are advantageous in terms of lower fuel consumption, lower unburned HC* and better fuel efficiency. Counter side they are disadvantageous in terms of high particulate emissions that results from fuel pyrolysis at high temperatures. These particulate emissions have antagonistic effect on both environment and human health. To regulate these diesel particulates, government is imposing stringent emissions norms on diesel engine exhaust. Therefore, it is important for all engine manufacturers to design and develop a system that is capable of measuring these particulate emissions. Further, diesel particulate matter is very complex structure, primarily composed of solid carbon with several absorbed species like ash, metallic abrasion particles, sulfates and silicates, which cannot be measured directly by analytical instruments based on direct detection method. The best approach to measure diesel particulate matter is based on the gravimetric method by using the device known as dilution tunnel. The present work focuses on design and numerical analysis of partial flow isokinetic dilution tunnel in order to determine the optimum mixing length to achieve complete mixing between the dilution air and exhaust sample. A commercial ANSYS FLUENT software has been used to perform the numerical simulations. To find optimum mixing length, various simulation test were conducted which can be categorized in three broad divisions. The first test consists of 9 different conditions based on variation in duct diameter and dilution ratio (DR) for constant duct length of 2500 mm. Results from first test shows that the shortest mixing length of 1250 mm was obtained for duct diameter of 150 mm when dilution ratio of 20:1 is maintained. Further, in order to reduce the mixing length, test 2 and 3 were conducted by introducing number of perforated plates and grid of cylinders only to best design of test 1. Results from test 2 and 3 shows that mixture gets uniform within 1000 mm of duct length when perforated orifice plate was used. The introduction of a grid of cylinder does not influence quick mixing of exhaust sample with diluted air.

Index Terms— Dilution tunnel, dilution ratio, nucleation and agglomeration, particulate matter.

* HC: Hydrocarbon

I. INTRODUCTION

Diesel particulate matter (PM) generally composes of three main fractions namely solid fraction (known as soot or SOL), soluble organic fraction (SOF) and sulfates, if the fuel contains sulfur [1]. PM having a diameter less than 100 nm [2] effects the human health most by directly penetrating the cell membrane, and entering into brain and blood of the human body. These harmful effects of PM have driven the nation to impose stringent BS-VI emission norms by 2019 for automotive industry. BS-VI requires up to 80% reduction in NO_x (0.08 g/kmhr) and 66% reduction in PM (0.005 g/kmhr) compared to current BS-IV norms [3]. Apart from mass concentration, BS-VI norms also put strict limits on the number concentration of particulate matter emitted into the atmosphere [3]. That makes it necessary to study the number and mass concentration of diesel PM.

Dilution tunnel is the most common and cheapest device that is used to determine the diesel exhaust contribution to the total particulate content in the atmosphere in terms of particle mass and number distributions. It allows dilution of the raw exhaust with cold ambient air which initiates various microphysical processes such as nucleation, condensation and agglomeration of particles leading to alteration and formation of new diesel PM [4]. The main purpose of dilution tunnel sampling is to simulate processes in an atmosphere around the vehicle. Dilution tunnels are either full flow or partial flow [5]. A full flow dilution tunnel completely dilutes all the exhaust gases leaving the vehicle and then a small portion is sampled, while in partial flow dilution tunnel only a small fraction of the exhaust gas is diluted and then the whole diluted sample is passed through filter assembly carrying filter paper. There are three main types of partial flow dilution tunnel [6] namely;

flow controlled systems with concentration measurement, flow controlled systems with flow measurement and isokinetic systems. Among all three types, an isokinetic system is the best suited system as the flow in the sampling probe is matched with the flow in the exhaust pipe in terms of velocity or pressure [7]. Further, it helps in achieving undisturbed and uniform flow at sampling probe [7]. L. M. Hildemann et al. [8] show that a dilution tunnel should closely simulate atmospheric dilution, provide enough residence time to allow condensation processes within the tunnel, minimize particle and vapour losses within the tunnel and finally avoid contamination of the dilution tunnel. Other researchers such as Chan et al. [9], Lyrranen et al. [10], Lipsky and Robinson [11], Yoon et al. [12] and Li et al. [13] presented various other dilution tunnel design that differs in terms of size, flow geometry and ease of portability. Chan et al. [9] presented strong evidence that for getting best results from the tunnel, particulate sampling should be done in a certain range of dilution ratio without exceeding a temperature of 52°C. Lipsky and Robinson [11] presented that particle mass distribution at the exit of dilution tunnel directly depends on tunnel geometry and Khalek et al. [14] shown that effective particulate trap depends on dilution ratio maintained inside the dilution tunnel. Nucleation mode is the first mode of particulate formation inside the dilution tunnel [14]. Further, nucleation mode directly depends on mixing of hot exhaust gas with cold ambient air which finally depends on flow condition. Overall, it may be concluded that the tunnel geometry, dilution ratio, and flow configuration inside the tunnel play an important role in measuring particulate matter distribution.

Computational fluid dynamics (CFD) helps to study the effects of various parameters like dilution tunnel length, the geometry of cross-section and dilution ratio on the performance of dilution tunnel, prior to fabrication [15]. This helps in deciding the optimum design and saves cost on fabricating different prototypes. Wang et al. [16] conducted CFD simulations of experimental data conducted by Lipsky et al. [11] on dilution tunnel. The CFD simulations match the experimental data; however, it was found that level of nucleation was different when the simulation was carried with dilution ratio (DR) 20 and DR 110 for the cross-flow tunnel. The above difference is validated in terms of differences in the relative humidity of the dilution air. The present work focuses on numerical simulation of partial flow isokinetic dilution tunnel with design modification such as the introduction of perforated tubes and a grid of cylinders within the tunnel so as to suggest an economical and efficient design for particulate mass measurement.

II.METHODOLOGY

Design Formulation

Dilution tunnels are full flow or partial flow [5]. A full flow dilution tunnel completely dilutes all the exhaust gases leaving the vehicle and then a small portion is sampled while in partial flow dilution tunnel only a small fraction of the exhaust gas is diluted and then the whole diluted sample is passed through filters. Partial flow dilution tunnel are of three types [6] namely, flow controlled systems with concentration measurement, flow controlled systems with flow measurement and isokinetic systems. Isokinetic systems are advantageous in terms of achieving undisturbed and uniform flow at sampling probe as flow in sampling probe is matched with the flow in the exhaust pipe in terms of velocity or pressure. The present study focuses on design and numerical analysis of various designs of partial flow isokinetic dilution tunnel in order to determine the effectiveness of rapid mixing design in achieving complete mixing between the dilution air and exhaust sample. Considering the basic requirements and restrictions imposed by ASTM standard E2515-11 [16], a 3D model (Fig. 1) of a partial flow isokinetic dilution tunnel is developed using SOLIDWORKS. The model is made up of four units namely air filter and intake blower unit, conditioning and preheating unit, mixing and agglomeration unit and finally filter assembly and exhaust unit. However, the numerical simulations are limited only to mixing and agglomeration unit, as mainly the dilution dynamics is affected by the design of this unit.

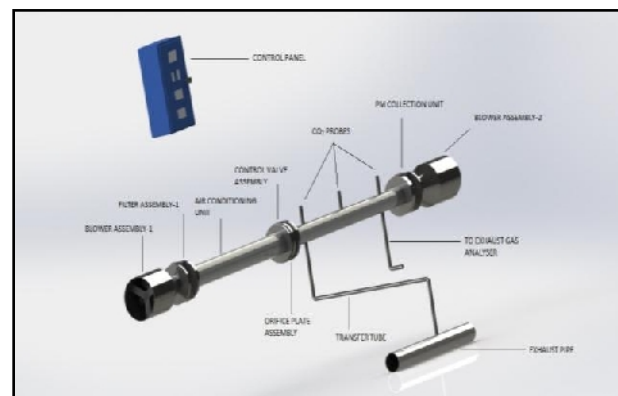


Fig. 1 Design of dilution tunnel prepared using SOLIDWORKS

Experimental Matrix

A commercial ANSYS FLUENT software has been used to perform the numerical simulations. CO₂ molar concentration is the main parameter that helps to get optimum mixing length by ensuring rapid and complete mixing of dilution air and exhaust gas sample. To find optimum mixing length, various simulation test were conducted which can be categorized in three broad divisions.

Test 1: Total 9 simulations (Table 1) are conducted at constant duct length of 2500 mm with variation in duct diameter and dilution ratio (DR).

Table 1. Experimental test matrix for TEST 1

Test No.	DR	10:1	15:1	20:1
1a	100 mm	√√	√√	√√
1b	125 mm	√√	√√	√√
1c	150 mm	√√	√√	√√

Test 2: Optimum design from TEST 1 will be further analysed by introducing perforated orifice plate of internal diameter 47mm.

Test 3: Optimum design from TEST 1 will be further analysed by introducing grid of cylinders of diameter 12 mm. Finally, the best design i.e. the design that requires minimum mixing length to achieve complete mixing between the dilution air and exhaust sample will be finally selected from above 3 tests.

Geometry Construction and Meshing

The CAD model of mixing and agglomeration unit is imported to Design Modeller part of ANSYS 15. The meshing is done using tetrahedral mesh. Fig. 2 shows the mesh geometry of mixing and agglomeration for one of the above test (Test 1a).

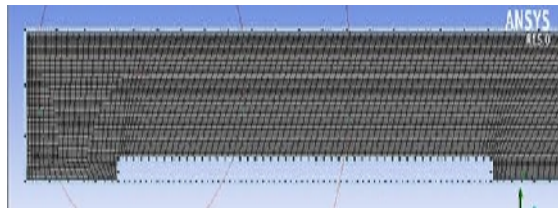


Fig. 2 Meshing for 100 mm diameter duct

A grid independence test is conducted to decide the optimum number of grids. Grids are refined by changing the horizontal length. Refinements of grids with horizontal length less than 3 mm and 1 mm, shows no changes in CO₂ concentration obtained at the outlet unit. Hence, it is chosen as the optimum grid size for conducting simulations. Standard k- ε model is used to solve the governing equations of the model.

Boundary Conditions

Boundary Conditions that are applied are as follows:

1. Air Inlet: Velocity: variable, temperature: 300 K, CO₂ molar fraction: 0 and O₂ molar fraction: 0.23.

2. Exhaust Inlet: Velocity: 12 m/s, temperature: 573 K, CO₂ molar fraction: 1 and O₂ molar fraction: 0.

3. Walls: All the inner and outer surfaces of the tunnel are stationary walls.

*Above exhaust inlet conditions are selected for a mid-sized diesel engine running at 2500 rpm speed and full load condition.

III. RESULTS AND DISCUSSION

The flow characteristics in the partial flow isokinetic dilution tunnel greatly dependent on relative velocities of sample exhaust and dilution air. For validating various dilution tunnel design, velocities are directly dependent on dilution ratio and diameter of the duct. Dilution ratio (DR) can be defined as:

$$DR = \frac{CO_2 \text{ concentration in exhaust}}{CO_2 \text{ concentration in diluted exhaust} - CO_2 \text{ Concentration in diluted air}}$$

Hence, the variation of CO₂ concentration is considered to be main output parameter for getting best and quick mixing of exhaust sample with dilution air inside the tunnel. Figure 3 shows various locations which are termed as series in graphs, along the circumference of tunnel duct where CO₂ concentration was measured. Total 9 locations or series were marked, each at a uniform distance of 0.01m from each other.

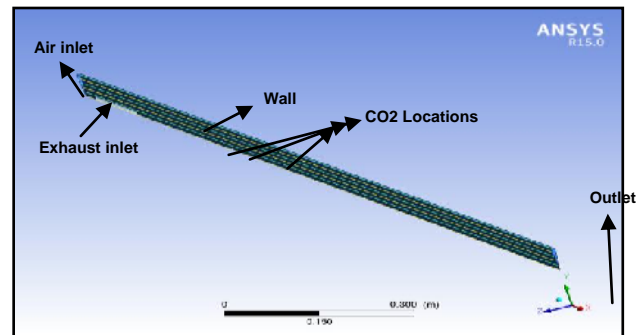


Fig. 3 Locations at which CO₂ concentrations are measured

Results of TEST 1

Total 9 experiments were conducted during TEST 1 for getting the best optimum design in lieu of getting minimum length required for complete mixing of exhaust sample with dilution air. Test 1a is conducted at constant duct length of 2500 mm and duct diameter of 100 mm with variation in dilution ratio according to an experimental matrix. Results show that the best optimum design was obtained for duct diameter of 150 mm and duct length of 2500mm when dilution ratio of 20:1 was maintained. The velocity of air at air inlet was found to be 2.4 m/s and

complete mixing occurs within 1.25 m length of duct length as shown in figure 4.

Further, in order to enhance quick mixing of exhaust sample with diluted air, perforated plates (TEST 2) and a grid of cylinders (TEST 3) were added to the best design of TEST 1. Figure 5 and 6 shows meshing for 150 mm duct diameter with the perforated orifice plate and a grid of cylinder. Results of TEST 2 and 3 shows that mixture gets uniform within 1m of duct length (fig. 7) when perforated orifice plate was used. The introduction of a grid of cylinder does not influence quick mixing of exhaust sample with diluted air.

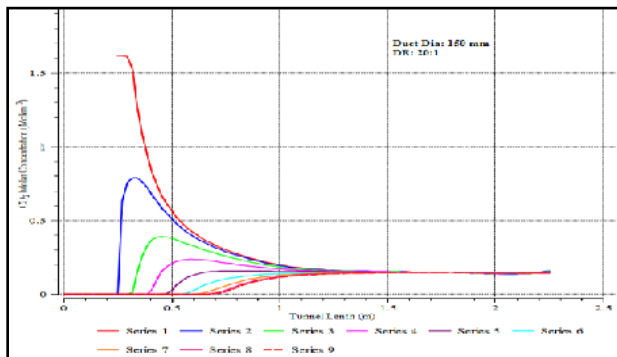


Fig. 4 Variation in CO₂ concentration for duct dia. 150 mm and DR 20:1

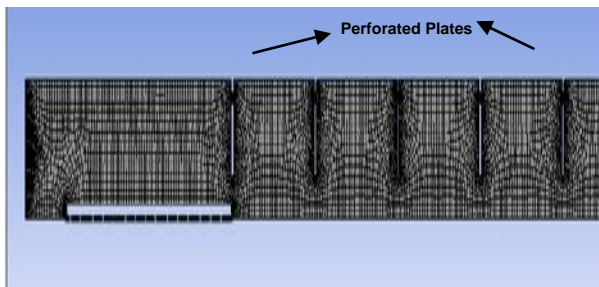


Fig. 5 Meshing for 150 mm duct diameter with perforated Orifice plate

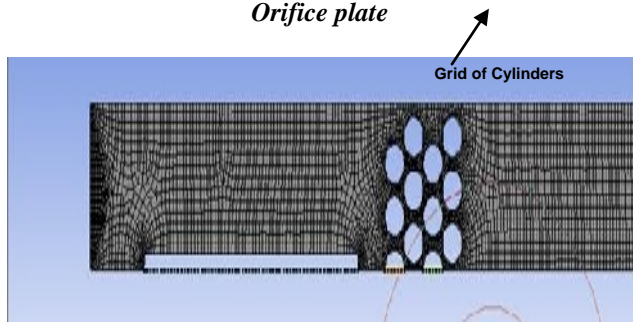


Fig. 6 Meshing for 150 mm duct diameter with grid of cylinders

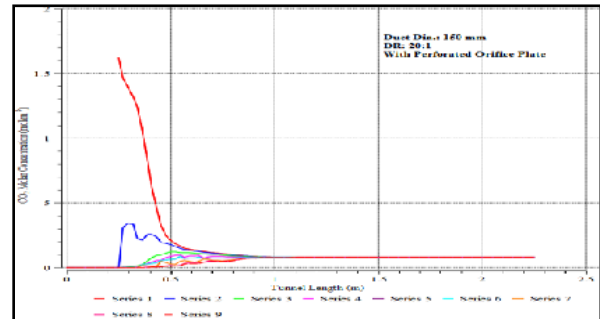


Fig. 7 Variation in CO₂ concentration for duct dia. 150 mm and DR 20:1 with perforated orifice plates

IV. CONCLUSION

Various simulation tests were performed to investigate the effects of various designs of partial flow isokinetic dilution tunnel in view to suggest the best optimum design. The best optimum design was based on getting minimum length required for complete mixing of exhaust sample with dilution air. Through various simulation tests it is found that the length required to achieve uniform mixing of exhaust gases and dilution air decreases with increase in duct diameter. Further, as the flow rate is increased, the length required to achieve uniform mixing within the duct gets increases. Finally, the use of perforated orifice plate greatly enhances the mixing characteristics of the dilution tunnel. Finally, a new and improved design of partial flow isokinetic dilution tunnel can be created using a perforated plate for 2500 mm length and 150 mm diameter keeping dilution ratio constant at 20:1.

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Integrated Inverter/Converter Control circuit of a 30kW Interior Permanent Magnet Synchronous Motor Used in Electric Vehicles

Wagh Jaya. G
Assistant Professor
Department of Electrical Engineering,
SVIT College of Engineering, PUNE University
Chincholi Nashik, Maharashtra, India
jaya89.wagh@gmail.com

Abstract:-- The pollution of environment is increasing due a very large numbers of conventional cars present today. To reduce pollution the electric hybrid electric vehicle are very beneficial. As the era of cheap fuel is also coming to an end the hybrid electric or electric vehicle is a good alternative to the conventional cars. In the paper, the optimization design and analysis of a 30kW interior permanent magnet synchronous motor (IPMSM) used in electric vehicles are fulfilled by finite element analysis (FEA). In order to satisfy good control performances, low cost and high reliability ,Simulation and experimental verification of the prototype are compared deeply, and the final comparison results indicate the prototype essentially satisfies the design In this project the survey of Electric car is done, also a new design of integrated circuit of inverter/converter is introduced to increase the efficiency of the hybrid electric cars & comparison of this technique with other control methods for HEV/EVs is being done. In this system it is given that at starting we need high starting torque for HEVs so we will use two PMSM (permanent magnet synchronous motor) motor feeding by two distinct Inverters sources. After starting we need high acceleration so we will use one of the Inverter & PMSM motor set as a DC-DC boost converter to assist other Inverter to increase the DC link voltage of that inverter to increase the output voltage & power. This integrated circuit allows the Permanent magnet synchronous motor (PMSM) to operate in motor mode or acts as a boost inductor of a boost converter, thereby boosting the output torque coupled to the same transmission system. In motor mode, the proposed integrated circuit acts as an inverter and it becomes a boost-type converter, while using the motor windings as the boost inductors to boost the converter output voltage. Therefore, the proposed integrated circuit can significantly reduce the volume and weight of the system.

Keywords: Permanent magnet synchronous motor (PMSM), Hybrid electric vehicle (HEV), Boost converter.

I. INTRODUCTION

Based on the research of the electric buses background, in this paper, the author designs a 30kW IPMSM; the electromagnetic design methods and the choice of permanent magnet rotor structure will be analyzed; the optimal design of the IPMSM is carried out by the FEA using Magnet electromagnetic field software ,the optimal analysis of the structure parameter and the inherent parameter of the IPMSM prototype is detailed to simulate; finally, a prototype experiments were conducted. In urban area, due to their beneficial effect on environment, electric and hybrid electric vehicles are an important factor for improvement of traffic and more particular for a healthier environment as electric vehicles are zero emission vehicles, as we are quite rapidly reaching to the end of the cheap oil era. Electric and electric hybrid

vehicles are offering the best possible chances for the use of new energy sources, because electricity can result a transformation with high efficiency of these sources and is always used with the highest possible efficiency in systems with electric drives or components. The integrated inverter convert control circuit is used to boost the torque coupled to same transmission and also has the ability to increase the dc link voltage of inverter circuit. This helps in increasing the efficiency of the electric or hybrid electric vehicle.

II. TYPES OF ELECTRIC VEHICLES

I. Plug in Electric vehicle

Plug in electric vehicle has the simplest construction of all it has components such as battery, converter, motor, gear system as show in fig.1 Battery is used to store energy, which is converted to in to dc or ac according the drive used to drive the vehicle. The motor

may be asynchronous motor i.e. induction motor, dc motor, brushless dc motor synchronous motor in which permanent magnet synchronous motor has very good efficiency. It is also possible to place more than one motor for splitting the torque. The motors are placed in wheel hubs. But in this case, each motor needs a separate converter with speed and torque control, which guarantees the necessary torque splitting in each condition. An electric vehicle is an emission free, environmental friendly vehicle. However, the electric vehicles remain unpopular among the consumers due to their lack of performance and their inability to travel long distances without being recharged. So, vehicle that embraces both the performance characteristics of the conventional automobile and the zero-emission characteristics of the electric vehicles are greatly being anticipated by the general consumers and the environmentalists alike.

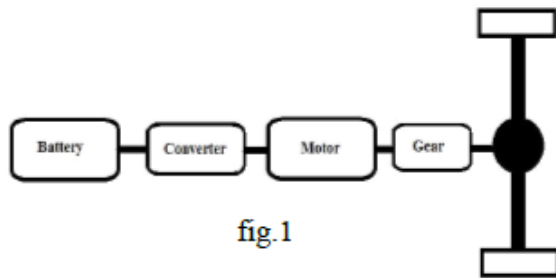


fig.1

Fig.1

1. Hybrid Electric Vehicle (HEV)

The electric vehicle with an additional energy source such as internal combustion engine, or a group of fuel cells is called as hybrid electric vehicle where both electrical and other energy system are integrated together to drive the vehicle. Hybrid electric vehicles powered by electric machines and an internal combustion engine are a promising means of reducing emissions and fuel consumption without compromising vehicle functionality and driving performances. Leading car manufacturers like Toyota and Honda have already started mass producing Hybrid electric cars, Prius and Insight respectively, which are now becoming very popular among the consumers for their incredible mileage and less emissions. Aside from that, a number of automotive manufacturers are marketing hybrid vehicles for the general population, examples are Daimler Chrysler, Mitsubishi, Nissan, Fiat, Renault, Ford, GM, and Subaru.

TYPES OF HEV

1. Series HEV

In series HEV configuration, only the electric motor is connected to the drive train and thus the vehicle is

entirely driven by the electric motor. The Internal Combustion (IC) engine drives an electric generator (commonly known as alternator), which then supplies the electric power to the motor and battery pack. The IC engine turns off if the battery is fully charged. In some cases, the electric power supply for the electric motor can come both from the battery and the engine generator set. As only the electric motor is connected to the drive train, the IC engine can run at an optimum speed to run the generator thus greatly reducing the emissions. The batteries can either be charged off-board, by external DC power link from the electric-grid, or on-board, with the help of an alternator and an IC engine.

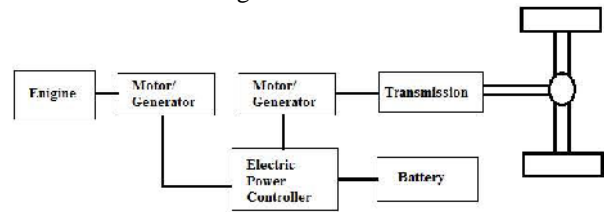


Fig.2

The fig.2 shows the schematic diagram of series HEV. It consist of IC engine, motor generator set electric power controller to control the power flow in circuit battery to store the energy further the transmission system also.

Advantages of Series HEV:-

1. Engine runs more efficiently as not directly coupled to transmission drive & maintains the constant output.
2. Low emission of gases as efficiency of engine increases.
3. Flexibility of location of engine & motor set.
4. Good stability for short trips.

Disadvantages of Series HEV

1. HEV requires full size motor as it drives the vehicle, thus the generator & engine also needs to be of full size.
2. As vehicle is totally driven by motor the battery size required will be more as continuous energy will be required by motor.
3. All the equipment's such as IC engine & generator must have good output efficiency as for long distance batteries will soon exhausted & all the power will have to supply by the engine generator set.

2. Parallel HEV

In the parallel HEV configuration there are two power paths for the drive train, while one comes from the engine the other comes from the electric motor. During short trips the electric motor can power the vehicle, while during long drives the IC engine can power the vehicle. The vehicle can thus have engine only, motor only, or a combination of engine and motor mode of operation. The electric motor can also assist the engine during hill climbs

and vehicle accelerations, thus the rating of the IC engine can be reduced.

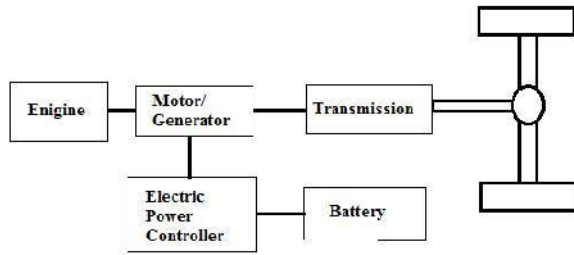


Fig.3

The fig.3 shows the schematic diagram of Parallel HEV. It consists of IC engine, motor, electric power controller to control the power flow in circuit battery to store the energy. These types of HEV do not require generators and they can be connected to an electric grid for recharging the batteries.

Advantages of Parallel HEV:-

1. The battery size can be small, as both the engine and motor are connected to the drive train.
2. The performance is very good as compared to conventional vehicles as dual power sources are present.
3. Constraints on battery packs are relaxed in this configurations.

Disadvantages of Series HEV:-

1. HEV cannot get full acceleration power when battery is low.
2. Control becomes complex as mechanical power is supplied by motor & engine in parallel.
3. To synchronize the power coming from motor & the engine necessitates the complex mechanical device.

3. Dual mode HEV (Series-Parallel mode)

Dual mode hybrid vehicles are parallel hybrids, but differ from them in the aspect, that an alternator (generator) is coupled to the IC engine that charges the battery. During normal operation, the IC engine turns both the drive train and the generator, which in turn feeds the battery pack through the electronic control unit. During full-throttle acceleration, the electric motor gets power from the battery and assists the IC engine to attain the requested acceleration. Choosing a full size electric motor, which uses the IC engine only for charging the battery and occasionally for turning the wheels, can reduce tail pipe emissions and this can be achieved with the help of a mechanical clutch. This configuration exhibits dual capability and hence the name dual mode HEV configuration.

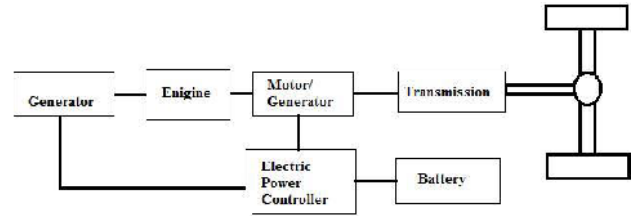


Fig.4

The fig.4 shows the schematic diagram of Dual mode HEV. It has only disadvantage that, it needs more components such as an electric motor, an electric generator, an IC engine and a battery pack, for its operation which makes it more expensive.

Barriers In Hybrid Electric Vehicles

Three important barriers include the high cost and cycle life of batteries, complications of chargers, and the lack of charging infrastructure. Another drawback is that batteries chargers can produce deleterious harmonic effects on electric utility distribution systems & thus increases the ripple in current & also reduces the efficiency this can be reduce using the integrated inverter/converter circuit & control technique of motor drive with dual mode operation. There are few more issues in Hybrid cars which are listed below:-

Currently more expensive than conventional

Heavier than conventional, due to battery pack and electric motors weight.

Limited battery life.

Low torques for hill climbing.

Expensive battery packs if you want to replace it.

Safety issues, high voltage battery and fuel.

Reliability, still under study.

More complex computer controlled systems.

May have drivability issues.

Needs heavy duty power plug terminal (high current) everywhere: home, parking and street with metering device.

Electric energy infrastructure (generation, transmission and distribution) must be expanded to provide extra energy for this type of cars.

Travels short distances, inner city

Low speed.

Battery charging takes time.

Need new regulatory standards.

So as to increase the efficiency, a new integrated circuit for motor drives with dual mode control is proposed. The proposed integrated circuit allows the permanent magnet synchronous motor to operate in motor mode or acts as boost inductors of the boost converter, and thereby boosting the output torque coupled to the same transmission system or dc-link voltage of the inverter

connected to the output of the integrated circuit. In motor mode, the proposed integrated circuit acts as an inverter and it becomes a boost-type boost converter, while using the motor windings as the boost inductors to boost the converter output voltage.

III. SCOPE OF WORK & CONCLUSION

A new integrated inverter/converter circuit & a control technique for motor drive with dual mode operation is selected where the integrated circuit allows the permanent magnet synchronous motor to operate in motor mode or acts as boost inductors of the boost converter, and thereby boosting the output torque coupled to the same transmission system or dc-link voltage of the inverter connected to the output of the integrated circuit. In motor mode, the proposed integrated circuit acts as an inverter and it becomes a boost-type boost converter, while using the motor windings as the boost inductors to boost the converter output voltage. The control technique for the integrated circuit increases the efficiency of the converter.

Old Techniques

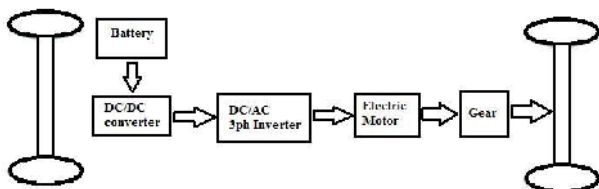
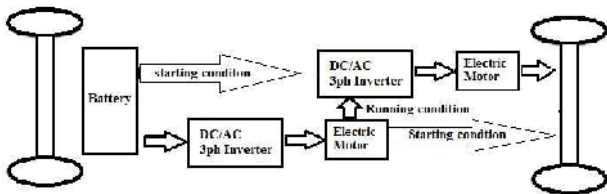


Fig .5 shows use of converter also for boosting of dc link voltage for a Electric vehicle.[1]

New Techniques



As in Fig.6 a new technique is shown which is an integrated circuit for motor drive with dual mode control. This integrated circuit allows the Permanent magnet synchronous motor (PMSM) to operate in motor mode or acts as a boost inductor of a boost converter, & thereby boosting the output torque coupled to the same transmission system or dc-link voltage of an inverter connected to the output of the integrated circuit. In motor mode, the proposed integrated circuit acts as an inverter and it becomes a boost-type boost converter, while using the motor windings as the boost inductors to boost the converter output voltage. Therefore, the proposed integrated circuit can significantly reduce the volume and weight of the system. The circuit shown Fig.7 can act as an

inverter & a boost converter depending upon the mode of operation. For the integrated circuit, it not only can reduce the volume and weight but also boost torque and dc-link voltage for motor/ converter modes, respectively. Moreover, a new control technique for the proposed integrated circuit under boost converter mode is proposed to increase the efficiency.

Table I
Technical Specifications of The Prototype

Parameters	Unit	Specifications
Rated power	KW	30
Peak power	kW	70
Power supply voltage (DC)	V	307
Rated speed	rpm	2500
Maximum speed	rpm	6000
Rated torque	Nm	115
Peak torque	Nm	240
Phase number		3

Conventional Circuits

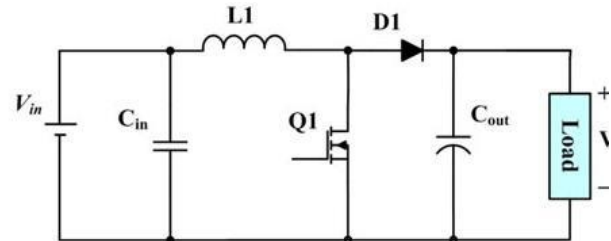


Fig.7 shows a single phase boost converter has been widely used for boost control due to its simplicity. However, for higher power applications, an interleaved boost converter can reduce the current ripple and components stress and thereby reducing the losses and thermal stress.

The single phase interleaved boost converter Based upon the interleaved control idea, a boost-control technique using motor windings as boost inductors for the proposed integrated circuit will be proposed. Under light load, the integrated circuit acts as a single phase boost converter for not invoking additional switching and conduction losses, and functions as the two-phase interleaved boost converter under heavy load to significantly reduce the current ripple and thereby reducing the losses and thermal stress. Therefore, the proposed control technique for the proposed integrated circuit under boost converter mode can increase the efficiency.

New Circuit Designs

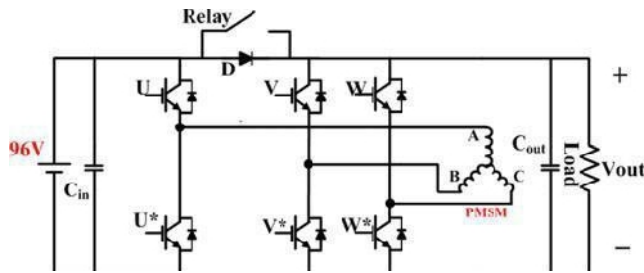


Fig 8 shows the integrated circuit for dual-mode control. In C_{in} and C_{out} can stabilize the voltage when input and output voltages are disturbed by source and load, respectively. Diode (D) is used for preventing output voltage impact on the input side. When the integrated circuit is operated in inverter (motor) mode, relay will be turned ON and six power devices are controlled by pulse width modulation (PWM) control signals. When the proposed integrated circuit is operated in the converter mode, relay is turned OFF. And a single-phase or interleaved control method will be applied to control of the power devices depending upon the load conditions.

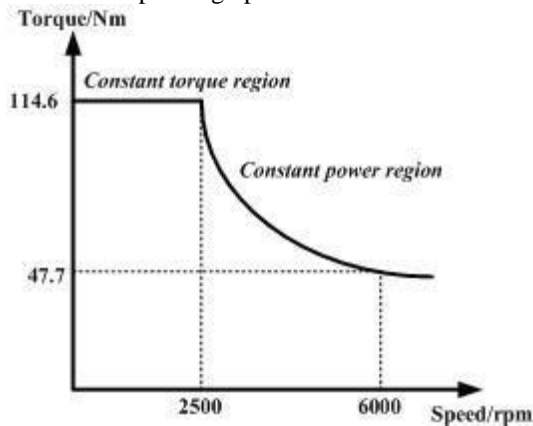


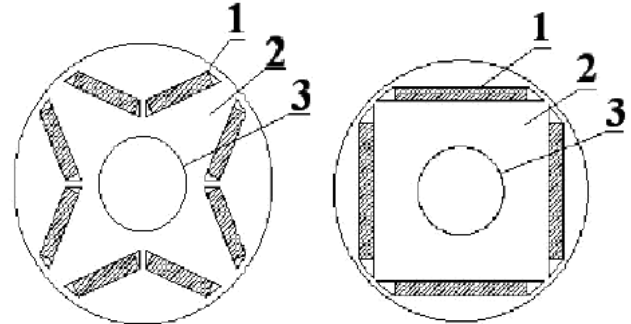
Fig.9. Torque versus speed curve of the 30kW IPMSM

In order to keep the long-time high efficient operation, the 30kW IPMSM is designed for a rated operating point at a corner speed. Rated power of the motor is 30kW, and its rated output torque is 114.6Nm at 2500 rpm. Corner speed is 2500 rpm, and constant power speed range is from 2500 to 6000 rpm. The characteristics shows the torque versus speed curve of the 30kW IPMSM in different operation mode.

A. IPMSM Structure

It is very important to choose the appropriate rotor structure for the IPMSM design. In this paper, the 30kW IPMSM rotor structure choose the V type because V type of rotor structure can increase permanent magnet excitation dosage effectively than the traditional straight type rotor structure (fig.10 (b)), the different rotor structures of IPMSM are shown in Fig.10. The determination of stator

structure refer to the stator structure of the same power grade asynchronous motor. In this paper, the stator structure is the type of parallel tooth 36 slots uniform distribution, and the stator windings adopt the double layer distribution winding type.



(a) V type (b) traditional straight type
1. permanent magnet 2. rotor core 3. shaft Fig. 9. Rotor structures of IPMSM

Fig.10. Preliminary design structures of the 30kW IPMSM

In order to satisfy the characteristics requirements of the IPMSM design, the stator structure will be optimized in the basis of the original 2 and 4 design structures, the length of yoke is increased, and the angle of V type PM will be increased to 133° , the PM width reduce 0.4 mm, the width of PM is 37.3mm, and the PM thickness remains the 8mm, and the air-gap length is increased to 0.6mm. Finally, the final optimization design structure of the 30kW IPMSM is shown in the fig.11.

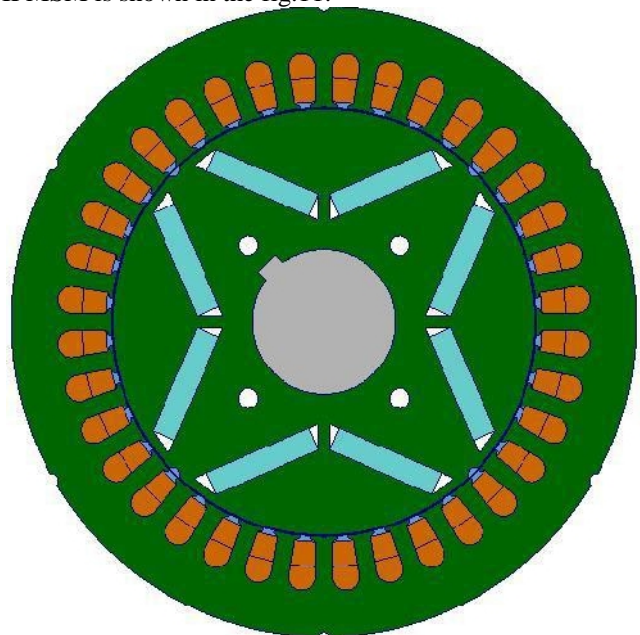


Fig. 11. The final design structure of the 30kW IPMSM

Through the finite element simulation analysis, the flux distribution of the final design structure at rated speed is shown in fig.6. From the simulation results analysis, the average air-gap flux density value of the final design structure is 0.54T, the tooth average flux density is 1.5T, the yoke average flux density is 1.7T, the yoke average flux density is not saturate. All the changes present.

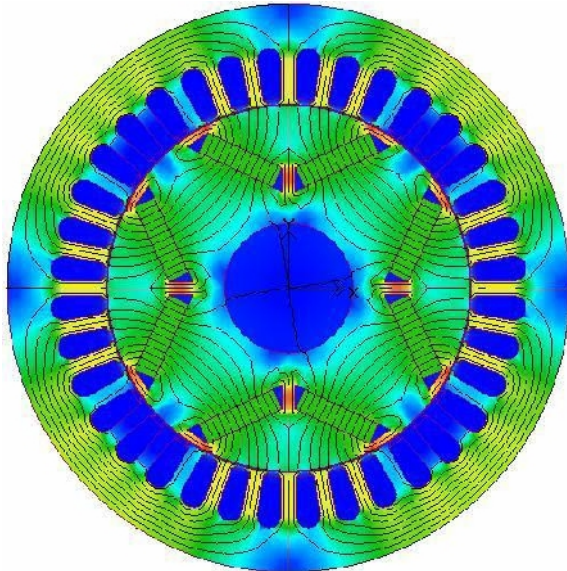


Fig.12. Plots of flux line and flux density of preliminary design structures the results of the optimization is desired.

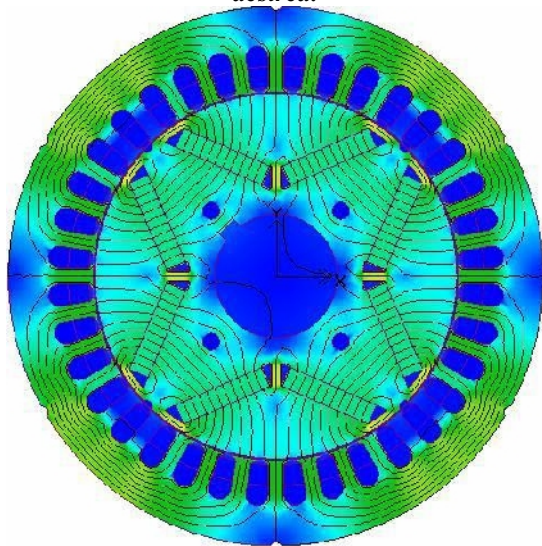


Fig.13. Plots of flux line and flux density of the final design structure

Although the average air-gap flux density of the 2 and 4 design structures reach 0.5 T or so, but the yoke average flux density are very high, the values are 1.85T

III. PERFORMANCE ANALYSIS

In this paper, the final design structure of 30kW IPMSM parameters is analyzed by finite element analysis (FEA). The performances were shown as follow:

A. Cogging torque and no load back-EMF

According to the control characteristic requirements of the IPMSM, the cogging torque of IPMSM should be as small as possible, and cogging torque is an oscillatory torque, which occurs even when there is no current in the stator. The waveform of cogging torque with time of the 30kW IPMSM at rated speed of 2500 rpm is shown in Fig.13.

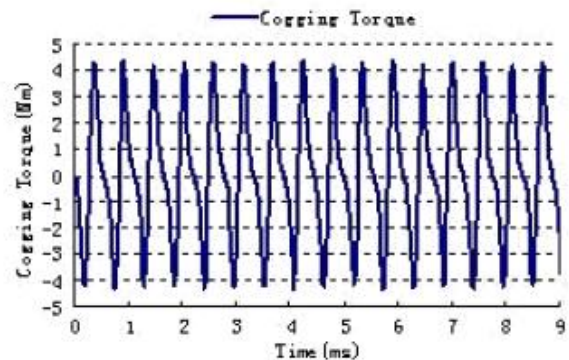


Fig.13. The waveform of cogging torque of the 30kW IPMSM

From the fig.13, It can be seen that the value of cogging torque is 4.12Nm of the IPMSM, and the cogging torque of the 30kW IPMSM is 3.03% ratio of the rated load torque.

IV. EXPERIMENTAL RESULTS

In this paper, the experiments of the 30kW IPMSM prototype is carried, the experimental platform for prototype is shown in fig.14.

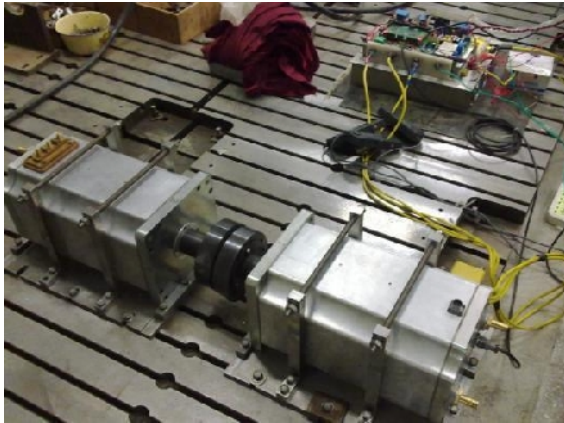


Fig.14. Experimental Platform for 30kW IPMSM Prototype

According to the no load experimental results, the no load back-EMF waveform is illustrated in the Fig.14. Contrasting the simulation results and the experimental results of the no load back-EMF, it can be seen that the simulation results and the test results agree well.

V. CONCLUSION

In this paper, a 30kW IPMSM used in electric vehicle was designed and analyzed. Firstly, the optimization design for the different structures of the 30kW IPMSM were simulated by FEA; and the performances in details of the final design structure 30kW IPMSM were analyzed. Finally, the experiments of the 30kW IPMSM prototypes were made, the experimental results of the prototypes show that the designed 30kW IPMSM not only have the lowest magnet mass, but also a wider range of constant power speed operation and excellent flux-weakening performance. What is more, the cogging torque and harmonic distortion of no load back-EMF are smallest. Therefore, the good performances of the optimization design 30kW IPMSM can satisfy completely the characteristic requirements for electric vehicle applications.

Acknowledgment

This work is supported by the General Project of National Natural Science Foundation of China (51177135), and the Key Project of Natural Science Foundation of Shaanxi Province (2011GZ013). performance of the motor, as the same time, the holes will be helpful for increasing heat dissipation condition and improving the long-time operation stability of IPMSM.

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Evaluation of Flexural and Torsional Strength of Self-Compacting Composite Concrete

Sudhir P.Patil
Associate Professor,
Department of Structural Engineering,
Maharashtra Institute of Technology, Pune - 411038, India.
Sudhir.patil@mitpune.edu.in

Abstract:-- In the present work, attempt has been made to improve the performance of self-compacting composite concrete by using recycled coarse aggregate, fly ash and steel fibers. The study is carried out by replacing of natural coarse aggregate with recycled coarse aggregate in self-compacted concrete (SCC) at different percentages like 10%, 20%, and 30%. It is observed that maximum of 30% recycled aggregate can be effectively used in production of SCC without any significant reduction in strength and durability. The present study also aims at improving the shear, flexural and torsional strength of the concrete by addition of fly ash (FA) and steel fibers (SF). In this research work, 20% of fly ash (class-C) is added as a replacement of binder to its weight and 1.5% steel fibers by weight of concrete. Based on the experimental results, it can be seen that the load carrying capacity of composite concrete increased by 40 to 50% than the plain beam along with energy absorption and ductility.

Keywords: Self-compacting concrete, recycled coarse aggregate, fly ash, steel fibers.

I. INTRODUCTION

Concrete is most widely used construction material all over the world in the view of its compressive strength, high strength, durability, structural stability and economic considerations.

Self-compacting concrete (SCC) is aqueous mixture, which is suitable for placing difficult conditions and also in congested reinforcement, without vibrators. SCC poured in the same way as conventional concrete but without vibration. It is very fluidic and can pass around obstacles.

India has established itself as one of the world's fast growing economies. Currently construction sector in India is growing at the rate of 10% per annum. Presently construction and demolition waste generation in India accounts up to 23.76 million tons annually and these figures are likely to double fold up to 2017[1]. According to an estimate the concrete industry consumes approximately 40% of the total worldwide construction aggregate production. The use of recycled coarse aggregate (RCA) for concrete production is not simply applied because the properties of RCA are different from natural aggregates. Furthermore, the quality of RCA fluctuates when collected from different sources. In physical terms,

characteristic differences are observed between the properties of RCA since it not only consist of original aggregates, but also comprise of the remains of mortar (cement paste) adhering to the aggregate surfaces. The presence of mortars remain in the RCA is a main reason for deteriorated RCA quality as 'compared to natural aggregates because adhered mortar characterized as porous and presents numerous micro cracks. As a result, RCA are characterized as having lower density, higher water absorption, and lower mechanical strength than the natural aggregates. Consequently, when using RCA in production of new concrete, these characteristics of the aggregate may have adverse effect on interfacial bond between RCA and cement paste. But considering the use of recycled aggregates could reduce the dependence of the construction industry on natural aggregates, and thus, maintain aggregate security and still ensure sustainable development their use in concrete is negotiable.

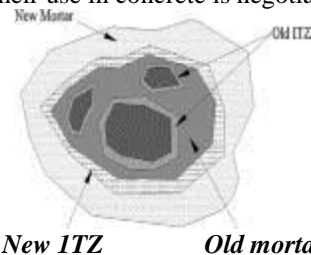


Figure 1: Structure of recycled aggregate

II. LITERATURE REVIEW

In this study of high performance self-compacting concrete researcher give the brief discussion on self-compacting concrete.

Durability aspects of steel fibre-reinforced SCC by Ganesan et al [2015]. They studied the effect of steel fibres on the durability parameters of self-compacting concrete (SCC). Based on the experimental investigation, it is concluded that addition of steel fibres improved the durability aspects of self-compacting concrete. The optimum dosage of fibres for better performance is found to be 1.5 percent.

A Study on the Properties of Self Compacting Concrete using Recycled Aggregate in Fresh and Hardened State by Nischay T G et.al. [2015].

Self-compacting concrete of M20 grade is mixed with recycled aggregate at different percentage. Replacement levels of Recycled aggregate-0%, 25%, 50%, 75%, 100%.

Effect of fly-ash on long term strength in High Strength Self Compacting Concrete (HSSCC) is studied by Jagadish Vengala et. al. [2016].

Based on fresh and hardened properties of SCC mixes they concluded that inclusion of fly ash as part replacement of cement has increased the paste content and hence enhances the self-compacting properties. The optimum dosage of Fly ash for better performance was found to be 20% percent.

III. OBJECTIVES

- ❖ To verify index properties like compressive strength, split tensile strength and flexural strength, torsion.
- ❖ To Improve performance of SCC using recycled aggregate.
- ❖ To find strength of concrete using fly ash, steel fiber.

IV. MATERIALS

The mix design is for M40 grade of concrete. The concrete mix proportion is 1:1.5:1.85 and water cement ratio of 0.45. The material used as follows:

Cement: Ordinary Portland Cement (OPC) of 53 grade conform to IS12269:1987. The compressive strength of cement obtained at 28 days is 59.2MPa. . Fitness of cement = 5 % < 10 % (IS: 12269-1976). Specific gravity of cement = 3.15 (IS: 2720-part3). Standard consistency test=29.25% <30% (IS: 4031-1968). Initial setting time = 115 minutes > 30 minutes (minimum) (IS: 12269-1976). Final setting time = 250 minutes <600 minutes (maximum)

(IS: 12269-1976). Coarse aggregate: The natural coarse aggregate, obtained from the locally available quarries with size in between 10mm to 12mm satisfy the grading requirements of BIS. The specific gravity of 2.65 and fineness modulus 6.2 is used. The aggregate are tested as per IS 383:1970.

Fine aggregate: The natural fine an aggregate, obtained from the local river is passed through 4.75 IS sieve. Fine aggregates shall be such that not more than 5 percent shall exceed 5mm in size and having a fineness modulus of 2.90 (Zone II).

Recycled aggregate: The recycled coarse aggregates are obtained from the demolished building of 25 years old. It is not exposed to any chemicals. The large pieces of slab [free from impurities] are transported to the laboratory and broken into pieces smaller than 20mm and sieved through 12mm. The pieces greater than 20mm are crushed through a crusher to the maximum of 12mm sieve and then both the materials are mixed and sieved again. The density and absorption, the most important properties of recycled aggregates are directly related to the quantity of adhered mortar. The procedure adopted for the production of recycled aggregates in the present study may not truly represent the field conditions. But by adopting the combinations of both manual as well as crusher, the quantity of adhered mortar can be minimized up to certain extent. Therefore this process will improve the quality of recycled aggregates.

Fly ash: In this study Class C fly ash is used. Chemical composition and physical composition are as per IS3812 Part I- 2003. It is replacing to cement of 20% by its weight.

Chemical admixture: Chemical admixture is a substance which imparts very high workability with a large decrease in water content (at least 20%) for a given workability. A water-reducing admixture, constitute of a Poly Carboxylic Ether (PCE). Admixture {Super plasticizer- Muraplast FK 61 viscosity modifying agent (VMA) - Centrament Stabi 510} is used in this experimental study. It is having quantity of 1.32% of the cement.

Steel fibers: Steel fibers manufactured by Bekaert-Dramix® are used having a 'trough' shape with hooks at both ends. Fibers had a length of 60 mm, a diameter of 0.75 mm (aspect ratio of 80).

V. MIX DESIGN

For the purpose of the experiment four types of concrete mixes are made. In each mix natural course

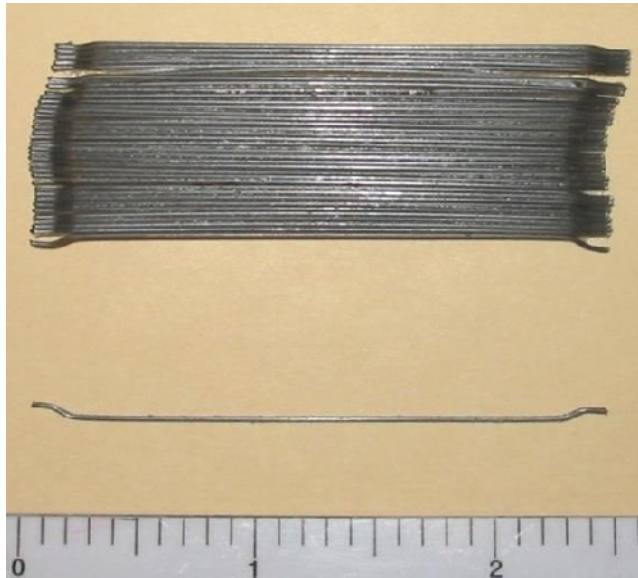


Figure 2: Hook type Bekaert-Dramix® steel fibers
 aggregate is replaced by recycled coarse aggregate in the ratio of 0%, 10%, 20%, and 30% by volume.

The preliminary mix design is carried out as per IS:10262-2009 for target strength of 40 MPa. After the initial mix design, the trial mixes are prepared and tested for the fresh properties of SCC as per the European Federation of Specialist Construction Chemicals and Construction Systems (EFNARC) guidelines. The quantity of components required for making 1 cubic meter of concrete is constant, with the exception of small variations in the quantity of super plasticizer for the purpose of achieving equal consistency for all the mixes and due to slightly higher water absorption by the recycled aggregate.

VI. METHODOLOGY

The study has been divided into various parts:

In the first part, the material characterization of the recycled aggregates as per Indian standards is conducted. In the second part, the suitability of RCA in M-40 self-compacting concrete mix is investigated. The hardened concrete wastes from demolished building are brought to the laboratory and it is crushed and sieved. The aggregates characterization are done by conducting the following tests as per IS 2386 Part III: 1990 and IS 2386 Part IV: 1990 and the properties of the crushed unprocessed aggregates are found.

The mix with OPC and fly ash are considered. Four batches of M-40 mix are prepared:

Batch-1 (40SCC0) mixes has Ordinary Portland Cement (OPC) 80%, fly ash 20% replacing to cement to its weight and natural coarse aggregates (NCA) 100% as determined in the mix design.

Batch-2 (40SCC10) mixes has OPC 80%, fly ash 20% and natural fine aggregates are taken as per mix design. However the coarse aggregates are substituted with RCA in the range of 10% replacement to natural coarse aggregates.

Table 1 Summary of properties of the recycled coarse aggregate

Mix Type	Slump Flow(mm)	T500 Slump Flow(sec)	J-RING (mm)
40SCC0	693	2.6	3.76
40SCC10	711	3.09	3.86
40SCC20	685	2.74	4.3
40SCC30	660	2.5	6.3

Batch-3 (40SCC20) mixes has OPC 80% , fly ash 20% and natural fine aggregates are taken as per mix design. However the coarse aggregates are substituted with RCA in the range of 20% replacement to natural coarse aggregates.

Batch-4 (40SCC30) OPC 80%, fly ash 20% and natural fine aggregates are taken as per mix design. However the coarse aggregates are substituted with RCA in the range of 30% replacement to natural coarse aggregates.

VII. RESULTS

The test program is divided into two parts. Testing of fresh properties of SCC and strength investigations on hard concrete.

A. Fresh state of concrete

SCC differs from conventional concrete in that its fresh properties are vital in determining whether or not it can be placed satisfactorily. The various aspects of workability which control its filling ability, its passing ability and its Segregation resistance all need to be carefully controlled to ensure that its ability to be placed remains acceptable. Different methods have been developed to characterize the properties of SCC.

In this investigation the fresh state properties of SCC are tested by following methods as suggested by EFNARC. Slump flow test and T50 slump flow for flowing ability and viscosity, j-ring test for passing ability.

Table 1 provides a summary of the properties of the recycled coarse aggregate self-compacting concrete mixes in the fresh state

B. Hard State Concrete

1. Compressive strength

The variation of compressive strength of concrete with respect to age of concrete for different percentages of recycled aggregate is shown in Figure 1. It is observed that all the mixes achieved the target strength of 40 MPa. All four mixtures quickly gain strength, and after 7 days they achieve more than 90% of the strength they have at the age of 28 days. Use of recycled coarse aggregate self-compacting concrete, there is a small variation in the strength and the same is reported.

The increase in compressive strength of recycled coarse aggregate self-compacting concrete. The tests are carried at 7, 14 & 28 days. It is found that the compressive strength at 28 days has decreased up to 7.45% with 30% of recycled aggregate.

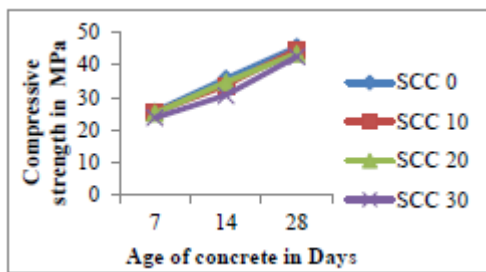


Figure 1 Compressive strength of SCC with different percentage of RCA

2. Split tensile strength

In this investigation, the Split tensile strength test of self-compacting concrete is carried out with 0%,10%, 20%, 30% replacement of recycled aggregate with coarse aggregate. The tests are carried out after 28 days of curing. All three mixtures quickly gain strength, and after 7 days they achieve more than 90% of the strength at the age of 28 days. Split tensile strength value is gradually increased to the percentage of recycled coarse aggregate replaced in the concrete. It is found that the split tensile strength at 28 days has decreased up to 5.5% with 30% of recycled aggregate. Percentage increases in split tensile strength of recycled coarse aggregate.

Table 2 Split tensile strength of concrete

Mix	% of RCA	Split tensile Strength in MPa
40SCC0	0	5.47
40SCC10	10	5.40
40SCC20	20	5.33
40SCC30	30	5.20

3. Flexural strength

In this investigation, the flexural strength test of self compacting concrete is carried out without steel fibers and with 1.5% steel fibers keeping 30% replacement of recycled aggregate. The tests are carried after 28 days of curing. The decreased in flexural strength at 28 days was recorded to be increase by using steel fibers and recycled aggregate.

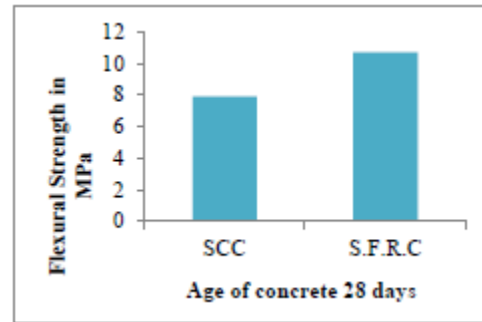


Figure 2 Flexural strength of SCC and SFRC

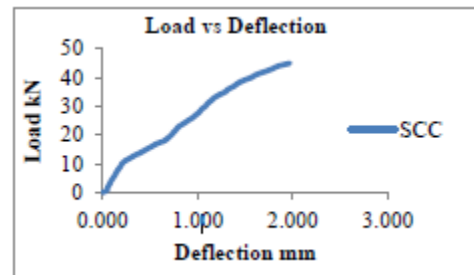


Figure 3 Load Vs deflection for loading of SCC

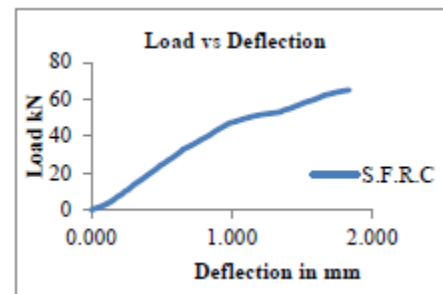


Figure 4 Load Vs deflection for loading of SFRC

4. Torsional strength

In this investigation, the torsional strength test of self-compacting concrete is carried out without steel fibers and with 1.5% steel fibers keeping 30% replacement of recycled aggregate. The tests are carried after 28 days of curing. The torsional strength at 28 days was recorded to be increase by using steel fibers and recycled aggregate.

Table 3 Split tensile strength of concrete

Sample identification	Torsion Nm	Angle of Rotation in radians
SCC	241.91	0.05767
S.F.R.C	340.148	0.06494

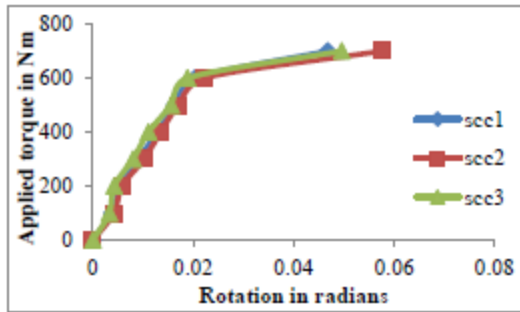


Figure 5 Pure torsional strength results for SCC

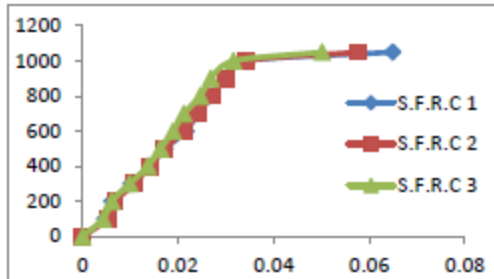


Figure 6 Pure torsional strength results for S.F.R.C

VIII. CONCLUSION

Based on the results obtained the following conclusion are drawn from the study:

- ♣ The surface texture of recycled coarse aggregate is more porous and rough due to the adherence of old porous mortar. This may increase the water demand and reduce the workability.
- ♣ The compressive strength at 28days has decreased 7.45% increase with 30% replacement of recycled aggregates.
- ♣ Split tensile strength at 28 days has decreased up to 5.5% with 30% of recycled aggregate but from adding steel fiber in same proportion it increases up to natural coarse aggregate concrete.
- ♣ Flexural strength at 28 days has increased with using recycled aggregate and steel fiber.

- ♣ Overall 30% recycled aggregate gives considerable strength mixture for self-compacting concrete.

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Execution of Cloud using Freeware Technology

^[1]Dr. Vijay Dhir, ^[2]Er. Gagandeep Kaur

^[1]Professor, Dept. of CSE, ^[2] Assistant Professor, Dept. of ECE

^{[1][2]}St. Soldier Institute of Engineering & Technology, Jalandhar

^[1]drvijaydhir@gmail.com, ^[2] kaurgagan10deep@gmail.com

Abstract:-- Cloud may be a metaphor for the net known as cloud computing where internet is cloud. In simplest words, cloud computing means that keeping and retrieving data and programs over the web rather than our secondary memory of hardware and software package facilities by creating them elastic instead of ascendible. The system may be scaled up or down in keeping with a user's want. The utilization of open source technology is a turning purpose in providing cloud computing infrastructure to cut back the value by an outsized magnitude. We will build our own personal clouds and share resources viz. hardware and software while not creating any investment. During this work, we tend to present EUCALYPTUS – computer. Cloud Computing offers a brand new view to our an open source software framework for cloud computing that implements what's normally stated as Infrastructure as a Service (IaaS); systems that offer users the flexibility to run and management entire virtual machine instances deployed across a range physical resources.

Index Terms—Cloud Computing, Eucalyptus, IaaS

I. INTRODUCTION

Cloud Computing [1, 2] is a technology for storage that uses net and central remote servers to keep up personal or skilled knowledge and applications. Cloud computing permits customers to use applications without installation also as access to their personal files at any pc with web access. This computing technology permits for far more economical computing by centralizing knowledge storage, process and information measure. in the simplest terms, cloud computing means that accessing and storing knowledge and programs over the web rather than your computer's disk drive. The cloud is simply a trope for the web. A straightforward example of cloud computing is Ymail, Gmail, or Hotmail etc. All you would like is simply a web affiliation and you'll begin causing emails by virtual surroundings. The server and email management software system is all on the cloud (internet) and is completely managed by the cloud service supplier Yahoo , Google etc.

II. PROPOSED SYSTEM ARCHITECTURE

A. Public Cloud:

A public cloud is established wherever many organizations have similar necessities and obtain to share infrastructure and information thus on appliance. additionally, it is economically engaging because the resources used and shared within the community are already exploited. this is often the cloud computing model wherever service suppliers build their computing resources

out there on-line for the public[8]. It permits the users to access numerous vital resources on cloud, such as: computer code, Applications or keep knowledge. a number of the foremost vital ones square measure mentioned here:

1. Economical storage and computing service [2,3]
2. Cheap, since all the virtual resources whether or not application, hardware or knowledge square measure coated by the service supplier. \
3. give simple property to servers and data sharing.
4. Assures acceptable use of resources because the users square measure needed to pay just for the services they need.
5. Extremely reliable and redundant.
6. Widespread availableness regardless of geographical precincts.
7. Sets the business individuals free from the hassles of shopping for, managing and maintaining all the virtual resources at their own finish, the cloud server will it all.
8. Public cloud, in today's advanced geographic point, empowers workers and alter them to become productive even once outside the workplace.

B. Non-Public Cloud:

A personal cloud may be a set of hardware, networking, storage, services, applications, and interfaces closely-held and operated by a company for the employment of its workers, partners, and customers. a personal cloud is created and managed by a 3rd party[9] for the exclusive use of 1 enterprise. The non-public cloud may be an extremely controlled environment not open for public consumption. Thus, a personal cloud sits behind a firewall. The non-public cloud is extremely machine-driven with attention on governance, security, and compliance. Automation replaces additional manual processes of managing IT services to support customers.



Fig.1: Public cloud, non-public cloud and Hybrid cloud

C. Hybrid cloud:

A hybrid cloud may be a combination of a personal cloud and public cloud services wherever one or many services exist between the environments. The goal is to mix services from each the clouds and knowledge from a range of cloud models to computing environment. Combining public services for clouds that square measure out there with non-public clouds and knowledge center as a hybrid.

III. PROBLEMS WITH CLOUD COMPUTING

Cloud computing has sure problems, issues & risk [10,11,12,13] related to it. Some issues with clouds are info Security, Compatibility, Standardizing Cloud Technology, and observation.

Information Security is one amongst the foremost major problems with cloud computing. it's utterly based on the net that makes it in danger of hack attacks. however it's also true that now a days all the trendy IT systems are connected to the net. In cloud computing it's easier for companies to quickly endure such attacks due to its distributed network system.

Compatibility with all IT systems during a company is another issue with cloud computing. Cloud Computing is most value economical choice for firms. however drawback is to switch a lot of of its existing IT infrastructures so as to create the system compatible on

the cloud. Hybrid cloud is one amongstst answer for this problem.

Lack of standardization within the system is another issue of cloud computing. There is no correct standards for cloud computing are set yet so it's virtually not possible for an organization to search out out the standard of services.

All the information is handled by service supplier once cloud computing responsibility is taken by service supplier. monitoring of processes is another issue of cloud computing.

IV. STACK OF CLOUD COMPUTING

A. Software as a Service (SaaS):

This type of cloud computing is additionally mentioned as software on demand. a well-liked example of SaaS is Google docs. SaaS permits individuals to access the functionality of a particular software without fear regarding storage or different problems.

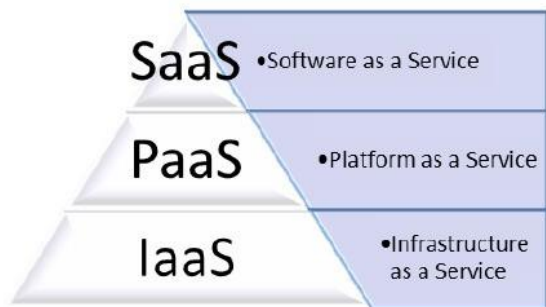


Fig.2: Stack of Cloud Computing

B. Platform as a Service (PaaS):

With this, organizations will run their own software system while not having to worry regarding maintaining hard drives and servers. Instead, they'll run their own applications on the cloud service's platform.

C. Infrastructure as a Service (IaaS).

With IaaS, organizations have access to the unlimited storage potential of the cloud. they'll grow and shirk their storage space as required. this implies that they do not need to worry regarding having dedicated servers on web site. It also means that they can weather increased use of their sites or applications as needed.

D. Network as a Service (Naas):

The least common model, wherever the user is given network connectivity services, like VPN and information measure on demand. Amazon, Microsoft, Google, IBM are biggest leaders of cloud services. Amazon is providing Infrastructure as a Services, info and Content Distribution since 2006 as Amazon net Services.

Microsoft is providing Application Platform as Services like .net, SQL data Services since 2009 as Windows Azure however from third Gregorian calendar month 2014 it's renamed as Microsoft Azure. Google is providing net Application Platform as Services since 2008 as Google App. Engine. IBM Salesforce.com is providing Proprietary 4GL net Application as a requirement platform since 2008 as Blue Cloud Force.com.



Fig.3: Leaders of Cloud Computing

Cloud Storage Subscriber Numbers

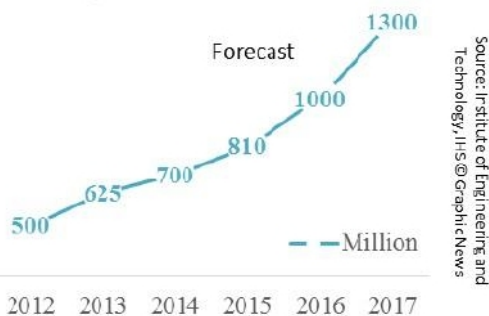


Fig.4: Cloud Storage Subscriber Numbers

Fig. 4 is showing cloud storage subscriber numbers. In 2012 it had been five hundred million subscriber, in 2013 it had been 625 million, and there's a chance to be 700 million subscriber in 2014. Forecast of Institute of Engineering and Technology is that it's progressing to be 810 million in 2015, one thousand million in 2016 and it'll bit 1300 million in 2017. So, we are able to see market growth of cloud computing goes to be terribly high. According to International information Corporation, Indian Cloud Computing market was estimated at \$535 million in 2011, is probably going to grow by mote the 70th. Cloud computing refers to pay-per-use model of computing wherever applications and software system area unit accessed over the net and not owned by users. analysis firm Zinnov has estimated market growth can reach \$1.8 billion by 2015. software system as

a Services (SaaS) is anticipated to achieve \$650 million of that revenue rest will be achieved by Infrastructure as a Services (IaaS) and Platform as a Services (PaaS).

V. RELATED WORK

Machine virtualization projects producing Virtual Machine (VM) hypervisor software [14,15,16,17] have enabled new mechanisms for providing resources to users. In particular, these efforts have influenced hardware design [18,19,20] to support transparent operating system hosting. The "right" virtualization architecture remains an open field of study [21]: analyzing, optimizing, and understanding the performance of virtualized systems [22,23,24,25,26] is an active area of research. Grid computing [3,4,5,7] must be acknowledged as an intellectual sibling of, if not ancestor to, cloud computing [27,28,29,30]. While grid computing (for e.g. Nimble@ITCEcnoGrid) [4] and cloud computing share a services oriented approach [31,32] and may appeal to some of the same users (e.g., researchers and analysts performing loosely-coupled parallel computations), they differ in two key ways. First, grid systems are architected so that individual user requests can (and should) consume large fractions of the total resource pool [33]. Cloud systems often limit the size of an individual request to be tiny fraction of the total available capacity [34] and, instead, focus on scaling to support large numbers of users.

In addition to the commercial cloud computing offerings mentioned above (Amazon EC2/S3, Google AppEngine, Salesforce.com, etc.), which maintain a proprietary infrastructure with open interfaces, there are open source projects aimed at resource provisioning with the help of virtualization. Usher [35] is a modular open source virtual machine management framework from academia. Enomalism [36] is an open-source cloud software infrastructure from a start-up company. Virtual Workspaces [37] is a Globus-based [38] system for provisioning workspaces (i.e., VMs), which leverages several pre-existing solutions developed in the grid computing [3,5,6,7] arena. The Cluster-on-demand [39] project focuses on the provisioning of virtual machines for scientific computing applications. oVirt [40] is a Web-based virtual machine management console.

VI. IMPLEMENTATION OF PRIVATE CLOUD USING EUCALYPTUS OPEN SOURCE

Generically, open source refers to a program or a software in which the source code is available to the general public for use and/or modification from its original design free of charge, i.e., open to use and customize [41]. Open source software is by definition software for which users have access to the source code.

This distinguishes it from the recent common practice of commercial software publishers by only releasing the binary executable versions of the software. Most open source software is also distributed at no cost with limited restrictions on how it can be used; hence the term free when used to describe open source carries two meanings:

- 1) Free of cost and
- 2) Free to do with the software as you wish (i.e., most importantly free to read and customize the code)[42].

Open source code is typically created as a collaborative effort in which programmers improve upon the code and share the changes within the community. Software is protected using the copyright system. Relying on the same protection as on books, music or film, the buyer of software is licensed the use of a copy of the product. Open Source also allows free redistribution of software and allows us to customize it to meet our needs eg. UEC, EUCALYPTS, UBUNTU.

VII. UBUNTU ENETRPRISE CLOUD AND ITS ELEMENTS

Ubuntu Enterprise Cloud, UEC for short, is a stack of applications from Canonical included with Ubuntu Server Edition. UEC includes Eucalyptus along with a number of other open source software. UEC makes it very easy to install and configure the cloud. Canonical also provides commercial technical support for UEC[43]. The figure shows a Private cloud implemented with Eucalyptus.

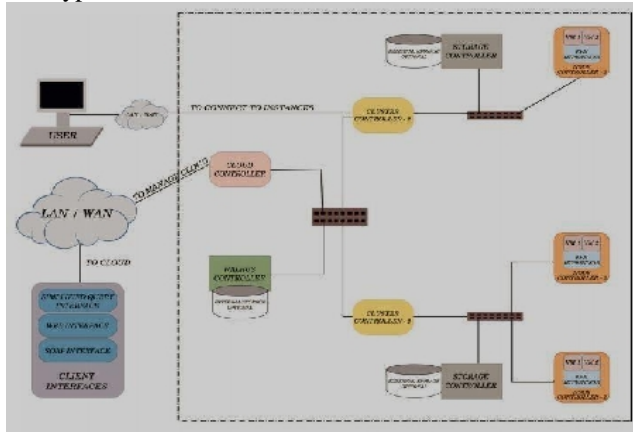


Fig.5: Private Cloud based on Eucalyptus [43]

A. Eucalyptus

Eucalyptus stands for “Elastic Utility Computing Architecture for Linking Your programs to Useful Systems”. Eucalyptus is a research project under direction of Prof. Rich Wolski, Computer Science Department at the University of California, Santa Barbara, USA[44]. Eucalyptus is a software available under GPL that helps in

creating and managing a private or even a publicly accessible cloud. It provides an EC2-compatible cloud computing platform and S3-compatible cloud storage platform. The Eucalyptus Cloud maintains its compatibility with the Amazon EC2 cloud.

- ♣ Node Controller controls the execution, inspection, and terminating of VM instances on the host where it runs.
- ♣ Cluster Controller gathers information about and schedules VM execution on specific node controllers, as well as manages virtual instance network.
- ♣ Storage Controller (Walrus) is a put/get storage service that implements Amazon’s S3 interface, providing a mechanism for storing and accessing virtual machine images and user data.
- ♣ Cloud Controller is the entry-point into the cloud for users and administrators. It queries node managers for information about resources, makes highlevel scheduling decisions, and implements them by making requests to cluster controllers[45].
- ♣ A CLC manages the whole cloud and includes multiple CC’s. There will be a WS3 attached to a CLC. A CC can contain multiple NC’s and SC’s. Ultimately the VM’s will be running in the NC making use of its physical resources.
- ♣ Eucalyptus is a platform for providing scalable internet service [45]. Eucalyptus allows to scale the cluster to multiple machines. Thus the resources can be easily added to the cloud eg. Node Controllers can be added to the cluster in the cloud.

VIII. CONFIGURING AND INSTALLING THE PRIVATE CLOUD

The UEC setup in Includes two servers (Server 1 and Server 2) which will run a Ubuntu 10.04 server version and the third system which will run a Lucid Desktop 64-bit version (Client 1)[11].

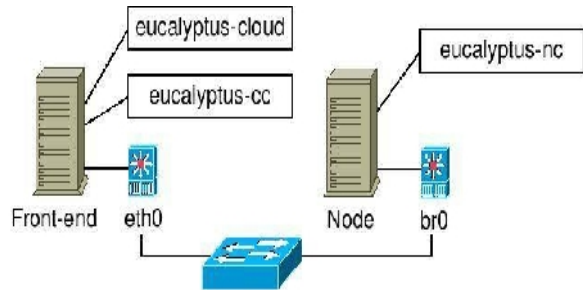


Fig.6: Private Cloud Setup Overview[40]

A. Server 1 Install

1. Insert ubuntu 10.04 server edition cd
2. Select “Install ubuntu enterprise cloud”
3. Configure the network: select “configure network manually” address 192.168.6.22 gateway 192.168.0.1 netmask 255.255.255.0 name server 121.242.xxx.xxx
4. Host name for this system: host1
5. Cloud controller address: leave it blank
6. Cloud installation mode:
Select following Cloud controller, Walrus storage service, Cluster controller, Storage controller
7. Partition disks select “Guided-use entries disk and set up LVM”
8. Full name for new user and username for account : gagan
9. Select no automatic updates
10. Eucalyptus cluster name : cluster1
11. Pool of IP addresses that can be dynamically assigned as public IP’s of virtual machines: 192.168.6.70-192.168.6.80
12. Install grub boot loader to master boot loader: yes[10]
Make sure you have latest version of eucalyptus \$sudo apt-get upgrade eucalyptus

B. Server 2 Install

1. Insert ubuntu 10.04 server edition cd
2. Select “Install ubuntu enterprise cloud”
3. Configure the network: select “configure network manually”
address 192.168.6.23
gateway 192.168.6.22 (IP of cloud controller)
netmask 255.255.255.0 nameserver 121.242.xxx.xxx
Here Cloud controller is detected automatically
4. Host name for this system: host2
5. Cloud installation mode: Node controller
6. Partition disks select “Guided-use entire disk and set up LVM”
7. Full name for new user and username for account : gagan
8. Select no automatic updates
9. Install grub boot loader to master boot loader: yes[47]

C. Client 1 Install

The purpose of Client1 machine is to interact with the cloud setup, for bundling and registering new Eucalyptus Machine Images (EMI).

1. Boot the Desktop off the Ubuntu Desktop 10.04 CD and install. The Desktop will be on the enterprise network and will obtain an IP address through DHCP.
2. Install KVM to help us to install images on KVM platform and bundle them:
\$sudo apt-get install qemu_kvm
3. Install euca2ools to manage the cloud from it
\$sudo apt-get install euca2ools[43].
Note:1. we can also install KVM on Server1 to bundle our images.
2. The Client1 is connected to CLC.

D. Exchange of Public SSH Keys

Note: This is needed only when the node controller is not discovered in the cloud:

1. On node controller set a temporary password
\$ sudo passwd eucalyptus
2. On cloud controller
\$ sudo -u eucalyptus ssh-copy-id -i /var/lib/eucalyptus/.ssh/id_rsa.pub eucalyptus@192.168.6.22
3. On node controller remove temporary password
\$ sudo passwd -d eucalyptus

E. Get credentials

1. On cloud controller: install credentials which consist of x.509

Certificates and environment variables. Open web browser and enter following url: https://192.168.6.22:8443/#login and click on credentials tab Download the credentials euca2-admin-x509.zip on cloud controller.

2. Alternatively, if you are on the command line of the Cloud

Controller, you can run:

```
mkdir -p ~/.euca chmod 700 ~/.euca cd ~/.euca
sudo euca_conf --get-credentials mycreds.zip
unzip mycreds.zip
```

```
In -s ~/.euca/eucarc ~/.eucarc cd-
```

In the above steps we make a folder ~/.euca and download the credentials and unzip the credentials after changing their permissions.

To validate that everything is working correctly, get the local cluster availability details:

```
./~/.euca/eucarc euca-describe-availability-zones
verbose[46] If you see the free/max VCPUs as 0 in the above list, it means the node did not get registered automatically. Please use the following on Server1 and approve when prompted to add 192.168.6.23 as the Node Controller:$sudo euca_conf --discover-nodes [44].
```

```

rajat@host1:/$ euca-describe-availability-zones verbose
AVAILABILITYZONE      cluster1      192.168.6.22
AVAILABILITYZONE      :-   m1.t2.micro    free / max    cpu    ram    disk
AVAILABILITYZONE      :-   m1.small       0002 / 0002   1     152    2
AVAILABILITYZONE      :-   c1.medium        0002 / 0002   1     256    5
AVAILABILITYZONE      :-   m1.large         0001 / 0001   2     512   10
AVAILABILITYZONE      :-   m1.xlarge        0001 / 0001   2    1024   20
AVAILABILITYZONE      :-   c1.xlarge        0000 / 0000   4    2048   20
rajat@host1:/$ _
    
```

Fig.7: Screenshot of available resources.

IX. LIMITATIONS AND CHALLENGES OF CLOUD COMPUTING

In comparison to the previous traditional computing paradigms, Cloud computing provides varied blessings to each service suppliers and users however it's also some limitations and challenges.

- i) Security and Privacy: data security is major problems connected with personal data and confidential data of organizations. User needs to fully depend on the cloud service supplier for his or her data privacy and security.
- ii) Technical Issues: High speed web connectivity demand makes the system complicated. Varied technical problems arise throughout high load.
- iii) data lock-in: the lack of normal apis restricts the migration of applications and services between clouds. With the increase of cloud the issues of data movability, migration and merchant lock-in scenario will increase.
- iv) data segregation: principally data segregation problem arises within the multi-tenant usage mode, where the various users' virtual machines square measure co-located on constant hard disks or same server. Here the risks includes to properly separate storage or memory between different users.
- v) data location: The geographic location of the info is also vital to secure the info and knowledge of client. Rules and regulation for sure forms of data is {different|totally different|completely different} within the different countries. A client can be concerned in illegal problems without even noticing.

X. CONCLUSION

The future of cloud computing is bright for the businesses that implement the technology currently however, like everything else, cloud computing too has its professionals and cons. whereas the technology will prove to be a good plus to corporations, it may additionally cause hurt if not understood and used properly. permanently service it need technology to confirm time period, and

strong in different word additional powerful & healthy. Centralization of data is needed with additional capability. Hybrid Cloud Computing, commodity hardware, low power processors, and standard and social software are about to be solutions to extend efficiency of cloud computing. right away we are within the early days of cloud computing, with several organizations taking their initial, tentative steps. however by 2020 cloud goes to be a significant and permanent a part of the enterprise computing infrastructure. It opens doors by creating applications and technology additional accessible than in previous years. Companies need huge amounts of startup capital may solely want a fraction of what was previously required to succeed. Cloud computing could be a large field, with that we will share our resources and couple them as within the non-public cloud. we've scan several analysis papers, articles, internet discussion regarding configuring a personal cloud within the type of IaaS and managed to seek out some way of building it using open supply software's like UEC, eucalyptus. within the cloud we will share the hardware and different resources of an organization. the use of Open supply Technology makes our move very economical. the assorted software's and in operation systems used are open supply and may be customized to meet our needs viz. Eucalyptus, Ubtuntu Server10.04 etc.

Future Scope

In the coming back years something that can either collect or show info ,will this may open a world of opportunities to attach something and everything to the cloud. Look to Sub-Saharan Africa and Asian markets like China and Asian country to steer the means within the use and adoption of cloud technology. These markets are uniquely positioned in that they have green field opportunities with a lack of legacy infrastructure in place. This lack of a gift infrastructure creates the best environment to skip the technologies of the past and move on to the additional economical cloud-centric ones of the long run. Sometimes, one cloud isn't enough. Sometimes, you need the entire sky. That's why variety of researchers are developing tools to federate clouds, an architectural concept dubbed "sky computing". The Sky Computing model allows the creation of large scale infrastructure victimization resources from multiple cloud providers. These infrastructures are able to run embarrassingly parallel computation with high performance. Developing a way to join many cloud infrastructures along into one large cloud would be particularly helpful to educational researchers UN agency utilize open large-scale compute resources

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Reduction of Current Leakage in VLSI Systems

^[1] Tayab Mustaq Ahmed ^[2] Deepak H.A ^[3] Madhusudhan G

^[1] 3rd year, ^[2] HOD ^[3] Assistant Professor

^{[1][2]} Electronics and Communication Department, NDRK Institute of Technology, Hassan-573201

^[3] Telecommunication Engineering Department,
Jawaharlal Nehru National College of Engineering, Shivamogga-577204.

Abstract:-- This paper consisting of the general information about the VLSI followed by the history and development of the VLSI. MOORE's LAW is explained shortly and the designing of the VLSI circuits is explained by the design of VLSI by HIERARCHY-STRUCTURE. In this paper some of the general discussion on the current leakage reduction in the processors are discussed in which the reduction of current leakage by using switches are included and also we can reduce the current leakage in the circuit by using "sleep transistor". Sleep transistors are the transistor which turns off completely when the circuit is not in use. This is a very effective technique. After that some of the discussions about the problems in implementing the sleep transistors is also discussed which is very important while designing any circuit.

I. INTRODUCTION

Very Large Scale Integration

Very large integration (VLSI) is the process of creating an integrated circuit(IC) by combining thousands of transistors into a single chip. VLSI is basically originated and began in year 1970's. At that time the complex semiconductor and communication technology were being developed. One of the example for VLSI device is microprocessor. Before implementing VLSI technology most of the IC's had a limited set of function they could perform and consist of limited set of hardware. An electronic circuit at that time consist of CPU, ROM, RAM, and other logic components. But by implementing VLSI technology IC designed were consist of all the above component in a single chip. The electronic industry has achieved a phenomenal growth over the last few decades, mainly due to the rapid advances in large scale integration technology and system design application with the advent of Very large scale integration(VLSI) design the number of applications of IC's in Higher-performance computing controls, telecommunication, image and video processing and consumer electronics has been rising very fast. Due to the advancement of the technology and the vast use of IC's in cellular communication and other hardware purposes the trend of VLSI design is expected to grow rapidly every year.

II. HISTORY

During the mid-1920's several inventors attempted devices that were intended to control current in solid state diodes and convert them into triodes. But the success did not come until world war II, during which the

attempt to improve silicon and germanium for the use in the radar detectors led to the improvement in the fabrication and in the understanding the quantum mechanical states of carriers in semiconductor. Then scientists who had been diverted to radar development returned to solid state device development with the invention of transistor at Bell Labs in 1947, the field of electronics shifted from vacuum tubes to solid state devices. At the time the electrical engineers of 1950's saw the possibilities of constructing far more advanced circuits than just transistors, as the complexity of the circuit grew the problems were arisen one of the greatest problem at that time was the size of the circuit. A complex circuit like a computer was dependent on speed. If the components of the computer were too long the time required for the electricity to flow will be less and this device could not be effective to use. Then in 1958 Jack Kilby at Texas instruments found a solution for that problem his idea was to make all the component of the chip out of the same block(monolith) of semiconductor material. Kilby presented this idea to his superiors and got permission to built his first IC in 1958. Although the 1st IC was crude and had some problems but the idea was mind blowing. By making all parts of the chip by using same material, the use of extra wires is reduced and no discrete components are required and the circuit could be made smaller and the manufacturing process could be automated. From here the idea of integrating all components on a single silicon wafer came into existence, which led to the development in small scale integration(SSi) in 1960's, then came medium scale integration(MSI) also in 1960's after that in 1970's and 1980's came the large scale integration(LSI) and very large scale integration (VLSI) with tens of thousands of transistors on a single chip is raised to hundreds of

thousands and now it has reached to billions of transistors in a single chip.

III. DEVELOPMENT

The first semiconductor chips had two transistors each of them but after time more and more transistors were added and more systems were integrated over time. The first integrated circuit had only a few devices, perhaps as many as ten diodes, transistors, resistors and capacitors making possible to fabricate only one or more logic gates on a single device, now which is known as small scale integration (SSI). Then they implemented at least hundreds of logic gates in a single device this process is known as medium scale integration (MSI). Then they implemented at least thousands of logic gates and this is known as the large scale integration (LSI). Now a days current technologies consists of millions of gates integrated in it and this is called as the very large scale integration (VLSI) and the implementation of logic gates beyond this number is known as Ultra-large scale integration (ULSI). The term suggesting greater than VLSI is not in use anymore.

IV. MOORE'S LAW

Moore's law is the observation that the number of transistors in a dense integrated circuit doubles approximately every two years. The observation is named after Gordon Moore, the co-founder of Intel and Fairchild Semiconductor.

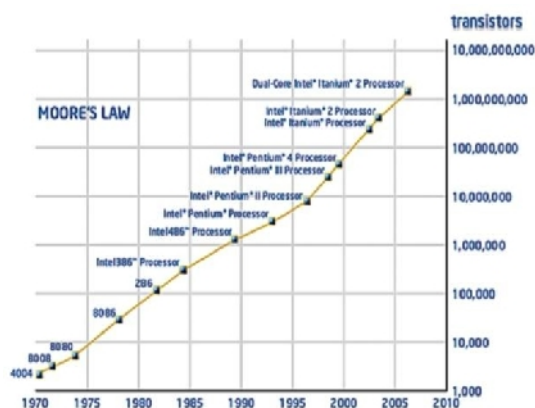


Fig 1.1

The above graph shows how the development of processors took place year by year, as we observe the graph we can see that the transformation of processors which containing hundred or thousand IC is now advanced to be containing millions of IC's in a single chip.

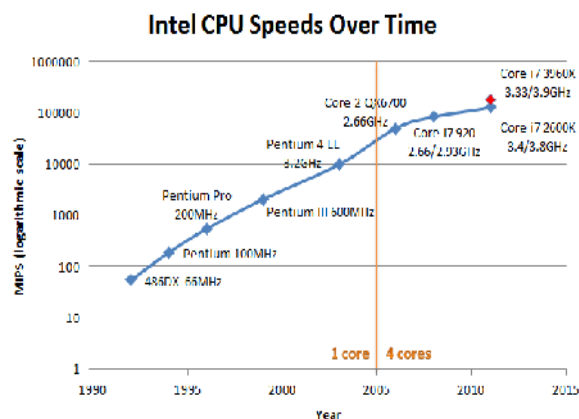


Fig 1.2

The graph shows the transformation of speed of the Intel processors from time to time. As the Moore stated that the number of transistor will increase every two years like that only we can see in the development of the INTEL processors from time to time how the processors are developed from C-4004 to INTEL i7 core processor. We were able to increase the number of transistors used in the chip, from around 100 transistors to billions of transistors in a single chip. And we also have increase the speed of the processors.

V. DESIGN

Designing of the circuit is one of the important and basic step while making a processor. Designing a circuit as that the manufacturing shall be easy and the complications in the circuit should be lesser is very important. In the below topic we have discussed some things about the designing of a structure using Hierarchy principle. In which 16-bit adder circuit is divided into half adder. As we know that the construction of Half adder is very easy when compared to the 4-bit adder. And the output obtained in the circuit is same and is not affected by the change in the circuit.

Design of Hierarchy- Structure

The design hierarchy involves the principle of "Divide and Conquer". It is nothing but dividing the task into smaller task until it reaches to its simplest level. This method is very much suitable because the last evolution of the design has become so simple that its manufacturing becomes easier. Let's take an example of 16-bit adder, Here the 16-bit adder is divided into four modules of 4-bit adder. Then each 4-bit adder is divided into module of 1-bit adder or Half adder which is easy to fabricate and simplest to design process. Its internal circuit is also easy to fabricate on the chip. Now by adding the last four adders we can design a 4-bit adder and moving on we can design a 16-bit adder.

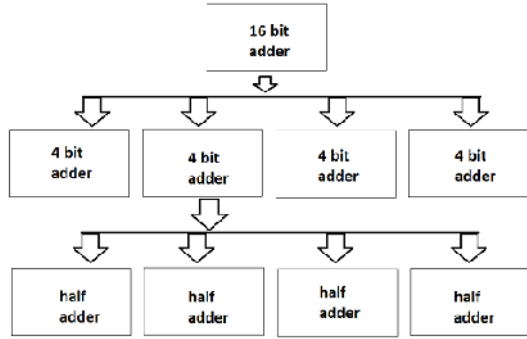


Fig 1.3

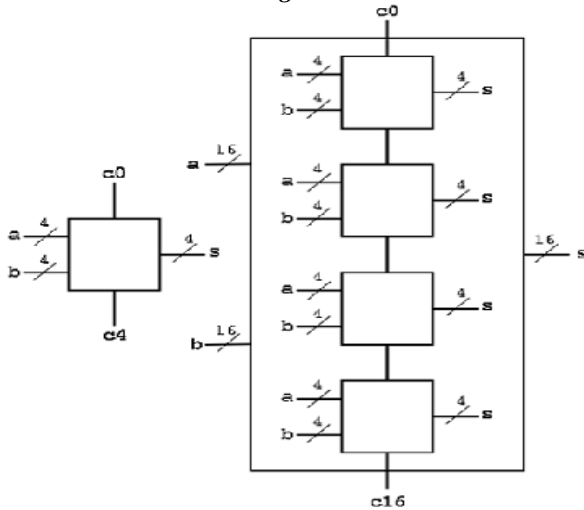
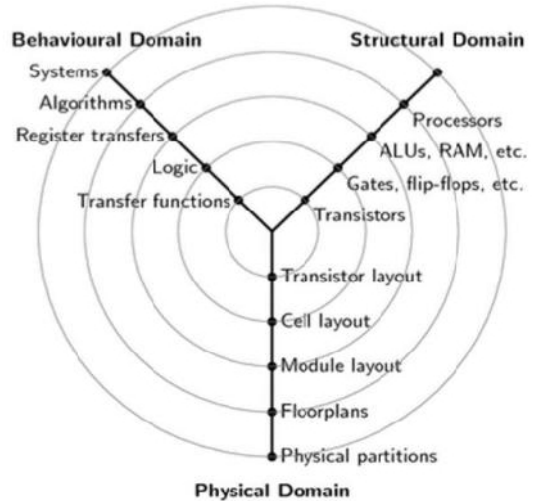


Fig 1.4

In the above 2 figures we can see how a 16-bit adder is divide into 1-bit adder and the output obtained is 16-bit. The output obtained is same but the method of dividing made the circuit simpler to design.

VI. Y CHART

The Gajski-Kunn Y-chart is a model, which captures the consideration in designing semiconductor devices. The three domains of Y-chart are on radial axes. Each of domains can be divided into levels of abstraction, using concentric rings. AT the top level or the outer ring, we consider the architecture of the chip, at the lower level or the inner rings we successive refine the design into the fines de tailed implementation. Creating a structural description from a behavioral one is achieved through the process of high-level synthesis or logical synthesis. Creating a physical description from a structural one is achieved through layout synthesis.



Gajski-Kuhn Y-chart

Fig 1.5

VII. LEAKAGE CURRENT REDUCTION TECHNIQUE

A) Leakage of current

Leakage of current is one of the major problem when designing a low power VLSI device, and is getting more and more as the technology is developing. In the older technology the consumption of more power is not important but when we go deep into sub-micro technology the higher static power consumption due to the leakage of current becomes a critical issue. MOSFET threshold voltage is one of the key point in low power VLSI design. One should consider carefully whether the circuit they design operates below threshold voltage or above threshold frequency. We want a differential amplifier topology to operates in low power and hence we can use power gating i.e., applying the controlled switches at the head or tail of the transistor. An adding of a switch for lower power consumption may yield us load device to operate at under the threshold voltage. Although this technique is not exactly suitable in this case but it possible to reduce the leakage of current by this process.

B) Managing The Leakage Of Current By Using Sleep Transistors

As the geometry of the transistor get smaller the leakage components, including both sub threshold and gate leakage have become a bigger problems. The leakage of power can take up on a significant portion of the overall chip power but, this can be controlled by using one of the efficient and relevant technique i.e., using of SLEEP TRANSISTORS using sleep transistors can reduce the transistor current leakage. Applying the sleep transistors in between normal circuit blocks and power supply rails, apply this at either end at v_{ss} or v_{cc} or both. Sleep transistor have a very unique character that it can shut itself off

completely when the circuit is not accessed. This blocks the flow of the current and hence the leakage of current can be reduced up to an extent. When the sleep transistors are turned off, the power supplies at V_{CC} and V_{SS} across the function block will be collapsed towards the centre, as a result the voltage difference across the transistor gate as well as source and drain is lowered. Which reduces the leakage significantly. The designing of the sleep transistor is simple. In this we need to add the "SLEEP" circuit at both the ends of the circuits i.e., V_{DD} and ground. We can take a simple example of NAND gate implementation. In which the "SLEEP" circuit is installed at the either end of the V_{DD} and ground.

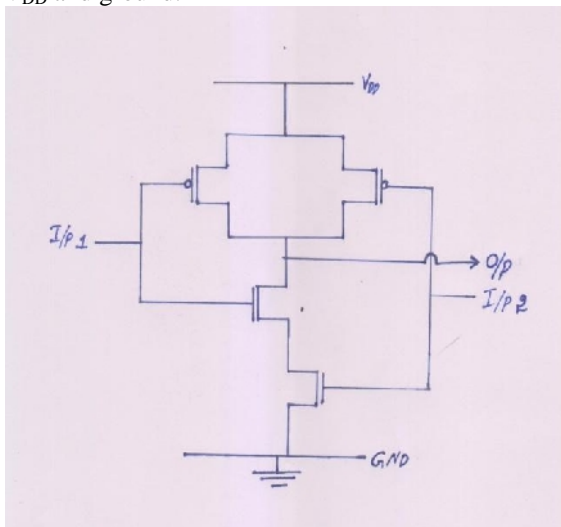


FIG 1.6

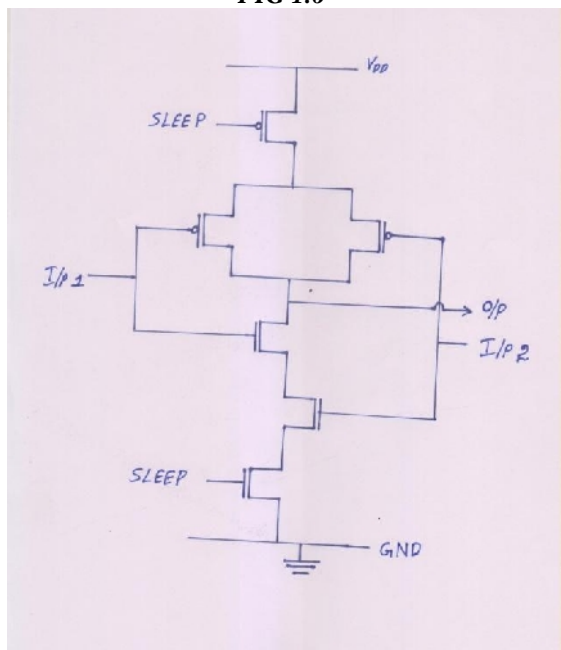


FIG 1.7

In the above given figures shows is the NAND gate. In fig 1.6 shows the normal NAND gate and fig 1.7 shows the NAND gate development using the sleep approach if we observe in both the figure we can see that the basic core of NAND gate is same only change in the circuit is that fig 1.7 consist of sleep circuit a both the ends i.e., at V_{DD} and ground. In general NAND gate transistor the circuit does not shut down completely when not in use. Even if it is off it consumes small amount of current or the current is wasted. But when we move on to the sleep transistors NAND gate, whenever there is no need of circuit or whenever the circuit is not in use it automatically shut off the whole circuit or block the supply of current in the circuit and hence no extra power is consumed and by this we can control the leakage of current in the processor or transistor. So, we can use the sleep transistor in place of the normal transistors to control the leakage of current in the processor. Using of sleep transistor is one of the best and effective method of controlling the leakage of current and hence can be implemented in the processors. Although to implement the sleep circuit in a normal transistor we need to change the design structure of the transistor, but by changing this we can make a current efficient micro-processor which can be a very bigger level of development in the field of VLSI or the development in the field of hardware technology. By using the sleep transistors it won't also effect the memory capacity of the chip neither the speed of the chip is effected, which is very much essential while designing. This is important because we need to develop a better functional chip by not affecting the present useful features.

VIII. DRAWBACKS OF USING SLEEP TRANSISTORS

- 1.It require modification of CMOS technology to support both high VT device for sleep transistor and low VT device for logic gates.
- 2.It decrease the DC noise margin as it decreases the voltage swing.
- 3.Decrease in the threshold voltage of the sleep transistor due to the supply voltage scale-down each generation. That mean the leakage of the current will continue to increase exponentially with every generation.
- 4.sleep transistor sizing is not a easy task and requires more effort.

IX. CONCLUSION

From this following paper we can conclude that the use of the sleep transistors are very much favourable and can be generally used to reduce the leakage of current or the wastage of current the circuit. Although there are some of the problems while designing or the implementation of the circuits, but this method is most desirable to design a current efficient circuit. And also

designing of the IC's with less power consumption is required now a days for the development in the field of hardware technology.

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Advance Biogas System for Irrigation - A Typical Application

^[1] Dr. Amol B. Ubale ^[2] Priyanka Tupe-Waghmare ^[3] Swapnaja A. Ubale

^[1] Department of Mechanical Engineering, ^{[2][3]} Department of E&TC Engineering

^{[1][2][3]} Symbiosis Institute of Technology, Symbiosis International University, Pune, Maharashtra-INDIA

^[1] amol.ubale@sitpune.edu.in ^[2] priyanka.tupe@sitpune.edu.in

Abstract:-- Anaerobic reaction of the organic substances like vegetable/food waste, animal/human waste and agricultural waste produces gas called as Biogas. This gas chemically consist of CH₄, CO₂ as major content(50-75% & 30-40%) and other constituents such as N, H₂S, H₂, O₂ and H₂O vapour in small amount (about 10% all). It is well known fact that CH₄ is a good IC engine fuel. As the gas mix with air easily it can be used as fuel in compression ignition (CI) engines. CO₂ content from it can be either reduced or completely removed by simple water scrubbing process. The burning of this gas gives clean energy with low emission. If it is used in compressed form in cylinders, it can be a supplement to compressed natural gas (CNG) and liquefied petroleum gas (LPG) and. Present study has demonstrated a small capacity biogas plant which is constructed using kitchen waste as feed stock. The gas produced from it is supplied to computerized CI engine test rig of 3.5 KW. Various tests were carried out at different speeds and load conditions. Typical running conditions are demonstrated with 2300 rpm and 20 N-m. The system works fairly well at low load conditions.

Key words:- Kitchen waste, biogas, scrubbing process, alternative fuel.

NOMENCLATURE	
BSFC	Brake Specific Fuel Consumption in g /kwh
m_f	Mass of fuel consumed in kg /s
BP	Brake power in kw
N	Speed of engine, rpm
T	Torque produced by engine, N-m
IP	Indicated Power, kw
n	Number of cylinders in engine
p_{mi}	Mean effective pressure, N/m ²
A	Area of single cylinder, m ²
L	Stroke length of engine, m
K	Constant 0.5 for 4S engine

I. INTRODUCTION

The major issue of any country is depletion of fossil fuels. As people throughout the world are relying on these fuels, they are near to exhaust. So it becomes a global issue to develop economical and feasible renewable resources. The renewable energy resources like solar energy, wind energy, bio diesel, biogas from biomass are some of the alternative to fossils fuel [1].

Out of these, biogas has lot of scope and has prospective future in India. As most of the population is in middle class and they are very sensitive to the price hike

of fuels and LPG [2]. In the early 1980's on large scale in rural areas biogas plants were constructed in India. Government of India had also contributed in by offering the subsidies. But based on survey nowadays most of the plants are not in working condition. Survey results have led to the following conclusions that could be the reasons for the shutdown of plants:

1) Due to civilization and unpredictable monsoon people are leaving villages and coming to the city for jobs resulting in decreasing cattle production hence reduced amount of cow dung. (Conventional biogas plant requires 40 kg of cow dung/day/m³, and most of the plants are constructed for minimum 3 m³ and above capacity)

2) Due to leakages in floating type domes or cracks in fixed type domes, gas leaks and due to which people think that these plants do not work [3][4]. This calls for modifying existing biogas plant which is suitable for rural as well as urban areas. These advance biogas plant are made up of fibre water tank. It requires kitchen waste as a feed stocks so it can be used every where its position can be changed so it can be installed anywhere like terrace, balcony or on the ground. This gas is alternative for LPG so large scale production of this renewable energy could save huge amount of fossils fuels as well as money. With few modifications, biogas can be used for running diesel engines to generate electricity [5]. Also this CI engine can be directly coupled to the water pump used for irrigation. This system overcomes the problem of load shedding in villages for irrigation. Some researchers have tried to build it by using two fibre water tanks. But the present study has designed a biogas plant with only one water tank. This reduces the cost of manufacturing by 40 percent. The lowest cost and maintenance free working increases the demands of such biogas plants for irrigation purposes in villages.

Biogas is a mixture of gases like methane and carbon dioxide. It is produced by a certain kinds of microorganisms, when air or oxygen is absent. ("anaerobic conditions." are due to absence of oxygen). Animals that eat a lot of plant material produce large quantity of biogas. The biogas is produced by numerous microorganisms living in its digestive system of animals like cows or elephants. Decaying organic matter builds up under wet conditions especially at the bottom of the lakes leading to biogas [6].

Time and again people have been using biogas. Biogas was used for streetlights (gaslights) by the underground pipes even before electricity was used. World wide , biogas is used to cook , fuel buses and light homes. It was collected from large-scale sources and through small domestic systems in many villages. But these days it is crucial to keep a commercial approach towards the biogas for production and its consumption [7].

1.1 Comparison With Conventional Biogas Plants

In the anaerobic digestion, organic waste (feedstock) is fed to a tank called as digester where microorganisms break down the waste material and discharge biogas. Biogas consists of mainly methane and carbon dioxide. The slurry coming out of the plant is also used as an organic compost [8]. The recent trend of using low calorie inputs like municipal organic waste, manure, distillery sewage, makes methane generation in the biogas plants highly unproductive. The methane gas

production efficiency of the plant can be improved by using the organic waste having high calorific and nutritive values. In this way by using simple principles it brings in many more benefits over the conventional systems, also it reduces the size and cost of the new compact system. The new biogas system is very compact and handy, whereas the conventional biogas system (Din Bandhu model) occupies about 3-4 cubic meters land space[9]. It is an economical and feasible system as it requires only a few kilograms of organic waste and the disposal of merely 5 liters of effluent slurry per day [10] [11].

In the present study biogas from the plant is directly used in the four stroke single cylinder diesel engine of 5 HP capacities with little modification done on the test rig. In the intake manifold biogas is supplied with the air. The testing is done on a computer control IC Engine of the automobile engineering lab, SVERI's College of engineering Pandharpur, Maharashtra, India.

II. MATERIAL AND METHODS

This study emphasis on testing the developed biogas plant and characteristics studied of the biogas plant. A small capacity biogas plant is prepared by using features of Arti biogas plant as shown in the fig1. The sample of the biogas is collected from the plant and analyze on the gas chromatography for finding the chemical composition. Tests are carried on seven samples collected from the biogas plant with different feed stock used. The feed stock like, waste rice from kitchen, waste bananas, mix vegetables etc. was used.

Table 1. Typical range of composition of biogas for all samples

Matter	Percentage (%)
Methane (CH ₄)	50-75
Carbon dioxide (CO ₂)	25-50
Nitrogen N ₂	0-10
Hydrogen H ₂	0-1
Hydrogen Sulphide H ₂ S	0-0.3
Oxygen O ₂	0-2

Specifications Of Test Rig Are As Follows:

Engine : Single cylinder Diesel engine
Capacity : 5H.P. (3.5KW@2200rpm)
Make : Comet make (CPW-5)
Cooling : Water cooled
Swept Volume : 345cc

The other characteristics of this test rig are a computer controlled engine which monitors the run time

situations more accurately than human observations so it reduces errors in the measurements. Also it gives the pressure versus crank angle graph which is very important for the present study [12].



Figure 1. Biogas Plant



Figure 2. Modification to Diesel Engine

III. TESTING AND RESULTS

Tests carried out on computer control diesel engine and following results are obtained.

3.1.1 Brake Specific Fuel Consumption Vs Brake Power

Various graphs are plotted to check the characteristics of the biogas when it is used as an alternate fuel. Brake specific fuel consumption is the criteria of economical power production of the engine.

Theoretically it is expressed as,

$$BSFC = \frac{m_f}{B.P.} \text{ kg/kwh} \quad (1)$$

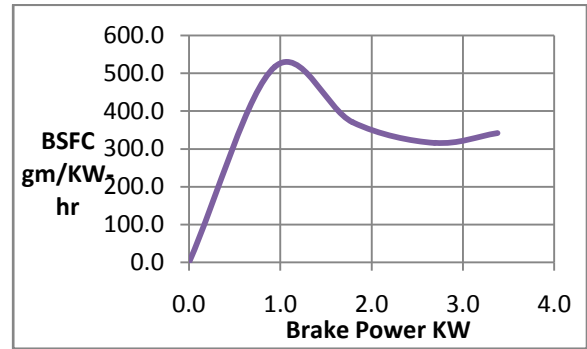


Figure 3. BSFC Vs BP

Figure 3 shows graph between brake specific fuel consumption and brake power. It is found that the BSFC is more which is around 500g/kwh at low B.P. and it gradually decrease up to 2-3kw again it increased marginally as B.P. increases.

3.1.2 Mechanical efficiency Vs Brake power

The actual and theoretical power output of the engine is calculated by the equations,

$$BP = \frac{2\pi NT}{60 \times 1000} \text{ kw} \quad (2)$$

$$IP = \frac{n_{p_{mi}} ALNK * 10}{6} \text{ kw} \quad (3)$$

And the ratio of actual to theoretical power output is termed as mechanical efficiency of the engine. Figure 4 shows Mechanical efficiency increases linearly with respect to B.P. up to certain limit (upto ~2KW B.P.) and then there is no change in efficiency though B.P. increases It is observed that maximum mechanical efficiency is 75%.

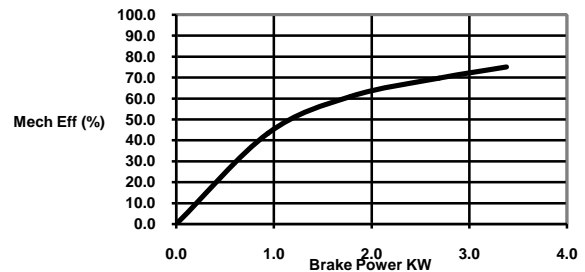


Figure 4. Mechanical Efficiency versus BP

3.1.3 Pressure Versus Crank Angle For A Sample Load

Figure 5 gives the idea about the pressure rise in the cylinder through the angle of rotation. This is plotted between cylinder pressure and crank angle graph for one sample load of 20 N-m. It is observed that there is slight

variation in the pressure rise of the cylinder near about 15 degrees after TDC. This is because the ignition delay of biogas is more.

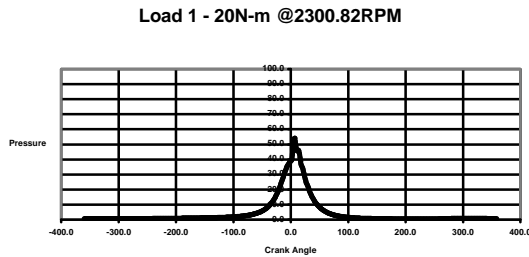


Figure 5. Pressure versus Crank Angle for a sample load

3.1.4 Pressure Versus Volume For Sample Load

The curve is similar to the PV diagram of actual diesel cycle PV graph for sample load (fig.6). It indicates that bio gas gives the same pressure rise in combustion chamber.

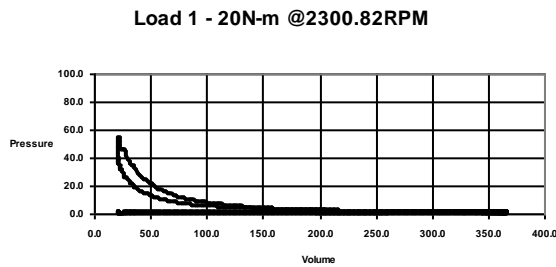


Figure 6. Pressure Vs Volume

3.1.5 Pressure Versus Crank Angle For All Loads

Figure7 shows the graph for all the selected loads and is plotted for the pressure versus crank angle. It is clear that there is slight variation in the all lines with various load conditions.

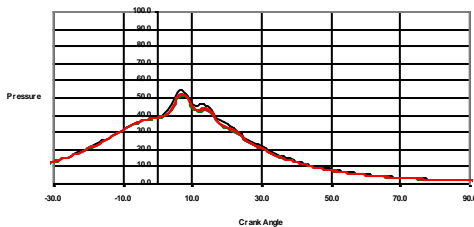


Figure 7. Pressure versus crank angle

This makes biogas very much suitable as an alternative, renewable, cheapest fuel for diesel engine.

3.2 Application For Irrigation Purpose

From the characteristics study of the biogas on test rig, it is clear that CI engine runs efficiently. The irrigation pump is coupled directly to the engine with synthetic material (to absorb the shock or sudden load condition). The engine requires some strong foundation while fixing it in field. The biogas plant is installed near to the engine. The capacity of the biogas plant is 2000liters which runs the 5 HP CI engine near about two and half hours. So probably this system is one of the best alternatives to overcome the load shedding problem as well as a good renewable source for the middle class farmers.

IV. CONCLUSIONS

Based on the results it can be concluded that the biogas is a renewable source of energy which can be an alternative to fossil fuel. It runs the CI engine very efficiently with minor modifications to engine. This alternative is a cost effective to run a CI engine on biogas energy. It is safe and affordable source of energy (nearly Rs10000 require to install the plant of 1500 lit capacity). Feed stock material is available in ample quantity in rural areas. The CI engine's inlet manifold is only modified to use dual fuel so in absence of the biogas the engine can run purely on diesel so giving uninterrupted source of energy. Thus this is an economical alternative to fossil fuel and can save nations sources of non renewable energy source.

V. Acknowledgement

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Performance of a Forced Convection Solar Tunnel Dryer with and without Thermal Storage for Drying of Tomatoes

^[1]Rajendra Patil, ^[2] Rupesh Gawande

^{[1][2]} Department of Mechanical Engineering

^[1] Bapurao Deshmukh College of Engineering, Wardha 442102

^[2] Rashtrasant Tukadoji Maharaj Nagpur University, 440001, Nagpur, India

^[1]rcp_296@rediffmail.com, ^[2]wsbdcoe@rediffmail.com

Abstract:-- A forced convection Hohenheim type of solar tunnel dryer incorporated with sensible heat storage material has been developed to test its performance for drying of tomatoes under the environmental conditions of Wardha, Nagpur India. The purpose of present work is to study a forced convection (PV powered) Hohenheim STD with and without the integration of heat storage material. Thermal bricks ($C_p = 840 \text{ J/Kg}$) were used as a heat storage media. Both tests have been carried out for the same mass of commodity and almost for same environmental conditions. Hourly values of global solar insolation and some meteorological data (temperature, relative humidity, wind speed etc.) have been recorded. Experiments were performed at varying mass flow rates ; varying from 0.023 to 0.038 kg/s and 0.025 to 0.036 kg/s with and without HSM. A uniform air temperature in the collector was observed with integration of heat storage material thus provides continuous drying. The Hohenheim STD with heat storage material is capable of producing an average temperature of 62.5 0C, which is suitable for dehydrating most of agro products; while an average temperature of 54.4 0C was recorded in dryer without use of heat storage media. The equilibrium moisture content for tomatoes was reached after 330 and 370 minutes when the system was used with and without heat storage material respectively. Therefore, the heat storage material reduced the drying time by 40 minutes and also increases thermal efficiency of dryer by 2.8 %. The quality of dried tomatoes in term of color, flavor, texture and time required for drying was favorable as compared to open sun drying and forced convection drying without heat storage material. However the performance of dryer can be increased by increasing loading rate and minimizing heat loss to surrounding.

Index Terms— brick, solar tunnel dryer, thermal storage, tomatoes.

I. INTRODUCTION

India is the fourth chief tomato producing nation in the globe after USA, China and Turkey. At present, India is the main exporter of tomatoes to Bangladesh, Nepal, Maldives, U.A.E, Oman and Pakistan. Indian typical yield of tomato (9.6 ton per hectare) is 42% of world's average yield (23 ton per hectare). Tomatoes are luscious and have numerous nutritional benefits. Tomatoes are loaded with phytochemicals which increases the cancer-fighting abilities and prevents cardio-vascular and heart disease [1]. Now days, spoilage of fresh tomatoes is momentous and in due course, the small-scale producers of India cannot go with their goods to high worth market in municipal areas. The spoilage and wastage of tomatoes can be avoided by use of cold storage (expensive process) and by drying of produce. The drying of foodstuff is the most precise solution for reducing the wastage, gaining extended shelf-life and enhancing the market price of the

produce, thus allowing poor farmers to get revenue. Drying of produce in India is usually done by sun drying. Even though sun drying is economical process, it regularly results in low-grade quality due to its reliance on environment and exposure to the attack of germs, bacteria, insect, pests and dust. In addition, it suffers with the lack of process control and uniformity in drying. Thus solar drying is a competent method of utilizing solar energy. Solar drying is a technical process and works on principle of greenhouse effect. A numerous types of solar dryer have been developed and mainly classified into direct, indirect and mixed modes. The restrictions of certain dryers next to the fact of reducing drying time, encourages the researchers to fabricate latest designs like tunnel and green- house type dryers. Tunnel is an enclosed duct apart from entrance and outlet and used for heating of air in several applications together with drying. Basically a Hohenheim solar tunnel dryer is a tunnel of framed structure covered with transparent glass or UV polythene sheet, where agricultural and industrial goods could be dried in control environment [2]. The most important

benefit of STD is quicker drying rate with less spoilage and microbiological infestation since produce receives heat energy from collector plus from incident solar radiations. Numerals of studies have been presented on greenhouse tunnel dryers by different researchers. A numerous study on hohenheim solar tunnel dryer at Mymensingh, Bangladesh were conducted by Bala et al. since 2003-2011 for drying of pineapple, jackfruit and leather. Thermal performance was found to be satisfactory. They also reported energy and exergy analysis along with a theoretical basis for drying process by means of ANN [3]-[5]. Derbala et al. conducted experiments for drying of squash in a solar tunnel dryer for investigating the effect of slice thickness on drying rate and relationship between air temperature, solar insolation and relative humidity [6]. The comparative analysis for solar tunnel dryer is presented in a roof type greenhouse dryer was developed by Tiwari and Jain in 2001 for drying of cabbage and peas under the metrological conditions of New Delhi, India [7]. Sultana et al. presented the drying performance of solar tunnel and rotating dryer. The studies were conducted on three marine fishes: Silver Jew fish, Bombay duck and Ribbon fish under the environmental conditions of Bangladesh [8]. A solar tunnel dryer was designed and constructed by Palled et al. in 2010 for drying of grapes under the metrological conditions of Raichur, India [9]. Dulawat and Rathore tested a semi cylindrical solar tunnel dryer in forced convection mode at Udaipur, India for drying processed tobacco [10]. Kagande et al. investigated a solar tunnel dryer for drying of tomatoes under forced convection mode at Zimbabwe's scientific research and development Centre (SIRDC) [1].

An incessant process is necessary during drying of a few agricultural products until it reaches a preferred moisture content which is not possible with solar drying after sunshine hours or even in bad weather conditions. Thus, for nonstop drying, a thermal storage could be provided with the solar collector. Energy storage has a key role in economy of fuels and moreover leads to an extra cost effectual method lessening wastage of energy and capital price. Sensible and latent heat storage methods are frequently used for thermal energy storage in uninterrupted solar drying systems [11]. The general sensible heat storage materials used to accumulate the sensible heat are sand, gravel bed, rocks, concrete, water etc. Table 1 shows the details of some commonly used sensible heat storage materials [12].

Ayensu and Asiedu-Boudzie (1986-1997) constructed a solar dryer with a rock as thermal storage

media, while Aboul-Enein et al. (2000) studied a solar air heater with and without thermal storage for drying of agro-commodities. El-Sebaei et al. (2002) also studied the solar dryer with thermal storage material for drying of various agricultural commodities [13]-[16]. Tiwari et al. proposed and analyze an innovative design of thin layer crop drying cum water heater; which operates throughout the year. The system can be used to give hot water when the drying system is not in operation and the water heater underneath the air heater systems would behave as a storage material for drying the crop during off sunshine periods [17]. Mohanraj and Chandrasekhar (2009) developed a forced convection cabinet solar dryer incorporated with gravel as a heat storage material for chili drying [18]. Ayyappan and Mayilsamy (2010) studied a natural convection dryer with sand as a heat storage material for drying of copra [19].

The purpose of current work is to develop a forced convection Hohenheim type of solar tunnel dryer incorporated with thermal brick as a heat storage material for drying of tomatoes. The performance of dryer under forced convection mode with and without heat storage material was discussed in this paper. The various parameters such as moisture content, dryer efficiency, air flow rate and temperature of drying air were calculated and compared accordingly.

Table 1 A List of selected solid-liquid materials for sensible heat storage [12]

Medium	Temperature Range (°C)	Density (kg/m ³)	Specific Heat (J/kgK)
Rock	20	2560	879
Bricks	20	1600	840
Concrete	20	1900	880
Water	0-100	1000	4190

II. MATERIALS AND METHODS

Materials

The good quality tomatoes were sorted and purchased from the local market of Wardha and then washed with clean water, weighed and cut in slices of uniform thickness (3mm) by using knife of stainless steel to avoid blackening on the surface. The pretreatment was given to the slices of tomatoes by using KMS (Potassium Meta bisulphate) solution. The initial moisture content of tomatoes was 94% (w.b) [20].

Experimental Setup

Fig. 1 shows the pictorial view for Hohenheim type of solar tunnel dryer of size 1m (w) x 4m (L) x 0.5m (H). The dryer consists of an air heating unit (collector), a tunnel and small fan to provide the required air flow rate over the tomatoes to be dried. A solar collector and a drying tunnel are connected in series and covered with transparent glass having transmittivity of 0.80. Inside the dryer two GI sheets of 1mm thickness coated with black paint was used as a absorber. The tomato slices were place in a thin layer on a net in drying tunnel. Thermocol is used as an insulation material to reduce the heat loss. The whole system is placed on a MS stand and oriented to face south to maximize the solar radiation incident on the dryer.

Instrumentation

PT 100 (Uncertainty ± 0.5 0C) type of thermocouples was used to measure the temperature of air in solar collector and drying chamber at every hour of interval. The relative humidity at inlet and exit of the dryer was recorded with the aid of digital hygrometer (Uncertainty $\pm 1\%$). Relative humidity of ambient air was high during morning hours due to cloudy conditions and gets reduced by 3% to 4% as it passes through the solar collector. The intensity of solar radiation was measured by solar meter (Uncertainty $\pm 10\%$). During experimentation solar intensity varies in the range of 700 W/m² to 1000W/m². The average value of 900 W/m² was used in analysis. An anemometer was used to measure wind speed. Experiments were performed at varying mass flow rates ; varying from 0.023 to 0.038 kg/s and 0.025 to 0.036 kg/s with and without HSM. The mass losses were recorded by using electronic balance having an accuracy of ± 0.01 g.

Experimental Procedure

The experiments were carried out under the environmental conditions of Wardha, Nagpur (latitude of 20.7453° N; longitude of 78.6022° E) India. Experiments were conducted in month of summer 2015. Initial moisture content of tomato is determined by oven method and found to be 90%. Initially the dryer was run at no load condition for about 30minutes and then loaded with 5600g of pretreated tomato slices. The DC fan operated by PV module is used to move the required quantity of air over the produce. The drying was carried out to final moisture content of 10% from initial moisture content of 90% (w.b). For this purpose various readings like solar

intensity, wind speed, relative humidity at inlet and outlet and temperature of drying air at various locations (eight locations) at every hour interval till end of drying were recorded.



Fig. 1: Pictorial view of Hohenheim type of STD

III. DATA ANALYSIS

1. Mass flow rate of air

The air flow rate through the solar collector was estimated by using following equation

$$m_a = \rho_a \times A_i \times v_a$$

Where

$$\rho_a = \text{density of air} = \frac{P_a}{R_a T_a}$$

T_a = Ambient temperature

A_i = Area for airflow

v_a = Velocity of air

2. Solar energy input

Solar radiations are incident on the aperture area of collector and get transmitted into the collector chamber. The amount of energy received from the solar insolation is given by the following equation

$$\text{Heat input} = I \times A_C = I \times A_C \times \tau$$

Where

I = Solar insolation

A_C = Collector area

τ = Transmittivity of glass

3. Heat utilized

The heat utilized by air flowing through the collector is given by following equation

$$Q_u = m_a \times C_{Pa} \times (T_C - T_a)$$

Where

T_C = air temperature in collector

C_{Pa} = Sp.heat of air

4. Collector efficiency

It is the ratio of amount of heat utilized to the heat received by collector.

$$\eta_c = \frac{Q_u}{I \times A_c \times \tau} \times 100$$

5. Dryer efficiency

The thermal efficiency of Hohenheim solar tunnel dryer was estimated by following equation

$$\eta_d = \frac{m_w \times \{ [C_{pw} \times (T_d - T_a) + H_l] \}}{(Q_u + I \times A_{dryer} + W) \times t} \times 100$$

Where

T_d = Drying air temperature

C_{pw} = Sp.heat of water

W = Wattage of fan

H_l = Latent heat of vaporisation

t = Drying time

6. Percentage of moisture removed

The amount of moisture removed can be represented in wet basis and expressed as percentage.

$$M = \frac{M_i - M_f}{M_i} \times 100$$

Where

m_w = mass of water removed = $M_i - M_f$

M_i = Initial mass

M_f = Final mass

IV. RESULTS AND DISCUSSION

1. Variation of collector temperature of air with time

Fig. 2 shows the comparison between variation of average temperatures of air in collector with and without heat storage material. The temperature in solar collector varies from 41 - 66°C for dryer without HSM and 58 - 67°C with HSM. Also Hohenheim type of STD with HSM is capable of producing average temperature of 62°C, which is suitable for dehydrating most of the agro products; while an average temperature of 55°C was recorded in collector without HSM. Figure shows that a consistent temperature is maintained inside the dryer when HSM is used.

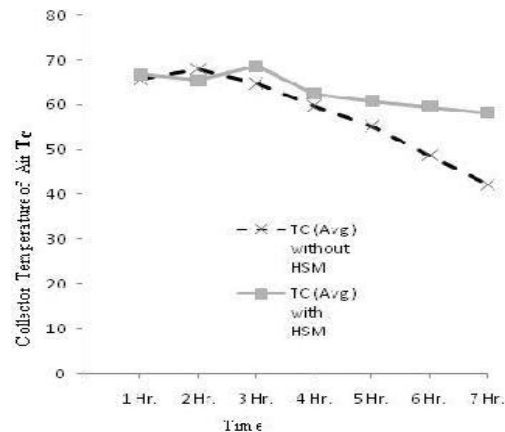


Fig. 2 Variation of collector temperature of air with time

2. Variation of drying air temperature with time

Fig. 3 shows the comparison between variation of average drying air temperature with and without heat storage material. The temperature in drying chamber varies from 37-60.5°C without HSM and 53 - 63°C with HSM. Figure shows a consistent temperature in drying chamber when HSM is used while a lot of variation in drying temperature lowers the drying rate.

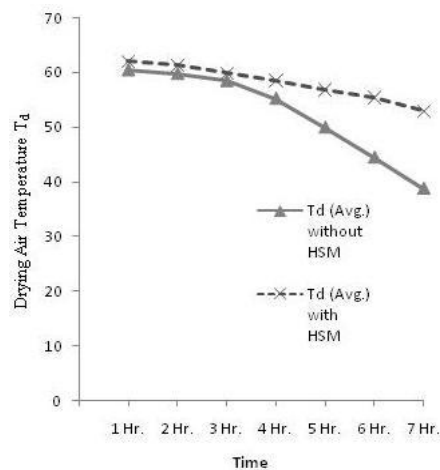


Fig. 3 Variation of drying air temperature with time

3. Variation of dryer efficiency with time

Fig. 4 shows the variation of dryer efficiency with and without integration of HSM. The maximum efficiency of dryer was found to be 72% and minimum was 11% with an average efficiency of 40% without HSM. The drying efficiency of Hohenheim STD using thermal brick as a HSM was found to be 4-5% more than the efficiency without HSM. This is due to fact that HSM (Thermal Brick) maintains the consistent desired

temperature throughout the drying and prolongs the drying even in bad weather conditions.

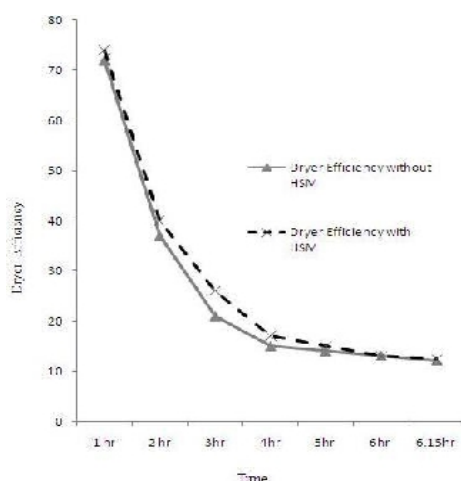


Fig. 4 Variation of dryer efficiency with time

4. Variation of moisture content with time

The variation of moisture content with drying time for solar tunnel dryer with and without heat storage material (HSM) was illustrated in Fig. 5. The moisture content of tomato slices were reduced from an initial value of 90% (w.b) to a final value of 10% (w.b) within 330 minutes in presence of heat storage material and 370 minutes without heat storage media. Initially the moisture removal rate was very high in early hours of drying due to rapid evaporation of free moisture from the outer surface. Afterwards the moisture removal rate gets reduced due to internal moisture movement from inner layers to the surface, which results in a progression of constant drying. Heat stored in a thermal brick reduces the drying rate and saves 40 minutes of drying.

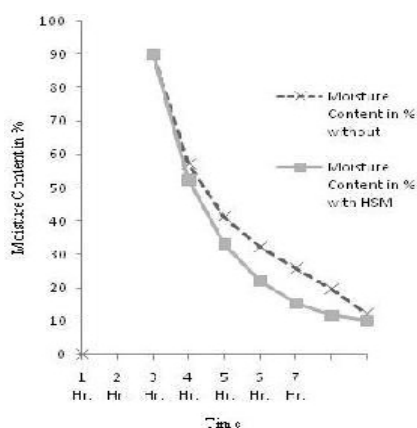


Fig. 5 Variation of moisture content with time

V. CONCLUSION

The investigations with alumina bricks as a thermal energy system shows a significant reduction in drying time and an improvement of the product quality. The quality of the final product is acceptable in taste and appearance, in fact better than natural drying as pre-treatment was done. The reduction in drying time was between 30 - 50 % compared to natural sun drying and between 10 - 12 % compared to drying in STD without thermal storage. Although the initial cost is relatively high, the running cost is low and the payback period is less than two years. Heat storage therefore permits drying to continue even when the environmental conditions such as rainfall and high relative humidity make it difficult for open-air sun drying to take place. From the experimental analysis it is suggested that for best economy and efficiency, mass of commodities can be increased to utilize the thermal energy developed.

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Various Pretreatment Technologies for Bioethanol Production: A Review

^[1]Shefali Chokshi, ^[2] Shreya Kundu, ^[3] Kunal Majmudar

^{[1][2][3]} Gujarat Technological University

^[1] shefi.1419@gmail.com, ^[2] kundushreya8@gmail.com, ^[3] kunal.sriect@gmail.com

Abstract:-- Due to increase in population and industrialization, all over the globe the demand for fossil based fuel is constantly increasing. This increase in demand for non-renewable fossil based fuel is exhausting the reservoirs of oil as well as possesses severe threats to environment. Thus energy sector have shifted its focus from non-renewable fossil based fuel to renewable biofuels like biogas, bioethanol, biodiesel, etc., contributing towards sustainable development and overcome the threats to environment. Among these biofuels, bioethanol is substituting source of energy receiving special attention over the globe due to exhaustion of non-renewable fossil fuels and has some significant advantages such as its capability to replace gasoline, to achieve the carbon emission goals under Kyoto Protocol and can be used as transportation fuel with minimal or no modifications in the existing vehicular engines. This bioethanol is produced using lignocellulosic materials and biomass like municipal solid waste, crops, etc. But crops cannot meet the global requirements of bioethanol production considering food v/s fuel debate. So, the lignocellulosic substances such as agricultural wastes, kitchen waste, municipal solid waste etc., are captivating raw material for bioethanol production. Agricultural wastes and kitchen wastes are not only cost effective but are also renewable and ample in quantity. Bioethanol from lignocellulosic material could be a promising technology though the process has several provocations and limitations such as handling and transport of the biomass and coherent pre-treatment methods for total delignification of lignocellulosic materials. Concentrations of fermentable sugars after enzymatic saccharification or enzymatic hydrolysis can be increased by considering appropriate pre-treatment methods, also improving the efficiency of the process. Converting glucose as well as xylose to bioethanol needs some new technologies, to make the whole process cost effective. This paper reviews various pre-treatment methods available for lignocellulosic materials to be further hydrolyzed and fermented to produce bioethanol.

Index Terms—Bioethanol, Pre-treatment, Lignocellulosic, Fermentation..

I. INTRODUCTION

Globalization, industrial revolution and increasing population have raised the demands for fossil fuel. In present scenario, our economy highly depends on energy sources which are generally derived from fossils like coal, natural gas, oil, etc [1]. It helps to satisfy our need by generation of electricity, fuel production, and producing other goods. Our dependency on such non-renewable sources not only leads reserves of oil to an exhaustion stage but also possess threat to our environment, causing high pollution potential, increasing levels of green house gases, increasing global warming and drastic change in climatic conditions.

To resolve these problems and contributing towards sustainable development, highlights the use of renewable resources like wind, water, biomass, geothermal heat and sun for energy focused industries while biomass as an alternative for near future for fuel and chemical industries. Generating and utilizing biofuels like biogas, biodiesel, bioethanol, etc., can be the key solution to these non-renewable fossils. A list of environmental

and economical advantages is declared for bio-fuels. Among these biofuels, production of bioethanol is a probable source for low cost biofuel generation and potential to blend with diesel, gasoline, petrol with or without modification in vehicular engines [7].

Under Ethanol Blended Petrol Program launched by Government of India in January 2003, it is made compulsory to blend 5 % ethanol (E5) to drive automobiles. By 2017 in India, it has been forecasted to utilize petrol with up to 20% blend of bioethanol and biodiesel. In the world, India with China and Thailand generates and grants 5% of production of bioethanol [3]. Across the globe, most familiar blend is 90% of petrol with 10% ethanol recognized as E10 but the vehicles having adaptable and modified engines can run on the blends upto 15% petrol and 85% of ethanol recognized as E85 [4]. When bioethanol is blended with petrol in lower amount, it results in increased octane number of the fuel and oxygen content of the fuel initiating to clean burning of the fuel with low emissions [5].

In India, for the production of ethanol molasses of sugar cane is the major raw material. But the increased

cost and shortage of supply is the restraint for its use [8]. Whereas the lignocellulosic material used to produce bioethanol are sufficiently available and provide the key solution to food v/s fuel debate. But these lignocellulosic materials require pre-treatment before undergoing hydrolysis and fermentation process and is the most expensive processing step [15]. Lignocellulosic materials are paper, wood chips, cotton, saw dust, municipal solid waste, crop residues like corn straw, etc [2, 3, and 6]. The lignocellulosic complex comprises of hemicellulose chains (15–35%) bounded in a matrix of cellulose (30–50%) and lignin (10–30%) [17]. the pre-treatment, breaks this matrix for reducing the degree of Crystallinity of the cellulose and increasing the fraction of amorphous cellulose that is suitable form for enzymatic attack. Also, delignification and hydrolyzation of hemicellulose should take place. The yield of cellulose hydrolysis after the pre-treatment of lignocellulosic material increases upto 90% of theoretical yield [16]. Thus, the objective of the pre-treatment, removal of lignin and hemicellulose and reducing the crystalline cellulose, and increases the porosity of the material. It also improves sugar formation further during enzymatic, and for subsequent process of hydrolysis and fermentation avoids the formation of inhibitors.

The financial resources for producing bioethanol depends on market for it's by products which is sent to distillers' dried grain which is served as animal food [2]. Thus, to make bioethanol viable and realistic, research in the area of pre-treatment of lignocellulosic material and enzymatic hydrolysis is carried on.

II. OBJECTIVES OF PRE-TREATMENT

For production of bioethanol being the first step, pretreatment plays important and crucial role in making biomass ready for conversion to C6 (cellulose) and C5 (hemicellulose) by enzymatic conversion or to oligomeric and monomeric sugars in few processes by direct hydrolysis of a structural carbohydrate [21]. For cellulose conversion process, pre-treatment is a crucial step for alteration of cellulose biomass structure making cellulose more approachable to enzymes which converts carbohydrate polymer to fermentable sugars. The objective is to break the seal of lignin and interrupt the crystalline cellulose structure. For conversion of cellulosic biomass to fermentable sugars the most expensive processing step is pre-treatment with cost as high as 3.72 Rupees per gallon of ethanol [15].

An effective pre-treatment is distinguished by various criteria. It circumvents the need for size reduction

of biomass, prevention of fractions of hemicellulose, restricts the formation of degradation products which inhibits the fermentative micro-organisms growth and lowers the cost as well as minimizes the energy demand. Results of pre-treatment should be balanced against their influences on trade off between biomass cost, capital cost and operating cost and on the cost of downstream processing steps.

Advanced pre-treatment technologies should be developed that adjusts to characteristics of different biomass, controls the mechanism and minimizes the cost. The ultimate objective of pre-treatment is effective and systematic fractionation of lignocellulosic material to various streams containing value added products in concentration which makes recovery, utilization and purification economically feasible. The selection, optimization, design and process control technologies of pre-treatment matching appropriate method, its process configuration and biomass are enabled by predictive pre-treatment models.

III. PRE-TREATMENT

Pretreatment plays a crucial role in increasing the bioethanol yield by converting macroscopic structure, microscopic structure as well as the chemical composition of the feedstock. It is the fundamental step that is required when dealing with lignocellulosic feedstocks. An effective and efficient pretreatment technique is cost determining step in production of bioethanol as it can increase or decrease the capital and operating cost. It is the most challenging step as this technique solubilizes or separates cellulose, hemicellulose and lignin content of biomass. The recalcitrant components in the biomass is made accessible to the enzymes for saccharification step by solubilizing them using pretreatment method [1]. The lignin and cellulose content is covered by the chains of hemicellulose and this matrix is broken down to expose cellulose to cellulase enzyme for enzymatic hydrolysis using various pretreatment methods. The pretreatment method also helps in reducing degree of crystallinity of cellulose and converts it to more fraction of amorphous cellulose which is easily degraded by cellulase. Therefore, the pretreatment method reduces the degree of crystallinity of cellulose, breaks down lignin content to expose cellulose matrix to enzymes, increases amount of accessible sugar, reduces refractory contents, limits the generation of toxic inhibitors, minimizes energy requirement, and decreases the overall cost [1, 3] The following section discusses the major types of pretreatment methods incorporated in the production of bioethanol.

II. PHYSICAL PRETREATMENT

The physical pretreatment is the method to reduce the size of the feedstock and rupture the lignin content using mechanical forces and thermal effects to make the cellulosic content and soluble sugars accessible for enzymatic hydrolysis. This pretreatment comprises of comminution, microwave oven irradiation pyrolysis [1] and electron beam irradiation [15].

(a) *Comminution:*

The basic pretreatment method is comminution which processes the lignocellulosic feedstock through methods like grinding, cutting, crushing and chipping. The method utilizes mechanical size reduction equipments like ball mill, hammer mill, vibratory ball mill, dry mill, wet mill, cutter mill, wet disk mill, etc., to obtain reduced size of the raw material. This method is used to decrease the concentration of crystalline cellulose and simultaneously increase the portion of amorphous cellulosic content. This method disintegrates the complex lignin and hemicellulosic matrix of the biomass to make it compatible for downstream operations. The result in more amounts of fine particles can reduce the efficiency by producing negative impacts like channeling and forming clumps in the process. The critical parameter in incorporating this pretreatment is the energy consumption by the above mentioned size reduction equipments [1]. For instance, if agricultural feedstock is utilized, then the energy consumption for mechanical reduction will be less as compared to forestry or woody biomass [3]. The energy consumed for reducing the wheat stover to 0.8 and 3.2 mm sizes using hammer mill were 51.6 and 11.4 kWh t⁻¹ respectively [1]. The chopping of banana peels and disinfecting using ethanol followed by fermentation using *Aspergillus Niger* yielded 6.540% bioethanol [9].

(b) *Microwave oven irradiation:*

This method uses the heating efficiency of microwaves produced in a microwave oven to produce thermal and non-thermal effects resulting in dissociation of chemical bonds of refractory materials in lignocellulosic feedstocks. This method can be proved to be a feasible method and is easy to operate. The thermal effects produced in feedstock is generated due to vibration in the polar bonds of aqueous medium and biomass resulting to internal heat in the biomass matrix using microwave radiation. This results in formation of hotspot in the biomass matrix which causes an explosion effect to rupture the structure of refractory lignocellulosic material. Thermal pretreatment has an added advantage of releasing acetic acid which initiates autohydrolysis [1] Microwave

pretreatment applied to feedstocks like bagasse and rice straw has been reported to yield 43 – 55 % of available sugar. The conversion of banana peel to bioethanol upto 6.289% using microwave oven irradiation pretreatment using microwave of power 160W for 5 minutes [10].

(c) *Pyrolysis:*

Pyrolysis also termed as destructive distillation can is an endothermic process that treats feedstock at temperature greater than 300 °C and decomposes the structure of biomass to hydrogen gas, carbon monoxide gas and residual char. The water present in the char contains great concentration of carbon which is leached out. This leached water contains glucose that can support the microbial growth and enhance bioethanol production [1]. About 80 – 85 % conversion of cellulose to sugar using mild acid leaching [1].

(d) *Electron beam irradiation:*

Irradiation degrades fraction of cellulose to fragile fibril, oligosaccharides having low molecular weight and cellobiose, due to favorable dissociation of the glucosidal bonds of the molecular chains of cellulose in the presence of lignin by irradiation. This method is expensive, requiring high energy and has industrial application problems. Using electron beam irradiation with accelerated electrons by a linear electron accelerator as a physical pre-treatment of milled and dried rice straw had the capacity to generate electron beams. Increases in yield is observed from 22.6% to 52.1% after enzymatic hydrolysis of untreated rice straw to that of electron beam irradiated rice straw after 132 hours of hydrolysis [15]. Scanning Electron Microscope and X-ray diffraction analysis shows physical changes to treated rice straw after this pre-treatment [14]. Generation of inhibitory substance during alkali or acid pre-treatment can be minimized or avoided as these methods does not involve the use of extreme temperatures.

III. PHYSICOCHEMICAL PRETREATMENT:

The physicochemical pretreatment combines physical and chemical treatments to reduce the recalcitrant material in biomass to reducing sugars. This pretreatment comprises of methods like steam explosion, ammonia fiber explosion, carbon dioxide explosion, etc.

(a) *Steam explosion:*

In the steam explosion method, steam is employed to rupture the structure of complex lignocellulosic substrate and make it accessible for attack by enzyme to carry on enzymatic hydrolysis. This method

uses the energy of steam and is a feasible method for pretreatment containing high amount of refractory material as use of any type of catalyst is avoided. In the steam explosion method, the feedstock is exposed to high pressure steam generally at temperature between the range of 160 and 290 °C and pressure in the range 20-50 bar for few minutes. Then the reaction is stopped by reducing the pressure to atmospheric pressure. This sudden release of pressure results in expansion of steam in the inhomogeneous material of feedstock and disintegrates the material to fibers. These fibers are compatible to attack by cellulase enzyme. This pretreatment produces xylitol, levulinic acid and other alcohols. This pretreatment is economically feasible as it produces xylose upto 45-60% [1].

(b) Ammonia fiber explosion:

Ammonia fiber explosion (AFEX) utilizes both ammonia and steam to breakdown refractory material to individual fibers and is referred as an alkaline thermal pretreatment. The feedstock is exposed to high temperature and pressure for a few minutes and is followed by sudden release of pressure which causes the ammonia and steam to produce explosion effect and form individual fibers which are readily attacked by the enzymes. This pretreatment does not result in formation for inhibitory material in operation but is inefficient when employed for feedstocks having higher content of lignin. It also results in recovery of very small fraction of hemicellulose. But AFEX produces polymers that are susceptible to attack by enzymes for hydrolysis and does not directly reduce to sugar. The use of ammonia increases the cost of this method which can be reduced by recovering the ammonia by evaporation. The method reduces the residence from 5-10 minutes to 30 minutes. Cellulose and hemicellulose can be converted till 90% at optimum conditions [1]. Dilute Acid, sulphur dioxide, and Lime methods rendered higher 72 h digestibility than the AFEX or soaking in aqueous ammonia for a fixed enzyme loading [23].

(c) Carbon dioxide explosion:

In the method of carbon dioxide explosion CO₂, high temperature, high pressure and sudden release of pressure results in disintegration of lignocellulosic feedstocks to fibers. It operates similarly as steam and ammonia fiber explosion method. But carbon dioxide explosion has an added advantage that it does not form toxic inhibitors that are formed in steam explosion. And it is more economically attractive and effective than AFEX as carbon dioxide is not too costly [1].

(d) Sulphur dioxide

Sulphite piping is well known technology using sulphur dioxide along with steam explosion. When combined with enzymatic hydrolysis it attains high yields of glucose and xylose. For a high enzymatic glucose yield, high temperature and less time is favorable where as low temperature and higher time is favorable for high enzymatic xylose yield. Using this pre-treatment, majority of hemicellulose carbohydrates is converted to soluble sugar by hydrolysis similar to dilute acid pre-treatment. Glucose is formed from small amount of cellulose and hemicellulose containing glucan but glucan remains in insoluble form further requiring enzymatic hydrolysis. Lignocellulosic material is first impregnated with sulphur dioxide and then high pressure steam heats upto targeted temperature in the pre-treatment reactor. Generally horizontal screw-feed reactor is used providing residence time of 10 minutes and temperature of 180°C [21]. 74.5% and 78.4% yield of glucose and xylose are obtained in this method [21].

(e) Liquid hot water treatment

Liquid hot water treatment method is a hydrothermal pretreatment technique that hydrolyzes hemicellulosic content in the biomass. In this process, at controlled pH the hot liquid water is compressed and is utilized to release high percentage of hemicellulose sugars [21]. The process occurs at 170 - 230°C temperature and under a pressure above 5 MPa for a period of 20 minutes [1]. But this releases refractory compounds which inhibit the microbial activity and hinder ethanol production. Still the treatment method is economically attractive as it recovers xylose by 88-98% [1]. Moreover, the method does not require use of chemicals which makes it environmentally reliable system [1]. Low reactor cost is the advantage of this pre-treatment, but that is often equalized by lower monomeric xylose yield [21].

(f) Soaking in aqueous ammonia (SAA) pretreatment

Aqueous ammonia in a simple reactor configuration is used in this pre-treatment. A significant degree of delignification is attained by switch grass. In the aqueous solution 70% of the lignin is soluble; the remaining carbohydrate biomass which is insoluble in this aqueous solution is processed in subsequent enzymatic hydrolysis [21]. Soaking in aqueous ammonia is modified Ammonia recycle percolation method, which has a reaction temperature ranging between 150 to 180°C having 10% to 15% concentration of aqueous ammonia [21]. At high temperature, the biomass swells in aqueous ammonia and depolymerizes lignin, breaking the lignin-hemicellulose bonds without degradation of carbohydrates, enhancing the cellulose digestibility in enzymatic hydrolysis which is the subsequent downstream

step. Whereas, soaking in aqueous ammonia process requires lower temperatures than the ammonia recycle process, typically ranging from 60–180°C [21]. In this method, for a time period (ranging from hours to days) the biomass is soaked in aqueous ammonia solution, and then treated at a high temperature and pressure for shorter residence time. It retains the hemicellulose in the biomass, eliminating separate processes of hemicellulose and cellulose sugars.

IV. CHEMICAL PRETREATMENT:

The chemical pretreatment techniques uses different chemicals like dilute acids, alkalis, organic solvents, ozone, SO₂, etc., to convert the lignocellulosic material to reducing sugars. For effective removal of lignin alkaline pretreatment, ozonolysis, peroxide and wet oxidation pretreatments are more efficient whereas solubilization of hemicellulose can be done effectively using dilute acid pretreatment [13]. However lignocellulosic structural components may have different effect of pretreatment based on the type of chemical used. This method provides high conversion in less residence time.

(a) Acid Pretreatment:

Acid pretreatment uses diluted or concentrated acids at temperature range 130 - 210°C to yield reducing sugars from lignocellulosic feedstocks to improve hydrolysis. Various types of acids are used for acid pretreatment namely sulphuric acid, nitric acid, hydrochloric acid and phosphoric acid. These acids readily attack the hemicellulosic content which is easy to hydrolyze than the cellulosic portion. The acid pretreatment produces microbial growth inhibiting materials like furfural, acetic acid, etc., which need to be detoxified to reduce impact on downstream operations. 74% saccharification yield is obtained when wheat straw was subjected to acid pretreatment using 0.75% v/v of Sulphuric acid at 121 °C for 1 hour [1].

(b) Alkaline pretreatment:

In this method of pretreatment alkalis like potassium hydroxide, calcium hydroxide, sodium hydroxide, etc., are used to rupture the cell wall and temperature generally ranges between 120°C to 180°C [19]. Also constant supply of 100 psi pure oxygen is maintained [22]. These alkalis dissolve hemicellulose, silica and lignin, by breaking down acetic and uronic esters and results in swelling of cellulose which reduces its degree of crystallinity. Advantage of this pretreatment is that it can be employed at lower temperature and pressure as compared to other technologies. The liberation

of 60 % lignin and 80% hemicellulose using 1.5% NaOH at 20 °C for 144 hours in wheat straw [1]. 44.3% yield of bioethanol is observed by grinding the banana peels and treating them with sodium hydroxide solution [10].

(c) Organosolv pretreatment:

This method of pretreatment involves the use of organic solvent which results in isolation of lignin. This technique is a pulping process utilized for eliminating lignin from lignocellulosic materials. Types of organic solvent utilized in this process are peracetic acid, ethanol, methanol, per formic acid, etc. The combination of organic solvents or water mixture generally used are 90% formic acid i.e., 50% water or alcohol mixture with 50% carbon dioxide at high pressure. Another combination is ammonia with ionic liquid which results in conversion of cellulose to glucose upto 97% for rice straw as feedstock [1].

(d) Ozonolysis:

Ozonolysis is potentially an effective method for pretreating the lignocellulosic biomass by degrading lignin and hemicellulose, to improve the production of fermentable sugars via enzymatic hydrolysis [12]. However cellulose is hardly affected. The ozonolysis can be performed for 2 hours with less than 60 mesh sized particles for achieving maximum oxidation of lignin [12]. This process decreases the lignin from 29% to 8%, increasing the enzymatic hydrolysis yield from 0% to 57% [11]. Also the rate of enzymatic hydrolysis can be increased by a factor of 5. This pre-treatment has various advantages like effective lignin removal, at downstream processes toxic residues are not formed and room temperature and pressure are favorable for the reactions to be carried out. However, the process becomes expensive as a large quantity of ozone is required.

(e) Oxidative delignification:

Lignin biodegradation can take place using enzyme peroxidase with hydrogen peroxide as a catalyst. The cane bagasse can be pre-treated with hydrogen peroxide, enhancing its susceptibility to enzymatic hydrolysis. 2% H₂O₂ at 30°C within 8 h solubilized around 50% lignin and most of hemicellulose, and subsequently saccharifying cellulase at 45°C for 24 h can achieve 95% efficiency of glucose production [11]. Using wet oxidation and alkaline hydrolysis of wheat straw (20 g straw/l, 170 C, 5–10 min), can achieve 85% conversion yield of cellulose to glucose [11].

(f) Wet oxidation

In this pre-treatment, the lignocellulosic material is treated with high pressure air and water at elevated

temperature generally above 120°C [13]. Typical pressure of air or oxygen falls in the range of 120 Psi to 480 Psi [13]. This pre-treatment effectively provides high susceptibility for enzymatic hydrolysis by fractionation of lignocellulosic material into cellulose rich solid fraction and hemicellulose fraction. Pre-treatment combination of alkali and wet oxidation improves the rate of oxidation of lignin and also the formation of furfural and hydroxymethylfurfural is prevented. Due to solubilization of hemicellulose components, acid formation takes place during initial reactions which catalyze the succeeding hydrolytic reactions by which lower molecular weight fragments, soluble in water are formed breaking down the hemicellulose. Compounds like phenol and carbon-carbon linkage under wet oxidation is very reactive due to which at higher temperatures lignin degradation is significant. Carbon dioxide, water and carboxylic acid are formed by decomposition of lignin. The alkaline wet oxidation of lignocellulosic material takes place at oxygen of 10 bar pressure and different temperatures [13]. At 170°C within 10 minutes about 65 % and 50% of delignification and solubilization of hemicellulose occurs respectively. The solid residue left over shows highest enzymatic convertibility of 85 (% w/w) of cellulose to glucose. On solubilization of hemicellulose, slight effect on oxygen pressure and alkaline (sodium carbonate) addition is indicated [13]. Almost 96% hemicellulose solubilizes just with oxygen pressure and without carbonate [13]. Alkaline addition, decreases the formation of furfural regardless of presence or absence of oxygen by more than 10-fold. On other hand, oxygen presence significantly affects removal of lignin [13]. For untreated rice husk there is 42.2% by weight cellulose which is increased to 68.6% for pre-treated rice husk also the content of lignin reduces to 19.4% in untreated rice husk to as low as 0.82% in pre-treated rice husk [18]. Recovery of total cellulose variably ranges from 78% to 92% [18].

V. BIOLOGICAL PRETREATMENT:

The biological pretreatment incorporates the utilization of microorganisms like soft rot fungi, brown rot fungi and white rot fungi for delignification of lignocellulosic biomass and liberation of cellulose. White rot fungi are more efficient in degrading hemicellulose and lignin while the brown rot fungi are effective in degrading cellulose. The soft rot fungi also degrade both hemicellulose and lignin. The biological pretreatment induces structural loosening of cells with a simultaneous increase in porosity. The benefit of this pretreatment includes no requirement of chemicals, and less energy consumption due to the limiting use of mechanical equipments. Also it is proved to be environmental friendly

and safe pre-treatment for removal of lignin from lignocellulosic material but yet a sufficiently rapid and controllable system has not been found, and the low rate of hydrolysis, low yields and long residence time obstructs the use of this pretreatment. Delignification upto 92% and reduction in cellulose upto 55.2% of sugarcane waste using *Aspergillus terreus* can take place [1]. Conversion of 35% of wheat straw to reducing sugars results in five weeks using 19 white-rot fungi [13]. *Aspergillus Niger* and *Aspergillus awamori* used for biological pre-treatment shows high yield of total sugars and bioethanol after fermentation [13].

VI. CONCLUSION

Bioethanol can be a potential biofuel that can replace gasoline, diesel etc., in order to conserve the exhausting oil reserves. But to increase the yield of bioethanol from lignocellulosic feedstock pretreatment is a crucial step that can make bioethanol compatible for commercial scale. The pre-treatment technology increases accessibility of enzyme to biomass and fermentable sugars yield [20]. This infers that an efficient and effective pretreatment technology suitable to the feedstock can reduce energy consumption and capital and operating costs of bioethanol production plants.

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Design of Photo Catalyst Induced Solar Photo Electrolysis Cell using Titanium Oxide as Catalyst and Zinc/Copper as Electrode

^[1]Diptanu Dey, ^[2]Sanjib Das, ^[3]Bharath Kumar Boyanapalli, ^[4]Solanki Das

National Institute of Technology, Agartala

^[1] ddiptanu.career@gmail.com, ^[2] sanjibdas9862@gmail.com, ^[3] bharathkn1999@gmail.com

^[4] solankidas.100@gmail.com

Abstract:-- Because of lower efficiency of solar photovoltaic cells, alternative means to harvest electric power from sunlight need to be explored. The idea is to use a photo catalyst to split water molecules into protons and hydroxyl ions and effectively separating the charges to produce usable electric power. A nafion membrane is used to separate the photons from the electrolyte. A zinc mesh is used to collect the protons effectively while copper plate situated outside the zinc mesh collects remaining electrons in the electrolyte. The protons generated are used to create a potential difference across the Copper(+) and Zinc(-) electrodes. Fine carbon particles are suspended within the electrolyte. Being effective black body, the carbon particles absorb maximum sunlight and transmit it to the electrolyte, thus improving the light absorption. To maintain constant supply of electrolyte, i.e., water, in the cell, it is fed by a water source separated by a RO membrane. Such a concept can also be used to harness solar energy when installed in bay area that have high amounts of incident Solar Irradiance, thus facilitating mass scale production of Solar Power and act as a major contributor in the overall electricity generation. Such a bay of cells provides high efficiency with negligible maintenance and low installation cost. It also has a very low requirement of surface availability, thus improving the effectiveness of the device. This project will be highly applicable in the Asian countries, especially the coastal areas.

Index Terms— Photo-catalyst, PEM Membrane, Titanium Oxide..

I. INTRODUCTION

Photo-catalytic water splitting is an artificial photosynthesis process with photo-catalysis in a photo-electrochemical cell used for the dissociation of water into its constituent parts, hydrogen (H₂) and oxygen (O₂), using either artificial or natural light. Theoretically, only solar energy (photons), water, and a catalyst are needed. The minimum potential difference (voltage) needed to split water is 1.23V at 0 pH. [1] Since the minimum band gap for successful water splitting at pH=0 is 1.23 eV, corresponding to light of 1008 nm, the electrochemical requirements can theoretically reach down into infrared light, albeit with negligible catalytic activity. . Under normal conditions due to the transparency of water to visible light photolysis can only occur are with radiation of wavelength 180 nm or shorter. We see then that, assuming a perfect system, the minimum energy input is 6.893 eV.[2] Materials used in photo-catalytic water splitting fulfil the band requirements outlined previously and typically have dopants and/or co-catalysts added to optimize their performance. The conversion of solar energy to hydrogen by means of photo-catalysis is one of the most interesting ways to achieve clean and renewable

energy systems. However, if this process is assisted by photo-catalysts suspended directly in water instead of using a photovoltaic and electrolytic system the reaction is in just one step, and can therefore be more efficient.

II. PROPOSED DESIGN

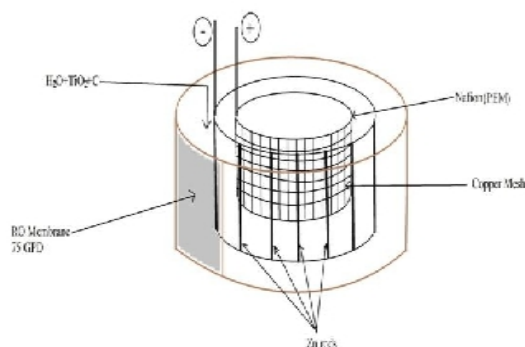
A. Structure of the cell

The following are the components of the cell-

- ◆ RO membrane
- ◆ Nafion membrane (PEM)
- ◆ Copper mess
- ◆ Zinc metal

The container is made of glass which has a opening containing RO membrane for constant supply of solutio Inside the container first section has number of Zinc electrode, second is the PEM membrane & finally we have the copper mess

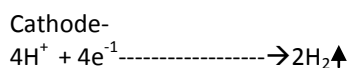
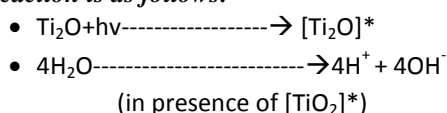
Design of Photo Catalyst Induced Solar Photo Electrolysis Cell using Titanium Oxide as Catalyst and Zinc/Copper as Electrode



B. Working

TiO₂ catalyst when exposed to sunlight absorbs energy & gets into excited state, this excited TiO₂ catalyst when placed in water undergoes certain reaction enhancing the dissociation of H₂O molecule.

The reaction is as follows:



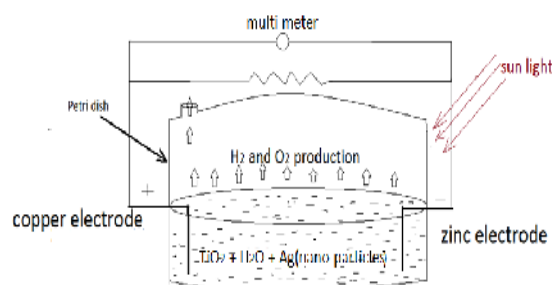
The energy received by TiO₂ molecule from sunlight is not enough to overcome the band energy gap, also water when exposed to sunlight does not receive sufficient energy to overcome the energy gap. But mixing TiO₂ with water together have enough energy to overcome the gap thus enhancing the chemical reaction.

The solution of TiO₂ & water is passed through the RO membrane in the case containing the copper mess, zinc electrode, PEM membrane. The positive ions released after the chemical reaction is attracted towards the electronegative metal Zn & the negative ions are attracted towards cathode. PEM membrane placed just outside the copper sheet does not allow the negative ions to recombine with the positive ones. Thus we finally have H₂⁺ ions & OH⁻ separated giving us the required potential.

c) Probable Problems

- ◆ corrosion of electrode
- ◆ precipitation of TiO₂
- ◆ Damage to the outer world by salt water.

III. ASSEMBLY & FABRICATION



This is our experimental setup for photo-electrolysis which we have observed during the sunlight. In this experiment, we have used two petri-dish as a container for solar photo-electrolysis and TiO₂ as a photo catalyst and silver(Ag) nanoparticles as co-catalyst. We also used two different types of electrode i.e. zinc(cathode) and copper(anode) for collecting the charge which were partially merged into the TiO₂ solution. After that we used a multimeter for measuring the output voltage and current.

III. DRAWBACKS & TROBLUSHOOTING

- ◆ **Photosensitivity:** The photosensitivity of this cell is very low that means it does not start generating electricity at the same time when it placed under sunlight, it takes 5-6 minute to start generating electricity and also it takes 5-6 minute to stop generation of electricity after stay away from sunlight to shadow place. To overcome of this problem in future we will test scintillation grade TiO₂ solution instead of anatase TiO₂ solution, though this form of TiO₂ is costlier but very effective.
- ◆ **Corrosion:** Corrosion to the electrodes is a big drawbacks for its cell electrodes. To overcome of this heavy corrosion we will use treated Mg and Sn electrode instead of copper and zinc electrode to avoid corrosion.

- ◆ **Precipitation of Ag nanoparticles:** The silver nano-particles are precipitated under the solution which gives negative effect i.e. slow down the reaction of photo electrolytic cell. To overcome this problem we used good emulsifier to avoid precipitation of silver nano particles.

IV- RESULT & CONCLUSION

After implementation of this experimental setup we measure the voltage and current during the sunlight period which gives a voltage of 0.8 volt and current of 0.04 ampere for a small single cell. Besides the electrical output we also investigated the output hydrogen and oxygen gas, we have collected the product gas using an inverted beaker submerged in water, and tested it by directing the gas towards flame using a nozzle.

Though the product gas was very less in amount, it exhibited combustion, as the flame experienced turbulence, and produced a fade bluish flame which maintain the properties of hydrogen. So we can say that in that produced gas there is enough hydrogen. This hydrogen may be utilized in a fuel cell for generation of electricity then efficiency of this cell will be increased.

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Setup of an Arduino Based GIC Monitoring System And Study of GIC Variation at Ground Level

^[1]Boyanapalli Bharath Kumar, ^[2]Diptanu Dey, ^[3]Sanjib Das, ^[4]Dr. Priyanath Das
National Institute of Technology, Agartala

Abstract:-- This paper deals with the setup of Arduino based monitoring system. In this paper, we calculated the amount of Geomagnetically Induced currents (GIC) in the power lines during normal conditions and during recent G1-class geomagnetic storm conditions occurred on November 2016. The selected site for this measurement was NIT Agartala Substation located in West Tripura, India. GIC will be induced due to the change in the magnetic field of the earth because of the geomagnetic disturbances (GMD) caused due to the solar flares. We calculated this change in the earth's magnetic field during the normal condition and during the recent magnetic storm condition. For this calculation we used a small magnetic field sensing chip called HMC5883L. This integrated chip (IC) senses the changes in the magnetic field. Since this IC is a 3-Axis chip it gives the value of magnetic field in X, Y, Z directions. We interfaced this chip with Arduino UNO and a program was implemented to make this chip sense the magnetic field variation. The readings are noted at two different points, i.e. One point was at under power lines and another was at a distance from the power lines. The readings were taken both at normal conditions and during the storm conditions. During the storm conditions the geomagnetic field was increased upto 360 uT under the power lines compare with the measured value under the power lines during the normal conditions. The difference in the magnetic field infers the GIC induced in the power lines. In this paper, we provided the setup of an Arduino based magnetic field measurement system and the measured range of GIC in the power lines.

Index Terms— Arduino setup, GIC monitoring, GIC variation, Ground level

I. INTRODUCTION

The sun propagates solar flares and these flares causes the changes in the magnitude of earths magnetic field with respect to the time. This change in the magnetic field induces an amount of current in the power lines which may cause a severe threat to the power system. This induced current in the power lines is called GIC. So we need to calculate the amount of GIC induced in the power lines, for this we need to calculate the variation of geo magnetic field because of the GMD [1].

The GIC causes severe threat to many technological systems like gas pipelines, Tele communications lines, railway lines, power systems etc. The impact of GIC was explained by many incidents [2]. The impact of GIC was shown in the figure 1.

II. MEASUREMENT OF MAGNETIC FIELD INDUCED DUE TO GMD

GIC in the power lines is induced due to the variation of the geomagnetic field because of GMD. So to estimate the amount of GIC in the power lines we need to calculate the variation of the magnetic field of the earth. To measure this we used an IC HMC5883L

interfaced with the Arduino UNO and a program has been implemented to make the sensor to sense the variation in magnetic field and gives its magnitude. The setup is shown in the figure 2. The readings were taken in such a way that, under normal conditions the data was recorded at two different points, one was under the power lines which measures the magnetic field due to GMD and Geomagnetic field. The other was at a distance away from the power lines where the only geomagnetic field was measured. The difference of the both will give the magnetic field induced only because of GMD. This magnetic field infers the amount of GIC flowing in the power lines. Similarly, the same procedure was repeated during the recent magnetic storm conditions and the variation in the magnetic field was observed during this period.

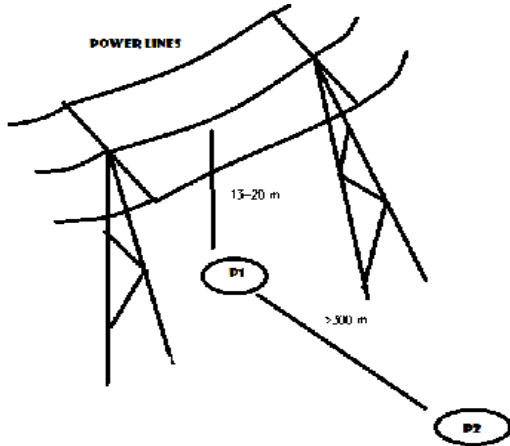


Figure 3. Setup for magnetic field measurement

The variation of the magnetic field during the normal and during the recent magnetic storm conditions was shown in the figure 3 and figure 4.

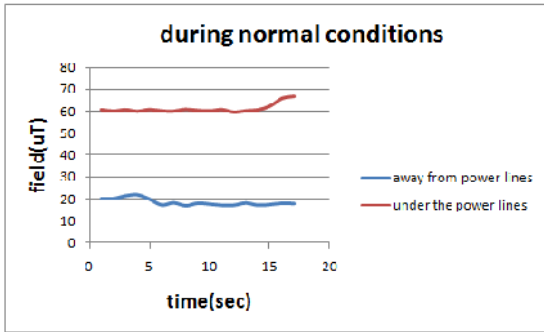


Figure 3. Variation of magnetic field during normal conditions.

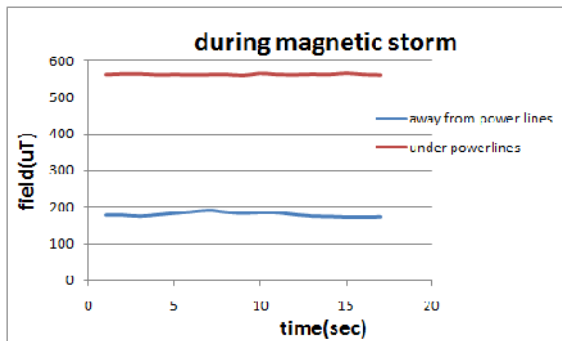


Figure 4. Variation of magnetic field during storm conditions

III. CALCULATION OF GIC

After getting the magnetic field induced due the GMD. The GIC was calculated from the formulae used below. The induced GIC due to the variation of geomagnetic field was calculated during the normal

conditions and during the recent magnetic storm. The calculation is done in the following way, the NIT Agartala substation data were taken, the power lines used are All Aluminium Conductors (AAC) the resistance of the power lines used in the transmission of power was 0.915Ω/ KM, nominal area of the power lines is 150 mm² and the length of the power lines was considered 100 KM i.e. From the Tripura electricity board to NIT Agartala substation. The important formulae used in calculation are given below.

$$\epsilon = \frac{d\Phi}{dt} \text{ (Volts)} \tag{1}$$

Where ϵ = EMF induced in power lines in volts

$$\Phi = B \cdot A \tag{2}$$

Where B = Magnetic Field in micro tesla and
A = Area of the power line in mm²

The magnetic field varies with respect to time and the area of the conductor is constant. By using the formulae 1 and 2 we calculated the EMF induced in power lines. After calculating the EMF from the substation data by taking the total resistance of the power line the current induced in the power line was calculated by using the formula below [3].

$$\epsilon = IR \tag{3}$$

The GIC was calculated under the normal conditions and during the recent magnetic storm and its magnitude variation is shown in figure 5.

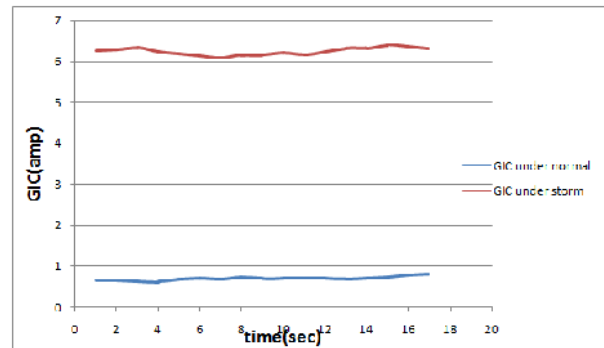


Figure 5. The magnitude of GIC (Amperes) in the power lines during normal and during magnetic storm conditions.

IV. RESULTS AND CONCLUSION

In this paper we provided the setup of an Arduino based monitoring required to measure the variation of the geomagnetic field during the normal conditions and during the recent magnetic storm conditions and the variation was shown in the figures 3 and 4 respectively. In this method we used an IC HMC5883L magnetic sensor interfaced with Arduino. A program has been implemented to make the sensor to sense the variation in magnetic field. In this paper, we calculated the amount of current induced i.e GIC in the power lines during the normal conditions and during the recent magnetic storm conditions which occurred in November 2016. By calculating the GIC during normal and storm conditions, we can conclude that during the storm conditions the GIC flowing in the power lines was increased compared with the normal conditions. This will be a severe threat to the power systems and various other technological systems and this should be mitigated.

Acknowledgments

We are very grateful to the chief engineer incharge of NIT Agartala substation and the department of electrical engineering department of NIT Agartala for their support throughout the research work.

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Design of a Petrol - HHO Hybrid Fuel System for 110cc, 4-Stroke IC Engine

^[1] Sanjib Das, ^[2] Diptanu Dey, ^[3] Bharath Kumar Boyanapalli ^[4] Priyanath Das
^{[1][2][3][4]} Department of Electrical

National Institute of Technology, Agartala

^[1]sanjibdas9862@gmail.com ^[2]ddiptanu.career@gmail.com ^[3]bharathknl999@gmail.com

^[4]priyanathdas@yahoo.co.in

Abstract:-- In this paper we have designed a hybrid fuel injection system that uses petrol-HHO mixture instead of pure petrol as fuel in a 3-valve, 4-stroke, 110 cc IC engine. We have designed a 120 cc electrolysis chamber consisting of copper electrodes and tested KOH, NaCl and their mixture for the optimal production of HHO and using taguchi method, we have estimated optimal molarity of KOH and NaCl. We have also used a pwm charge controller to regulate 5 volt 1 amp supply from a 12 volt battery. We have also processed the produced HHO using a silica gel based dryer and designed a safety bubbler to prevent unnecessary injection of HHO in case of blockage. We have measured the amount of produced gas and its calorific value from combustion. We also estimated the enhancement of engine performance by using this assembling. Furthermore we have compared the results by using normal tap water and medical grade distinct water and found that HHO production rate decreases rapidly with time if tap water is used instead of medical grade distinct water.

Keywords:— HHO gas, pwm charge controller, IC engine, KOH solution

I. INTRODUCTION

The HHO gas is a mixture of hydrogen and oxygen, where the ratio of hydrogen and oxygen 2:1 which is a stoichiometric ratio. This mixture also called as oxyhydrogen or knall gas. Now a days energy crisis is a main issue for the Govt as well as normal people. To overcome this problems many researchers are work on different types of energy efficient resources. Among all the energy efficient resources HHO gas is most promising eco-friendly fuel which don't have any emission of carbon or sulphur contents. HHO gas have some properties like high flammable velocity, low spark ignition power and highly combustable with any fuel. For these properties, there is no backfire can happen in the IC engine and make the engine very much thermal efficient. As the HHO gas has wide flammable velocity and low ignition energy, so this HHO gas can be used by mixing with the petrol for enhance engine performance. Comparing with the traditional fossil fuels, HHO gas is a carbon less fuel whose combustion does not emit any HC, CO, CO₂. The high flame temperature of HHO gas-petrol mixture fuel, resulting in the increased NO_x emission can be a negative issue for the wide application of hybrid fuel engines.

II. EXPERIMENTAL SET UP

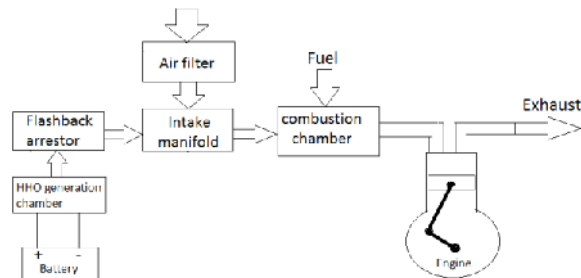
The oxyhydrogen or HHO gas was directly added to the combustion chamber without any modification or manufacturing. These HHO gas was produced in a production chamber of plexiglass with two similar types of electrode, connected as anode and cathode with the battery. Here we were used Aluminium as an electrode by giving positive and negative charge from an external electrical source. After giving external charge the electrolysis reaction was starting and for the anode and cathode reaction the hydrogen and oxygen are generated respectively. At the first few minutes the generation of HHO gas was healthy but after few minute the generation become slow which happened because the current was become constant for the high current. To overcome this problem we used a dc-dc charge controller to control the charge. In this experiment we set the maximum limit of voltage 5v and current 1amp and a membrane was set at the middle of two electrodes to separate them to prevent short circuit. A flow meter was used to measure the flow rate of HHO gas and a multimeter was used to measure the voltage and current. For better electrolytic solution for electrolysis we used KOH as electrolyte with the water in the amount of 6 gm/L is the best amount for better HHO production which we investigated. The technical specification of the HHO generation system is shown in below,

Table-1

In this setup we used a battery for external source of energy, a flashback arrestor for prevent HHO flashback from intake manifold, an intake manifold for mix up the air and fuel, an air filter for filter the air , a combustion chamber for combust the mixed air-fuel-HHO gas. After combustion of mixed fuel it was directly fed to the engine and observed the speed and torque in different gears.

Maximum gas supply	150 ml/minute
Electrodes(anode-cathode)	Aluminium
Maximum electrolysis voltage and current	5volt – 1amp
Electrolyte	KOH aqueous solution 6 gm/L
Electrolysis container volume	120 ml
Water level control	Float system
Water temperature	40 – 45 degree centigrade
Dimension	6cm * 6cm * 18cm
Weight	700 gm

The whole system shown as schematic diagram in figure-1.



III. RESULT AND DISCUSSION:

It is investigated that, among the different concentration of KOH with water, 6 gm/L of water concentration gives better efficiency at different engine speeds with compared to NaOH and maximum voltage of 5volt and maximum current of 1amp gives better HHO production.

It is found that after using the petrol-HHO gas mixture instead of only petrol, the performance of the engine was improved and fuel consumption decreased. We investigated the improvement of performance characteristics of torque- speed with different gears.

During the experiment, it is also noted that while using the HHO gas and air-petrol mixture the HC, CO and NOx emission less in amount with compare to while using only air-petrol in the engine. As we are using the HHO gas and fuel mixture, there is obviously carbon particles are less in amount. So using mixture of HHO gas ,reduces the CO which was observed by a gas analyzer as the fuel consumption is less . For these less fuel consumption it is obvious that the HC and NOx emission also less. . The emission of HC, CO and NOx has been reduced to 12%, 6%, and 13% respectively on average while using HHO gas with petrol.

IV. CONCLUSION:

In this experimental work, it is investigated that, using of HHO gas mixed with the fuel effected the engine torque-speed performance characteristics and fuel consumption by the engine itself. Here, a new HHO generator has been set up for the HHO generation to mixed with the fresh air and fed to the intake manifold. Although the exhaust gas or emitted gas concentration have been sampled and measured using a gas analyzer. From this experiment it is concluded that, HHO cell can be setup and integrated easily with existing engine system and its also justified that KOH with concentration of 6 gm/L is best for efficient HHO generation. The engine thermal efficiency has been increased by using this technology upto 15% and fuel consumption reduced upto 40% . The emission of HC, CO and NOx has been reduced to 14%, 8%, and 12% respectively on average while using HHO gas with petrol.

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Design and Study of Compound Parabolic Trough Collector Based Solar Air Cooker for Advanced Heat Interception

^[1]DiptanuDey, ^[2]SanjoyDey, ^[3]ArnabKanti Roy

^[1] Assistant Professor ^{[2][3]} Student, B.Tech

^{[1][2][3]} Department of Electrical Engineering, National Institute of Technology, Agartala

^[1]ddiptanu.career@gmail.com, ^[2]sanjoydey2912@gmail.com, ^[3]arnabk93@gmail.com

Abstract:-- In this paper, we have discussed the design of a solar cooker that uses heated air for contact less cooking using a compound parabolic trough collector. We have modified the existing design of compound parabolic collector using ray tracing method, and redesigned the angular position for better heat collection efficiency. The collected heat will heat up the air present inside the cooking chamber and the sealed airtight mechanism maintains additional pressure inside the chamber to increase the boiling point of fluids present in the foods to be cooked. We have coated an aluminium sheet with carbon nanoparticles prepared from specially processed carbon shoot which ensures excellent heat trapping. The entire model is economic as it is low cost and the adjustable angular placing of the reflectors ensures that it can be used in any latitude or longitude. We have also conducted a comparative study of existing solar cookers and concluded that the new design is 34% more efficient than any other existing solar cooker. Instead of aluminium reflectors, float-glass mirrors have been used to increase the reflection of solar radiation. The cooker is much healthier as it utilises the concept of roasting instead of frying.

Index Terms:—Compound parabolic collector, LASER Tracing, Pressure Dependent Valve, Solar Flickering

I. INTRODUCTION

Many concentrating technologies have been used for solar heat collection especially cooking. Compound parabolic collectors offer high efficiency but because of their bulky structure they haven't been used much for cooking. Here we have designed a solar cooker for concentrating solar heat on an intermediate metallic collector coated with fine carbon particles which collect the heat and transfer it to the cooking chamber. This way we can control the heat supplied for heating. Being a passive air heated system, the intermediate air eventually overcomes flickering in solar irradiance. It also provides protection from overheating as a safety valve is deployed to let out the heated air in case of overheating. The angle of inclination of the collector has been determined keeping in mind solar irradiance throughout the year.

II. FABRICATION OF CPC:

A. Materials used:

Materials that are used in fabrication of CPC are aluminum frames to hold the mirrors (float glass mirrors). Float glasses are arranged in such a way that 3 mirrors of dimension: 1) [0.32mX 1.2m] , 2) [0.39mX1.2m] & 3) [0.32m X 1.2m] are made a plate like structure that

represents one side of the parabolic structure. Similarly, using other mirrors we made another identical plate and place them apart such that the lower mirror has base distance of 0.45m and upper mirrors have top distance of 1.06m.

#	Name of the material	Specification	Quantity
1	Float Glass Mirror	Dimensions:	4 No.s 2 No.s
		i> 0.32m X 1.2m	
		ii> 0.39m X 1.2m	
		Reflection Efficiency: 38%	
2	Aluminum Frames	Dimensions:	4 No.s 2 No.s
		i> 0.32m X 1.2m	
		ii> 0.39m X 1.2m	
3	Gas welding machine		1

The top mirrors of dimension 0.32mX1.2m are placed at an angle of 77

Design and Study of Compound Parabolic Trough Collector Based Solar Air Cooker for Advanced Heat Interception

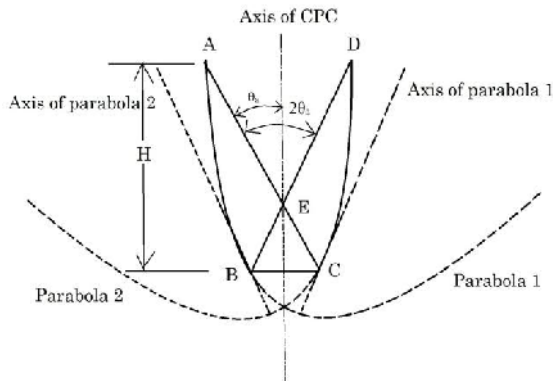
The middle mirrors of dimension 0.39mX1.2m are placed at an angle of 74°.

The bottom mirrors of dimension 0.32mX1.2m are placed at an angle of 66°.

B. Mathematics Used

Two parabola are taken and put in such a way [as given in figure] such that the axis are $(24 \times 2)^\circ$ apart i.e. 48° apart. The 24° is taken because the sun varies approximately at $\pm 23.5^\circ$ apart.

So when the sun is even at an angle of 24° with the axis of the parabola, the collector retains its efficiency.[1]



C. Reflectors used:

Float glass mirrors are used normally for reflection of sunlight from infinity angle. Here a simple plane mirror is used that contains highly reflective thin aluminum sheets under a transparent glass substrate. The width of the mirror pieces used is nearly 3 mm and are kept least to maintain the total weight of the structure. The glass substrate used above the aluminum sheet should be very thin so that heat doesn't trap..

III. FABRICATION OF COOKING CHAMBER

A. Dimension:

The dimension of the cooking chamber is given by $(0.45m \times 1.2m \times 0.18m) = 0.097m^3$. i.e. approximately 9 liters. This is the volume of air that is trapped in the cooking chamber under normal temperature and pressure.

B. Construction

The shape of the cooking system is simple cuboidal with one side opening. The cooking chamber is so made that the inside volume remains air sealed, when the opening is closed and the chamber is sealed. A valve is used to release the extra pressure so that it doesn't hamper the structure. The upper portion of the cooking chamber is covered with carbon particles that help in better absorption and uniform distribution inside the

chamber. The inner part of cooking chamber is lined with 80 GSM aluminum foil. This is done to decrease the wastage of heat energy from radiating out of the chamber. This thin reflective aluminum coating is used just as a coating and so similar paints can also be applied.

IV. SUPPORTING STRUCTURE:

A. Design

The trough collector that is made is still not ready for any kind of implementation and so it is needed to set in such a position that average sunlight reception is maximum. So the aperture of the trough is set at 23° and it is made in such a way that the cooking chamber that is attached to the collector is having base parallel to the ground. The stand we used is made of iron bars as the stand is just to hold the trough and has no other mathematical or scientific value. The supporting structure is now suspended to the trough as seen in figure and real pic attached. But the iron bar used for supporting the structure increased the mass of the structure dramatically and so it is very inconvenient to move it. So caster wheels are attached under the supporting structure and for this we came to find that loads are not equidistant and so 8 wheels are attached on one side and 6 wheels are attached on the other side.

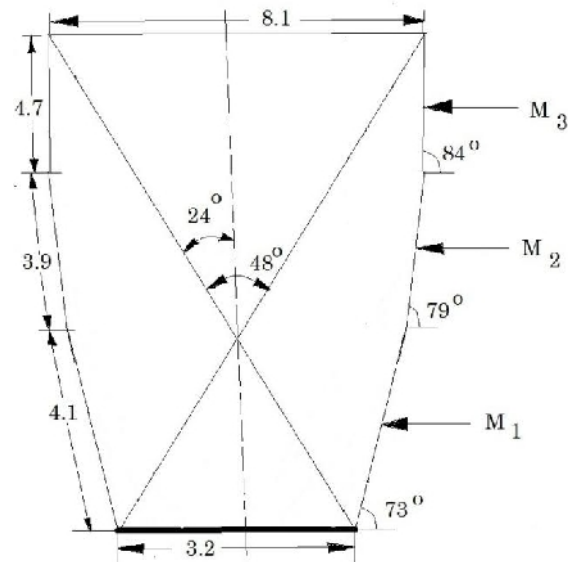


Fig: Constructional features of the CPC

B. Calculation of angle of inclination:

Both the geographical coordinates and time determines the position of the sun. But due to our trough shape. The position of the sun during a day (i.e. azimuth angle) need not be taken under consideration..[2]

The angle of the sun is given by the angle
 The angle of the sun is given by the angle

$$\delta = -23.44^\circ \times \cos \left[\frac{360^\circ}{365} (X + 10) \right] [3]$$

Where X is the number of days of the year.

At equator

When x=0,

$$\delta = -23.44 \times \cos(9.863) = -23.094^\circ$$

when X=183

$$\delta = -23.44 \times \cos(0.9863 \times 193) = 23.058^\circ$$

at latitude 23.5° N, $\delta_{x=0} = 0.406$ and $\delta_{x=183} = 46.0558$

So sun gets diverted in between 0.406°N and 46.558°N.

So the average is what the aperture angle of trough should be i.e. 23.48°.

V. TESTING AND STUDY

A. Preliminary study using LASER

This tracking is done by using visible light rays from diff positions and different angles on the reflectors and recording the path of light in the arrangement. For this method, a 5 mW Red LASER (Ruby) was chosen with a beam diameter of 1.5mm. This light was positioned at various locations at a constant distance from the reflector. The reflection of the light beam was traced each time and the ray tracing diagram was drawn. Then at the same position the tilting angle was changed from zero to twenty degrees in steps of five degree and the angle ray tracing diagram was drawn. It is found that each time the reflected beam reaches the absorbing surface. The same process was repeated with the cooking chamber.[4]

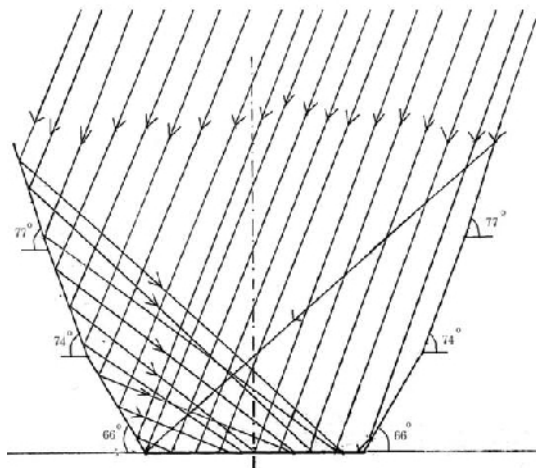
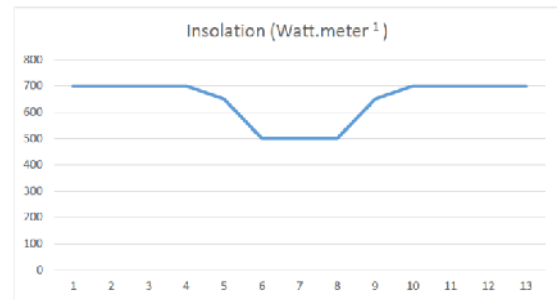


Fig: LASER tracing diagram

VI. PROTECTION AGAINST FLICKERING

One of the biggest disadvantages of solar energy is sudden drop in solar energy intercepted due to cloud cover. The cooker section is made airtight and is insulated by 80 gsm aluminum sheet to minimize the energy loss due to heat dissipation.[5]



Graph: Insolation VS Time graph

VII. SAFETY AND PRECAUTION

Temperature triggered pressure relief valve A pressure relief valve is a safety device designed to protect a pressurized vessel or system during an overpressure event. An overpressure event refers to any condition which would cause pressure in a vessel or system to increase beyond the specified design pressure or maximum allowable working pressure (MAWP).[reference] According to Guy-Lussac's Law, as temperature increases the pressure exerted on the walls of a constant volume container increases. Therefore, we can use temperature as a triggering factor. The optimal temperature range of the designed cooker using the CPSC is 100°-230° Celsius. Therefore, the activation temperature of the pressure relief valve is 230° Celsius. [6]

A mercury-expansion valve has been used. Mercury expands proportionately with rise in temperature. The length of the piston and the axle has been calibrated to relief the pressure when the mercury expands above the predetermined limit at temperature higher than 230° Celsius.

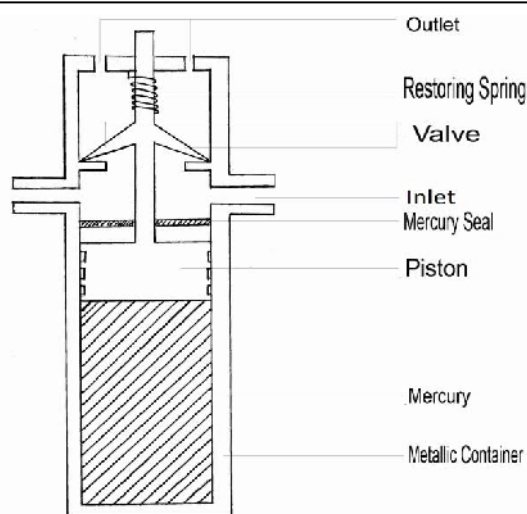


Fig : Mercury based pressure relief Valve

VIII. CONCLUSION

We have made a comprehensive study of the design and fabrication of a solar cooker using a compound parabolic solar collector. Efforts have been taken to increase the efficiency of existing solar cookers by improving the CPSC geometry and also designing a much lossless heat collector. The designed solar cooker has its application in remote rural communities and also in big food chains like KFC, McD to reduce their carbon footprint. Further study can be made to make this solar cooker more consumer friendly.

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Synthesis and Characterization of Silver Nanoparticles using *Ricinus communis* Plant and Study of their Biological Activity

^[1] Vinay.S.P, ^[2] Dr.Chandrashekar.N

^[1] Research Scholar ^[2] Professor - Research and Development Center

^{[1][2]} Department of Chemistry, Shridevi Institute of Engineering and Technology, Sira Road, Tumkur-572106, Karnataka, India.

Abstract:-- The main aim of this study is to evaluate the Green synthesis of silver nanoparticles synthesized from aqueous plant extract of *Ricinus communis* and study its Antimicrobial activity. The synthesized silver nanoparticles were characterized by UV-VIS spectroscopy, Fourier Transform Infra-Red spectroscopy, Scanning Electron Microscopy and X-ray diffraction. The antimicrobial activity of synthesized silver nanoparticles was compared with their respective plant extract by agar well diffusion method was calculated. The zone of inhibition varied in range of 12 to 17 mm with 100 µg/ml silver nanoparticles concentration. The antimicrobial activity of synthesized silver nanoparticles was higher than that of the standard drug i.e. streptomycin (for bacteria). The synthesized nanoparticles of *Ricinus communis* have shown good antimicrobial efficacy as compared to plant extract and may prove to be better antimicrobial agent against wide range of microbes.

Index Terms:— *Ricinus communis*; Silver nanoparticles; Plant extract; Antimicrobial

I. INTRODUCTION

Nanotechnology is one of the most active research in material science and its capability of modulating metals into their nano size, which drastically changes the optical, physical and chemical properties of metals. Nanoparticles are the small particles its size range of 1-100 nm. Nanoparticles are fundamental building blocks of nanotechnology. The most important and distinct property of nanoparticles have found uses in many applications in different field, such as catalysis, photonics and electronics. Silver nanoparticles as an arch product from the field of nanotechnology, because of its distinctive properties, those are good conductivity, catalytic, antifungal, chemical stability, antiviral, antibacterial activity, and anti-inflammatory, etc[1]. Nobel metal nanoparticles such as silver(Ag), platinum(Pt), gold(Au) and palladium(Pd) is an emerging field of research due to their important applications in the fields of metal-based consumer products, textile engineering, water treatment, biotechnology, bioengineering and other areas, optoelectronics, magnetic, electronic, information storage and Medical [2]. In medical industry such as topical ointments to prevent infection against burn and open wounds [3]. The antibacterial activities of silver nanoparticles are related to their size, with the smaller particles having higher activities on the basis of equivalent silver mass content.

The content of this work is collection and identification of plant species, isolation and identification of silver nanoparticles and their characterization by UV-Visible spectroscopy, Fourier Transform Infra-Red spectroscopy, X-ray diffraction, Scanning Electron microscopy and to study its Biological activities. Castor oil has many uses in medicine and other applications. An alcoholic extract of the leaf was shown, in lab rats, to protect the liver from damage from certain poisons.[4][5][6]Methanolic extracts of the leaves of *Ricinus communis* were used in antimicrobial testing against eight pathogenic bacteria in rats and showed antimicrobial properties. The extract was not toxic.[7] The pericarp of *Ricinus* showed central nervous system effects in mice at low doses. At high doses mice quickly died.[8] A water extract of the root bark showed analgesic activity in rats.[8] Antihistamine and anti-inflammatory properties were found in ethanolic extract of *Ricinus communis* root bark.[9]

II. MATERIALS AND METHODS

Plant Materials:

Ricinus communis, the castor bean[10] or castor-oil-plant,[11] is a species of flowering plant in the spurge family, Euphorbiaceae. It is the sole species in the monotypic genus, *Ricinus*, and subtribe, *Ricininae*. The evolution of castor and its relation to other species are currently being studied using modern genetic tools.[12]It

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reproduces with a mixed pollination system which favor selfing by geitonogamy but at the same time can be an out-crosser by anemophily or entomophily. Its seed is the castor bean, which, despite its name, is not a true bean. Castor is indigenous to the southeastern Mediterranean Basin, Eastern Africa, and India, but is widespread throughout tropical regions (and widely grown elsewhere as an ornamental plant). [13]

- ◆ Scientific classification
- ◆ Kingdom: Plantae
- ◆ Order: Malpighiales
- ◆ Family: Euphorbiaceae
- ◆ Sub-family: Acalyphoideae
- ◆ Tribe: Acalyphaeae
- ◆ Sub-tribe: Riciniinae
- ◆ Genus: Ricinus
- ◆ Species: R. communis
- ◆ Binomial name: Ricinus communis
- ◆ Collection and preparation of plant materials:

Fresh leaves of *Ricinus communis* plant free from diseases were collected from S.I.E.T college campus, tumkur, Karnataka and then washed thoroughly 2-3 times with tap water and once with sterile water. 20 gm of fresh leaves was finally chopped and added to 100 ml of distilled water and stirred at 600 C for 1 h. After boiling, the mixture was cooled and filtered with Whatman filter paper number 1. Filtrate was collected [14]

Synthesis of Silver Nanoparticles [15]. 5mM aqueous solution of silver nitrate (AgNO_3) was prepared and used for the synthesis of silver nanoparticles. 5ml of leaf extract of *Ricinus communis* was added to 45 ml of 5mM AgNO_3 solution for bioreduction process at room temperature.



III. CHARACTERIZATION

UV-Vis spectroscopy: Leaf extract were challenged to 100ppm AgNO_3 solution, The mixture were observed visually for an colour change and one mL of reaction mixture were withdrawn periodically for analysis of surface Plasmon resonance of silver nanoparticles using a UV-Vis spectrophotometer (Shimadzu 1601 model, Japan) at the resolution of 1 nm in range of 340 to 900 nm. **X-Ray diffraction analysis:** The scintillation detector present in the instrument moved with required angle at specific counts and sample was scanned with a straight angle at 100C and stopping angle at 700C. The output was obtained in the form of a graph with 2θ on x-axis and intensity on y-axis. The obtained graph from analysis having peaks corresponding to different planes of the crystal was compared with the standard data in JCPDS card. From the subsequent data obtained, the average size of particle was calculated by Scherer's formula [14]. $D = 0.9\lambda / \beta \cos\theta$, where, λ is wavelength, θ is Bragg's diffraction angle, β is full width at half maximum of peak and D is average particle size.

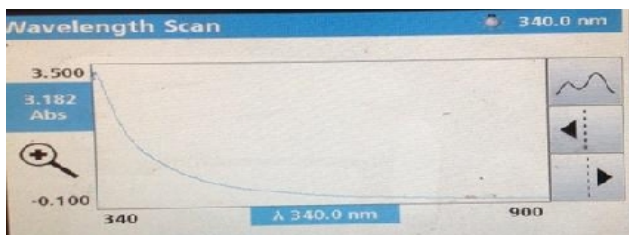
FT-IR analysis: FT-IR analyses were performed using Shimadzu FT-IR model number 8400. Approximately three mg of lyophilized flower extract under study was mixed with 300 mg of dried KBr, crushed well in mortar and pestle to prepare thin pallet for analysis, Same procedure was performed for synthesized Ag NPs using flowers extract, 16 scans per sample were taken in range of 400-4000 cm^{-1} [16]. **Scanning electron microscopy (SEM) :** A drop of aqueous solution containing purified silver nanomaterials obtained after repetitive centrifugation was placed on the carbon coated copper grids and dried under infrared lamp for characterization of their morphology using FEI Quanta 200 Scanning electron microscope at accelerating voltage of 20 KeV.

Assay for antimicrobial activity of silver nanoparticles : The silver nanoparticles is deionized water were tested for their antibacterial activity by the agar diffusion method. *Pseudomonas aeruginosa*, *Shigella flexneria*, *Klebsiella pneumoniae*, *Salmonella typhi*, *Enterobacter* and *Vibrio cholerae* were used for this analysis. These bacteria were grown on nutrient broth (NB) media for 24 hours prior to the experiment, seeded in agar plates by the pour plate technique. **Phytochemical analysis:** Test was performed for the detection of alkaloids, flavonoids, cardenolides, saponins, phenols, tannins, anthraquinones, cardiac glycosides, phlobatannins, terpenoids. [17,18]

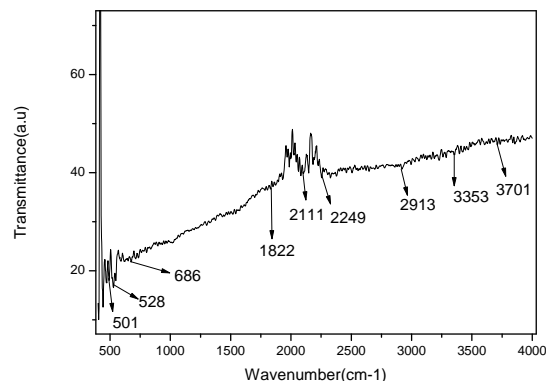
IV. RESULTS AND DISCUSSION

A reduction of Ag NPs was clearly observed when *Ricinuscommunis* leaf extract was added with AgNO₃ solution within 20 min. The colorless solution was changed to brown color which indicates the formation of silver nanoparticles. UV-Vis-spectroscopy and Fourier transform-infrared spectroscopy analysis

The mixture of leaf extract and AgNO₃ solution was subjected to ultraviolet-visible (UV-vis) spectroscopy analysis in the recorded spectra, and showed a observable peak at 340 nm which corresponds to the wavelength of the surface Plasmon of Ag NPs (Figure 1). Various reports have established that the resonance peak of silver nanoparticles appears around this region [15]. Fourier transform-Infrared (FT-IR) analysis was performed to identify the possible biomolecules responsible for the reduction of the Ag⁺ ions and capping of the reduced Ag NPs synthesized using *Ricinuscommunis* leaf extract, The strong IR bonds were observed at 3,702, 3354, 2,913, 2249, 2111, 1823, 688, 528, and 500 cm⁻¹. The bands which appeared at 3,702 cm⁻¹ corresponding to N-H, 3354 and 2913 cm⁻¹ –OH stretching and alkyl –C-H stretching, respectively [19]. The bands at 2249 and 2111 cm⁻¹ are due to the alkyl C=C and alkyne C≡C stretching, respectively. The IR band observed at 1823 cm⁻¹ may be ascribed to carbonyl –C=O stretching mode, respectively. The low band at 688 cm⁻¹ corresponds to alkyl halide C-Cl stretching. The two new strong bands recorded at 528 and 500 cm⁻¹ in the spectra of the synthesized material were assigned to Alkyl halides of C-Br and C-I bending peaks may be raised due to the reduction of AgNO₃ to Ag nanoparticles (Figure 2).



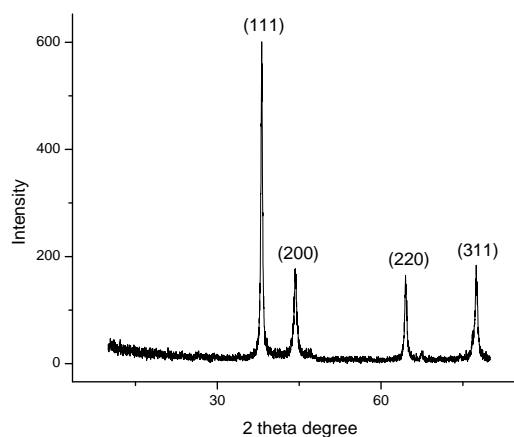
(Figure 1) UV-vis spectrum of Ag NPs synthesized by *Ricinuscommunis* leaf extract.



(Figure 2) IR spectra of Ag NPs synthesized using *Ricinuscommunis* leaf extract.

X-ray diffraction

X-ray diffraction pattern (XRD) was recorded for the synthesized Ag NPs (Figure 3). Three distinct diffraction peaks at 38⁰, 44⁰, and 64⁰ were indexed with the planes (111), (200), and (220) for the face-centered cubic silver as per the JCPDS card no. 89-3722. The well resolved and intense XRD pattern clearly showed that the Ag NPs formed by the reduction of Ag⁺ ions using *Ricinuscommunis* leaf extract are crystalline in nature. Similar results were reported for Ag NPs in the literature [20]. The low intense peak at 77⁰ belongs to (311) plane. Average particle size (D) of synthesized NPs is found to be 27-29 nm using Scherer's formula.

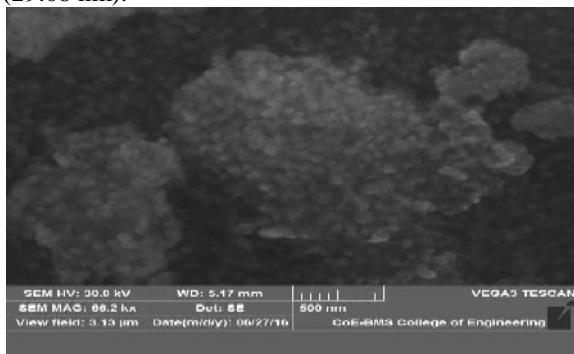


(Figure 3) XRD pattern of synthesized silver nanoparticles

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Scanning electron microscopy (SEM) analysis:

The scanning electron microscopy (SEM) image (Figure 4) further ascertains that the silver nanoparticles are pre-dominantly spherical in morphology. The average size of synthesized AgNPs is obtained in SEM analysis (29.08 nm).



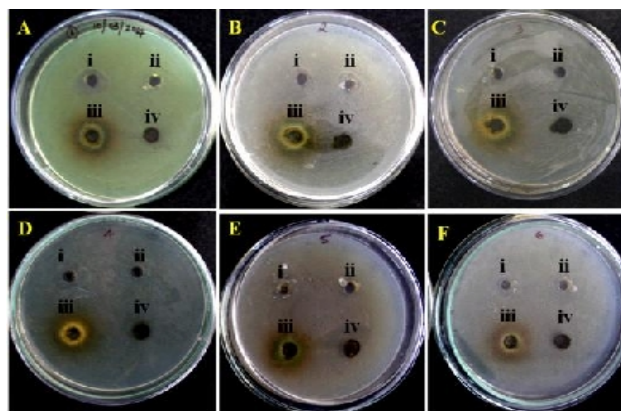
(Figure 4) SEM image of Ag NPs using leaf extract of *Ricinuscommunis*.

Antibacterial Assay:

antibacterial assay was performed against bacterial pathogens like nosocomial pathogens such as *Pseudomonas aeruginosa*, *Shigella flexneria*, *Klebsiella pneumoniae*, *Salmonella typhi*, *Enterobacter* and *Vibrio cholerae* by standard disc diffusion method, briefly agar medium was used to cultivate bacteria. Fresh overnight culture of inoculum (0.1 ml) of each culture was spread on to Mueller Hinton Agar (MHA) plates. The plates were incubated at 37°C overnight. Next day the inhibition zones around the discs were measured. For *Ricinuscommunis* the Zone of inhibition was found to be mm for *Pseudomonas aeruginosa*, *Shigella flexneria*, *Klebsiella pneumoniae*, *Salmonella typhi*, *Enterobacter* and *Vibrio cholerae* whereas the study done by the Zone of inhibition found was 12-17mm for these specie[21].

Table 1: Result for antibacterial activity by disc diffusion method

Plate	Bacterial Species	Aqueous extract (mm)	AgNPs (mm)
A	<i>Pseudomonas aeruginosa</i>	NS*	16
B	<i>Shigella flexneria</i>	NS*	13
C	<i>Klebsiella pneumoniae</i>	NS*	17
D	<i>Salmonella typhi</i>	NS*	16
E	<i>Enterobacter</i>	NS*	14
F	<i>Vibrio cholerae</i>	NS*	16



(Figure 5) Zone of inhibition of A) *Pseudomonas aeruginosa*, B) *Shigella flexneria*, C) *Klebsiella pneumoniae* D) *Salmonella typhi* E) *Enterobacter* F) *Vibrio cholerae* for i) Standard ii) Control iii) AgNPs iv) Aqueous extract.

V. PHYTOCHEMICAL ANALYSIS:

Qualitative phytochemical analysis:

The ethyl alcohol as well as petroleum ether extracts of *Ricinuscommunis* were evaluated for qualitative and quantitative determination of major phyto constituents i.e. tannins, cardenolides, terpenoids, flavonoids, cardiac glycosides, saponins and phenols. The results of phytochemical analysis of *Ricinuscommunis* plant are presented in table 2, and some photographs of phytochemical analysis are shown in fig 1,2,3,4,5,6,7,8 and 9. Both extracts yielded the presence of flavonoids, saponins, cardiac glycosides, terpenoids. including these phytochemicals ethyl alcohol extract shown the presence of phenols, anthraquinones, alkaloids and cardenolides.

Table 2. Results of phytochemical analysis of *Ricinuscommunis* (leaf)

Sl. No	Phytochemicals	Solvents used for extraction	
		Petroleum ether	Ethanol
1	Flavonoids	++	++
2	Saponins	-	-
3	Phenols	-	-
4	Tannins	++	-
5	Anthraquinones	-	+
6	Cardiac glycosides	++	++
7	Terpenoids	+	+
8	Cardenolides	-	+
9	Alkaloids	-	+

Repeated the experiment two times for each replicates. - : absent, +: indicates, ++: presence, +++: confirms

Synthesis and Characterization of Silver Nanoparticles using *Ricinus communis* Plant and Study of their Biological Activity



Fig 1: Test For Tannins



Fig 2: Test For Flavonoids



Fig 3: Test For Alkaloids



Fig 4: Test For Cardiac Glycosides



Fig 5: Test For Cardenolids

Quantitative phytochemical analysis:

- ◆ Flavonoids: 1.794g in 10g of dry sample.
- ◆ Alkaloids: 0.308g in 5g of dry sample.
- ◆ Phenol: 162.5mg/L.

VI. CONCLUSION

The present work indicates the green-synthesized AgNPs using *Ricinus communis* leaf extract was done and confirmed by UV-Visible spectrometer, FT-IR, SEM and XRD techniques. The average size of synthesized silver nanoparticles is found to be 27-29nm using XRD data by Scherrer's formula, which is approximately similar as the size obtained in SEM analysis (29.08nm). The antimicrobial activity depends upon the concentration of Ag NPs to produce the most significant effects against the gram-positive and gram-negative bacteria. The phytochemical analysis shows that the more number of phytochemicals are present in the *Ricinus communis* leaf extract. This green-synthesized method is rapid, facile, convenient, less time consuming, environmentally safe, and can be applied in variety of existing applications. This plant leaf extract compounds can be extended to the synthesis of the other metal and non-metal oxide nanoparticles.

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Design and Study of a Small Tesla Coil for Wireless Power Transmission in Domestic Sector

^[1] Anandita Goswami ^[2] Diptanu Dey ^[3] Bharat Kumar Boyanapalli ^[4] Prasenjit Debnath
^[5] Rajnish Kumar Chaudary

^[1] Department of Electronics & Communication Engineering,
^{[2][3][4][5]} Department of Electrical Engineering
National Institute of Technology
Agartala

Abstract:-- This paper has focused on the step-by-step design of a high frequency medium size (1-3 kW) air-cored resonance transformer commonly called tesla coil, that can be easily used for measurements and general research. Therefore, the task is to minimize the number of stochastic and unknown parameters influencing the device functionality and pointing out pros and cons of each solution. The physical dimension of the tesla transformer has been chosen due to cost effectiveness and availability of the regarding components. This design has mainly two units' viz., a power supply and tesla coil. The power supply which fed the Tesla coil having voltage rating 12kV and current rating 120mA has been designed by using three microwave oven components. These components are assembled as dual MOTs voltage doubler circuit and necessary simulation has been carried out by using MicroSimSchematics for the verification of performance.

Index Terms:--Microwave Oven , Transformer, Multi mini Capacitors, MicroSim Schematics, Toroid, Tesla Coil CAD

I. INTRODUCTION

A Tesla coil is a special type of transformer which takes up the primary voltage to a significantly higher secondary voltage. This secondary voltage is fed to a metallic dome or toroid circuit for dissipation of electric equipotential line. When an apparatus is within a limit such that it receives significant amount of electric flux, the apparatus starts working. Another method states that these electric lines can be converged and collected by another metallic dome and can be stepped down so that it can be fed to any regular apparatus. In the first case, only those apparatus that operate on very high voltages like fluorescent lamp, CFL, CRT, etc can be operated directly using a Tesla coil. When the Tesla coil emits electric flux, it comes in terms of kilovolts and miliamperes. As the Copper losses are dependent on current , Tesla coil significantly reduces such losses.

II. DESIGN OF TESLA COIL

Cylindrical Primary Coil Design

The primary coil was designed the a cylindrical one, made of PVC coated conducting wire. For the secondary coil to move freely inside the primary coil, the inner diameter of the primary turn must be a bit more than the outer diameter of the secondary coil. For optimal performance, secondary and primary circuits must have

the same resonance frequency. The value of the primary capacitor is taken as 0.033μF. Now, the primary inductance may be calculated by the equation (1)

$$L_p = \frac{1}{C_p} \left[\frac{1}{2\pi f_s} \right]^2 \dots\dots\dots (1)$$

The cylindrical coil is also better for compact design. It distributes the flux evenly to the secondary, and doesn't cause much variation in flux density. It is also easier to place in domestic households as it requires less space.

Pole Type Secondary Coil Design

The secondary diameter and height (D/H) ratio has been chosen as 1:5. As per the position of a typical household, it was decided that secondary coil height should be 50cm and to maintain the D/H ratio, suitable coil diameter is 10cm. The 26 SWG (diameter of 0.457mm) magnet wire is used for secondary coiling through out 55cm. Since, no spacing between the turns, thus total number of turns are above 1100. The secondary inductance is given by Wheeler's [4] emperical equation (2).

$$L_s = \frac{R_s^2 N^2}{2540 (9 R_s + 10 H)} \dots\dots\dots (2)$$

Where; L_s is secondary inductance (mH), R_s is secondary radius (cm), H is secondary height (cm), N is number of turns.

The secondary self capacitance is estimated by a formula due to Medhurst [5] is given in equation (3).

$$C_s = KD \dots\dots\dots(3)$$

Where; C_s is secondary self capacitance (pF), D is secondary diameter (cm), K is a constant depending on the D/H ratio.

The self- resonance frequency of the secondary without top load is given in equation (4).

$$F_s = \frac{1}{2\pi\sqrt{L_s C_s}} \dots\dots\dots(4)$$

Where; F_s is self-resonance frequency of the secondary (kHz), L_s is secondary inductance (mH), C_s is secondary capacitance (pF).

c. Toroid design

The selected top terminal [6] is a toroid with an outer diameter d_1 and a cross-section diameter d_2 . The toroid capacitance is calculated from the following empirical equation (6).

$$C_{top} = 2.3(1.2781 - \frac{d_2}{d_1})^2 \cdot 0.1217 d_2 (d_1 - d_2)$$

Where, C_{top} is toroid capacitance (pF), d_1 is toroid outer diameter (cm), d_2 is toroid diameter .

III. CURRENT LIMITING AND SAFETY

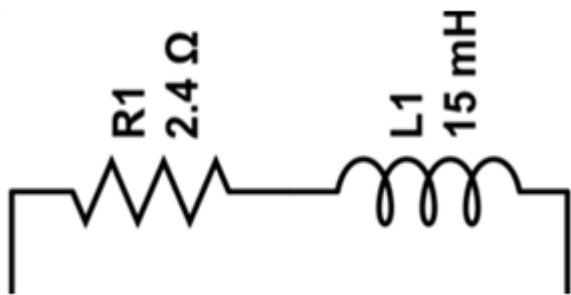


Figure 1: Resistance-inductor assembly

In order to limit the current flowing through the coil, an assembly of resistor of 2.4Ω and inductor of 15 mH is added in series. This restricts the current to 2A .

IV. RESULTS:

After the Tesla Coil was ready, the Voltage and current was measured at various points by placing the receiving arrangements at various intervals. The received values of Voltage and Current was multiplied to get the value of received power. The ratio of received power and dissipated power indicates the efficiency of the transmission. This efficiency was measured at various distances from the dissipating coil, and the graph was plotted as shown in figure 2.

As shown in the graph, the efficiency of the system is more or approximately equal to 40% till 5 metres. A typical domestic household can be well covered within 5 metre radius.

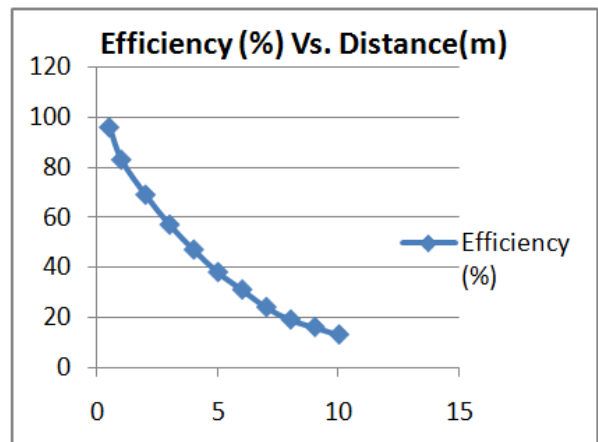


Figure 2: Efficiency Vs. Distance graph for the Tesla Coil

Direct Applications of wireless power transmission using Tesla Coil include Fluorescent lamps where high voltage and low current is required. Furthermore there is no requirement of choke or ballast as Tesla coil is already supplying high voltage. CFL also can run directly by the use of Tesla coil. Relatively smaller Neon Signs can be powered by the use of similar Tesla coils. Besides CRT appliances like Televisions, Biomedical monitors can be powered directly by similar Tesla coils.

Indirect applications of Tesla coils involve the convergence of electric lines which can be collected by another metallic dome and can be stepped down so that it can be fed to any regular apparatus which include fan, pumps, inductive loads, Incandescent Lamps.

Therefore ultimately the usage of Tesla Coils provide excellent transportation in short range (1-2m

radius) with almost no loss transmission along with negligible current hazards (max 2 mA) and is amazingly cost effective and almost maintenance free.

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Effective De - Duplication Method in Secure Cloud Storage

Dr.Sunil Tekale
Professor-CSE
Department of Computer Science
Malla Reddy College Of Engineering
Sunil.tekale2010@gmail.com

Abstract:-- Cloud computing is a promising computing standard which resources of the computing infrastructure are provided as services over the Internet. There is limited source of storage and networking in cloud system. So data de-duplication takes an important role in the cloud structure. In this paper data de-duplication process will be discussed in detail. In data de-duplication there are several methods available that makes it easy to implement. In this paper we will examine about all methods, processes that are used in data de-duplication.

Keywords: cloud computing, Scalability, virtual machine, de-duplication.

I. INTRODUCTION

Clouds are large pools of easily usable and reachable resources. In cloud all resources connected virtually to create single system image. These resources can be dynamically reconfigured to adjust to a flexible load (scale), allowing optimum resource utilization. Cloud storage refers to scalable and elastic storage capabilities that are delivered as a service using Internet technologies with elastic provisioning and use based pricing that does not penalize users for changing their storage consumption without notice. There are five basic characteristic of any cloud system that are:

- ◆ On-demand self-service
- ◆ Broad network access
- ◆ Resource pooling
- ◆ Measured service
- ◆ Rapid elasticity

Cloud computing contains both hardware and applications provided to users as a service by the Internet. With the fast development of cloud computing, ever more cloud services have emerged, such PaaS (platform as a service), as SaaS (software as a service), and IaaS (infrastructure as a service). Computing resources [9] are limited and eventually any system which grows in data or usage will saturate the resources available to it.

The resources in question may be e.g. processing capacity for computationally intensive

systems or storage capacity for data intensive systems. Network Capability is an important scalability point in distributed systems. Structural scalability alarms the interior design of a system and provides methods to it to manipulate the data model. It means it provides methods to shrink data model and expand data model. It can understand like its deployment.

Cloud storage is a paradigm in which the online storage is networked and records are stored on several committed storage servers. Sometimes these storage servers can be maintained by other third parties. The concept of cloud storage is derived from cloud computing. It denotes to a storage device accessed over the Internet via Web service application program interfaces (API). For example: HDFS (Hadoop Distributed File System, hadoop.apache.org) is a distributed file system that runs on commodity hardware; it was introduced by Apache for managing huge data.

Data de-duplication is also known as single instancing or intelligent compression. It essentially points to the removal of replicate data. In the de-duplication process, duplicate data is deleted, only one copy or single instance of the data to be stored in the database. Data de-duplication is a term used to describe an algorithm or technique that eliminates duplicate copies of data from storage. Data de-duplication is commonly performed on secondary storage systems such as archival and backup storage.

II. RELATED DATA

A. Data De-Duplication

The term data de-duplication points to the techniques that [1] saves only one single instance of replicated data, and provides links to that instance of copy in place of storing other original copies of this data. By the evolution of services from tape to disk, data de-duplication has turned into a key element in the backup process. It specifies that only one copy of that data is saved in the datacenter [10]. Every user, who wants to access that copy linked to that single instance of copy. So it is clear that data de-duplication helps to decrease the size of datacenter. So it could be said that de-duplication means that the number of the replication of data that were usually duplicated on the cloud should be controlled and managed to shrink the physical storage space requested for such replications.

The basic steps for de-duplication are:

- a) In the first step files are divided into small segments.
- b) After the segment creation new and the existing data are checked for similarity by comparing fingerprints created by SHA-1 algorithm (another method can also be applicable).
- c) Then Metadata structures are updated. d) Segments are compressed.
- e) All the duplicate data is deleted and data integrity check is performed.

B. Requirements for data De-Duplication

There is only one necessary condition for the data de-duplication is that data de-duplication should be scalable [2]. It means that de-duplication should be elastic. It doesn't affect to the overall storage structure. To handle scalable de-duplication, two methods have been proposed,

1. Sparse indexing: Sparse indexing is a method used to solve the chunk lookup blockage caused by disk access, by using sampling and manipulating the inherent locality inside backup streams. It picks a small slice of the chunks in the stream as samples; then, sparse index maps these samples to the existing sections in which they occur. The arriving streams are fragmented into relatively big segments, and each segment is de-duplicated against only some of the most similar previous sections (segments).

2. Bloom filters with caching. The Bloom filter exploits Summary Vector. Basically summary vector is a compact in-memory data structure, for discovering new segments; and Stream-Informed Segment arrangement, which is a data arrangement method to

improve on-disk locality, for consecutively accessed segments; and Locality Well-maintained Caching with cache fragments, which maintains the locality of the impressions of duplicated segments, to achieve high cache hit ratios.

C. Types of data de-duplication

There are two major categories [8] of data de-duplication: Offline Data de-duplication: [7] in an offline de-duplication state, first data is written to the storage disk and de-duplication process takes place at a later time. Online Data de-duplication: In an online de-duplication state, replicate data is deleted before being written to the storage disk. Once the timing of data de-duplication has been decided then there are numbers of existing techniques that can be applied. The most used de-duplication approaches are: whole file hashing (WFH), sub file hashing (SFH), and delta encoding (DE). Whole File Hashing: In a whole file hashing (WFH) technique, the whole file is directed to a hashing function. The hashing function is always a cryptographic hash like MD5 or SHA-1. The cryptographic hash is used to find entire replicate files. This approach is speedy with low computation and low additional metadata overhead. It works very well for complete system backups when total duplicate files are more common. However, the larger granularity of replicate matching stops it from matching two files that only differ by one single byte or bit of data. Sub File Hashing: [2] Sub file hashing (SFH) is appropriately named. Whenever SFH is being used, it means the file is broken into a number of smaller sections before data de-duplication. The number of sections depends on the type of SFH that is being used. The two most common types of SFH are fixed size chunking and variable-length chunking. In a fixed-size chunking approach, a file is divided up into a number of fixed-size pieces called "chunks". In a variable-length chunking approach, a file is broken up into "chunks" of variable length. Some techniques such as Rabin fingerprinting [28] are applied to determine "chunk boundaries". Each section is passed to a cryptographic hash function (usually MD5 or SHA-1) to get the "chunk identifier". The chunk identifier is used to locate replicate data. Both of these SFH approaches find replicate data at a finer granularity but at a price.

Delta Encoding: The term delta encoding (DE) comes from the mathematical use of the delta symbol. In math and science, delta is used to calculate the "change" or "rate of change" in an object. Delta encoding is applied to show the difference between a source object and a target object. Suppose, if block A is the source and

block B is the target, the DE of B is the difference between A and B that is unique to B. The expression and storage of the difference depends on how delta encoding is applied. Normally it is used when SFH does not produce results but there is a strong enough similarity between two items/ locks / chunks that storing the difference would take less space than storing the no duplicate block.

III. CATEGORY OF DATA DE- DUPLICATION STRATEGIES

Data de-duplication strategies can be categorized according to their operational area. In this respect there are two main data de-duplication strategies:

File-level De-duplication: File level de-duplication is performed over a single file. In this type of de-duplication two or more files are identified as similar if they have the same hash value.

Block-level de-duplication: Block level de-duplication is performed over blocks. It first divides files into blocks and stores only a single copy of each block. It could either use fixed-sized blocks or variable-sized chunks. Target based de- duplication: This type of de-duplication performed on the target data storage center. In this case the client is unmodified and not aware of any de-duplication. This technology improves storage utilization, but does not save bandwidth Source based de- duplication: This type of de-duplication performed on the data at the source before it's transferred. A de-duplication aware backup agent is installed on the client who backs up only unique data. The result is increased bandwidth and storage efficiency. But, this enforces extra computational load on the backup client. Replicates are changed by pointers and the actual replicate data is never sent over the network.

IV. THE PROPOSED SYSTEM

In the proposed system we are achieving the data de-duplication by providing the proof of data by the data owner. This proof is used at the time of uploading of the file. Each file uploaded to the cloud is also bounded by a set of privileges to specify which kind of users is allowed to perform the duplicate check and access the files.

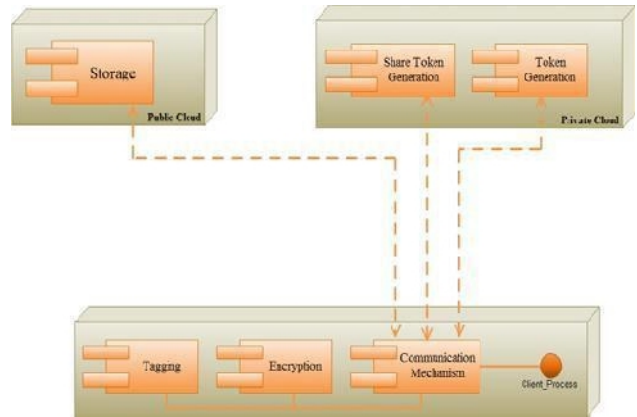


Fig1. Proposed System Framework Communication

Before submitting his duplicate check request for some file, the user needs to take this file and his own privileges as inputs. The user is able to find a duplicate for this file if and only if there is a copy of this file and a matched privilege stored in cloud. Fig1. Shows the Proposed System Framework Communication between clients, Private Cloud, Public Cloud.

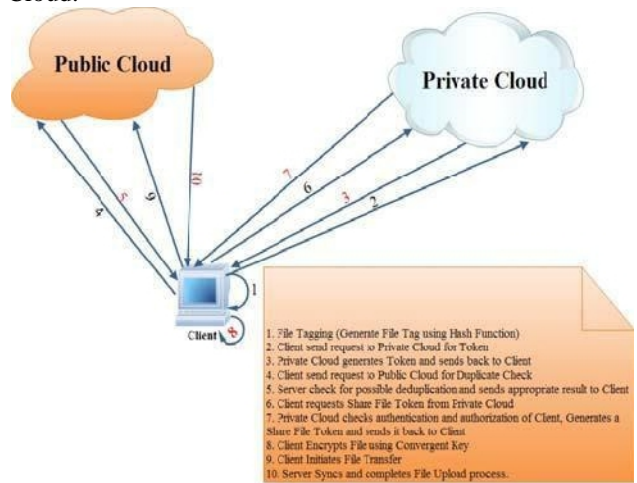


Fig2. Proposed System of Operations

In this work Public Cloud is used for storage data ,Private Cloud is used for performance the operations like share token generation ,token generation, also Client is performed operations like tagging of file ,encryption of file, communication between private cloud and public cloud.

Encryption of Files

Here we are using the common secret key k to encrypt as well as decrypt data. This will use to convert the plain text to cipher text and again cipher text to plain text. Here we have used three basic functions:

KeyGenSE: k is the key generation algorithm that generates κ using security parameter l .

EncSE (k, M): C is the symmetric encryption algorithm that takes the secret κ and message M and then outputs the ciphertext C ;

DecSE (k, C): M is the symmetric decryption algorithm that takes the secret κ and ciphertext C and then outputs the original message M .

V. CONFIDENTIAL ENCRYPTION

It provides data confidentiality in de- duplication. A user derives a convergent key from each original data copy and encrypts the data copy with the convergent key. In addition, the user also derives a tag for the data copy, such that the tag will be used to detect duplicates. The user has to prove that the data which he wants to upload or download is its own data. That means he has to provide the convergent key and verifying data to prove his ownership at server.

VI. CONCLUSION

Cloud computing has reached a maturity that leads it into a productive phase. This means that most of the main issues with cloud computing have been addressed to a degree that clouds have become interesting for full commercial exploitation. This however does not mean that all the problems listed above have actually been solved, only that the according risks can be tolerated to a certain degree. Cloud computing is therefore still as much a research topic, as it is a market offering. For better confidentiality and security in cloud computing we have proposed new de- duplication constructions supporting authorized duplicate check in hybrid cloud architecture, in which the duplicate-check tokens of files are generated by the private cloud server with private keys. Proposed system includes proof of data owner so it will help to implement better security issues in cloud computing.

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Study of Land Acquisition issues Causing Delay of NHAI Projects

^[1]Thakur Aman Singh ^[2] Avinash Kumar Singh ^[3] Prof.Siddesh K. Pai ^[4] Dr.Ashish Tripathi
^[5] Dr.Neeraj Anand

^{[1], [2], [3]} National Institute of Construction Management and Research (NICMAR)

^{[4], [5]} University of Petroleum and Energy Studies (UPES), Dehradun

Abstract:-- India's long-standing problems in delay in highway project included lack of funding, weak capability to implement projects, poor policy coordination, and delays in decision making. The government took actions to fill up the financing gap, such as increasing the funds for highway development and facilitating private sector participation. Despite these efforts, fundamental issues still remained including introducing more sophisticated financial instruments, diversifying methods to involve the private sector, and enhancing the financial and managerial autonomy of the National Highways Authority of India (NHAI) for eventual corporatization. During last financial year about 40% of projects totaling 14,000 km and costing around Rs 94,000 crores got delayed, and 70% of these are managed by NHAI and the total cost of these works is close to Rs 80,500 crores. NHAI was implementing 185 projects during 2014-15 costing Rs 1.36 lakh crores. Out of the 185 projects, 120 were delayed. This covered 9,376 km and their total cost was around Rs 80,500 crore. The major role in the delay of project is due to Land Acquisition, which is a major part of concern in our research work.

The paper deals with analysis of Western Transport Corridor which was funded by ADB. The Western Transport Corridor, comprising NH-8 and NH-4, connecting Delhi, Mumbai, Bangalore, and Chennai (Golden Quadrilateral) is one of the busiest corridors in India. The section between Bangalore and Mumbai falling within NH-4 also has high traffic volume. At appraisal, the project was envisaged to be implemented over 48 months, inclusive of procurement and pre-construction activities, and was expected to be completed by 30 June 2005 but it was completed on 7 August 2012.

Keywords:-- Project delays, National Highways Authority of India (NHAI), time overruns, Land acquisition.

I. INTRODUCTION

Time is money and the delay in any construction project affects time and hence money, which is the essence of any economy. The timely completion of highway construction projects is well-thought-out one of the most important factors referring to the project success, as well as the quality and the safety. Uncertainties, risks, delays related to land acquisition, protests and resistance on the part of the displaced have become the most important tailback for investments exclusively in the infrastructure sector. To be sure environmental protest that has a mass following also have their roots in the problems of land acquisition and rehabilitation. Thus if the problems arising out of land acquisition, rehabilitation and environment (especially environmental protest) are considered together, they account for the irresistible cause of delays, cost overruns and high risks in projects today.

This paper includes the issues regarding the acquisition of land in the highway projects in pre-execution process or during execution. It also enumerates the different types of process involved in land acquisition.

The issues are also there in various fields like railways, canals, buildings etc.

1: List of NH projects delayed due to Land Acquisition [2]

State	Name of Project
Assam	1. Construction of new 2 lane road with paved shoulder from 52.00 to 67.600 of NH-154
	2. Reconstruction and widening of 2 lane from km.67.600 to 89.000 of existing road including paved shoulder of nh-154
	3. Construction of 20.35 km.2 lane Tinsukia bypass with paved shoulder between km.635.800 to km.653.400 of NH-37
	4. Construction of 2 lane highway with paved shoulder between km.603/00 to km.637/0 of NH-37(bypasses of Mohanbari, Chabua and other villages)
	5. Construction of 2 lane nh-37 with paved shoulder from end of rob at Makum TO NH-52 near Rupai.
	6. Realignment and construction of 2 lane nh-37 with paved shoulder from Rupai O

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	Tallap
Arunachala Pradesh	2 laning of NH-229 from Nechipu to Hoj section
Bihar	1.Construction of road NH-102 Takiya bridge in km.21 2.Patna-Muzzaffarpur 3.Laning of Mokama-Munger (Approved Length 70 Km)
Jammu & Kashmir	1.Upgradation of Srinagar –Uri (NH-1A) 2. Construction of 2 Lane Road Batote – Kishtwar-SinthanpassAnantnag (NH-1B) 3.Double Laning Of Road Srinagar-Kargil-Leh (NH-ID)
Goa	1.Goa –Karnataka Border –Panaji 2.Maharashtra-Goa Border –Panaji
Kerala	1.Cherthalai To Ochira 2. Ochira- Thiruvananthapuram 3.Kerala/Knt Border-Kannur 4.Kannur- Kuttipuram 5.Thiruvananthapuram-Kerala/TN Border 6.Vadakkancherry-Thrissur(KL-3) 7.NH-Connectivity To ICTT Vallarpadam
West-Bengal	1.Dalkola Bypass 2.Siliguri-Islampur 3.Bahrapore-Farakka 4.Farakka-Raiganji 5.Raiganji-Dalkola 6.Barasat-Krishnagar 7.Krishnagar –Bahrapore

*Source: www.cerebral business .com,
www.cerebral business research.mht*

II. LAND ACQUISITION ISSUES CAUSES DELAYS IN HIGHWAY PROJECTS

Land acquisition in India is the process by which the Central or a state government in India acquires private land for the purpose of development of infrastructural facilities, industrialization or urbanization of the private land, and provides compensation to the affected land owners and their rehabilitation and resettlement.

Land acquisition in India is overseen by the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (LARR) and which came into existence from 1 January 2014. Till 2013, land acquisition in India was administered by Land Acquisition Act of 1894.

Issue 1: Efficiency of (Non- Government Organization) NGOs

An NGO (Development Management Trust) was hired to assist the EA in effectively implementing the RPand to provide psychotherapy to APs. An NGO tasked to be responsible for such responsibilities so that to have a strong local presence and maintain close relationship with APs. The project WTC, comprising NH-8 and NH-4, connecting Delhi, Mumbai, Bangalore, and Chennai, is one of the busiest corridors in India. Support for road safety, capacity building and project implementation including land acquisition and resettlement activities were also provided. In this project the NGO was not as effective as originally visualized. The NGO was not locally based and hence it could not be expected to immediately have empathy with the APs and to be ethnically delicate to the Project-affected villages. Most of the time, the APs alleged the NGO as “an agent of NHAI” and not as an independent organization who would look out for their welfares. The NGO failed to strategize for the effective income generating activities of APs. The NGO didn’t perform as the facilitator to guide and advice APs on how best to utilize their compensation and assistance packages, even in creating linkages between APs and the government’s development schemes, local finance institutions, and to encourage enterprise development. Moreover, the NGO didn’t play an active and effective role in coordinating with the contractors in providing employment to APs, only few of the APs were employed.[3]

Typically people whose habitans and land are taken over by the government suffer a lot and their protest while unsuccessful result in much social loss and arouses the sympathy of the intellectuals so much so that a significant anti-development orientation among people, especially the intellectuals and (Non-Government Organizations) NGOs builds up.[4]

Issue 2: Compensation and Entitlements

For this issue we are dealing with the same case of the project WTC which was funded by ADB. The compensation, entitlements, and accountabilities associated with impacts under the Project were set out and the detailed suitable matrix was developed. The APs suffered land losses have been categorized under two categories:

- (i) APs losing a part of their houses,
- (ii) APs losing entire houses.

Provisions had also been made for loss of orchard lands and private factory lands. In general,

compensation at market rates would be paid to all persons losing lands. Compensation for loss of structures was computed at current construction (replacement) cost levels. Income losses would be compensated accordingly.

ADB's IR Policy stipulated that compensation for APs will be at replacement value of the asset. However, the laws and regulations in India, particularly the Land Acquisition Act, allow compensation at market value which is decided based on the asset registration value and is generally lower than the replacement value. In the case of agricultural land, the NHAI used certain approaches to calculate the replacement value of land. There was no established formula to derive the replacement value for urban land. NHAI calculated compensation as per the National Highways Act at government rate. A provision for arbitration was made available to the APs. Also the APs could appeal to the Arbitrator in case they were not satisfied with the compensation received.

According to the findings, the compensation was to be paid to APs in December 2002 or several months after the land acquisition notification was awarded between 2000 and 2001 and the issuance of the notice to land owners in 2002. After the receipt of the award in 2003, the APs came up to the Arbitrator but only received assistance between 2004 and 2005. The APs related that it took them endless excursions to the Arbitrator and NHAI office before they were able to receive their compensation, thereby rendering the whole process slow and inefficient.[3]

There are laws regarding land acquisition in most of the countries that require quick and acceptable monetary compensation for persons who lose their land and property. However, cash compensation has many undesirable consequences, predominantly for tribal and other marginal people. Tribal economies are in large part non-monetized, based on reciprocal exchange of goods and services; therefore, people are not well accustomed to managing cash.[5]

Issue 3: Resettlement plan

The implementation of the RP, including land acquisition, was to be completed within 18 months from the start of the Project. Implementation of the RP including land acquisition, resettlement costs and services of NGOs, was estimated around Rs750 million (or \$15.9 million equivalent).

Relocation of forty-four shops took place under the Project, mainly owned by displaced non-titled APs

who had been successfully running their shops long along the Highway for at least 18 years (with a proof of panchayat license and record of stay). The 44 shop-owners had systematized themselves into the Sri Maruthi Squatters Association (SMSA) in 2001. The SMSA had so far collected a total of Rs70,000 (\$1,485) to buy the 1 acre land for their relocation site that NHAI had bought from the State Government. SMSA also covered the cost of the operating license from the local panchayat at Rs14,000 (or \$297) through member contributions. NHAI had constructed the shops and allotted Rs2,000 (or \$42) to each member of the 44 families as cash assistance but the APs refused to take this assistance since they preferred working capital to reinstate their respective businesses.[3] The research has largely focused on the impacts of relocation and strategies for adjustment (see Hansen and Oliver-Smith 1982).

There will be two issues of cultural survival quarterly (vol.12, Nos.3 and 4[1988]) they are also focus on problem of dislocation and resettlement. This article having also focuses on various aspects of the resettlement process Land acquisition & compensation.

Main causes for the delay are:

- ◆ Work of District level administration formed by the NHAI was not so effective that they had a proper influence on the people
- ◆ Recruited NGOs were not able to convince the people efficiently for the resettlement plan made by NHAI
- ◆ Micro-level planning was not done with an proficient manner

Upon completion, the NGO that was recruited to assist in the implementation of the resettlement action plan prepared a final report. The report indicated that

- ◆ The affected persons compensated with cost of Rs202.3 million,
- ◆ The resettlement was carried out adequately with assistance from the implementation unit of the project
- ◆ The common assets affected were well relocated

Issue 4: Environmental and Forest Clearances

Environmental clearance process has emerged as one of the critical pain areas impeding the infrastructural growth in India. The problem of balancing the environmental concerns with the needs of the growing economy and expanding population has thwarted infrastructural developments in the country for quite a few years now. It is extremely distressing that most of the crucial infrastructure projects in sectors like mining,

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national highway, thermal power, special economic zone, cement industry etc. have been unnecessarily and immensely delayed due to the process of environmental clearance. Delayed projects include crucial sixteen major highway projects within four states including the Chennai Port-Maduravoyal road in Tamil Nadu, Bahrapore-Farakka and Krishnanagar-Bahrapore projects in West Bengal, Cherthala -Ochira and Thiruvanthapuram (Kerala)/Tamil Nadu border. Projects in Kerala and Goa/Karnataka border-Panaji in Goa which are awaiting environmental clearances from the Ministry of Environment and Forests (MoEF).

In addition to this, certain projects have also suffered delay due to the time taken for reconstitution of the Expert Appraisal Committee from time to time. It has been seen both at the centre as well as the state level that Appraisal Committees are constituted and reconstituted periodically and their sittings to appraise projects and EIA can be more frequent than the present situation.

EC procedures for environmental clearance and public hearing are generally cumbersome. Factors like submission of incomplete information, poor quality of EIA/EMP, disproportionate details required with applications, delays in the meetings of the Expert Committees and site visit, etc., are the major reasons behind delays. Besides, projects after completion are also subjected to many regulatory requirements in terms of periodic inspections, returns, licenses, etc.; extending the whole procedure and thereby delaying the clearance. These regulatory constraints delay the grant of environment clearances.[7] The whole environment zone covering approximately more than five km on both side of the proposed alignment was studied, and strip plans prepared to lateral direction for the proposed alignment in parallel as well as diversion section. [8]

Details of projects for which concessionaires/developers have served termination notice to NHAI and projects already terminated due to delay in environment and forest clearance [1]

S.No	Name of the Project	Name of the Concessionaire	Remarks
1	Kishangarh-Udaipur-Ahmedabad	M/s GMR	Concessionaire issued termination notice on the grounds of non availability of Environment

			Clearance (EC)/Forest Clearance (FC). Both the clearances are received. The matter is subjudice
2	Sholapur-Bijapur	M/s Sadbhav Engineering	Project is foreclosed/terminated due to non availability of Wildlife Clearance (WC).
3	Cuttack-Angul	M/s AshokaCuttack - AngulTollway Ltd.	Concessionaire issued termination notice on the grounds of non availability of EC. EC since been received, the matter is sub-judice in the court.
4	Kota-Jhalawar	M/s Keti Constructions Ltd.	The project is terminated due to non availability of FC/ WC.
5	Aurangabad-BarwaAdada	M/s KMC Constructions Ltd.	The project has been foreclosed due to non availability of FC/EC.

Issue 5: Change in Scope

Scope change could be result in delay and cost overrun of the project. Scope can be defined as the entire accomplishment that is expected to be achieved at the end of a project. It can be said that all estimation, schedule, project plans, base lines & quality are generally designed as base in the early project scope. Thus, during execution any change in the project scope will mean that the entire early project plan will have to be revised such that as a revised budget, schedule and quality will have to be developed. This results in the consumption of more time and hence resources will be needed as against the initial baseline. Scope change in the project could be as a result of wrong initial scope definition, intrinsic risk and uncertainties, sudden change in interest, change in funding of project, etc. this could lead to request for change which in turn could lead to change in project accomplishment, budget or even the entire project team. Change in management due to poor scope could lead to dispute

which may necessitate spending time and money on arbitration and litigation for what the contractor or the client believes he is entitled to. Hence it would surely lead to delay of the highway projects.

We are dealing with the same case here, the WTC project. Encroachers on government land private owners was notified to remove their structures before civil works commenced and were allowed to salvage materials from the demolished structures, but no other compensation was provided to them. Susceptible families in this category were assisted on a case-to-case basis to improve their incomes and compensated for their lost assets at replacement value. Public utilities such as water tanks, bore wells, and water pumps; public buildings such as schools, hospitals; common property resources; and boundary walls would be affected. The original alignment design was changed to minimize negative impacts, predominantly land acquisition and resettlement; bypasses were constructed to avoid heavily populated areas. This results in the delay in the completion of project.

Issue 6: Delay due to land encroachment.

It was observed that when we are acquiring land for construction of proposed alignment lot of land which exist as government property was acquired by the people living near about and further they construct their houses and so on. Delay due to land acquisition is the one vital issues in construction industry. All the delay causes will affect the progress of the project as per their significance and occurrence.

Ennore Port Road Connectivity Project was done to validate the questionnaire survey. The project involves adequate improvement on four major roads connecting the Chennai – Ennore port involving total of 30.1 kilometers. The contract value is about 258.78 Crore and the actual duration of project was 24 months. The date of commencement of project is 03-06-2011 and the completion period was 02-06-2013. the special purpose vehicle (SPV) were formed comprising of NHAI (National highway authority of India), Chennai port trust, Ennore Port Limited and Govt. of Tamil Nadu they are looking after the funding of the project. the project was given at least five extension time.

The project was given four extension of time by NHAI itself and the fifth extension was recommended by the contractor. Even after the fifth extension of time (EoT) being granted, the project was just 91% completed till Jan 2015. Since it's a complex project consisting of four major roads, the works was carried out parallel. The major factor comprises of delay the project are:

- ◆ Land acquisition process.
- ◆ Delay due to land encroachment, temples, sewage pipes affected the progress of the project. [10]

III. CONCLUSIONS & RECOMMENDATIONS

1. Recruitment of NGOs

Hiring of NGOs is a very important and effective work, so this work should be done well before with the proper planning according to the schedule of project.

Role of NGOs:

- ◆ NGOs act as the pilots for larger projects mainly government projects by virtue of their capability to act more quickly and efficiently than the government bureaucracy.
- ◆ Upward communication involves updating government about what local people are thinking, doing and feeling while downward communication involves notifying local people about planning and doing and doing of government.
- ◆ In some cases, NGOs become representatives for the poor people and endeavour to influence government policies and programmes on their behalf. This could be done through various means fluctuating from demonstration and pilot projects to participation in public scenes and the formulation of government policy and plans, to publicize the research results and case studies of the poor people. Thus NGOs play roles from advocates for the poor to implementers of government programmes; from agitators and critics to partners and advisors; from sponsors of pilot projects to mediators.
- ◆ NGOs use interpersonal methods of communication, and study the right entry points whereby they gain the trust of the community they seek to benefit. They would also have a good idea of the feasibility of the projects they take up

In this project the NGO was not as effective as originally visualised. The recruitment of the NGO should be done after analysing it very carefully and on the basis of its past experience. The NGOs were not able to play even a single role successfully. NGO should be locally based so that it has greater influence on the people so that all the roles can be performed in a very efficient manner and which will ultimately result in the less or no delay in the land acquisition.

2. Resettlement Plan

District level administration work should have done an efficient work in understanding the people with scope of the project. Communication between these administration and localities took long time to get the conclusion and further continuation of the work. Therefore they should have communicated well with them even they could have convinced them about the project scope and the advantages of this highway project. Proper resettlement plan could be prepared well before the commencement of the project and which could be basically done by these local district administrative bodies.

The role of recruitment of NGO is to be done in a well-organized manner after analyzing it properly and on the basis of their work and influence on the local people. Communication between and NGO and people is assumed to be very successful as they stand by their side and work for them and make them understand every scenario of the project. This thing was something lacked in the project.

3. Compensation and entitlement

The Project required the acquisition of 1,601 acres of land, out of which 1,341 acres were agricultural land, 173 acres non-agricultural land, and the remaining 87 acres are government land. Land acquisition was expected to affect an estimated 18,906 persons. APs were not compensated properly or quickly. The compensation was allotted to them in 2002 or several months after notification was awarded to them about the land acquisition in between 2000 and 2001 and the issuance of the notice to land owners in 2002. Compensation should have given to them as per by the local district administration.

This compensation issue took them to endless trip to arbitrator and NHAI office which was the major cause due to land acquisition in the delaying of the project. These issues could have resolved well earlier if the proper planning had been done before and APs could have compensated well before by the administration. These issues are not good for the health of project so, an efficient communication is required and the main aim of the project should be accomplishment without affecting larger people and with proper effectiveness.[9]

4. Environmental clearance

Whether is it the Environmental Clearance process itself or purely the procedures? It is the later one in my understanding. The Environmental Clearance process consists of a chain of steps ranging from screening whether the project requires an environmental

clearance or not; to identifying the potential impact of the project; followed by a public consultation to a recommendation by the Expert Appraisal Committee to the Ministry of Environment and Forests. The most crucial issue in the process of environment clearance that comes in the way of implementation of project is the lengthy process of the Environmental Clearance. In general, a minimum of around 10- 12 months is the timeframe that project proponents face to only obtain an Environmental Clearance. This time frame is more often than not stretched due to mere procedural delays.

The process has also been made uselessly elaborate wherein after the review of the projects by the Expert Appraisal Committee; the recommendations are sent to the Ministry of Environment and Forest, which then awards the Environmental Clearance. This also results in inordinate delay. If this procedure is done away with, considerable time can be saved. Environmental management plan should be prepared relating to major environmental factors such as land-use patterns, water resources, biodiversity, air quality and the potential impact of air pollution on the health of local people to get the quick Environmental Clearance.

5. Change in scope

The first and the foremost thing is to identify the fact that change is anticipated in project and could equally be beneficial to the overall project success so that to achieve an efficient control for scope change. To incorporate a proper change management plan such that a proactive approach could be adopted and this is the most important thing to do. It should involve the project investors and assimilating their needs during the course of the project lifespan. Identifying the key success factor in conjunction with the client and establish KPI in the form of milestone during the planning phase of project plays a vital role. This will measure the accomplishment for reaching towards the project scope.

6. Land Encroachment

As per the observation in this case the main root cause of delay in project is due to land acquisition and it is excusable type delay the two major parameters that determine the success of the project is overall project cost and time. Since infrastructure brings economy to the country, any delays have to be avoided by clients and the contractors. In case of any delays, EVM is found to be helpful in finding out the probable completion time for the projects.

IV. ABBREVIATION

WTC	Western Transport Corridor
ADB	Asian Development Bank
NGO	Non-Government Organization
EA	Executing Agency
RP	Resettlement Plan
NHAI	National Highway Authority of India
APs	Affected Persons
EIA	Environmental Impact Assessment
EC	Environmental Clearance
WC	Wildlife Clearance
FC	Forest Clearance
EoT	Extension Of Time
NHAI	National Highways Authority of India

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Investigations on the Sloshing Behavior of Elevated Rectangular Water Tanks with and Without Internal Obstruction

^[1] Ganesh S.S.Y, ^[2] Sreenivas Sarma . P

^[1] Assistant Professor,CED, Madanapalle Institute of Technology and Science ,Madanapalle,

^[2] Professor,CED,Chaitanya Bharathi Institute of Technology , Hyderabad

^[1] ganeshssy@gmail.com ^[2] sreenivassarma.p@cbit.ac.in

Abstract:-- Sloshing has been one of the major concerns in the design of liquid storage tanks, particularly under seismic excitation. There are evidences of failures of liquid storage tanks due to sloshing, during the past earthquakes. The consequential increase in the hydrodynamic forces on the tank walls depend on a variety of factors such as geometry of the tank, height of liquid in the tank , fluid tank interaction etc.,. Added to these, the presence of an internal obstruction in the form of protruded columns or a shaft in to the tank structure will make the sloshing behavior all the more complicated.

This paper presents the results from an experimental study conducted on elevated rectangular tank models, on a mini shake table , simulating the seismic excitation . Sloshing heights and sloshing patterns are recorded from the experiments and their variation was studied by varying parameters such as tank capacity, spacing of bracings, water level in the tank and the amplitudes of vibration. All the studies were made with and without the presence of internal obstruction. Results obtained were compared with those obtained theoretically from the relevant code and also with those obtained from a software tool SaE Ca net. It is observed that the experimental results are in close agreement with the theoretical ones.

Index Terms— Elevated rectangular liquid storage tanks , Sloshing behavior , seismic excitation.

I. INTRODUCTION

A. *Definition and meaning of sloshing*

Sloshing means any motion of the free liquid surface inside its container. It is caused by any disturbance to partially filled liquid containers and is one of the major concerns in design of liquid storage tanks, moving tankers fuel tank of space vehicles and also in ships. During lateral base excitation seismic ground acceleration causes hydrodynamic pressure on the tank wall which depends on the geometry of tank, height of liquid, properties of liquid and fluid-tank interaction. There are evidences of failures of liquid storage tanks during earthquakes in the past , particularly due to sloshing.

B. *Effect of sloshing*

Earthquake induced sloshing in tanks is caused by ground motions which attenuate slowly with distance. A minimum freeboard is needed to accommodate the sloshing waves. Since freeboard results in unused storage capacity, many tanks lack the required freeboard. As a result, sloshing waves impact the roof, generating additional forces on the roof and tank wall. In spite of the fact that many tanks have suffered extensive damage due

to sloshing waves in the past earthquakes, the effect of sloshing waves is usually ignored in seismic design of tanks.

Insufficient freeboard causes upward load on the roof due to impacts from the sloshing wave, and increase in impulsive mass due to constraining action of the roof. The upward force on the roof can damage the roof, break the roof shell connection or tear the shell. Sloshing causes extreme lateral forces, moments and shears in various components of tank structures (supporting structures or tank structures as the case may be) which may cause even failures, if not accounted properly.

II. REVIEW OF WORKS DONE ON QUANTIFYING SLOSHING EFFECT IN ELEVATED WATER TANKS REVIEW STAGE

Many researchers and scientists did their research to quantify the sloshing effect in elevated tanks. Housner (1963) was the first to propose models to quantify the sloshing .and those models are being used even today .Sloshing of liquid in a tank is basically accounted by splitting the liquid in to two components viz., Convective and Impulsive . These components will be acting on the tank walls at different heights that depend on the

geometry proportions of the tank and the level of liquid in the tank as well .

Tang, M. and Chang (1991) shows that the sloshing motion in a tank containing two liquids are quite different from in a identical tank containing only one liquid, and the sloshing wave height computed based on the one liquid assumption may lead to an un conservative result. This finding make it a necessity to consider the effect of two liquids on the computation of hydrodynamic pressure in the fuel recycling tank .This deal with the dynamic response of a tank containing two different liquid subjected to seismic excitation. Both analytical and numerical methods are employed in the analysis. Subhash Babu and Bhattacharyya (1994) developed a numerical scheme based on finite element method to estimate the sloshing height in the seismically excited tank and to calculate the resulting pressure.

Choun and Yun (1998) also studied the sloshing response of rectangular tanks considering linear wave theory. Shenton et al., (1999) presents the results of an analytical investigation of the seismic response of isolated elevated rectangle water tanks. A discrete three-degree-of-freedom model of the isolated structure is presented that includes the isolation system, tower structure, and sloshing fluid. Seismic responses of base – isolated elevated tanks were studied by H W Shenton III & P Hampton (1999) seismic response of elevated water tanks“. The study involves a discrete three-degree of freedom model of the base – isolated structure & sloshing fluid. The results of their studies show that the seismic isolation system is effective in reducing the tower drift, base shear, overturning moment. The study also concluded that the isolation is most suitable for small capacity tanks.

Shenton and Hampton(1999) presented the result of an analytical investigation of the seismic response of isolated elevated rectangle water tanks. A discrete three-degree-of-freedom model of an isolated structure has been developed that includes the isolation system, tower structure, and sloshing fluid. Fluid-structure interaction is modeled using the mechanical analogy proposed by Housner. Premasiri (2000) also completed a concentrated research on the sloshing in the reservoirs subjected to multi DOF base motion. Comparing the result of experimental test on the rectangular tanks subjected to multi DOF base motion, with the analytical solution using linear superposition method.

Praveen Malthotra (2006) presented a simple method to estimation additional loads on tank roof, wall and foundation due to the impact from sloshing wave. He divided the mass of the mass into impulsive and convective mass and both mass are attached by linear spring.

Akyildiz et al. (2006) investigated the three-dimensional effects on the liquid sloshing loads in partially filled rectangular tanks by introducing non-linear behaviour and damping characteristic of the sloshing motion using Volume of Fluid (VOF) techniques. Livaoglu (2007) also investigated the effect of parameters such as fluid-structure interaction, soil structure interaction and presence of embedment on the dynamic responses of rectangular tanks. Ghaemmaghami and Kianoush (2010) conducted intensive research on the dynamic time-history responses of the rectangular tanks and also concluded the wave amplitude at the corner of the three-dimensional tank is higher than the wave amplitude at the middle cross section of the walls. The amplification of wave height at the corner of the tank against the one at the middle of the wall is profoundly related to tank configuration as well as the water depth.

Waghmare and Madhekar (2013) has conducted experimental investigation on Behavior of Elevated Water Tank under Sloshing Effect and also concluded Sloshing of water in tank depends not only on the volume of water in tank but also on staging height and h/D ratio. A detailed note on the computation of the sloshing effects is given in the draft code (IS 1893 Part II)

III. NEED FOR FURTHER STUDIES ON TANKS CONSIDERING SLOSHING AND INTERNAL OBSTRUCTION

Several special situations crop up in the practical field such as, presence of internal obstructions (in the form of columns / shafts protruding in to the tank part) . This aspect is still unexplored properly and requires attention. Keeping the non-availability of formulae for the computation of sloshing effects on tanks for such special situations in rectangular water tanks which are very commonly built in practice, an attempt is made in this work to study the dynamic behavior of rectangular water tank models considering the effects of sloshing and internal obstruction. For this purpose, rectangular tank models of two capacities are tested on a unidirectional mini shake table, giving two excitation amplitudes as inputs. By varying the parameters such as water levels in the tank, spacing of bracings, frequency of excitation and

Investigations on the Sloshing Behavior of Elevated Rectangular Water Tanks with and Without Internal Obstruction

Dimension of Sliding Platform	500mmX500mm
Operating Frequency	0-25Hz
Amplitude Resolution	1mm to 10mm
Max. Payload	50 kgs

capacity of the tank, the sloshing response of the tank models is noted in terms of Sloshing heights and Sloshing patterns, with and without internal obstruction in the tank. Sloshing heights obtained experimentally are compared with the theoretical values obtained from the formulae given in code and those obtained from a dedicated software as well.

IV. GSDMA GUIDELINES FOR SEISMIC DESIGN OF LIQUID STORAGE TANKS

Most elevated tanks are never completely filled with liquid. Hence a two-mass idealization of the tank is more appropriate as compared to a one-mass idealization, which was used in IS 1893: 1984. Two mass models for elevated tank was proposed by Housner (1963) and is being commonly used in most of the international codes.

A. Sloshing Wave Height

Maximum sloshing wave height for a rectangular tank is given by

$$d_{max} = (Ah)C R L/2$$

Where, $(Ah)C$ = Design horizontal seismic coefficient corresponding to convective time period Given in IS 1893 Part II

V. SIMULATION TESTS

To investigate the real behavior of the structures against earthquakes, several seismic test methods are used. Most popular methods are Real earthquake experiences, In situ tests, Static tests (pushover analysis), Shake table tests, Pseudo-dynamic tests, and Centrifuge tests. Among these tests, Shake table testing is being widely used as it is the only available means to reproduce nearly true dynamic effects of the earthquakes imposed on structures. Shake table generates harmonic motion in required direction to study the behavior of an earthquake of similar pattern. Throughout the world there are variety types of shake tables appropriate for use in a seismic certification program. For the present study a mini-shake table is used with the following features.

A. Horizontal Shake Table

Table.1. Features of the Horizontal Shake Table

table will be able to generate harmonic motions of different amplitudes and, the amplitude of base motions can be varied by changing the eccentricity of the cam. By varying the speed of the motor, the frequency content of the base motion can be varied. Accelerometers, Data Acquisition System, a lap top and a Vibration analyzer software “Kampana” are provided for measuring vibrations of the structural models , acquiring the Data, Plotting different Graphs etc.,. Information appearing on the display screen can be seen in real time and in offline mode with the help of the software. Display Layout consists of Configuration and control, Time/Frequency domain display, Display configuration and Vibration Parameter display.

VI. MODELS CONSIDERED FOR STUDY

The setup consists of four rectangular columns of aluminum (1200mmx25mmx3mm) ,two sets of top plate & base plate with dimensions(300mm X 200mm) and (200mm X 200mm) ,Water tank model of Perspex material of thickness of 5 mm and tank dimensions are 300mmx200mmx200mm- 12L capacity and 200mmx200mmx200m-8L capacity which are molded on top plate. Horizontal braces of sizes of 200mm X 25mmX3mm, 300mmX25mmX3mm which are placed @ 200mm c/c to column and @400mm c/c to column, respectively.

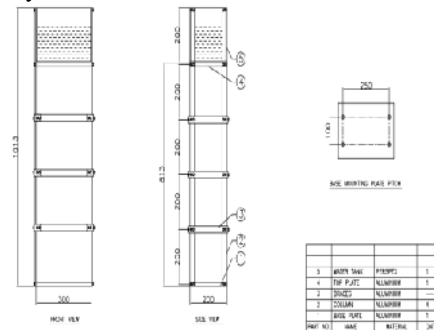




Figure 1. Details of a typical structural model of the tank

VII. PARAMETERS VARIED

- A. Water Levels.**
- Empty
 - 25% (50 mm water depth)
 - 50% of water(100 mm water depth)
 - 75% of water (150mm water depth)
- B. Spacing of Bracings**
- 200 mm C/C
 - 400 mm C/C
- C. Capacity of Tanks**
- 12L (300mmx200mmx200mm)
 - 8L (200mmx200mmx200mm)
- D. Amplitude input**
- 3mm
 - 2mm

All these variations are done for two cases i.e., with and without internal obstruction in the tank.

VIII. RESPONSE PARAMETERS STUDIED

Frequencies, Peak displacements, Peak Accelerations, Sloshing patterns and Sloshing heights were studied as a part of the experimental work. However, only the sloshing heights and patterns are discussed here

IX. RESULTS AND DISCUSSIONS

A. Sloshing Heights and Patterns

It was practically difficult to record the sloshing heights and patterns for the tanks, particularly with higher amplitude input and for full water levels. However, a sincere effort is made to capture the sloshing patterns through photographs and video recordings. similarly

efforts were made to record the sloshing heights with reference to the original water levels in the tanks before vibrations , by physical measurements with scale .This was also difficult for the case of full water levels for greater amplitude. Some of the photographs captured for different water levels and vibrating conditions are shown in figure 2. Based on these and the sloshing heights recorded, the following discussion is made.

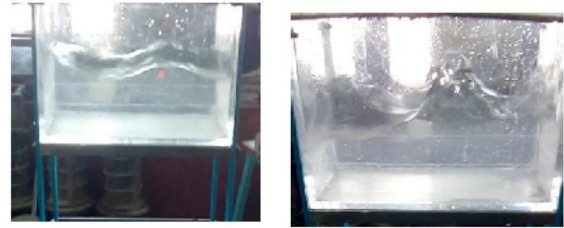


Figure 2 : Typical sloshing patterns observed during the experimentation

B. Absolute Maximum sloshing height

Sloshing height is recorded as 180 mm for larger tank with 75% of water condition , 3mm amplitude input , 400mm spacing of bracing and without internal obstruction

C. Variation with Water Levels

Sloshing heights have in general increased gradually with increase in water levels for all conditions of tanks . However , for larger tank with 3mm amplitude , without internal obstruction the sloshing heights were gradually increasing up to a frequency input corresponding to zone 4 acceleration and then onwards decreasing for the frequency input corresponding to zone 5

D. Sloshing Heights Using SaECa Net tool

Sloshing height (mm) = Water height (h) + Wave height obtained from tool (W)

Calculation of Wave height by Sloshing Response:

Inputs: Water level: h (m) , Breadth of water tank : L (m) , Velocity Response Spectrum : Sv (m/s) , Gravitational acceleration (g) = 9.80665 (m/s²) ; X-axis : h (m) , Y-axis : W(m)

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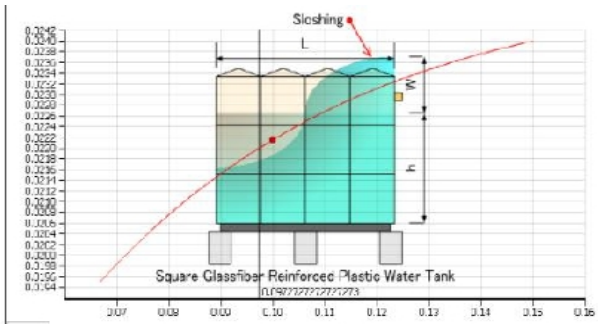


Figure 3 : Typical sloshing wave height for zone V

Table 2: Comparison of experimental and SaE Ca Net values of Sloshing heights

Input Acceleration	Experimental values (mm)			Dmax (mm)		
	25% of water level	50% of water level	75% of water level	25% of water level	50% of water level	75% of water level
0.1g	15	10	15	12.66	15.97	17.86
0.16g	18	25	22	20.16	25.56	28.58
0.24g	20	15	37	30.2	38.34	42.88
0.36g	25	17	28	45.33	57.51	64.31

Table 3: Comparison of Sloshing heights obtained experimentally and from code As per 1983:2002 (part II)

Input Acceleration	Experimental values (mm)			SaE Ca Net tool (mm)		
	25% of water level	50% of water level	75% of water level	25% of water level	50% of water level	75% of water level
0.1g	65	110	155	50.35	108.63	158.91
0.16g	68	125	160	56.35	120.8	165.32
0.24g	70	150	175	60.4	176.16	178.45
0.36g	75	117	165	61.41	122.1	151.23

X. CONCLUSIONS

Mini Shake table experiments provide an affordable and near true dynamic effect on structural models. They are thus useful tools in conducting simulation studies on models of liquid storage tanks. In the present study sloshing patterns and sloshing heights were observed experimentally, for structural models of elevated rectangular water tanks of two different

capacities. The sloshing heights obtained experimentally for these two models are in good agreement with 'SaE Ca Net' tool results as well as those computed from draft code.

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Big Data Architecture

R.P.L.Durgabai
Senior Lecturer in Department of MCA
Andhra Loyola College,
Vijayawada, Andhra Pradesh, India
poonamramchandra@gmail.com

Abstract: -- Big data architecture describes a dimensions-based approach for assessing the viability of a big data solution. There are 4 key layers of a big data system - i.e. the different stages the data itself has to pass through on its journey from raw statistic or snippet of unstructured data (for example, social media post) to actionable insight. The whole point of a big data strategy is to develop a system which moves data along this path. In this post, I will attempt to define the basic layers you will need to have in place in order to get any big data project off the ground.

I. INTRODUCTION

A. Data sources layer

This is where the data is arrives at your organization. It includes everything from your sales records, customer database, feedback, social media channels, marketing list, email archives and any data gleaned from monitoring or measuring aspects of your operations. One of the first steps in setting up a data strategy is assessing what you have here, and measuring it against what you need to answer the critical questions you want help with. You might have everything you need already, or you might need to establish new sources.

B. Data storage layer

This is where your Big Data lives, once it is gathered from your sources. As the volume of data generated and stored by companies has started to explode, sophisticated but accessible systems and tools have been developed - A computer with a big hard disk might be all that is needed for smaller data sets, but when you start to deal with storing (and analyzing) truly big data, a more sophisticated, distributed system is called for. As well as a system for storing data that your computer system will understand (the file system) you will need a system for organizing and categorizing it in a way that people will understand - the database. Hadoop has its own, known as HBase, but others including Amazon's DynamoDB, MongoDB and Cassandra (used by Facebook), all based on the NoSQL architecture, are popular too. This is where you might find the Government taking an interest in your activities - depending on the sort of data you are storing, there may well be security and privacy regulations to follow.

C. Data processing/ analysis layer

When you want to use the data you have stored to find out something useful, you will need to process and analyze it. A common method is by using a MapReduce tool (which I also explain in a bit more depth in my article on Hadoop). Essentially, this is used to select the elements of the data that you want to analyze, and putting it into a format from which insights can be gleaned. If you are a large organization which has invested in its own data analytics team, they will form a part of this layer, too. They will employ tools such as Apache PIG or HIVE to query the data, and might use automated pattern recognition tools to determine trends, as well as drawing their conclusions from manual analysis.

D. Data output layer

This is how the insights gleaned through the analysis is passed on to the people who can take action to benefit from them. Clear and concise communication (particularly if your decision-makers don't have a background in statistics) is essential, and this output can take the form of reports, charts, figures and key recommendations. Ultimately, your Big Data system's main task is to show, at this stage of the process, how measurable improvement in at least one KPI that can be achieved by taking action based on the analysis you have carried out. Although people have come up with different names for these layers, as we're charting a brave new world where little is set in stone.

II. LOGICAL LAYERS OF A BIG DATA SOLUTION

Logical layers offer a way to organize your components. The layers simply provide an approach to organizing components that perform specific functions. The layers are merely logical; they do not imply that the

functions that support each layer are run on separate machines or separate processes. A big data solution typically comprises these logical layers:

1. Big data sources
2. Data massaging and store layer
3. Analysis layer
4. Consumption layer

Big data sources: Think in terms of all of the data available for analysis, coming in from all channels. Ask the data scientists in your organization to clarify what data is required to perform the kind of analyses you need. The data will vary in format and origin:

- ◆ Format— Structured, semi-structured, or unstructured.
- ◆ Velocity and volume— The speed that data arrives and the rate at which it's delivered varies according to data source.
- ◆ Collection point— Where the data is collected, directly or through data providers, in real time or in batch mode. The data can come from a primary source, such as weather conditions, or it can come from a secondary source, such as a media-sponsored weather channel.
- ◆ Location of data source— Data sources can be inside the enterprise or external. Identify the data to which you have limited-access, since access to data affects the scope of data available for analysis.

Data massaging and store layer: This layer is responsible for acquiring data from the data sources and, if necessary, converting it to a format that suits how the data is to be analyzed. For example, an image might need to be converted so it can be stored in an Hadoop Distributed File System (HDFS) store or a Relational Database Management System (RDBMS) warehouse for further processing. Compliance regulations and governance policies dictate the appropriate storage for different types of data.

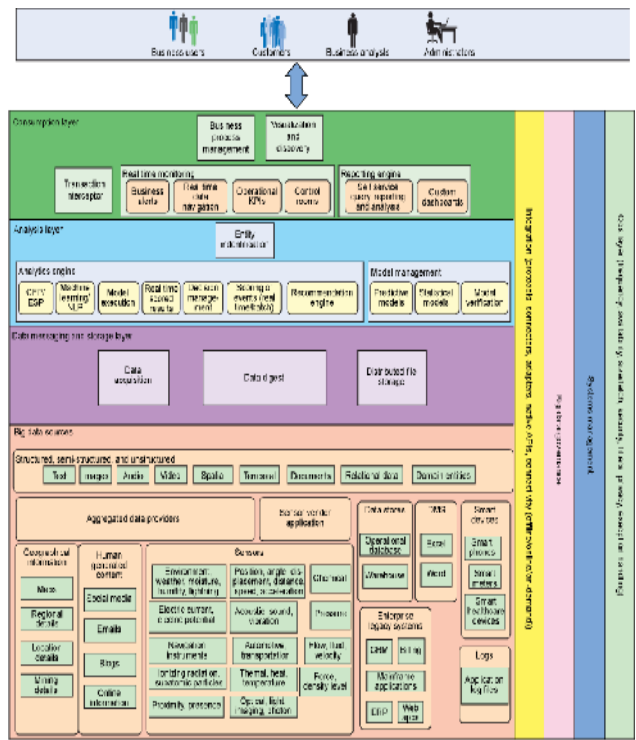
Analysis layer: The analysis layer reads the data digested by the data massaging and store layer. In some cases, the analysis layer accesses the data directly from the data source. Designing the analysis layer requires careful forethought and planning. Decisions must be made with regard to how to manage the tasks to:

- ◆ Produce the desired analytics
- ◆ Derive insight from the data
- ◆ Find the entities required

- ◆ Locate the data sources that can provide data for these entities
- ◆ Understand what algorithms and tools are required to perform the analytics.

Consumption layer: This layer consumes the output provided by the analysis layer. The consumers can be visualization applications, human beings, business processes, or services. It can be challenging to visualize the outcome of the analysis layer. Sometimes it's helpful to look at what competitors in similar markets are doing. Each layer includes several types of components, as illustrated below.

Figure 1. Components by logical and vertical layer



Big data sources

This layer includes all the data sources necessary to provide the insight required to solve the business problem. The data is structured, semi-structured, and unstructured, and it comes from many sources:

Enterprise legacy systems:— These are the enterprise applications that drive the analytics and insights required for business:

- ◆ Customer relationship management systems
- ◆ Billing operations

- ◆ Mainframe applications
- ◆ Enterprise resource planning
- ◆ Web applications

Web applications and other data sources augment the enterprise-owned data. Such applications can expose the data using custom protocols and mechanisms.

Data management systems (DMS):— The data management systems store legal data, processes, policies, and various other kinds of documents:

- ◆ Microsoft® Excel® spreadsheets
- ◆ Microsoft Word documents

These documents can be converted into structured data that can be used for analytics. The document data can be exposed as domain entities or the data massaging and storage layer can transform it into the domain entities.

Data stores:— Data stores include enterprise data warehouses, operational databases, and transactional databases. This data is typically structured and can be consumed directly or transformed easily to suit requirements. Such data may or may not be stored in the distributed file system, depending on the context of the situation.

Smart devices:— Smart devices are capable of capturing, processing, and communicating information on most widely used protocols and formats. Examples include smartphones, meters, and healthcare devices. Such devices can be used to perform various kinds of analysis. For the most part, smart devices do real-time analytics, but the information stemming from smart devices can be analyzed in batch, as well.

Aggregated data providers:— These providers own or acquire the data and expose it in sophisticated formats, at required frequencies, and through specific filters. Huge volumes of data pour in, in a variety of formats, produced at different velocities, and made available by various data providers, sensors, and existing enterprises.

Additional data sources:— A wide range of data comes from automated sources:

Geographical information:

- ◆ Maps
- ◆ Regional details
- ◆ Location details
- ◆ Mining details

Human-generated content:

- ◆ Social media
- ◆ Email
- ◆ Blogs
- ◆ Online information

Sensor data:

- ◆ Environment: Weather, moisture, humidity, lightning
- ◆ Electricity: Current, energy potential, etc.
- ◆ Navigation instruments
- ◆ Ionizing radiation, subatomic particles, etc.
- ◆ Proximity, presence, and so on
- ◆ Position, angle, displacement, distance, speed, acceleration
- ◆ Acoustic, sound vibration, etc.
- ◆ Automotive, transportation, etc.
- ◆ Thermal, heat, temperature
- ◆ Optical, light, imaging, photon
- ◆ Chemical
- ◆ Pressure
- ◆ Flow, fluid, velocity
- ◆ Force, density level, etc.
- ◆ Other data from sensor vendors
- ◆ Data massaging and store layer

Because incoming data characteristics can vary, components in the data massaging and store layer must be capable of reading data at various frequencies, formats, sizes, and on various communication channels:

Data acquisition:— Acquires data from various data sources and sends the data to the data digest component or stores it in specified locations. This component must be intelligent enough to choose whether and where to store the incoming data. It must be able to determine whether the data should be massaged before it can be stored or if the data can be directly sent to the business analysis layer.

Data digest:— Responsible for massaging the data in the format required to achieve the purpose of the analysis. This component can have simple transformation logic or complex statistical algorithms to convert source data. The analysis engine determines the specific data formats that are required. The major challenge is accommodating unstructured data formats, such as images, audio, video, and other binary formats.

Distributed data storage:— Responsible for storing the data from data sources. Often, multiple data storage options are available in this layer, such as distributed file

storage (DFS), cloud, structured data sources, NoSQL, etc.

III. ANALYSIS LAYER

This is the layer where business insight is extracted from the data:

Analysis-layer entity identification— Responsible for identifying and populating the contextual entities. This is a complex task that requires efficient high-performance processes. The data digest component should complement this entity identification component by massaging the data into the required format. Analysis engines will need the contextual entities to perform the analysis.

Analysis engine— Uses other components (specifically, entity identification, model management, and analytic algorithms) to process and perform the analysis. The analysis engine can have various workflows, algorithms, and tools that support parallel processing.

Model management— Responsible for maintaining various statistical models and for verifying and validating these models by continuously training the models to be more accurate. The model management component then promotes these models, which can be used by the entity identification or analysis engine components.

Consumption layer

This layer consumes the business insight derived from the analytics applications. The outcome of the analysis is consumed by various users within the organization and by entities external to the organization, such as customers, vendors, partners, and suppliers. This insight can be used to target customers for product offers. For example, with the business insight gained from analysis, a company can use customer preference data and location awareness to deliver personalized offers to customers as they walk down the aisle or pass by the store.

The insight can also be used to detect fraud by intercepting transactions in real time and correlating them with the view that has been built using the data already stored in the enterprise. A customer can be notified of a possible fraud while the fraudulent transaction is happening, so corrective actions can be taken immediately.

In addition, business processes can be triggered based on the analysis done in the data massaging layer. Automated steps can be launched — for example, the process to create a new order if the customer has accepted an offer can be triggered automatically, or the process to

block the use of a credit card can be triggered if a customer has reported fraud.

The output of analysis can also be consumed by a recommendation engine that can match customers with the products they like. The recommendation engine analyzes available information and provides personalized and real-time recommendations.

The consumption layer also provides internal users the ability to understand, find, and navigate federated data within and outside the enterprise. For the internal consumers, the ability to build reports and dashboards for business users enables the stakeholders to make informed decisions and to design appropriate strategies. To improve operational effectiveness, real-time business alerts can be generated from the data and operational key performance indicators can be monitored:

Transaction interceptor— This component intercepts high-volume transactions in real time and converts them into a suitable format that can be readily understood by the analysis layer to do real-time analysis on the incoming data. The transaction interceptor should have the ability to integrate with and handle data from various sources such as sensors, smart meters, microphones, cameras, GPS devices, ATMs, and image scanners. Various types of adapters and APIs can be used to connect to the data sources. Various accelerators, such as real-time optimization and streaming analytics, video analytics, accelerators for banking, insurance, retail, telecom, and public transport, social media analytics, and sentiment analytics are also available to simplify development.

Business process management processes— The insight from the analysis layer can be consumed by Business Process Execution Language (BPEL) processes, APIs, or other business processes to further drive business value by automating the functions for upstream and downstream IT applications, people, and processes.

Real-time monitoring— Real-time alerts can be generated using the data coming out of the analysis layer. The alerts can be sent to interested consumers and devices, such as smartphones and tablets. Key performance indicators can be defined and monitored for operational effectiveness using the data insight generated from the analytics components. Data in real time can be made available to business users from varied sources in the form of dashboards to monitor the health of the system or to measure the effectiveness of a campaign.

Reporting engine— The ability to produce reports similar to traditional business intelligence reports is critical. Ad-hoc reports, scheduled reports, or self-query and analysis

can be created by users based on the insight coming out of the analysis layer.

Recommendation engine— Based on the outcome of analysis from the analysis layer, recommendation engines can offer real-time, relevant, and personalized recommendations to shoppers, increasing the conversion rates and the average value of each order in an e-commerce transaction. In real time, the engine processes available information and responds dynamically to each user, based on the users' real-time activities, the information stored within CRM systems for registered customers, and the social profiles for non-registered customers.

Visualization and discovery— Data can be navigated across various federated data sources within and outside the enterprise. The data can vary in content and format, and all of the data (structured, semi-structured, and unstructured) can be combined for visualization and provided to the users. This ability enables organizations to combine their traditional enterprise content (contained in enterprise content managements systems and data warehouses) with new social content (tweets and blog posts, for example) in a single user interface.

Vertical layers

Aspects that affect all of the components of the logical layers (big data sources, data massaging and storage, analysis, and consumption) are covered by the vertical layers:

- ◆ Information integration
- ◆ Big data governance
- ◆ Systems management
- ◆ Quality of service

Information integration

Big data applications acquire data from various data origins, providers, and data sources and are stored in data storage systems such as HDFS, NoSQL, and MongoDB. This vertical layer is used by various components (data acquisition, data digest, model management, and transaction interceptor, for example) and is responsible for connecting to various data sources. Integrating information across data sources with varying characteristics (protocols and connectivity, for example) requires quality connectors and adapters. Accelerators are available to connect to most of the known and widely used sources. These include social media adapters and weather data adapters. This layer can also be used by components to store information in big data stores and to retrieve information from big data stores for processing.

Most of the big data stores have services and APIs available to store and retrieve the information.

Big data governance

Data governance is about defining guidelines that help enterprises make the right decisions about the data. Big data governance helps in dealing with the complexities, volume, and variety of data that is within the enterprise or is coming in from external sources. Strong guidelines and processes are required to monitor, structure, store, and secure the data from the time it enters the enterprise, gets processed, stored, analyzed, and purged or archived.

In addition to normal data governance considerations, governance for big data includes additional factors:

- ◆ Managing high volumes of data in variety of formats.
- ◆ Continuously training and managing the statistical models required to pre-process unstructured data and analytics. Keep in mind that this is an important step when dealing with unstructured data.
- ◆ Setting policy and compliance regulations for external data regarding its retention and usage.
- ◆ Defining the data archiving and purging policies.
- ◆ Creating the policy for how data can be replicated across various systems.
- ◆ Setting data encryption policies.

Quality of service layer

This layer is responsible for defining data quality, policies around privacy and security, frequency of data, size per fetch, and data filters:

Data quality

- ◆ Completeness in identifying all of the data elements required
- ◆ Timeliness for providing data at an acceptable level of freshness
- ◆ Accuracy in verifying that the data respects data accuracy rules
- ◆ Adherence to a common language (data elements fulfill the requirements expressed in plain business language)
- ◆ Consistency in verifying that the data from multiple systems respects the data consistency rules
- ◆ Technical conformance in meeting the data specification and information architecture guidelines

Policies around privacy and security

Policies are required to protect sensitive data. Data acquired from external agencies and providers can include sensitive information (such as the contact information of a Facebook user or product pricing information). Data can originate from different regions and countries and must be treated accordingly. Decisions must be made about data masking and the storage of such data. Consider the following data access policies:

- ◆ Data availability
- ◆ Data criticality
- ◆ Data authenticity
- ◆ Data sharing and publishing
- ◆ Data storage and retention, including questions such as can the external data be stored? If so, for how long? What kind of data can be stored?
- ◆ Constraints of data providers (political, technical, regional)
- ◆ Social media terms of use

Data frequency

How frequently is fresh data available? Is it on-demand, continuous, or offline?

Size of fetch

This attribute helps define the size of data that can be fetched and consumed per fetch.

Filters

Standard filters remove unwanted data and noise in the data and leave only the data required for analysis.

IV. SYSTEMS MANAGEMENT

Systems management is critical for big data because it involves many systems across clusters and boundaries of the enterprise. Monitoring the health of the overall big data ecosystem includes:

- ◆ Managing the logs of systems, virtual machines, applications, and other devices
- ◆ Correlating the various logs and helping investigate and monitor the situation
- ◆ Monitoring real-time alerts and notifications
- ◆ Using a real-time dashboard showing various parameters
- ◆ Referring to reports and detailed analysis about the system
- ◆ Setting and abiding by service-level agreements
- ◆ Managing storage and capacity
- ◆ Archiving and managing archive retrieval

- ◆ Performing system recovery, cluster management, and network management
- ◆ Policy management

Summary

For developers, layers offer a way to categorize the functions that must be performed by a big data solution, and suggest an organization for the code that must address these functions. For business users wanting to derive insight from big data, however, it's often helpful to think in terms of big data requirements and scope. Atomic patterns, which address the mechanisms for accessing, processing, storing, and consuming big data, give business users a way to address requirements and scope. The next article introduces atomic patterns for this purpose.

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Development of Disposable Activated Bombyx Mori Silk Fabric Biostrips for Pasteurization Test of Milk

Kirti Rani

Assistant Professor (III)

Amity Institute of Biotechnology, Amity University Uttar Pradesh,
Noida, Sec-125, Noida-201313 (UP), India.

krsharma@amity.edu, Kirtisharma2k@rediffmail.com

Abstract:-- Pasteurization of Milk and milk products are essential because non-pasteurized milk has alkaline phosphatases (ALP) which cause intra-abdominal bacterial infections after drinking. Therefore, milk industries test the milk after pasteurization using various chemical methods including boiling. Here, objective of this work is to detect the presence of alkaline phosphatase in the pasteurized milk by using disposable dry-reagent biostrips of sodium nitrate treated/ sodium chloride treated activated Bombyx mori silk fabric which are prepared by immobilization of bromocresol green and p-nitrophenol phosphate which gave the instant color change from light blue to green if sample is not pasteurized and test is called positive (ALP +ve). This test was observed to carry out any ambient temperature conditions and prepared activated silk strips can be stored up to 7-8 months in non-humid conditions which might be considered cost effective and rapid biosensor employed for the qualitative estimation of alkaline phosphatase in the milk samples or milk products.

Keywords:-- Alkaline Phosphatase, Pasteurization, P-Nitrophenol Phosphate, Biostrips, Activated Silk Fabric

I. INTRODUCTION

Alkaline phosphatase (ALP) is an enzyme naturally present in raw milk which causes intra-abdominal bacterial infection after consumption and pasteurization test has been reported in raw milk and milk products [1]. Previously, silk fibers had been chosen in the form of woven fabric because of its biocompatibility and antimicrobial properties for the immobilization of lipase from *Candida* sp. and alkaline phosphatase as a novel and inexpensive matrices [2, 3]. Hence to exploit these properties of silk fabric, the activation was done by using sodium nitrate/sodium chloride for improved immobilization of bromocresol green (chromogen) and p-nitrophenol phosphate (substrate) which gave positive (+ve) with the instant color change from light blue to green if sample is not pasteurized/boiled well which means that alkaline phosphatase is still present in the sample. As well as, this test can be out any ambient temperature conditions and prepared activated silk biostrips can be stored up to 7-8 months in non-humid conditions which might be considered cost effective and rapid biosensor to perform qualitative estimation of alkaline phosphatase in the milk samples or milk products being a more potent pasteurization test.

II. MATERIALS & METHODS

The Mixture of 2mg of the Bromocresol green dye and 2mg of p-nitrophenol phosphate in 10 ml of 1 M Tris-HCl buffer (pH 8) solution was immobilized on uniform strips of Bombyx mori silk fabric which was activated via their pretreatment with sodium nitrate/sodium chloride and dried at 30°C for 1h in a humidity-free chamber for 2-4 hours [3,4].

Evaluation of Pasteurization Test in Chosen Milk Samples These prepared biostrips were blue colored and dipped once in various milk samples chosen milk samples e.g., boiled or unboiled raw milk (cow Milk & buffalo Milk) and Mother Dairy milk sample. Change in color was started to observe within 5 to 10 seconds after dipping from light blue to green if alkaline phosphatase (ALP) might be present in samples and test was found positive (+ve). If no change in the color was observed which gave negative test (-ve) test that indicate the denaturation of alkaline phosphates is done well in chosen milk samples.

Color change:

Original strips color ----- After dipping in chosen milk samples

(Light Blue) (Light Blue)..... ALP -ve test
(Green)..... ALP +ve test

III. RESULTS & DISCUSSION

The light blue color was changed to light green when the dried strips were dipped in raw unboiled milk samples of cow and buffalo milk samples which are available in the market for local consumption. Thus, we were able to observe distinguish the qualitative detection of alkaline phosphatase (ALP) in chosen milk samples such as raw milk (unboiled) and pasteurized milk samples (Table 1). Thus, it was found the color change from light blue to green in non-pasteurized/ raw unboiled milk samples such as local milk of cow milk and buffalo because of presence of alkaline phosphatase. And no change in color was observed in chosen pasteurized milk samples such as Mother dairy Milk sample because complete denaturation of alkaline phosphatase was done in this sample by boiling or UV method employed by the respective milk company (Table 1). These results were found be pretty comparable with the previous observations of employed dry-reagent biostrips which has been used for quantitative estimations of various chemicals and biomolecules [4,5,6]. As well as, these disposable activated silk strips of activated Bombyx mori silk fabric were found to be stable at room temperature for up to 7 to 8 months when stored under humidity-free conditions.

Table 1: Qualitative Observations of Pasteurization Test in Chosen Milk Samples by Using Disposable Activated Silk Fabric.

S.No.	Chosen Milk Samples	Observed Pasteurization Test
1.	Raw Cow milk	Green (ALP +ve)
2.	Boiled Cow Milk	Light blue (ALP -ve)
3.	Raw Buffalo Milk	Green (ALP +ve)
4.	Boiled Buffalo Milk	Light blue (ALP -ve)
5.	Mother Dairy Milk	Light blue (ALP -ve)

IV. CONCLUSION

Hence, this developed method using disposable activated silk fabric biostrips was found to be very easy, safe, economical and quick biosensor method which do not require any sophisticated instrument and can be visualized by naked eyes. The color change of biostrips depends upon the presence or absence of alkaline phosphatase (ALP) in chosen milk samples which are available in market for consumption. So, this method

might be considered safer and more cost effective over other previously employed methods for quantitative estimations of various chemicals/biomolecules which were noted more expensive, cumbersome and require many chemicals to detect alkaline phosphatase in pasteurized milk.

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Development of Analytical Framework on Optimization of Construction Equipment for Multiple Infrastructure Projects

^[1]Mr. Amit Shriwas, ^[2]Dr. Sudhir Nigam

^[1] M-Tech (Construction Technology and Management) at Lakshmi Narain College of Technology, Bhopal,

^[2] Principal at Lakshmi Narain College of Technology & Science, Bhopal

^[1] er.amitshriwas@gmail.com, ^[2] nigam_sudhir@hotmail.com

Abstract:-- India's gross domestic product (GDP) grew by 7.6 per cent in the year 2015-16, has made India the fastest growing economy in the world. Considering the importance of Infrastructure growth, a critical factor for the continued economic growth of the country, the Ministry of Road Transport and Highway - Government of India has proposed Rs 25 trillion investment in infrastructure for the next three years (2017-2020) duration imparting major share for developing 27 industrial clusters and for road, railway and port connectivity projects.

Construction equipment plays vital role for development of Infrastructure. Construction equipment's operational cost contributes 36 percent of the total project cost. Hence effective equipment management plays important role in infrastructure project management resulting into the substantial cost saving.

In this research paper we have analyzed two infrastructure (highway development) projects comprising construction of bridges, reinforced earthen wall, culvert and vehicular underpasses. Critical path method is applied for the time and activities scheduling along with construction equipment allocation for both the project. During study float availability is identified as main influencing factor and the same is analyzed to optimize the construction equipment in infrastructure project.

Key Words:— Construction, Equipment, infrastructure, Project, Management, Float, Optimization.

I. INTRODUCTION

India has the second largest road network across the world at 33 Lakhs km. As per National Highway Authority of India Indian road network consist of following:

Category	Length (KM)
Expressways	200
National Highways	96,261
State Highways	1,31,899
Major District Roads	4,67,763
Rural and Other Roads	26,50,000

About 65% of freight and 80% passenger traffic is carried by the roads. National Highways constitute only about 1.7% of the road network but carry about 40% of the total road traffic. Number of vehicles has been growing at an average pace of 10.16% per annum over the last five years. Ministry of Road Transport and Highway - Government of India, has decided to increase the national highway cover from the current 96,000 kilometers to 200,000 kilometers in the country. The project includes

development of four-lane and express highways. Creating a world class infrastructure in highways is the top priority. Highway contracts worth US \$45 billion between May 2016 and May 2017. Ministry of Road Transport and Highway - Government of India has set an ambitious target of laying more than 40 km of roads every day in 2016-17.

Effective project management is the most important factor to accomplish infrastructure development target set by Government of India. Construction equipment plays vital role in infrastructure construction. In this research paper we have considered two infrastructure (highway development) projects. Project details are as follows:

A. Four laning of NH-4A (NH-748) between Km.118/000 to 125/000 including construction of high level four lane new khandepar bridge at Km.118/800 in the state of Goa.

B. Construction of Canacona National Highway Bypass from km. 68/00 (chainage 00/00) to km. 85/740 (chainage 7/740) on NH-17 (New NH-66) on P.m section in the state of Goa.

We have applied Primavera 6.0 R8.4 for complete project planning of both the project. Critical path method applied for calculating the time span of the project. Activity with free float identified to carry out analysis reducing the substantial cost towards construction equipment operation for both the projects.

II. LITREATURE REVIEW

We have reviewed various research paper and books buy various authors on highway project management using critical path method. Major finding are as follows:

CPM Analysis of Rolai-Rinjilai Road Construction: Research paper work is based on empirical data of a part of the Rolai-Rinjilai road construction project, in which raw material is available at different quarries providing different options to the contractor. Considering the project as a network, author used CPM technique in an attempt to obtain the critical path of the network and suggested the best approach for acquiring material and construction of road under the stated constraints. Author used crashing to further reduce the project completion time. CPM assumes that each activity has available - all the resources needed to perform the activity in the normal way (or on a crashed basis). In this study, a small amount of overlapping i.e. simultaneously laying the same layer at different spots has provided the slack/float needed to compensate for the “unexpected” delays that inevitably seem to slip into a schedule. Schedule proposed by us provides much shorter completion time as compared to the actual time taken by the project and paves the way for use of CPM scheduling for road construction projects to be a lucrative and viable option.

A Study on Resource Planning in Highway Construction Projects: In this research paper authors used Microsoft project to schedule the BRTS Vishakhapatnam for planning of construction equipment. Author have compared actual resource planning against the ideal resource planning for the project. Planning of BRTS Road Project by using Microsoft Project 2007 for 013 KMS and Existing Carriage indicate poor planning of resources. Also equipment assign for total project is less as compared to required number. From the planning of BRTS highway project after allocating resources to various activities, we come to know if Equipments and manpower is provided as per required data which is analyze by using Microsoft Project-2007 as compare to

actual used on site. It will help to complete project on time with specified duration as per contract.

Project Management: A project is a temporary endeavor undertaken to create a unique product or service. The three main most important project characteristics include uniqueness, temporary, and predefined goals. About 44 important activities have to be performed by a project manager during the project's life cycle. These activities are grouped in the five processes groups discussed as follows: Project Initiation is the phase of formally authorizing a new project. This phase links the project to the ongoing work of the performing organization. Projects are typically authorized as a result of one or more of the following: a market demand, a business need, a customer request, a technology advance or a social need. Executing processes coordinate people and other resources, such as equipment and material, to carry out the plan in order to perform the project. Monitoring and controlling processes ensure the high-quality achievements of the project plan and updating it when necessary. Closing processes formalize acceptance of the project by its customers and other stakeholders and bring it to an orderly conclusion.

Critical Path Method: The Project Management Body of Knowledge (PMBOK), an internationally recognized collection of processes and knowledge areas accepted as best practice for the project management profession, defines the critical path as “the sequence of scheduled activities that determines the duration of the project.” It is the longest sequence of tasks in a project plan that must be completed on time in order for the project to meet its deadline. If there is a delay in any task on the critical path, then your whole project will be delayed. Although many projects have only one critical path, some projects may have multiple critical paths.

Float: Float is the amount of time an activity, network path, or project can be delayed from the early start without changing the completion date of the project. Float denotes the flexibility range within which the activity start and finish time may fluctuate without affecting the total project duration.

- ◆ ***Total Float:*** It is the time span by which the starting or finishing of an activity can be delayed without affecting the overall completion time of the project.
- ◆ ***Free Float:*** It is that duration by which an activity can be delayed without delaying any other

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succeeding activity. Free float is the portion of total float. This concept is based on all activities start at their earliest times.

- ◆ **Independent Float:** It is the excess time available if the preceding activity ends as late as possible and the succeeding activity start as early as possible.
- ◆ **Interfering Float:** Interfering float is the difference between the total float and free float.
- ◆ **Research Gap:** After reviewing various research paper and books on highway project management, we found that critical path method applied for calculating project completion period, resource optimization, cost control, risk assessment etc. Neither float management nor construction equipment sharing aspect is being discussed in any of the research.

We strongly feel that float management and construction equipment sharing can play very important role in infrastructure project management. Hence we have considered free float for sharing of major construction equipment between two highway and bridge development project in Goa. Primavera 6.0 R8.4 applied for scheduling and identification of free float in both the project.

III. FLEET OF CONSTRUCTION EQUIPMENT

Major construction equipment and their rate are as follows:

Table – 1: Major Equipment Rate

Sr. No.	Name of Equipment	Rate Per Hour (INR)
1	Batching and Mixing Plant 30 cum capacity	1940
2	Hot mix Plant - 120 TPH capacity	15100
3	Hot mix Plant - 100 TPH capacity	11167
4	Hot mix Plant - 60 to 90 TPH capacity	8930
5	Hot mix Plant - 40 to 60 TPH capacity	1950
6	Piling Rig with Bentonite Pump	4200
7	Crane 5 – 10 – 15 – 20 - 40 Tonne	536
8	Crane 80 tonnes	1200
9	Dozer D - 80 - A 12	3030
10	Dozer D - 50 - A 15	2145
11	Integrated Stone Crusher 100THP	6000
12	Integrated Stone Crusher 200 HP	12000
13	Hydraulic Excavator of 1 cum bucket	1000

14	Transit Mixer 4.0/4.5 cum	820
15	Transit Mixer 3.0 cum	700
16	Tipper - 5 cum	438
17	Tandem Road Roller	800
18	Smooth Wheeled Roller 8 tonne	700
19	Truck 5.5 cum per 10 tonnes	200
20	Vibratory Roller 8 tonne	1163
21	Wet Mix Plant 60 TPH	1400
22	Paver Finisher Hydrostatic with sensor or mechanical control 100 TPH	2000
23	Kerb Casting Machine	50
24	Mechanical Broom Hydraulic	410
25	Motor Grader 3.35 mtr blade	436
26	Mobile slurry seal equipment	790
27	Hydraulic Chip Spreader	171
28	Front End loader 1 cum bucket capacity	800
29	GSB Plant 50 cum	1224
30	Emulsion Pressure Distributor	640
31	Wet Mix Plant 100 TPH	8847
32	Wet Mix Plant 75 TPH	6610
33	Vibrating Pile driving hammer complete with power unit and accessories.	1200
34	Piling rig Including double acting pile driving hammer (Hydraulic rig)	6250
35	Jack for Lifting 40 tonne lifting capacity.	1200
36	Bitumen Pressure Distributor	760
37	Bitumen Boiler oil fired	522
38	Concrete Paver Finisher with 40 HP Motor	2500
39	Pneumatic Road Roller	727
40	Pneumatic Sinking Plant	3094
41	Pot Hole Repair Machine	2145
42	Pre stressing Jack with Pump & access	140
43	Ripper	1878
44	Rotavator	450
45	Compressor with guniting equipment along with accessories	500
46	Plate compactor	63
47	Batching and Mixing Plant 15 - 20 cum capacity	1520
48	Cement concrete batch mix plant @ 75 cum per hour (effective output)	3245
50	Road marking machine	90
51	Tractor	370
52	Tractor with Rotevator	200
53	Tractor with Ripper	200
54	Belt conveyor system	800
55	Cold milling machine @ 20 cum per hour	500

Development of Analytical Framework on Optimization of Construction Equipment for Multiple Infrastructure Projects

56	Drum mix plant for cold mixes of appropriate capacity but not less than 75 tonnes/hour.	1200
57	Epoxy Injection gun	200
58	Induction, DE induction and erection of plant and equipment including all components and accessories for pneumatic method of well sinking.	15000
59	Joint Cutting Machine with 2-3 blades (for rigid pavement)	50
60	Truck Trailor 30 tonne capacity	300

IV. PROJECT A: NH 4A FOUR LANNING WITH TWO GRADE SEPARATOR AND KHANDEPAR HIGH LEVEL BRIDGE

Project Title: Four laning of NH-4A (NH-748) between Km.118/000 to 125/000 including construction of high level four lane new khandepar bridge at Km.118/800 in the state of Goa.

Location: Ponda – Goa.

Client: Ministry of Road Transport and Highways – Government of India.

Contractor: M. VENKATA RAO INFRA PROJECTS PVT. LTD (MVR)

Project Start Date: 01.01.2016

Project Finish Date: 22.01.2019

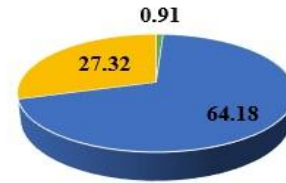
Project Detail: Project consist of construction of service / slip road on LHS and RHS for total length of 13.586 KM, 106 m long Khandepar high level bridge, 400 m long grade separator at Ponda, 30 m long grade separator at Amigos junction, 4 vehicular underpass, widening of 26 culverts, 4 box culver and junction improvement at 9 location.

Cost Of The Project: RS. 241 CRORE

Construction Equipment Operation Cost: Rs. 92 Crore.

Weightage Construction Equipment Operation Towards Total Cost: 38%

CONSTRUCTION EQUIPMENT COST BREAK UP IN CRORE (INR.)



- RESOURCE MOBLIZATION
- MAJOR PLANT INSTALLATION ANDNS OPERATION
- FOR OTHER MACHINARY

V. PROJECT B: CANACONA NATIONAL HIGHWAY BYPASS AND THREE BRIDGE

Project Title: Construction of Canacona National Highway Bypass from km. 68/00 (chainage 00/00) to km. 85/740 (chainage 7/740) on NH-17 (New NH-66) on P.m section in the state of Goa.

Location: Canacona – Goa.

Client: Ministry of Road Transport and Highways – Government of India.

Contractor: M. VENKATA RAO INFRA PROJECTS PVT. LTD (MVR)

Project Start Date: 01.01.2016

Project Finish Date: 13.02.2018

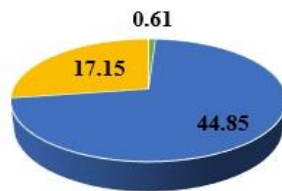
Project Detail: Project consist of construction of 7.74 km four lane road as Canacona bypass, 500 m long bridge at Galgibag, 450 m long bridge at Talpona, 100 m long bridge at Mashe, 21 new culvert and 1720 m long reinforce earth wall.

Cost Of The Project: Rs. 180 Crore

Construction equipment operation cost: Rs. 63 Crore.

Weightage Construction Equipment Operation Towards Total Cost: 35%

CONSTRUCTION EQUIPMENT COST BREAK UP IN CRORE (INR.)



- RESOURCE MOBILIZATION
- MAJOR PLANT INSTALLATION ANDS OPERATION
- FOR OTHER MACHINERY

VI. FRAMEWORK TO OPTIMIZE CONSTRUCTION EQUIPMENT FOR PROJECT A AND B

Project A: NH 4A FOUR LANNING WITH TWO GRADE SEPARATOR AND KHANDEPAR HIGH LEVEL BRIDGE and **PROJECT B:** CANACONA NATIONAL HIGHWAY BYPASS AND THREE BRIDGE considered for optimization of construction equipment. In this project we have analyzed the potential construction equipment sharing strategy under following heads:

Total Cost For Project A And B:
 $241 + 180 = \text{Rs. } 421 \text{ Crore}$

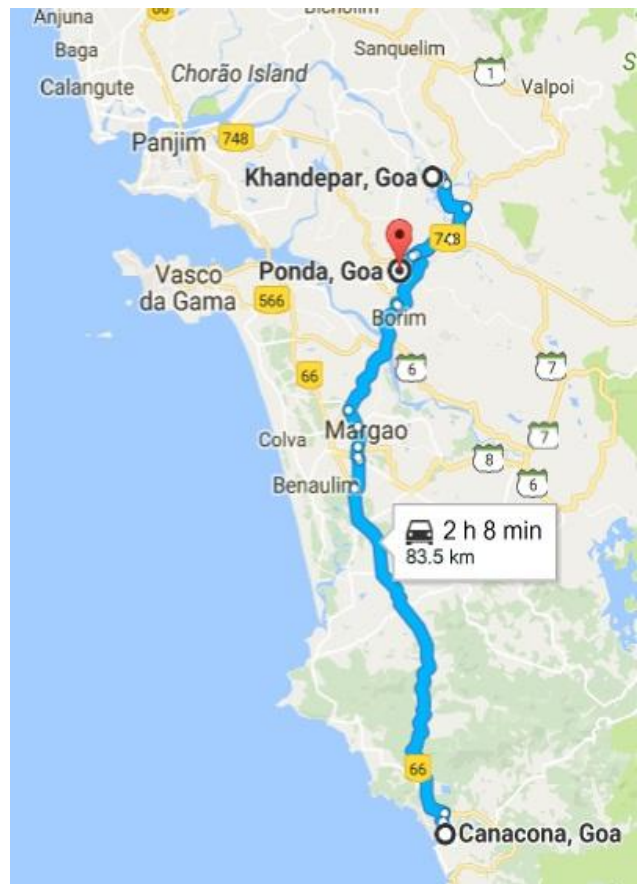
Total Cost Towards Construction Equipment Operation For Project A And B: $92 + 63 = \text{Rs. } 155 \text{ Crore}$

Weightage Construction Equipment Operation Towards Total Cost For Project A And B: 37%

Major Plant Installation And Operation Cost For Project A And B: $64 + 45 = \text{Rs. } 109 \text{ Crore}$

WEIGHTAGE OF MAJOR PLANT INSTALLATION AND OPERATION COST FOR PROJECT A AND B: 70%

Project Connectivity: Distance between Project A & Project B is 83.5 KM. Project are very good road connectivity by NH-4A (NH-748) and NH-17 (New NH-66). Distance can be covered in 2 to 3 hours.



Concept Of Construction Equipment Sharing For Project A And B: We have used critical path method to prepare construction schedule for the project A and B.

Free Float Analysis

Project A:

Nh 4A Four Lanning With Two Grade Separator And Khandepar High Level Bridge

SR. NO.	ACTIVITY DECSCRIPTION (AT DIFFERENT CHAINAGE)	FREE FLOAT (IN DAYS)
A	13.586 KM NH 4A Widening	
1	Earthwork & Sub-grade	595
2	Bituminous Concrete (BC)	3 TO 409
B	Widening of existing culvert and new box culvert construction	
1	Miscellaneous works: (Stone Pitching, Painting of Head walls. etc)	1
2	Excavation	49
C	Vehicular Underpass	
1	Excavation	2
D	Bridge Construction	
1	Superstructure - Pier Head	30
2	Superstructure - T Arm (Casting)	80
3	Superstructure - T Arm (Launching)	30 - 663

Project B:

Canacona National Highway Bypass And Three Bridge

SR. NO.	ACTIVITY DECSCRIPTION (AT DIFFERENT CHAINAGE)	FREE FLOAT (IN DAYS)
A	7.74 KM NH 17 Construction	
1	Bituminous Concrete (BC)	14 TO 160
	Granular Sub-base (GSB)	1 TO 7
	Wet Mix Macadam (WMM)	3 TO 5
	Dense Bitumen Macadam (DBM)	5
B	New Culvert Development	
1	Miscellaneous works: (Stone Pitching, Painting of Head walls. etc)	1 TO 506
2	Excavation	41
C	Reinforce Earth Wall	
1	Excavation	2
D	Bridge Construction	
1	Superstructure - Pier Head	18
2	Superstructure - T Arm (Casting)	48
3	Superstructure - T Arm (Launching)	42 - 538

From above two table it is clearly visible that free float is available to various activities of both the project. Hence start and finish date cab be adjusted according to float availability, and construction equipment can be shared for these activity.

Cost saving depends on specific activities with free float.

Cost Saving Towards Major Plant Installation And Opetration:

Total Rs. 109 Crore incurred towards major plant installation and operation cost for project A and B, which is 70% of construction equipment budget and 25% of total project cost. By analyzing both the project characteristic and location, it is found that common set plant installation required. Hence project B CANACONA NATIONAL HIGHWAY BYPASS AND THREE BRIDGE can utilize plant installed for the project A NH 4A FOUR LANNING WITH TWO GRADE SEPARATOR AND KHANDEPAR HIGH LEVEL BRIDGE. This strategy will be resulting in cost saving of Rs. 45 Crore.

VII. EXPERT INTERVIEW

We have interviewed GENERAL MANAGER - M. VENKATA RAO INFRA PROJECTS PVT. LTD (MVR), comments are “Construction equipment plays

vital role in project delivery. Sharing of construction equipment is one of the most important strategy to counter time and cost overrun. Construction equipment optimization model like this will not only control the time and cost but also result in substantial cost saving in multiple infrastructure project.”

VIII. CONCLUSION

Construction equipment are the primary requirement of all infrastructure project. Effective management of construction equipment ensured timely delivery of infrastructure project within the contractual cost. In this research paper we have carried out the potential of construction equipment sharing model between two highway and bridge project in Goa. We have used critical path method. Primavera 6.0 R8.4 applied for schedule preparation. Activity with free float considered for sharing of construction equipment. Free float utilization will be resulting in substantial cost saving for the project. Considering both the project weightage of construction equipment is 37% of the total cost. Cost towards major plant installation and operation turns around 25% of the total project cost. In this case project B CANACONA NATIONAL HIGHWAY BYPASS AND THREE BRIDGE can utilize plant installed for the project A NH 4A FOUR LANNING WITH TWO GRADE SEPARATOR AND KHANDEPAR HIGH LEVEL BRIDGE. This strategy will be resulting in cost saving of Rs. 45 Crore. Construction equipment optimization is very important for success of infrastructure project. Float management and construction equipment sharing strategy is one of the most important step towards professional project management practice to deliver the infrastructure project within contractual time and budget.

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Survey on Digital India Campaign

^[1]Prof. Sushopti Gawade, ^[2]Samruddhi Khandare ^[3]Komal Raikar ^[4]Prof. Swati Chopade
^[1] Research Scholar Faculty Engineering, PAHER, Udaipur
^{[2][3]} Computer Department PCE, New Panvel
^[4] MCA Department Veermata Jijabai Technological Institute
^[1]sushopti@gmail.com, ^[2]samruddhi@mes.ac.in ^[3]komal@mes.ac.in ^[4]schopade@vjti.org.in

Abstract:-- Digital India emphasis on the importance of the use of various available electronic devices and their functions, operations and applications. Today's digital world is the result of various innovations, modernizations and automations. Today, all nations of the world wish to be totally digitalized that will legitimize the nation in an improved way. Today the world has transformed from knowledge savvy to techno knowledge savvy. [1] The reality of digital India will have positive impact on the lives of several people in urban as well as in rural areas. In this paper we have discussed about the Digital India program, impact of Digital India on rural areas, impact of Digital India on urban areas and Impact of Digital India on Agriculture. The digital India campaign will progress the life of urban population as well as that of rural population.

The Digital India drive is a dream project of the Indian Government to remodel India into a knowledgeable economy and digitally empowered society, with good governance for citizens by bringing synchronization and co-ordination in public accountability, digitally connecting and delivering the government programs and services to mobilize the capability of information technology across government departments. [2]

Key Words:— Digital Divide; Information and Communication Technologies (ICT); Digital India; Impact; Rural; Urban; Agriculture

I. INTRODUCTION

Even though the technology has become more economical and the internet access is ubiquitous, there is a breakdown between the under privileged and prosperous people of the nation. This breakdown is termed as "Digital Divide". The term Digital divide is termed as the divergence between the population and the countries that have approach to modernized knowledge and technology, and those that have restricted access. This technology incorporates the televisions, telephones, personal computers, laptops, mobile phones, internet, etc.

The Digital Divide continues among the following groups:

- ◆ Rich and poor.
- ◆ Educated and Uneducated.
- ◆ Socioeconomic groups.
- ◆ Rural and urban areas.
- ◆ Globally.
- ◆ More and less industrially matured population.

Digital Divide in India occurs due to the following aspects:

- ◆ Poor education system.
- ◆ Low literacy percentage.
- ◆ Language Barrier.

To eradicate the Digital Divide it very necessary to raise the use of Information and Communication Technologies (ICT), economic growth and equality, social mobility and literacy. To uproot the Digital Divide completely from the nation, the Prime Minister of our country; Mr. Narendra Modi launched a campaign named "Digital India".

The main motive of Digital India campaign is to make various Government services digitally accessible to the people throughout the country so that the people can have the knowledge of the latest information and several new technological modernizations. The Digital India campaign can lead to failure if it is not implemented properly. The factors that can lead to the failure of Digital India campaign are inapproachability and inflexibility.

II. OBJECTIVE OF STUDY

The main objective of this paper is to understand:

- ◆ What is Digital India?
- ◆ Project: Digital India.
- ◆ Services By Digital India
- ◆ Digital India: 3 Key Areas.
- ◆ Pillars of Digital India.
- ◆ Impact of Digital India in rural areas.
- ◆ Impact of Digital India in urban areas.
- ◆ Digital India in agricultural sector.
- ◆ Digital Green.

- ◆ Impact of Digital India by 2019.

III. LITERATURE REVIEW

Tanuja R. Patil, Shamshuddin K., Rajashekhar Patil, Sadanand P. [1] proposed the idea that a farmer's club should be formed in each village and each village information is linked together through networking. This idea is originated by an NGO called Rajaganga Farmers Foundation. An NGO should function as a facilitator between farmer's club and Govt. Farmers club will work to collect information from the farmers and get any sort of help through NGO. This is based on the concept "Farmers are for Farmers". The authors are carrying out this idea in four phases. These phases are: 1) Database creation: A detailed survey of each farmer has to be carried out, which include the information regarding the land details, crop details, the type of crops he was growing before and what crop he is planning for next Karif or Rabi season. This helps in crop yield analysis. 2) Website development for precision agriculture information: Precision Agriculture is the application of technologies and principles to manage all aspects of agriculture for improving production. 3) Android App development: An Android application for this project is developed to facilitate farmers to get agriculture information in their hands. 4) Farmer specific SMS creation: The farmers who have limited or no internet connection and who does not have smart phones can still receive precision agriculture information on mobile phone as a SMS.

Jinal Jani and Girish Tere [2] represents the idea where Digital India campaign is a welcome step in shaping an India of the 21st century powered by connectivity and the technological opportunity that such connectivity offers in terms of access, services. Digital India has three essence components. These include: 1) Digital infrastructure creation, 2) Digitally Delivering services and resources and 3) Digital Education. The authors have developed a program that targets to make different government services available to people digitally and enjoy the benefit of the newest information and technological innovations. The consumers will be benefited by the way of saving time, money, physical and cognitive energy spent in lengthy government processes. This paper also focuses on the universal availability of the digital services in different Indian languages.

Sudhir Kumar Sharma, Vandana Lama and Nidhi Goyal [3] proposed the objective to have a vision on the Digital India campaign where technologies and connectivity will come together to make an impact on all aspects of governance and improve the quality of life of

citizens. This initiative will ensure that all government services and information are available anywhere, anytime, on any device that are user friendly and secured. The authors aim at providing 1) Digital infrastructure as a utility to every citizen i.e. to deliver high speed communication technologies 2) Governance and Services on Demand i.e. every government services or information is available online and on mobile platforms with a single touch and 3) Digital Empowerment of Citizens i.e. every citizen will empower through digital literacy and universal access to digital resources.

Suman Rani [4] through this paper has discussed about the various Government services provided by the Government of India for the people living in the rural areas of the nation. This paper also focuses on the nine pillars of Digital India, economic, environmental and social impact of Digital India. The author has also discussed about the challenges brewing because establishment of Digital India.

IV. DIGITAL INDIA

Digital India is a movement lofted by the Government of India. The main motive of Digital India is to assure that the different Government benefits are made accessible to the people of India belonging to different states through electronic means of communications. These services are disseminated to the people with the help of ICT (Information and Communication Technologies) such as mobile phones, personal computers, laptops, tablets, televisions, radios and internet. The Government ensures to make the different Government benefits available to the people by improving the online framework and by enhancing the internet connectivity so that it is easily disseminated to the people all over the country without any barriers. The Digital India Campaign or the Digital India Movement was launched by the Prime Minister of India Mr. Narendra Modi, on 1st July, 2015. The initial aim of this campaign is to hook up all the rural areas with high speed internet connectivity so that the people do not have any obstacles while accessing the information. Digital India focuses on three basic factors. These factors are as follows:

- ◆ Establishment of digital framework: Digital sharing of data across the globe i.e. through electronic means of communication.
- ◆ Distribution of services digitally: All the Government services are sent using ICT's.
- ◆ Digital literacy: Imparting knowledge and skills to people to use digital devices such as computers, laptops, smart phones, tablets, etc.

V. PROJECT: DIGITAL INDIA

The project Digital India has undertaken several tasks. Some of these tasks are discussed below:

- ◆ BBNL (Bharat Broadband Network limited), a body of Indian Government is a custodian of Digital India project. The BBNL has undertaken the project of National Optical Fiber Project. BBNL has given the major task of connecting 250,000 villages across India through GPON (Gigabit Passive Optical Network) which is an Internet Protocol based optical network. It has high bandwidth and efficiency. GPON is majorly used to connect multiple premises. This project will be completed by 2017.
- ◆ The Government of India is devising to constitute 28,000 vacancies for BPO (Business Process Outsourcing) in different states of India.
- ◆ The Government of India is also devising to set up at most one Common Service Centre in each state's Gram Panchayat.
- ◆ The 2016 Indian Union Budget declared the evolution of 11 new technologies.
- ◆ One of the latest technologies is the Data Analytics. This technology will be very useful in long terms to take hold of the tax defaulters.
- ◆ With the use of latest technologies the Indian Government has declared to connect 550 markets of farmers.
- ◆ Due to the high number of illiteracy rate and language as the barrier the Government of India, induced the famous electronic mail (e-mail) service providers: Rediff and Gmail to give the e-mail addresses to the people residing in different states of India in their regional languages.

VI. SERVICES BY DIGITAL INDIA

The services that are provided by the Digital India are as follows: [6]

- ◆ DigiLocker: It is used for storing one's important personal documents like degree certificate, housing documents, passport, PAN card, and other personal documents digitally.
- ◆ MyGov.in: This is a platform where people can discuss and share their opinions regarding policies and governance.

- ◆ SBM Mobile App: Termed as Swachh Bharat Mission. It is a mobile application. This app is used to bring about the intentions of Swachh Bharat Abhiyaan.
- ◆ Attendance.gov.in: This service is a website that is used to keep the daily track of the government employee's attendance.
- ◆ E-sign framework: This service grants the citizens of India to sign any important document digitally through online. This process can be done only after Adhaar authentication.
- ◆ E-Hospital: This application allows the patients to do online payment of fees, online hospital registration, online health reports, online checking of availability of blood.

VII. DIGITAL INDIA: THREE KEY AREAS

Digital India Campaign focuses on the three main key areas. They are as follows: [5]

1. Digital Infrastructure as a Utility to Every Citizen: All the citizens in the country residing in rural as well as urban areas should be provided with the latest digital services. Service learning programs should be carried out so that they are able to use the various Government services with ease.
2. Governance and services on demand: All the Government related services that are implemented for the benefit of the citizens are to be provided to the people whenever they demand.
3. Digital Empowerment of Citizens: Enables people to access better education, technology, skills and knowledge through digital tools and digital literacy

VIII. PILLARS OF DIGITAL INDIA

The Government of India aspires to target the nine pillars of the Digital India Campaign. They are given as follows: [4]

1. Broadband Highways: This service facilitates broadband connection for urban as well as for rural areas across the country.
2. Universal Access to Mobile Connectivity: This service promises increase in the network penetration and coverage of maximum states across India.

3. Public Internet Access Program: Each and every state including the rural areas of each state should have good and obstacle free access to the Internet. All Government services should be reached to all the citizens throughout the nation.

4. e-Governance: Reforming Government through Technology: This service entails the different Government transactions using IT (Information Technology). All information and information in the databases are to be stored in electronic databases rather than storing it manually.

5. E-Kranti-electronic delivery of services: It includes: e-education (i.e., e-schools, e-colleges, e-distance learning), e-health care, e-farming, technology for justice, technology for security.

6. Information for all: Enables two way communications between the Government and the citizens of nation, clear and easy accessible information from the online repositories. Delivering online messages to people during any special programs.

7. Electronics manufacturing: Low cost manufacturing of electronic devices such as smart phones, tablets, personal computer, laptops, etc. so that the poor people can also take benefits from it.

8. IT for Jobs: Giving training for IT sector jobs to people and students from small towns and villages. Giving training to the Service Delivery Agents to run feasible businesses that deliver various IT services.

9. Early harvest programs: To develop standardized design for Government e-mail template, to provide secure transfer of e-mails within different Government organizations, implementation of free Wi-Fi's in all universities across the nation, to develop mass and group messaging applications where many one message can be disseminated to many people at one time, compulsory biometric attendance in all organizations and offices, availability of e-greetings, establishment of national portal for the lost and found children, implementation of hotspots and Wi-Fi's in public areas, information on weather and disaster alerts via SMS, school children's are provided with e-books instead of manual books.

IX. DIGITAL INDIA: IMPACT ON RURAL AREAS

The digital seepage in the rural areas of the country is flourishing quietly but speedily. Several actions are taken by the Non-Government Organizations (NGO's), Indian Government and by the special social groups that work independently. Due to these steps taken there is efficient transmission of different Government services and this is showing miraculous development. The population of India is more than 1.12 billion out of which 69% of the culture resides in rural areas. The Internet transmission in the rural areas is increasing very rapidly.

From the study conducted, it was observed that, out of the 90% rural population using the internet; 80% of the population was using the internet only for communication purpose, 67% was using it for online services such as paying bills, 65% was using it for e-trade or we can say for e-commerce such as buying and selling of good via internet and 60% of the population was using it for social networking. With the availability of cheap smart phones and several internet services the sum of Internet consumers was 85 million in June 2014.

Due to the increase in the rapid transmission of the Internet services, the attitude, lifestyles and the awareness among the people in rural areas in changing very swiftly. The Government of India's ambitious plan of "Digital India" aspires to connect all the Gram Panchayat's and the villages of India digitally through broadband internet connection. The Indian Government aims to provide e-governance to the rural people of the nation and remodel India into linked intelligent economy.

The Government of India has imparted different schemes for Digital India which will profit all the sectors and districts of India along with the population in the rural areas. Since there is limitation in internet and computer literacy in the rural areas, the rural population is not able to take the benefits of the various schemes provided by the Indian Government.

For example, the DigiLocker Scheme which is provided by the Government to digitally store all the important documents and certificates of the people would be of no use if the population in the rural countries do not use Internet and take advantage of this facility.

Similarly, the facility of electronic signature or digital signature through the identification of one's Aadhar card i.e. e-Sign provided by the Government will be of no use if the people in village are not aware about the digital literacy.

X. DIGITAL INDIA: IMPACT ON URBAN AREAS

The achievement of any social progress, in any advanced sector of the nation not only depends upon the involvement of Government but also relies on the active participation of the people and as well as the independent sectors. The people from the developed sectors of India are highly contributing to the success of Digital India. Free 24x7 Wi-Fi's and hotspots have been implemented in the public areas such as railway stations, colleges, universities, recreational parks, etc. so that people can have internet access anywhere and anytime. E-learning has been implemented, i.e., e-books are provided instead of manual books. The e-books can be provided in the form of tablets. 24x7 power supply is provided. The tower site from where the power supply is provided is in the close proximity of schools, industries, factories and residential buildings.

XI. DIGITAL INDIA: IMPACT ON AGRICULTURE

Out of the total population in India, 70% are the poor people who live in rural areas. The livelihood of these rural people relies upon agriculture. The occupational framework of our country is mainly dominated by agricultural sector. Since long time, India has been facing major challenges in agriculture. The Government of India has come up with many services for the development of the farmers. 94% of the total farmers in the country depend upon their fellow farmers as the favored source of information, whereas 10% depend upon the information provided by the agricultural retailers, 4% depend upon the information obtained from television and radio and only 3% depend upon the agricultural extension officers. Due to the illiteracy the farmers in the rural areas are not able to operate the electronic devices. Apart from the illiteracy, there are other main challenges in India that affect the agricultural sector. These challenges are as follows:

- ◆ Poor agricultural infrastructure.
- ◆ Poor agricultural support facilities.
- ◆ Inadequate information regarding relevant agricultural practices.
- ◆ Shortage of common platforms for farmers.
- ◆ Poor use of ICT by farmers for agriculture.
- ◆ Inadequate awareness about applicable government schemes.

In order, to overcome the above challenges faced by the Indian farmers, the Government of India invented the concept of Digital India. The Digital India scheme helps the farmers to sell their crops at better prices. With the use of internet, the farmers will come to know about the new farming technologies. Internet will help the Indian farmers with better farming techniques, better marketing, different government policies, etc. It is estimated that by the year 2022 the income of the farmers will be doubled due to the execution of Digital India campaign.

Following aspects are proposed by the Government of India under the program of Digital India.

- ◆ Assure that more farmers have access to the different crop insurance schemes: Under the scheme of Pradhan Mantri Fasal Bima Yojana, a premium of 2% for Kharif crops will be charged from the total amount insured and a premium of 1.5% for Rabi crops will be charged from the total amount insured.
- ◆ Inspire the use of modernized machinery and equipments: The Government of India encourages the farmers in the rural areas to use the modern technologies, machineries and equipments for farming rather than using the traditional old methods. The use of modernized machinery will lead to good productivity.
- ◆ Increase the scope of “Soil Health Card Scheme”: Under this scheme, basic knowledge on the different types of fertilizers and how to use the fertilizers is given to the farmers to enhance the productivity of agriculture.
- ◆ Implementation of irrigational projects in the different rural areas of the country: The set up of irrigational projects in the rural areas will reduce the dependency of farmers on the monsoon. The Indian Government has sanctioned the sum of Rupees 50,000 Crore to set up several irrigational projects in different parts of rural areas in the country.

XII. DIGITAL GREEN

Digital Green is a NGO (Non Government Organization) which uses inventive digital platform to enhance the lives of the people living in the rural areas of the South Asia and Sub-Saharan Africa. This organization associates with the regional public, governmental society

organizations and private public to give the knowledge and information on various upgraded and enhanced agricultural processes, well-being, nourishment and employment. This knowledge is disseminated using locally generated videos which are human mediated. This technique of imparting knowledge and information to the people in rural areas was ten times more productive and cost-effective and the use of new and latest agricultural practices was found to be seven times more superior as compared to the old conventional practices. Digital green is presently enforcing several projects in partnership with 20 different organizations situated across 9 different states in India and certain parts of Niger, Afghanistan, Tanzania, Ghana and Ethiopia. From the year 2008 to June 2016, the Digital Green Organization has hit more than a million of population over 4,426 videos across 13,592 rural areas which exhibit and illustrate leading services.

XIII. IMPACT OF DIGITAL INDIA BY 2019

Total cost invested in Digital India by the Government of India:

- ◆ The Government of India has invested Rs. 100,00 Crore in the current going schemes.
- ◆ Further, The Government of India has invested Rs. 13,000 Crore for the upcoming new activities and schemes.
- ◆ Development of digital India by 2019:
 - ◆ Broadband setup in 2,50,000 villages.
 - ◆ Universal telephone and mobile connectivity.
 - ◆ Setup of 400,000 Public Internet Access Points.
 - ◆ Providing e-Services and e-Governance across the nation.
 - ◆ 24x7 free Wi-Fi's in all universities across the country.
 - ◆ Wi-Fi setup in 2,50,000 schools across the nation.
 - ◆ At least 8.5 Crore indirect job recruitment.
 - ◆ Full fledge services of e-hospital, e-banking and e-education.

XIV. CONCLUSION

It is concluded that the Digital India Program initiated by Government of India is the leading initiative which will help to reduce the gap between the rural and urban sectors of the nation. The Government of India has implemented many Government services for the benefit of the rural people. The rural people should be able to make use of these services for their benefit. This will surely eliminate the Digital Divide of the country. Various

projects of Digital India are still under implementation phase. Some of the projects may require minute changes in future depending upon the nation's requirement.

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A Novel Low Cost RCD Snubber and Totem Pole Drive Circuit for PMDC Motor

^[1]Ajit Nivrutti Shinde, ^[2]Uday Tanajirao Patil ^[3]Mr.Sandip Sarjerao Godhade
^{[1][2]} Assistant Professor

Sanjay Ghodawat Institute, Atigre, Kolhapur

^[1] shinde.an@sginstitute.in, ^[2] patil.ut@sginstitute.in ^[3] godhade.ss@sginstitute.in

Abstract:-- Manufacturing plant in industries like chemical, pharmaceutical, plastic and textiles all need speed variation. And it could be flat belt application, flow management application or combining of liquids. There are different kinds of motors-AC, PMDC, Servo or steppers which are used according to the applications. Of these, PMDC motors have widely used. The PMDC motors are easy to control compare to other types of motors. The treadmill is a walker which is used for exercise. This is one application in which a PMDC motor plays an important role in its operation. The PMDC motors are used to operate these machines.

In this paper, implementation of PIC 16F877A microcontroller to change the speed of PMDC motor fed by a MOSFET has been investigated. The MOSFET is driven by high frequency PWM signal. Controlling the PWM duty cycle is same as to control the motor terminal voltage, that changes directly the motor speed. Experimental results are obtained that shows the use of microcontroller for speed management and over current protection of a DC motor.

Index Terms— MOSFET, PWM, PMDC motor, PIC microcontroller, Treadmill etc.

I. INTRODUCTION

The power electronics makes not only a good control of electrical machines caused by precise control and quick response, but also makes easy implementation with low maintenance cost. In parallel with the advance in power electronic there is a fast growth in microcontroller primarily based control systems due to the microcontroller flexibility and versatility. This can be due to use of control algorithms which is implemented within the software [1].

Adjustable speed drives could also be operated over a large range by changing armature or field excitation. Speeds less than the rated value by armature voltage control and more than the rated value by field excitation variation, the growth of different solid state switching devices in form of diodes, semiconductor devices in the form of diodes, transistors and thyristor together with different analog/digital chips employed in firing/control rolling circuits, have made DC drives easily accessible for control in number of areas of applications[2].

Speed management of a low power drives by applying low voltage is simple. These types of drives are difficult to use for applications wherever high torque is needed. The designing of a high capacity variable speed drives is more complex due to thermal run away of

switching devices like power MOSFET, if used in switching applications. The snubber circuit protects MOSFET from extreme temperature loss. The frequency of switching devices when goes on increasing, the rate of change of voltage (dv/dt) & rate of change of current (di/dt) takes place across the MOSFET terminals. This makes the thermal breakdown of power MOSFET. The Laszlo Balogh [6] has shown systematically, the design of high performance gate drive circuits for switching applications with high speed. Paper consists of an introduction of MOSFET technology and switching operation, design procedure for ground reference and high speed gate drive circuits in detail.

The controlling of a gate charge of a MOSFET during turn off protects the MOSFET from ringing & overshoot caused by dv/dt. John E.Makaran [3] has given the relation between VGS & VDS to obtain the two stage control of gate charge removal at the time of turning off MOSFET. PMDC motor offers the simplest way for speed regulation using PI controller, as compared to other controllers, literature [4] shows the response of PI, PD & PID controller once it's connected to PMDC drive. Fuzzy controller with PIC 16F877A may be used for speed control of any motor solely by changing control algorithm & by changing program while not changing hardware [5]. Design of driver circuit is needed for switching of a high power motor which gives a smooth control of motor speed [7]. The objective this paper is to suggest a microcontroller based closed loop controller.

The interfacing of a circuit with software are all designed with a temperature control system to protect the motor from overheating.

II. HARDWARE DESIGN

The hardware system consists of DC shunt motor, power control circuit, MOSFET driver circuit, PIC microcontroller 16F877A, speed sensor circuit, and temperature control circuit. 16F877A microcontroller gives control algorithm by conditioning the speed, current signals and controls the speed according to reference input given through the keypad. The software includes a routine to read the motor temperature and this shutdown signal it sends to DC motor to protect the system from overheating.

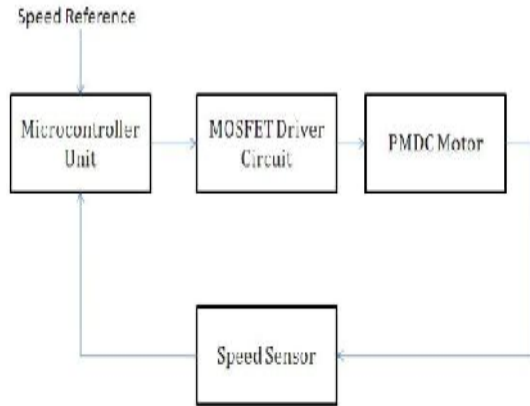


Fig.1 Block Diagram

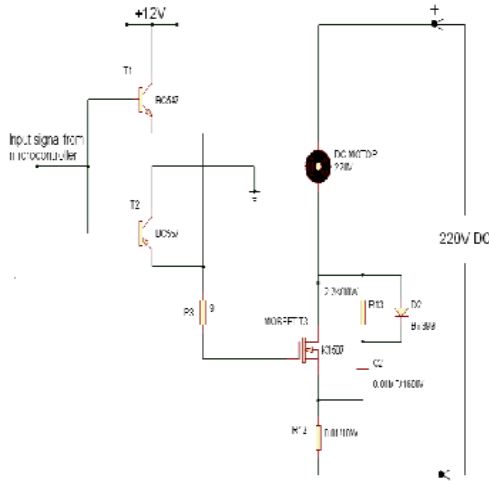


Fig.2 Circuit Outline

III. DESIGN OF SNUBBER CIRCUIT

When a DC motor is suddenly turned OFF, the back EMF in the motor inductance is dissipated in the

switching device which causes an overvoltage across the device. The magnitude of this back EMF is proportional to the amount of inductance and rate of turn off current. This situation becomes very dangerous at the time of fast switching of MOSFET devices. These devices become turn OFF and turn ON at high magnitude of currents in short duration of time which rises potentially destructive voltage transients. Thus the di/dt generated in the MOSFET could be of few thousand A/us. Proper attention need to be provided to protect these devices form destruction. It is found that snubber offers good protection against voltage transients during turning on and turning off devices. The use of such type of protection circuits allows quick and safe operation by operating the device within the boundaries of rated safe operating area.

IV. RCD SNUBBER CIRCUIT

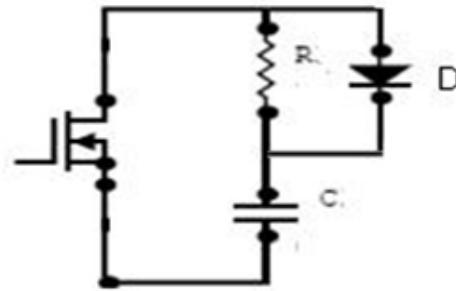


Fig.3 Snubber Circuit

The charge discharge snubber as shown in above figure can be used to minimize turn off dissipation in MOSFET. During MOSFET turn on the snubber capacitor is fully discharged and during turn off it is fully charged. This circuit reduces the rate of rise of voltage across MOSFET at turn off and gives softer switching and thereby reducing the losses in MOSFET.

V. SPEED MONITERING SYSTEM

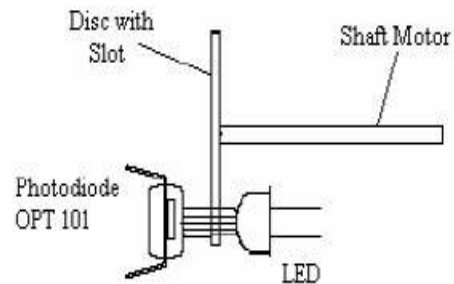


Fig.4 Speed monitoring system

The speed monitoring system consists of an optical encoder as a speed sensor to measure the speed of motor. This sensor is used as a velocity sensor is capable of much better performance than the generator type of tachometer (used as a back emf). This system consists of an optical disc which is properly mounted on the motor shaft, which generates a frequency directly proportional to motor speed. The output of tachometer doesn't get change due to change in gap, temperature and magnet strength. The analog tachometer gets directly affected by all the problems listed above. The encoders available in the market are very expensive. In this system an optical encoder is prepared to reduce the cost of system. Fig. Below shows the schematic of the optical encoder in action respectively. The speed accuracy over fractions of a revolution depends on the quality of the optical encoder. An optical disc made by card board is mounted on the shaft of motor. This disc has N radial lines on its surface. A single slot is made in the disc to pass the LED lights from one side to another side. A LED is put on one side of disc as transmitter and a photo diode on other side as a receiver to sense the speed of motor.

VI. TEMPERATURE CONTROL SYSTEM

The motor winding temperature gets increases due to continuous operation of treadmill. The motor conductors gets short circuited due to increased temperature. Hence there will be chances of burning of motors is possible. In this system motor temperature protection is provided. The temperature sensor IC LM 35 is used to sense the motor temperature. This sensor is fixed near to motor winding. When temperature of motor increases above the set value, signal is transferred from sensor to relay circuit, which stops the motor immediately. Hence the motor is protected from burning.

VII. SOFTWARE DESIGN

The microcontroller is a brain of the DC motor speed control system. In this system microcontroller chip PIC16F877A is selected for the purpose of controlling the speed of DC motor manufactured by Microchip. The selection of chip is based on several reasons:

- a. The size of chip is small and equipped with sufficient output ports .No need to use a decoder or multiplexer.
- b. It has very low current consumption

- c. The pulse width modulation techniques (PWM) are inside the chip itself which allow us to vary the duty cycle of DC motor drive.
- d. The controller chip is a very simple to understand and powerful. Users would only need to learn 35 single word instructions in order to program the chip.
- e. It is programmed and reprogrammed easily (up to 10,000,000 cycles) by using the universal programmer in robotics

In this system microcontroller receives the desired speed from user through thumbwheel switch. The actual speed will be compared with the desired speed and the correction signal is given to microcontroller to maintain the DC motor speed at the desired speed.

VIII. SPEED CONTROL PROGRAM FLOW

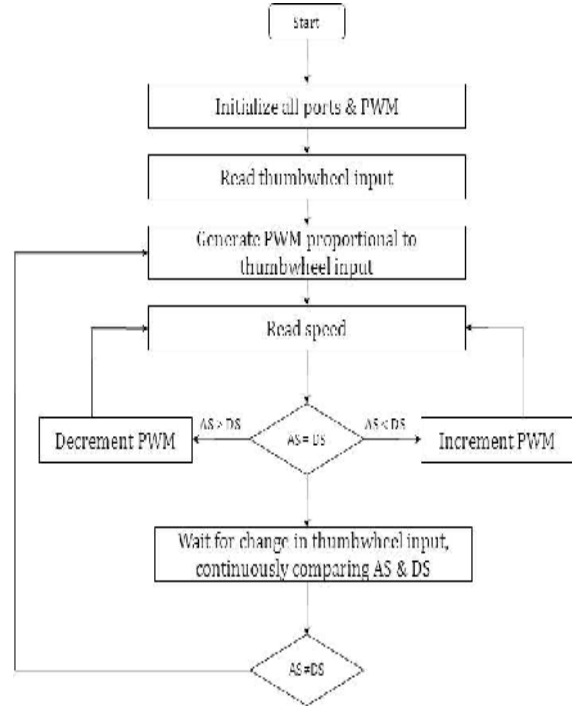


Fig 5 Speed Control Program Flow Chart

IX. CONCLUSION

The above PID speed control implementation through PIC 16F877A microcontroller for a Permanent magnet DC motor for treadmill reduces the voltage fluctuations. A low cost RCD snubber and Totem pole driver circuit has very low effect of dv/dt-change in voltage and di/dt- change in current. The response time of motor gets improves by PID control strategies.

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Kernel Density based Germplasm Evaluation Using Cluster Ensemble

^[1] Dr. Sangeeta Ahuja ^[2] Dr. H.L. Raiger ^[3] Dr. D. K. Ghosh ^[4] Mudenge Fabrice
^{[1][4]} Scientist (S.S.) Indian Agricultural Statistics Research Institute, New Delhi, India.
^[2] Principal Scientist, National Bureau Plant Genetic Resources, India.
^[3] Head and Professor, UGC Fellow, Saurashtra University, Gujarat, India.
^[1] reach2san@yahoo.com

Abstract: Germplasm Evaluation plays very important role in genetic resources management and hybrid selection. The germplasm evaluation using the Kernel Density based Bayesian Ensemble (KDBCE) method gives promising results. It is based on Multivariate Kernel Density Estimation and Naive Bayes Classifier to obtain robust clustering using Density based (DBSCAN) clusterer. This algorithm operates in three phases. During the first phase, H input clustering schemes are generated by using the density based algorithm (DBSCAN) with different number of clusters in each clustering scheme. The optimum number of clusters is determined by computing the Silhouette coefficient for each clustering scheme. The second phase equalizes the number of clusters generated by different clustering schemes depending upon the optimum number of clusters. Accordingly, the clusters split or merge in different clustering schemes by using the kernel density based split and merge method. In the third phase, consensus partition is generated by the Naive Bayes Classifier. Empirical evaluation of the algorithm shows that the proposed method significantly improves the quality of resultant clustering scheme compared to the best of the original schemes.

Keywords: DBSCAN, Cluster Ensemble, Naive Bayes Classifier, Cohesion, Separation, Silhouette Coefficient.

I. INTRODUCTION

Getting the high quality results is very difficult by utilizing the traditional clustering methodologies because of the various anomalies viz., randomization, idiosyncrasies of algorithms [1], statistical, sampling techniques [2]. Germplasm evaluation have been done by traditional clustering methodologies and difficult to describe the best method as any one method. Cluster ensemble techniques [1, 3, 4, 5, 2, 6, and 7] can be utilized for combining multiple schemes for robust clustering solution. These methods not only improves the quality but also the accuracy and stability.

Problem Definition

Let D is a data set of N, d-dimensional vectors $x = \langle x_1, x_2, \dots, x_d \rangle$, each representing an object. D is subjected to a clustering algorithm which delivers a clustering scheme π consisting of K clusters. ($\pi = \{C_1, C_2, \dots, C_K\}$). Let $\{\pi_1, \pi_2, \dots, \pi_H\}$ be H schemes of D obtained by applying either same clustering algorithm on D or by applying H different clustering algorithms. Further, let $\lambda_\pi : D \rightarrow \{1, K\}$ be a function that yields labeling for each of the N objects in D. Let $\{\lambda_1, \lambda_2, \dots, \lambda_H\}$ be the set of corresponding labelings of D. The problem of cluster ensemble is to derive a consensus function Γ , which combines the H partitions (via labelings) and delivers a clustering π_f , with a promise that π_f is more

robust than any of constituent H partitions and best captures the natural structures in D.

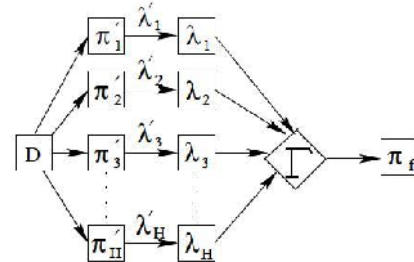


Figure 1: The process of Cluster Ensemble
 Figure 1 shows the process of construction of cluster ensemble.

II DESIGN AND DEVELOPMENT OF KDBCE

KDBCE (Kernel Density Based Cluster Ensemble) has been developed in Windows environment with multithreaded Microsoft Visual C++ 6.0 programming language which is an object-oriented language and suitable for software development. It utilizes various key features of object oriented technologies such as reusability, inheritability, encapsulation, portability and modular development. For details, a reference may be made to Kruglinski [9,14] and Ritcher. Discriminant Analysis and Logistic Regression have been performed using R 2.0.0 software distributed by CRAN Foundation

(R Development Core Team, 2004). The Multilayer Perceptron has been performed using the data mining package WEKA Software (2000). The hardware used was a dual core Intel (R) machine (2. 20 GHz, 4 GB RAM). But any system with minimum of 64 MB RAM and 2 GB Hard Disk capacity is required to run this algorithm and it will be compatible on Microsoft Windows 98, ME, 2000 ,XP and . Net Platform.

III. ARCHITECTURE OF KDBCE ALGORITHM

The density based algorithm (DBSCAN) [13] for generating the original clustering schemes has been utilized in order to handle clusters of arbitrary shapes and sizes. KDBCE consists of three phases (see Figure 2). During the first phase, H input clustering schemes are generated by using the density based algorithm (DBSCAN) with different number of clusters in each clustering scheme. The optimum number of clusters is determined by computing the Silhouette coefficient for each clustering scheme. The second phase equalizes the number of clusters generated by different clustering scheme depending upon the optimum number of clusters. Accordingly, the clusters are splitted or merged in different clustering schemes by using the multivariate kernel density based split and merge method. In the third phase, consensus partition is generated by utilizing the Naive Bayes Estimation with Probability Index. The KDBCE is mathematically shown as follows:

Let D denote the data set of N, d-dimensional vectors $X = \langle X_1, X_2, \dots, X_d \rangle$, each representing an object. D is subjected to Density based clustering algorithm i.e. DBSCAN (Tan, et al. , 2006). Let $\pi_1', \pi_2', \dots, \pi_{H'}'$ be H partitions of D obtained by repeatedly applying DBSCAN clustering algorithm with different parameters (φ and ρ). Each application results into different number of clusters in each partition, i.e. $\pi_i = (C_{i1}, C_{i2}, \dots, C_{iki})$ where $k_i =$ number of clusters in the i^{th} partition.

Since, the number of clusters in each scheme may be different mapping of clusters in the scheme is not straight forward. It is necessary to first equalize the number of clusters in all schemes before proceeding. In the present context, this requires determining the optimal number of clusters before equalizing the number of clusters in H schemes. The optimum number of clusters is determined by computing the Silhouette coefficient for each clustering scheme and identifies the best clustering scheme. The number of clusters in this scheme is taken to be optimum, and to equalize the remaining schemes, clusters are merged or split, as the case may be. After equalizing the number of clusters by split/merge method the final consensus partition has been obtained.

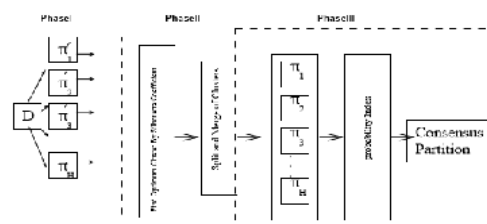


Figure 2: The architecture of KDBCE Cluster Ensemble

Experimentation

The experimentation has been executed on chickpea data set by implementing the KDBCE algorithm. The data has been collected from NBPGR, New Delhi, India. It consists of 3584 observations with 8 different characters viz., days of 50% flowering, number of primary branches per plant, plant height, number of pods per plant, number of seed per pod, days to 80% maturity, 100 seed weight, grain yield per plant and yield. Rigorous experimentation has been done by varying the cluster size and partitions for both the traditional and KDBCE cluster ensemble algorithm. Quality of KDBCE clustering and best of traditional clustering algorithm has been compared as shown in figure 3 and figure 4 respectively. In figure 3, 1 represents the purity of best of traditional clustering algorithm and 2 represents the purity by KDBCE algorithm. Similarly in figure 4, 1 represents the NMI of best of traditional clustering algorithm and 2 represents the NMI by KDBCE algorithm and results strongly improve the quality (Purity and NMI) by KDBCE cluster ensemble algorithm.

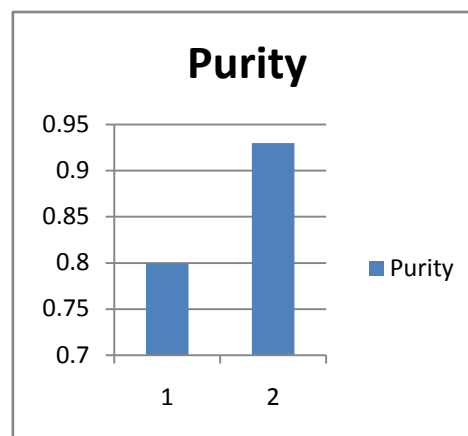


Figure 3: Purity comparison

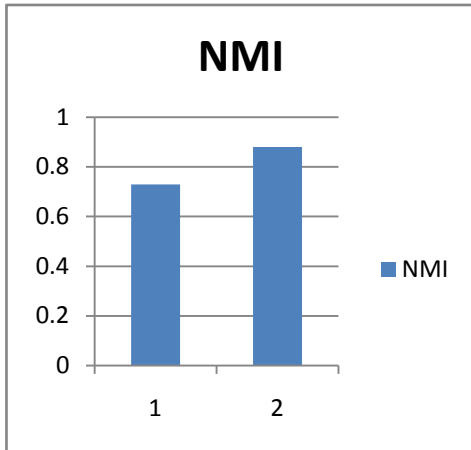


Figure 4: NMI comparison

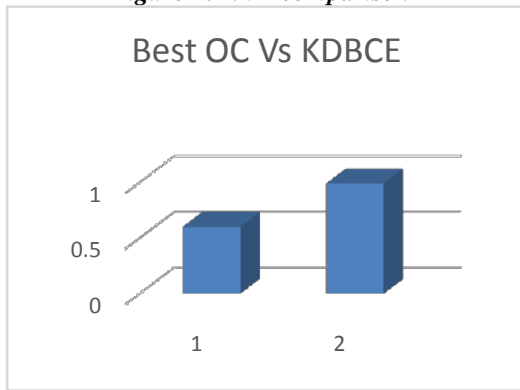


Figure 5: Silhouette Coefficient

Other comparisons have been done for best of original (traditional) clustering scheme (Best OC) with the clustering scheme obtained from our cluster ensemble method that is, Kernel Density based Bayesian Cluster Ensemble (KDBCE) with optimum number of clusters and optimum partition. Best of Original clustering scheme is the partition at which we achieved the maximum silhouette coefficient value. 1 in Figure 5 refers to Best of silhouette coefficient and 2 refers to the KDBCE silhouette coefficient for chickpea germplasm. It clearly shows that through KDBCE cluster ensemble results improves a lot as compared to best of other clustering methods.

Assessing Quality of Cluster Ensemble

We employ the following measures for determining the quality of Performance Ensemble [14]

Purity (Accuracy): Let there be K clusters in the data set D corresponding to K classes in the data and the size of cluster C_j be $|C_j|$. If $|C_j|_{class = i}$ denotes number of objects of class i assigned to C_j , then purity of C_j is given as

$$Purity(C_j) = \text{Max}(i=1, K) \{ |C_j|_{class = i} / (|C_j|) \}$$

The overall purity of a clustering scheme is expressed as a weighted sum of individual cluster purity.

$$Purity = \sum_{(j=1, K)} (|C_j| * Purity(C_j)) / |D|$$

In general, larger value of purity, indicates better quality of the solution.

◆ **Normalized Mutual Information(NMI):** Intuitively, the optimal combined clustering should share the most information with the original clusterings. Let A and B be the random variables described by the cluster labeling $\lambda(a)$ and $\lambda(b)$ with k (a) and k (b) groups respectively. Let $I(A, B)$ denote the mutual information between A and B, $H(A), H(B)$ denote the entropy of A and B respectively. Then normalized mutual information (NMI) is defined as follows

- ◆ $NMI(A, B) = 2I(A, B) / H(A) + H(B)$
- ◆ Clearly, the value lies between [0, 1] and $NMI(A, A) = 1$.

◆ **Silhouette Coefficient (SC)**

Silhouette coefficient combines both Cohesion and Separation [8,11,12]. Cohesion measures the closely related objects in a cluster [8,11,12]. The steps for computing the silhouette coefficient for an individual point are as follows.

For the ith object, calculate the average distance to all other objects in its cluster. Call this value a_i .

(i) **For the ith object and a cluster not containing the object,** calculate the object’s average distance to all the objects in the given cluster. Find the minimum such value with respect to all clusters; call this value b_i .

(ii) **For ith object, the silhouette coefficient is given by**

$$s_i = (b_i - a_i) / \text{Max}(a_i, b_i)$$

Silhouette coefficient for the clustering scheme is aggregation of the coefficients of individual points.

$$SC = \frac{1}{N} \sum_{i=1}^N s_i \tag{3.4}$$

SC ranges [-1, +1], If SC = -1 represents bad, SC = 0 represents indifferent and SC = 1 represents good value.

IV. CONCLUSION

Kernel density based Germplasm evaluation by using the KDBCE Cluster Ensemble improves the results significantly as compared to other traditional clustering method. The algorithm of cluster ensemble consists of three phases from generation of clustering schemes to fusion of schemes in order to achieve the best final clustering scheme with compact clusters. The DBSCAN algorithm has been utilized for generation of initial clustering schemes. The unequal and irregular number of clusters can be handled by this KDBCE cluster ensemble. The advanced statistical techniques of Kernel Density Estimation and Bayesian concept have been used for construction of consensus partition. Empirical evaluation and extensive experimentation with chickpea data sets for germplasm evaluation shows better cluster quality with KDBCE as compared to best of original clustering schemes.

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Online Big File Storage Mechanism

^[1] Ms.Noopur Adarsh Purwar ^[2] Prof.Nilima Nikam ^[3] Prof.Vaishali Londhe
^{[1][2][3]}Yadavrao Tasgaonkar Institute and technology Bhivpuri, Karjat

Abstract:-- Online data storage refers to the practice of storing electronic data with a third party service accessed via the Internet. It is an alternative to traditional local storage (such as disk or tape drives) and portable storage (such as optical media or flash drives). It can also be called "hosted storage," "Internet storage". One of the biggest benefits of online storage is the ability to access data from anywhere. As the number of devices the average person uses continues to grow, syncing or transferring data among devices has become more important. Not only does it help transfer data between devices, online data storage also provides the ability to share files among different users. This paper presents the different techniques which help in making online storage an easier way of storing data. Data deduplication is one of important techniques for eliminating duplicate copies of repeating data, and has been widely used in online storage to reduce the amount of storage space and save bandwidth. To protect the confidentiality of sensitive data while supporting deduplication, we have also proposed an encryption technique which helps in encrypting the data before storing it. Our approach to deduplication ,encryption and compression in online storage aims at reduction in storage space and efficient use.

Index Terms:— BFS Big File Storage, Compression, Deduplication, Encryption

I. INTRODUCTION

Any and every computer user knows that backing up data is absolutely vital to maintaining the integrity of their files and folders. Users who do not back up data appropriately are highly susceptible to losing access to important information due to hardware failures, file corruption, viruses, disasters, accidental deletions, and even theft. When this happens, many people are often devastated by the loss of important and unrecoverable data. Despite having this knowledge, many computer users still fail to backup their data regularly, or they simply rely on intermittent backups to USB and thumb drives. Today, there are more backup solutions than ever before, including online backup services that allow you to store your data, so there is little reason to forego routinely backing up important data. This paper focuses on the infrastructure services dealing with storage and network usage. Deduplication and compression, which are described in detail later, are some of the important data optimization services that the online storage system offers [9].

We have proposed an architecture wherein there is a chunk storage mechanism which leverages parallel computing capabilities of the underlying hardware. That make it easier to store data and scale-out the storage system. We have developed a deduplication mechanism to avoid storage of duplicate files by differentiating them on the basis of their content rather than their name. We also propose usage of a compression algorithm to efficiently store chunks of a file thus managing and utilizing storage space efficiently. A storage based on the proposed

architecture helps in saving a lot of storage space. Data deduplication is a specialized technique for eliminating duplicate copies of repeating data in storage.[2] Deduplication techniques are widely employed to backup data and minimize network and storage overhead by detecting and eliminating redundancy among data.[4]

1.2 Contributions in this research

In this paper ,we propose an online storage mechanism which helps in storing big file data securely and efficiently. We propose the following:

∑ A light-weight meta-data design for a file. Every file has nearly the same size of meta-data. BFS has $O(1)$ space complexity of meta-data of a file, while size of meta-data of a file in Dropbox , HDFS has space complexity of $O(n)$ where n is size of original file[1].

∑ Propose a chunk storage mechanism which leverages parallel computing capabilities of the underlined hardware. This allows faster storage and processing of data as compared traditional sequential processing of data.

∑ A deduplication mechanism across users of the system. This is based on the actual content of the file rather than the name used for the file.

∑ Propose usage of a compression algorithm to compress chunks of a file.

∑ An encryption algorithm which helps in encrypting the data being stored. This keeps the data secure and confidential.

1.3 Organization

This paper is organized as follows. In Section 2, we present the system model of big file storage system. The development is presented in Section 3. The results are presented in section 4. Finally, we draw our conclusions in section 5.

II. SYSTEM ARCHITECTURE

The system architecture of the system is as shown in figure 1.

Shown Below is the diagram of Online Big File Storage Mechanism(BFS).A user uploads files on the server through its web interface.As soon as the file /files are uploaded,the file goes through a series of mechanism like deduplication,compression ,encryption and metadata design.The file splits into chunks and a meta data is created for that particular file.The working of the modules is explained with the help of diagrams in the below sections.

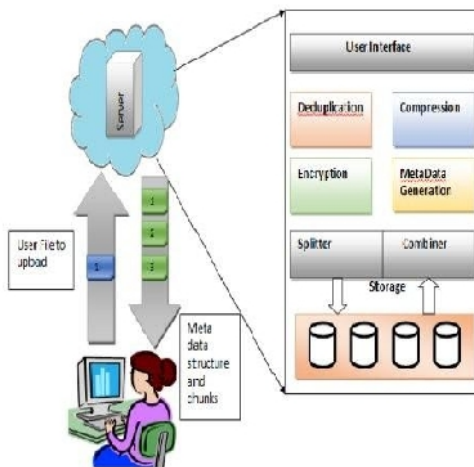


Figure 1: Online Big File Storage Mechanism

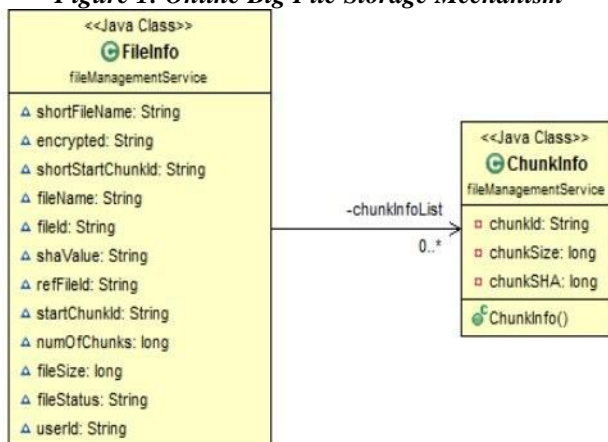


Figure 2: ChunkInfo based metadata design



refFileid : populated for a duplicate file. It points to the original file uploaded

Figure 3: Deduplication based on ref FileId

As seen in figure 1. a user/users select a file /files for uploading to the Big File storage system. The file goes through a set of processes before getting stored in the underlying storage. First, the metadata is generated for a file. Next the file is checked for duplicacy. It is then encrypted and split into chunks of predefined size.Each chunk is then encrypted. Finally each chunk is compressed and stored. This is the approach followed in the BFS system.

The figure 2 shows the metadata design of existing online storage systems available in the market. In this metadata design as we can see along with FileInfo, another datastructure ChunkInfo is created. FileInfo stores the metadata of a file and ChunkInfo stores metadata related to the chunks of a file.

The figure 3 shows improved metadata design of BFS wherein the need for ChunkInfo datastructure is eliminated resulting in improved storage.

III. DEVELOPMENT

The following figures depict a basic use case of file storage and retrieval performed using the Big File Storage system.

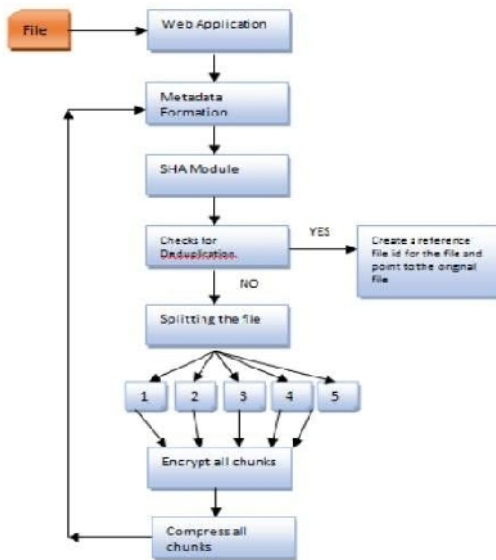


Figure 4: Upload Flow

- Step 1: User uploads a file on the server.
- Step 2: The BFS creates a metadata of the particular file.
- Step 3: Based on the content of the file, the system creates an SHA value of the file based on its content.
- Step 4: It then checks the database for files which have the same SHA value. If the content of the file is same, then BFS creates a reference FileId and points to the original file
- Step 5: The file is split in different number of chunks where each chunk is of the same predefined size except the last chunk.
- Step 6: The chunks are then encrypted using AES encryption standard and compressed using Snappy Java Algorithm.

Use Case A. Uploading a file

The processes running inside the proposed BIG FILE STORAGE system are split into following phases.

- 1) **Metadata generation** :- Metadata generation for a file is essential so as to be able to uniquely identify a file and its chunks.
- 2) **Deduplication**:- Using metadata generated a file being uploaded by a user is cross checked for duplicacy
- 3) **Encryption (AES)** and splitting of file: A new non duplicated file is split up into chunks based on the metadata generated and each chunk is encrypted.
- 4) **Compression**: Every chunk of the file generated in the previous step is compressed thus enhancing the storage capability of the storage system.

Phase 1: Metadata generation

Typically, in any data storage system such as Dropbox, the size of meta-data increases respectively with the size of original file. The metadata design in these systems contains a list of chunk metadata structure which stores information such as chunk id, chunk size, hash value of chunk and other chunk metadata. Size of this list is equal to the number of chunks which will be generated from the actual file. The overall size of this list grows and becomes a performance bottleneck for the overall system as the file sizes and the number of files being stored grows. As shown in the figure the metadata design in such systems is not optimized and it eats up the storage space and processing power of the system as the system matures. We propose a solution in which the size of metadata is independent of the number of chunks generated from a file. The solution just stores the id of first chunk, and the number of chunks which is generated by original file.

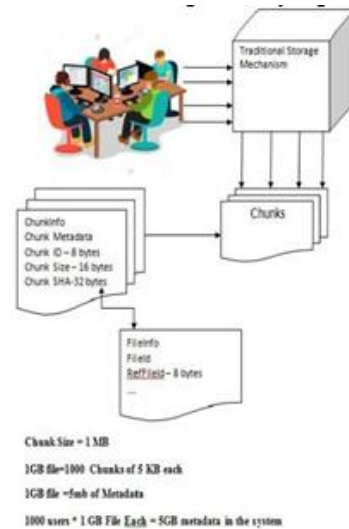


Figure 5: Metadata stored in file storage

The figure above shows how metadata is stored in the Big File Storage

Because the id of chunk is increasingly assigned from the first chunk, we can easily calculate the ith chunk id by the formula:

$$\text{chunkid}[i] = \text{fileInfo.StartChunkID} + i \quad (1)$$

Meta-data is mainly described in FileInfo data structure which consists of following fields:

- ∑ File Name- the name of file;
- ∑ Encrypted: the file will be encrypted
- ∑ SHA value: 32 bytes - hash value by using sha-256 algorithm of file data;

- Σ Start ChunkID : 8 bytes - the identification of the first chunk of file, the next chunk will have id as startChunkID+1 and so on;
- Σ Number of Chunks :Chunk: 8 bytes - the number of chunks of the file;
- Σ File ID: 8 bytes - unique identification of file in the whole file;
- Σ Reference FileID: 8 bytes - id of file that have previous existed in System and have the same sha256 - we treat these files as one, refFileID is valid if it is greater than zero;
- Σ File Size : 8 bytes - size of file in bytes;

Phase 2: Deduplication:-

Data deduplication is a method of optimizing the storage by eliminating redundant data. Only one unique instance of the data is actually retained on storage media, such as disk or tape. Redundant data is replaced with a pointer or reference to the unique data copy. For example, a typical email system might contain 100 instances of the same one megabyte (MB) file attachment. If the email platform is backed up or archived, all 100 instances are saved, requiring 100 MB storage space. With data deduplication, only one instance of the attachment is actually stored; each subsequent instance is just referenced back to the one saved copy. In this example, a 100 MB storage demand could be reduced to only 1 MB.

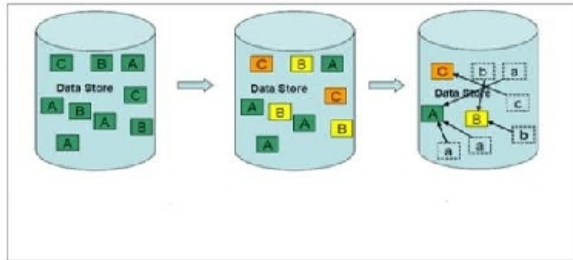


Figure 6: Data Deduplication process

In Figure 7,

1. Data store contains multiple instances of the same data
2. Deduplication process checks the content of the files to identify duplicates
- 3 .If the content of the file found is the same, a pointer/reference is created to original file

Algorithm 1: Metadata generation and Deduplication check

Terms	Description
1) Createfileinfo()	Creates basic metadata for the file
2) Idgeneratorservice	such as filename, fileId, fileSize, No. of chunks that will be created from the file.
3) Hashgeneratorutils.Hashfile()	
4) Dbutils.retrievefileinfo()	Generates a sequence
5) Dbutils.savefileinfo()	

	<p>of ids for the fileId field and the start chunkId field in the FileInfo datastructure Generates an SHA256 hash value derived from the content of the file. It is used during the deduplication process. Retrieves any existing metadata from the database using the hash value. If found then the file being uploaded is considered duplicate. This method persists the FileInfo metadata created in the database.</p>
--	---

Data: file

Result: Metadata

```

1 begin
2 FileInfoService.saveFileInfoAndSplit
(file)
/* The entry point of the entire flow. */
3 FileSplitter.createFileInfo()
/* Create a FileInfo object. FileInfo object is
populated fileId, fileSize, the total number of chunks
which the file will be split into.refFileId is populated later.
4 HashGeneratorUtils.hashFile
(fileName);
/* Generate the hash value using SHA256
MessageDigest api. Hash value is generated for each
incoming file upload request. */
5 retrieveFileInfo(hash)
/* check for exiting metadata based on the hash value
generated above*/
6 if (existingMetadata) is found then
populate refFileId with fileId of the existing metadata
else
persist new metadata and
continue to split the file
7 end
    
```

Algorithm 2: Encryption and Chunk generation

Terms	Description
AES Encryptor Decryptor getAesEncryptCipher() chunkNoToChunkIdMap()	Uses the 128 bit AES encryption algorithm to encrypt the chunks

<pre> getChunkSize() FileIO </pre>	<pre> generated. Creates an AES encrypt mode cipher with the SHA value as the secret key Prepares a map of the chunkNo. To chunkId . It uses the FileInfo object's start chunkId and no. of chunks field to generate a map of the chunkNoToChunkId Predefined chunk size The FileIO api which is used to split the file in a number of chunks each of the predefined size except the last chunk. </pre>
--	---

```

Data: file
Result: chunks
1 begin
2 FileSplitter.split(FileInfo)
/* The entry point of the entire flow. */
3 AESEncryptorDecryptor.
getAesEncryptCipher
(SHA,ENCRYPT.MODE)
/* Creates an AES 128 bit encrypt cipher. The SHA
value is used as the secret key in encrypt mode
The encrypt cipher is used for encrypting the chunks
generated from the file*/
4 Utilities.getChunkNoToChunkIdMap
(getFileInfo())
/* Prepare a map of chunkNo. to chunkId . This map
will be used in naming the chunks and saving them
on the file system */
5 if(filesize < chunksize)
/*splitting of the file is not done and the file is
saved as is*/
Else
/* split the file in the number of chunks.
Encrypt all the chunks*/
6 end
    
```

Phase 3: Compression

The main advantages of compression are a reduction in storage hardware and the resulting cost savings. A compressed file requires less storage capacity than an uncompressed file, and the use of compression can lead to a significant decrease in expenses for disk and/or solid-state drives. A compressed file also requires less time for transfer, and it consumes less network bandwidth than an uncompressed file. We have proposed compression technique using Snappy algorithm which is

helping in further reducing the size of the file and helps in saving storage space.

Algorithm 3: Chunk generation and compression

Terms	Description
<pre> Chunk Deflater Compress Chunk() </pre>	<pre> Uses the Snappy Java api to compress and decompress the chunks Uses Snappy Output Stream to compress the incoming chunk </pre>

Compression of the chunks is carried out simultaneously while the chunk is generated and encrypted .

Data: Encrypted chunk

```

Result: chunks
1 begin
2 chunkDeflater.compress
(incomingChunk,outgoingChunk)
/*start compressing the chunk
generated */
3 SnappyOutputStream.write
(SHA,ENCRYPT.MODE)
/* SnappyOutput stream uses a buffer size of
[64*1024] and writes a compressed chunk on the
storage*/
4 end
    
```

Use Case B. Downloading a file

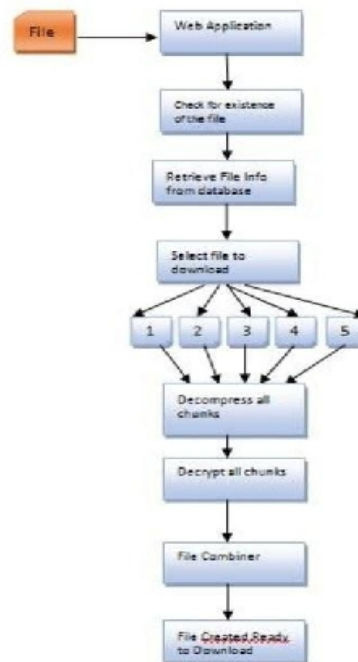


Figure 7:Download Flow

Step 1: User logs into the account and selects which file to download

Step 2: The server retrieves metadata of the file from the database

Step 3: The decompression engine first decompresses all the chunks of the file using Snappy Java Algorithm.

Step 4: After decompression ,the chunks are decrypted by the decryption engine

Step 5: Then all the chunks of the file are combined by the file combiner engine

Step 6: The file is thus recreated and is downloaded at the users end.

```

api to decompress*/
5      getAesDecryptCipher.decrypt
/*Use the AES 128 bit
decryption      process to decrypt the
chunk.*/
6      Join the chunks using the FileIO api
7      end
    
```

Terms	Description
getFileInfo And Combine ()	The entry point of File Info Service download flow
retrieve File Info()	Retrieve FileInfo metadata based on the filename
chunk Deflater decompr ess Chunk()	Decompress the chunks of the file
get Aes Decrypt Cipher()	Decrypt the chunks of the file.Uses SnappyInputStream to decompress the chunk
File Combiner.join()	Join the chunks to get the original file

Algorithm 4: Chunk Decompression, Decryption and file generation

```

Data: Compressed and Encrypted chunks
Result: Decompressed, decrypted and chunks
1      begin
2      DbUtils.retrieveFileInfo
/* Retrieve FileInfo metadata from
the database for the file to be
downloaded*/
3      FileCombiner.getNumberParts
/*Prepare a map of the chunkNoTochunkId which
will be used to look up the chunk */
4      ChunkDeflater.decompressChunk
/* Use the SnappyInput stream
    
```

IV. RESULTS

A.Metadata Design

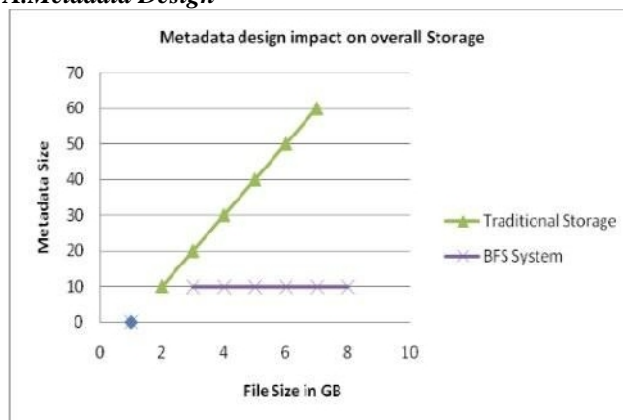


Figure 8:Metadata Size comparison with traditional storage

The above figure shows the impact of the metadata design on storage.The x-axis shows the file size stored and the y axis shows the metadata size.The traditional storage shows the considerable increase in metadata size with respect to file size.While the BFS shows that the metadata size does not increase with respect to file size.

B. Deduplication

**Table 1
Space Saved In BFS System**

File	Number of Files	File Size before Deduplication	Space saved After Deduplication
1.	10	500 MB	440 MB
2.	15	700 MB	550 MB
3.	25	1000 MB	815 MB

The above table shows the different size of files we have saved in BFS .As the content of the file is checked for deduplication and if the file already exists, the system just refers to the original file by creatibg a reference fileid.Thus,it helps in saving storage space.The first reading shows that 10 files were uploaded ,out of which one was a copy,so the file was referenced to the

original file. In the second reading, 15 files were uploaded, out of which 3 files were copy, so only the 12 files got saved, copy files were referenced to the original one. More than 50% of the space is saved overall thus increasing scalability.

C. Compression

Table II
File Size Before And After Compression

Type of document	Size of the File	File size after Compression
Text	100 MB	80 MB
Mp3	40 MB	33.5 MB
Video	700 MB	615 MB

As we can see from the above table, the first reading shows the text file uploaded. The file size of the text was 100 MB, but after compression the file size got reduced to 80 MB. The second reading shows the audio file (mp3) which was of size 40 MB but got reduced to 33.5 MB after compression. Similarly, the video file of 700 Mb got reduced to 615 MB after compression. Thus compression helps in reducing storage space and increasing scalability.

V. CONCLUSION

BFS optimizes an online storage system by redesigning a simple metadata system to create an efficient storage mechanism. Every file in the system has a constant size of metadata regardless of the file size. The data deduplication methodology of BFS uses SHA-256 based hash function to fast detect duplicate files being uploaded and thus reduces data redundancy. The chunks generated from the file are encrypted using AES-128 algorithm which improves the security aspect of the online storage. Finally the encrypted chunks are compressed using a fast compression algorithm Snappy Java which further reduces storage space on the server.

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A study on the pH Value of Fly Ash Concretes

^[1]Dr. Mudimby Andal, ^[2]Dr. T.D. Gunneswara Rao

^[1] Associate Professor of Civil Engineering, Kakatiya Institute of Technology and Science, Warangal

^[2] Associate Professor of Civil Engineering, National Institute of Technology, Warangal

Abstract:-- Use of fly ash in concrete as replacement to cement is an established practice accepted all over the world. The reason is mainly due to the fact that replacement or addition of fly ash reduces the cement consumption and make the concrete economical. Flyash concretes are more durable than conventional concretes. However, the addition of fly ash in concrete decreases the pH of concrete and reduction in pH value disturbs the passivation layer formed around the rebars. The passivation layer is formed around the rebars in concrete due to the higher alkalinity of concrete. Thus the addition/replacement of cement by fly ash affect the pH and thereby the alkalinity. This article describes the effect of replacement of cement by fly ash on the pH value of the end product i.e., fly ash concrete. Fly ash concrete and mortar specimens are cast and tested for pH. It is found that replacement of cement by fly ash reduces the pH of the matrix. With the increase in the age of fly ash concrete reduction in pH value is found to be more. This indicates that the reaction of fly ash with Calcium Hydroxide present in concrete with time reduces the pH value. It is concluded that the treated flyash would be more effective and beneficial than replacement of cement with untreated fly ash..

Index Terms—Corrosion, Durability, Fly ash, pH of concrete.

I. INTRODUCTION

Corrosion of re-bars in reinforced concrete structures is recognized as a major problem in the maintenance of the structural integrity. The most important causes for initiation of corrosion of reinforcing steel are the ingress of chloride ions and carbon dioxide to the steel surface and pH of concrete surrounding the rebar. Chloride ion causes local destruction of the passive film leading to localized corrosion. Carbon dioxide, on the other hand, reacts with the hydrated cement matrix, leading to a decrease in pH and subsequent loss of steel passivity and to corrosion initiation. Chemical protection is provided by the high pH (12.5-13.5) of the concrete interstitial solution, which causes passivation of the reinforcing steel. Concrete also provides physical protection, by hindering the access of aggressive agents. Severe corrosion problems however occur in many structures.

Addition of fly ash to concrete has become common practice in recent years. Reasons for fly ash addition include economy and enhancement of certain mechanical properties of fresh concrete (workability and pumpability) and of hardened concrete. However the effect of fly ash addition/replacement to the cement on the corrosion aspects of the concrete needs careful consideration. In this investigation an attempt has been made to estimate the pH of fly ash concretes.

II. FLY ASH

Fly ash is a finely divided residue resulting from powdered coal combustion and acts as a pozzolanic material i.e., the particles react with water and lime to produce cementations products. The carbon content of fly ash is a major concern. Class C fly ash, most of which is produced from lignite coal contains little carbon. However, Class F fly ash, produced primarily from anthracite and bituminous coal, contains significant amounts of carbon. Class C and Class F material also differ from each other and from source to source with regard to strength, rate of strength gain, color and weather ability. Class C fly ash results in a buff-colored concrete; Class F is a darker grey. Class C fly ashes contain more calcium oxide (greater than 10%) compared to Class F fly ashes. High calcium fly ashes possess self-hardening properties while the low calcium fly ashes possess less or no self-hardening properties. The first equation in Fig.2 shows the chemistry of hydration of Portland cement. About 50% of Portland cement is composed of the primary mineral tri-calcium silicate, which on hydration forms calcium silicate hydrate and calcium hydroxide. If you have Portland-pozzolan cement, and fly ash is the pozzolan, it can be represented by silica because non-crystalline silica glass is the principal constituent of fly ash. The silica combines with the calcium hydroxide released on the hydration of Portland cement. Calcium hydroxide in hydrated Portland cement does not do anything for strength, so therefore use it up with reactive silica. Slowly and gradually it forms additional calcium silicate hydrate which is a binder, and which fills up the space, and gives impermeability and more and more strength.

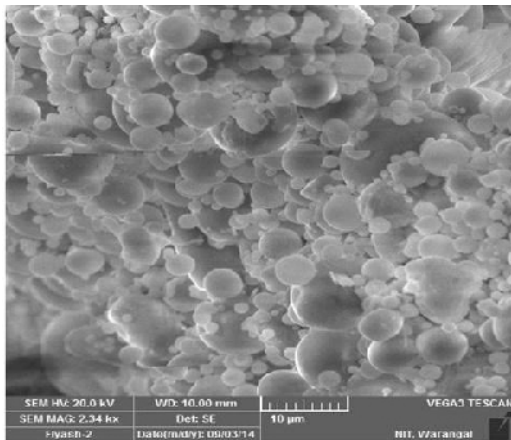


Figure 1 SEM of Fly ash

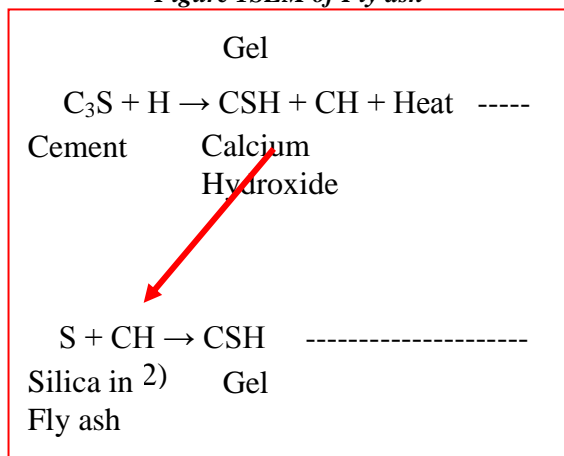


Figure 2. Chemistry of Fly ash in concrete

The properties of hardened concrete that are significantly influenced by the addition of flyash are strength and permeability, and these in turn, influence several other durability and long term strength properties. Addition of fly ash in fly ash concrete may be as high as 60 percent of OPC content and because of the high replacement level; the fly ash concretes are characterized by their low early strength and high ultimate strength. The low early strength is attributed to the partial replacement of Portland cement, with a material that is not hydraulic. High dosage of fly ash in concrete may reduce the pH of the concrete. A drop in the pH of concrete reduces the passive alkaline layer over the rebar, thereby promoting the favorable conditions of corrosion. Thus the present study focuses on the tests on blended cement fly ash mortars for estimating the pH.

III. LITERATURE REVIEW

Kajsa Byfors (1987) reported the test results on high volume fly ash concrete examined for pore water

content, Calcium Hydroxide (CH) content and pH of pore water solution. It is mentioned that the reduction in CH content increases with the progressing of hydration process and varies linearly with the logarithm of curing age. It is also mentioned that at 20°C, the pH of pore solution of high-volume fly ash cement paste was reduced to a great extent at early ages and it continued to decline at later ages due to the inclusion of large amount of fly ashes.

Yoon-Seok Choi, Jung-Gu Kim, Kwang-Myong Lee (2006), reported the half cell potential data of reinforced fly ash concretes. It is mentioned that the partial replacement of cement by fly ash showed better resistance to corrosion and a decrease in the chloride ion permeability. This indicates the improvement in the durability of fly ash concrete compared to conventional concrete.

V Saraswathy, S Muralidharan, K Thangavel, S Srinivasan (2003) reported the advantages of partial replacement of cement by activated fly ash. The activation adopted physical, chemical and thermal. It is mentioned that replacement of cement by activated fly ash to the tune of 20-30% improves the corrosion resistance and strength of concrete. It is also mentioned that activation of fly ash by chemical means is more useful than activation by other two methods.

Cengiz Duran Atis (2003) reported that 70% replacement of cement by fly ash carbonated more when compared to the same concrete with 50% replacement of cement by fly ash. It is also pointed that the normal concrete without fly ash showed more carbonation than concrete with 70% replacement of cement by fly ash.

IV. METHODOLOGY AND TEST RESULTS

pH tests are conducted at different levels of replacement of cement by fly ash in mortars and concrete specimens at different ages of curing. In the first phase of experimentation fly ash and cement mixture in solution is tested for its pH value. In the second phase of experimentation mortar planks of different proportions of cement and fly ash are tested for pH. River sand is used as fine aggregate and water to binder ratio is taken as 0.35. Binder to fine aggregate ratio is maintained constant as 1:3. In the third phase of experimentation concrete of 1:2:4 proportions with different replacement levels of cement by fly ash are considered for its pH. The fly used in this investigation is obtained from Vijayawada Thermal Power Station, Andhra Pradesh. Chemical composition of the same is presented in Table.1. Initially tests were

conducted to know the pH of cement, fly ash and different replacements of cement with fly ash. The pH of the cement and fly ash solution for different replacements of cement by fly ash were shown in Table.2 and Fig.3.

From this phase of the investigation it is clear that fly ash alone has a pH value of 7.8. The results indicate that the pH of cement in solution state is around 11.89 & pH of fly ash in solution state is around 7.8. So by addition of fly ash, we can claim that the pH of the concrete as a whole will decrease. The test conducted on the mixture after 24 hours of preparation. As the curing period is very small the test result is taken as indicative only and in the next phase of investigation cement – fly ash mortar planks are cast and are tested for different ages of curing. However the test results indicate that the drop in pH value is noticeable if the percentage replacement of cement by fly ash is more than 90%.

In the second phase of investigation , PH tests were conducted on mortar planks prepared for different replacements of cement by fly ash were noted at the end of 3rd, 7th, 14th, 28th & 90th day of curing. The results are as presented in Table.3 and Figure 4. Mortar planks are cast with water to binder ratio of 0.35. The test results indicated that replacement of cement by fly ash decreased the pH value. Age of curing upto 28days showed little decrease in pH content while the decrease in pH value at 90days of curing is mark able. Decrease in pH value at 90 days of curing of mortar planks with 80% replacement of cement by fly ash showed about 14.83%. When the percentage replacement of cement by fly ash is 40%, then the decrease in pH value for 90days curing is found to be 9.11%. From this discussion it can be concluded that partial replacement of cement by fly ash reduces the pH of the matrix with age of curing. This issue may be detrimental to the corrosion resistance of such fly ash concrete.

In the third phase of investigation, concrete is prepared with cement, fly ash, fine aggregate and coarse aggregate with a water to binder ratio of 0.45. The PH tests were conducted on 1:2:4 concrete cubes with 0.45 w/c cubes with different fly ash replacement were cast. PH tests were conducted at the end of 3rd, 7th, 14th, and 28th day of curing. The results are presented in Table 4 and Figure 5. The test results of this phase of investigation indicated that the pH of concrete decreases with increase in the percentage replacement cement by fly ash. When the cement is replaced by fly ash to the tune of 40% the reduction in pH value in concrete at 28 days curing is observed to be 3.36%. This clearly indicates that reduction in pH value of mortars is pronounced with

higher replacement levels of cement by fly ash than the same in concrete. Thus it can be inferred that the partial replacement of cement by fly ash needs an essential attention. Especially in case of rich mortar adopted in ferrocement elements this reduction in pH value may be detrimental. Research work in this direction is more needed for further recommendations.

V. CONCLUSIONS

Based on the experimental observations the following conclusions are presented.

1. Replacement of cement by fly ash decreases the pH of the mix.
2. Reduction in pH at higher replacement levels of cement by fly ash in mortars is more pronouncing than in concretes.
3. Higher replacement levels of cement by fly ash in rich mortar needs a careful study in respect of pH reduction or its corrosion resistance.
4. Further studies are needed in this direction for high strength concretes.

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Table 1. chemical composition of fly adopted

Specific surface	5840 cm ² /gram
Specific Gravity	2.01
SiO ₂	58.14%
Al ₂ O ₃	28.98%
Fe ₂ O ₃	4.90%
CaO	5.68%
MgO	1.04
SO ₃	0.64%
LOI	0.54%
Insoluble Residue	84.44%

Table.2 Effect of pH of cement fly ash solution for different replacements of cement by fly ash

Percentage of cement replaced by Fly ash	pH
0	11.89
5	11.85
10	11.83
20	11.82
30	11.80
40	11.79
50	11.76
60	11.68
70	11.52
80	11.42
90	11.30
95	11.24
98	10.76
99	10.62
99.2	10.58
99.4	10.50
99.5	10.42
99.6	10.15
99.7	9.84
99.8	9.55
99.9	8.17
100	7.28

Table.3. Variation of pH of the cement fly ash mortar planks made with for different replacements of cement by fly ash.

% cement replaced by fly ash.	3 rd day	7 th day	14 th day	28 th day	90 th day
0	12.61	12.40	12.36	12.49	12.18
5	12.60	12.38	12.32	12.47	11.71
10	12.60	12.32	12.28	12.45	11.62
20	12.59	12.29	12.26	12.44	11.54
30	12.57	12.27	12.24	12.42	11.41
40	12.54	12.23	12.20	12.35	11.07
50	12.52	12.20	12.17	12.26	11.04
60	12.37	12.14	12.08	12.14	10.69
70	12.28	11.88	11.82	11.82	10.54
80	12.20	11.77	11.72	11.58	10.39

Table 4. PH of concrete cubes for different replacements of cement by fly ash.

% Cement replacement by Fly ash	Concrete Cubes			
	3 rd day	7 th day	14 th day	28 th day
0	12.38	12.36	12.32	12.20
5	12.35	12.34	12.28	12.17
10	12.32	12.32	12.22	12.12
20	12.28	12.29	12.18	12.09
30	12.24	12.22	12.10	11.94
40	12.20	12.16	12.03	11.83
50	12.15	12.05	11.98	11.79
60	12.10	11.92	11.91	11.64
70	11.78	11.81	11.84	11.54
80	11.55	11.48	10.84	10.76
90	11.20	11.21	10.54	10.15

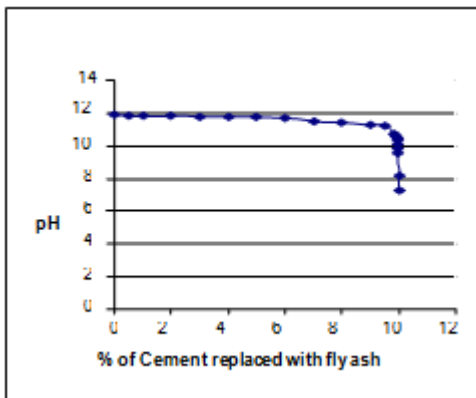


Fig.3 Variation in the pH of cement and fly ash solution for different replacements of cement by fly ash

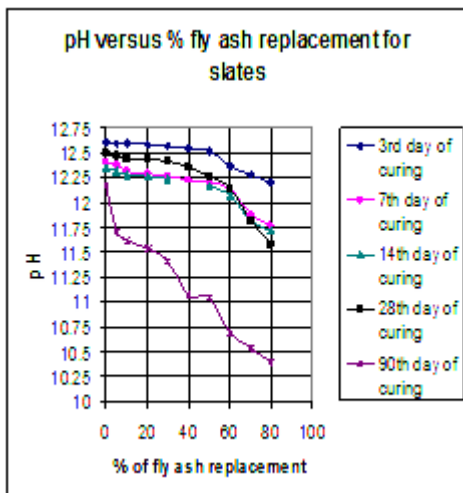


Fig.4. Variation of pH of the cement fly ash mortar for different replacements of cement by fly ash

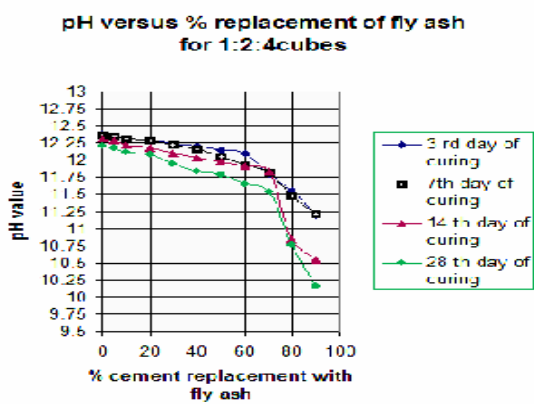


Fig.5. Variation of pH of the cement fly ash concrete made with different replacements of cement by fly ash

Structural Health Monitoring Systems as a Tool for Seismic Protection

^[1]Ammu Vijay ^[2]Parvathi M Nair

^[1] ^[2]Student, Third Semester, Sree Buddha College of Engineering
^[1]ammuvija@gmail.com , ^[2]parvathimnair97@gmail.com

Abstract:-- Structural health monitoring (SHM) is emerging as a vital tool to help engineers improve the safety and maintainability of critical structures. SHM combines a variety of sensing technologies with an embedded measurement controller to capture, log, and analyze real time data. SHM systems are designed to reliably monitor and test the health and performance of structures such as Bridges and dams, Buildings and stadiums, Vessels and platforms, Airframes, wind turbines, Large machinery and equipments. One of the main advantages of SHM is the early detection of damages increasing the cost efficiency of its maintenance. Other advantages include increased understanding of in-situ structural behavior, assurance of structural serviceability, increased down-time for inspection and repair development of rational maintenance/ management strategies etc.

In this paper, Structural Health Monitoring systems as a tool for seismic protection which assure a larger importance in the field of civil engineering are discussed. The main purpose of this system is providing of data based on dynamic behavior of structures under the effect of earthquakes. The installation of networks for strong earthquake and the result which are obtained from them has become an increasing need in earthquake engineering. It has considerable contribution to overall activities for seismic risk reduction and for minimizing the damages of these structures under effect of disastrous earthquake. The application of the result is equally important both for the theoretical and fundamental and practical investigations in the field of earthquake engineering.

Index words— Earthquake engineering, structural health monitoring, seismic protection, detection of damages.

Contact and Marketing Management System based on Big-data and Campaign Analysis

^[1] Ms.SanamKadge ^[2] Nabil Kazi ^[3] PriyankaPasalkar ^[4] HussainSakriwala ^[5] Owais Merchant

^[1] Assistant Professor, ^[2]^[3]^[4]^[5] Student
^[1]^[2]^[3]^[4]^[5] Department of Information Technology,

M.H. Saboo Siddik College of Engineering
Mumbai, India

^[1] sanam.kadge19@gmail.com ^[2] nsk.qaze@gmail.com ^[3] priyankapasalkar1994@gmail.com
^[4] Hussainskr27@gmail.com ^[5] owaismerchant86@gmail.com

Abstract— Marketing Management System, not a new term. It's been on the internet for a very long time and is practised in almost every organization. Each organization has its own marketing management application and practices, which are solely automated. Organizations today, invest a lot in new marketing strategies to increase their sales. But, are they gaining that amount of customers? We all know the answer to this question. Straight NO. What if they are targeting the wrong Customer base? Marketing isn't just about marketing to everyone on the go. That would be a waste of lot of resources and time. Our Proposed System combined with Big-data analytics will provide real time quality insights from Customer behaviour to his likes and interests. A tracker embedded in websites and mobile app will capture customer behaviour in real time. Now this data from all the sources such as social network, web browsing history. Etc. will be fed to a Big-data Analytic tool which will provide us with his likes and interests at a particular time and this will trigger the marketing management system to launch client specific campaigns according to their interests. This will in turn yield more positive response and increase the Sales of an Organisation minimizing the wastage of resources and time.

Index Terms: Big Data Analysis, Contact Management, Marketing Management, Campaign Analysis.

I. INTRODUCTION

The world is changing, and this impacts how organisations need to engage. Before involving you, customers are 57 percent through the buying cycle. When the customer does reach out, marketers are now at every step. Contact and Marketing management system is a marketing solution that enables your team to plan, execute, and measure campaigns across channels, from start to finish, bringing your marketing vision to life. Customers can be engaged one to one across channels, building the sales pipeline, and demonstrating the impact of the marketing investments in real time. Contact and Marketing Management System are information systems that help to efficiently maintain the contacts of an organization as well as automate various marketing activities needed by the organization to increase its outreach to new and existing customers. This system is often combined with Sales and Customer Service systems. This can be used to benefit selected customers by tailoring product/service offers to them specifically or in micro-segment. This can be used to reduce the cost to acquire customers, cost of selling, cost of serving, time of serving. Marketing management system combined with big-data analytics will give better customer

insights and help the organisation to select appropriate targets for marketing.

II. BIG-DATA ANALYSIS

Having big data doesn't automatically lead to better marketing – but it has the potential. Think of big data as your raw material, your necessary element. It's not the data that's so important. Rather, it's the insights that will be derived from the data, the decisions you make and the actions you take makes all the difference. Using Big-data, the analysis of all customer data, including social media, email, internet and call centre, allow marketing management and big data to segment customers according to their actions. Customer trends can be mined from big data and used to predict the requirements, which will fuel product development and promotional efforts. Big data enables provision of businesses with sales, marketing and performance metrics of customer service. With big data, organizations can predict and determine ROI and use it to endorse additional investment. Once the value or lack thereof in customer-facing operations is made clear, businesses can make appropriate corrections and better decisions moving forward. Using big data, businesses will be able to predict how customers are going to respond in

the future, based on various demographics and behavioural history. A powerful component of big data is the ability to define vital indicators such as customer sentiment, retention and cost vs. revenue per service call. Once the areas that need improvement are recognized, companies have the tools which will help them to rise above industry standards.

III. CAMPAIGN ANALYSIS

Just simply sending mass emails to all the targets on weekly or monthly basis without knowing their response will not shed light on exactly how much the organisation is benefited by such campaigns. This exhaustive technique will yield minimum response. The organisation should put in their extra effort only where it should. This is an effective technique and is the need of hour.

Tracking the response of your targets, keeping an eye on who actually is interested in your products will result in better planning of campaigns. The customers can be targeted on the basis of their interests. Also the organisation will come to know through the ROI that which type of campaigns yield more ROI and can modify their further campaigns accordingly. Campaign analysis will help an organisation to plan, modify, and execute the campaigns which will benefit the organisation effectively with the help of various past data and campaign insights.

IV. NEED FOR SYSTEM

Globalization has led firms to go beyond the borders of their home countries, making international marketing highly significant and an integral part of a company's marketing strategy. Marketing managers are often responsible for influencing the level, timing, and composition of customer demand. In part, this is because the role of a marketing strategies in increasing the sales of organisation.

The marketing campaigns launched today are generalised one. They are not intended for particular customer base. This causes the campaigns to be unnoticed and just a waste in case where customer is not interested in what was marketed to him. Also this would affect the overall view of an organisation in the mind-set of a customer. Take an example of Tele-marketing calls and people ignoring them. If people are targeted at random they would also start ignoring further campaigns. This would affect the organisation and all its marketing efforts would go in vain. On the counter part imagine a situation where person browsing some stuff on internet and likes or comments on some kind of stuff that he likes and the other day there is a mail which displays similar kind of products.

The interest of that person in that product will automatically go up and also the organisation will make a positive mark on that person, making him their customer. Hence there is a need of customer specific marketing based on his likes and interests.

V. PROBLEMS IN EXISTING SYSTEMS

There are various systems available for marketing management, for example MSD Dynamics CRM, Sugar CRM, Vtiger, Zoho CRM, Sales force CRM. Etc. Let us discuss each one of them one by one. We will start from SalesForce.com.

The very first drawback of SalesForce.com is that it does not have a very highly customizable campaign management module as industries require. It is focused mainly on managing and maintaining sales records where as they expect the SMBs to buy a marketing automation software to be used for marketing related activities, this is where our system will come into picture.

The existing system does not include the Campaign Analysis module. So the extent of a successful campaign of the organization cannot be analyzed.

MS Dynamics CRM is a proprietary software and is very costly, thus making it unfavourable for SMB's to buy it. SugarCRM and Vtiger are open source softwares, which makes it easier for the developers in various organisations to customize the product as per their needs and also distribute developed versions of the software. But they come with certain limitations too. Such as lack of smsnotifier, no support for free versions, workflows not that robust, and the most important- lack the analysis of campaign part which gives an insight to organization which types of campaigns are gaining more customers and which products are most liked and used by customers. Vtiger also lacks user management part where we restrict users to their particular domain by assigning security groups. Whereas Speaking of SugarCRM, it lacks many features which the developer expects that the users will incorporate in it from the modules available on developer's site. Newbies to CRM cannot perform this task on their own.

And here comes the biggest one, None of the system till date has used big-data analysis while marketing which means the campaign launched are not customer specific and cannot yield better results.

VI. PROPOSED SYSTEM

We have proposed a marketing management system interfaced with Big-data analysis that helps in managing the company's marketing and contact management. Big data analysis will help organizations to collect more accurate and detailed performance information on everything from product inventories to customer sentiment, and With the help of this campaign

analysis an enterprise can enable its marketing departments to identify and target their best customers, manage marketing campaigns with clear goals and objectives, and generate quality leads for the sales team. This Contact and Marketing Management System gives marketing managers a unique database, enabling them to propose marketing operations to help win new customers and develop customer loyalty. Campaign analysis will enhance customer satisfaction, return on relationships, competitive advantage, number of consumers, retention rate, revenue per customer, impact of order fulfillment, returns and call center activity on actual sales performance. The analysis will allow you to plan marketing campaigns, automate reporting and monitor efficiency with segmentation and analysis of profitability, winning therefore expose variability and boost performance. Campaign analysis provides complete solution for promoting company's product and interacting with customers, approaching them, campaigning etc. Companies can use this system for data collection and analysis to make better management decisions for low frequency forecasting and high frequency "now casting" to adjust their business decisions in real time.

This system is a customer-oriented system which involves tracking of customer's lifecycle right from the point the company approaches the potential customer till the time it gets converted into a lead.

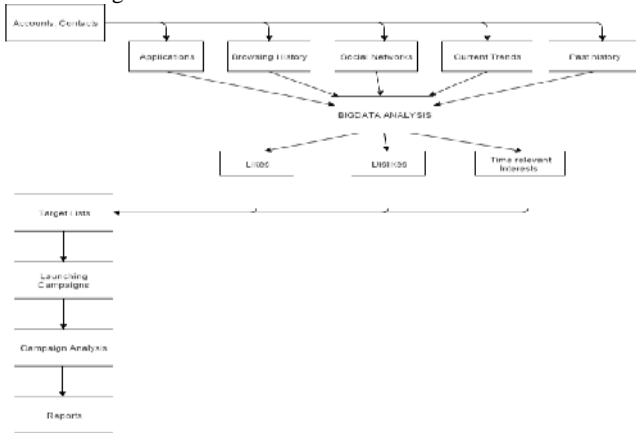


Figure 1. Workflow Of The System

Strategies, measurement of results obtained and campaign management. Big data analysis allows narrower customer segmentation, resulting in more precisely tailored products and services. Big data is used to improve upon the development of future products and services by only producing tailored products. Organization can focus only on those products of customer's interest, thereby achieving the trust of customer, which results in extension of regular customers. This marketing management system with big data analysis will involve email marketing, creating target lists, SMS notifications, managing contacts and also tracking the customer responses. It also comprises typical

marketing activities like building the customer base and also helps in extending the present customer database. It enables organizations to clearly set rules and responsibilities in terms of who is to handle what kind of work and when. This results in improved productivity and better response to customer.

VII. IMPLEMENTATION

The developed web application will be used to manage the marketing activities of an organization. This will include the activities right from creating target lists for various campaigns to launching those campaigns and tracking the responses. Based upon a target's response, if they show some kind of interest by checking out the product or going through the mentioned link, he/she will be classified as a Lead.

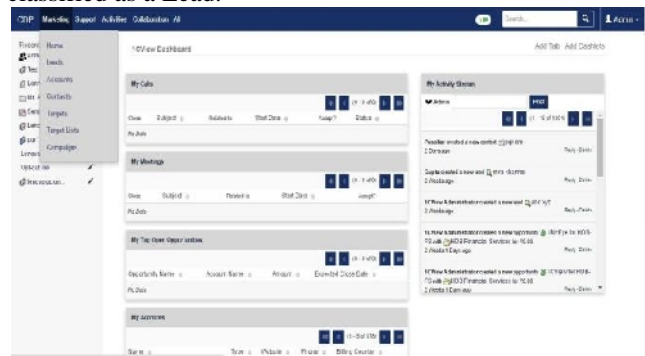


Figure 1. Dashboard

Fig. 2 Shows the Dashboard of the System displaying the marketing menu and its sub-modules. The Dashboard is fully customizable according to the need of a particular person. It will display all the recent activities and will enable the user to quickly get the notification and browse the particular module.

The Marketing Menu includes- Requirements. Big-data Analysis will trigger time relevant marketing campaigns based on the personal likes and interests of customer.

The technologies used in this system include MySQL, PHP, HTML, and CSS. The System will also be used to track down the success of a particular campaign by tracking the responses and displaying an automated report. This helps the company to monitor, which campaigns are more successful which will be used to improve the strategies of marketing.

- ❖ Accounts
- ❖ Contacts
- ❖ Targets
- ❖ Target Lists
- ❖ Campaigns
- ❖ Leads



Figure 2. Marketing Campaign

Fig. 3 depicts a marketing campaign, the details for a campaign include normal details, Budget of the campaign, Targets and Target-Lists for that campaign, Trackers which will be used to track click-thru links, Email templates, and finally scheduling that Campaign.



Figure 3. Return on Investment of a Campaign

Fig. 4 Shows the Return of Investment of a particular campaign which is based on the revenue, investment, budget and expected revenue of the Campaign. An automated report will be generated based on the amount gained from the opportunities which were created from leads and who were initially the targets of a particular campaign. Hence a target will be tracked until that target is converted to lead then to opportunity and then whether that opportunity is won closed or lost closed.

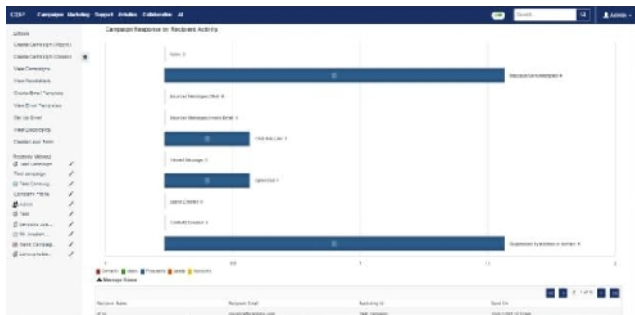


Figure 4. Campaign Response Chart

Fig. 5 displays an automated generated chart which depicts the overall response of a particular campaign. The status of campaign

contains a detailed report of all the values displayed in the chart. The chart contains the tracked result of following parameters-

VIII. ANALYSIS OF RESULTS

The click through rate (CTR) can be calculated after some time from the campaign being launched. This gives us the analytic result which depicts how many customers were interested in the product and visited the link. The leads generated from the campaign also gives us the figures on how many targets were turned into leads and opportunities. Using Big-data to target customer specific products and interest based marketing campaigns generates huge amount of CTR and conversion rate.

As you can see from the fig. 6 where the system earlier without big-data based marketing campaign yield very less CTR where as the system where targets are targeted based on the results of big-data analysis showed greater interest and CTR.

Our system, where the customers are targeted based on their interests will give more than 30% of conversion rate. And this will be more than any of the existing systems.

- ❖ Messages sent
- ❖ Bounced messages
- ❖ Number of Click-thru
- ❖ Viewed messages
- ❖ Opted-out Targets
- ❖ Leads Created

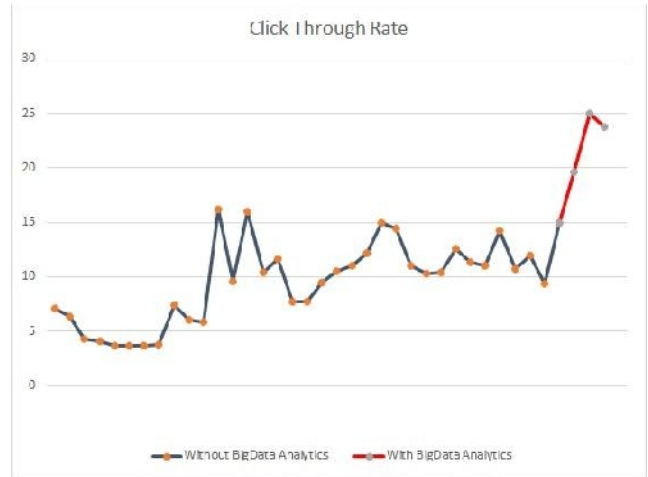


Figure 6 Click through Rate

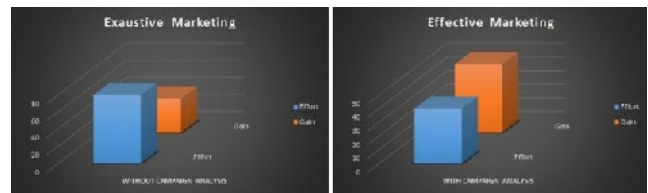


Figure 7 Marketing With and Without Campaign Analysis

Marketing where there is no campaign analysis results in lesser output and also has no provision for keeping a track of all the results and responses obtained once the marketing is done. Whereas with the inclusion of campaign analysis, a company or an organisation can have better results as they can have a complete track of all the results and responses from the approached consumers. It gives a statistical knowledge of the consumer's feedback. There is comparatively much less effort when campaign analysis is done, on the other hand without it the effort is high and the gain is less.

IX. CONCLUSION

Big data has the potential to change the way companies manage customer relationships and target specific customers based on their interests. It is capable of identifying sales opportunities and analysing customers' responses to products, by combining internal data with comments made on social networks. Using big data and Campaign analytics to find associations, recognize patterns and identify trends that allow a company to shape customer experiences for increased engagement and will bring the perspective of the customer into business decisions, while helping marketing people to target the best possible customer base for a specific product generating profits for an organisation.

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Geolocation Architecture For The Investigation Of An It Forensics Based On Preincident Preparation

^[1]G.Arun, ^[2]S.Saravanan, ^[3]N.SankarRam

^[1]Final Year B.E/CS Student ^[2] Asst.Professor/CSE ^[3] Professor/CSE
^{[1][2][3]} RMK College of Engineering and Technology Chennai

Abstract—In the field of IT forensics, Attack traceability and attribution are two of the main tasks. In order to support this, IT forensics is not limited to investigate the network data after the attack has taken place. Already before the attack, a best optimal environment for the forecoming investigation must be created. While the primary focus is on ordinary logging, we propose an architecture that sets both degree and characteristics of logging, based on geo location. Hence, for observable locations, more knowledge is gathered and stored in advance that is geo reputation. Next to this, according to the fact that the distribution of IP addresses is dynamic, additional information is stored to determine the Internet service provider (ISP), that was responsible for the IP during the time of commitment of the crime. This additional data also contains geo information which can be used later to reconstruct attack routes and to identify and analyze distributed attacks. For the above said purposes, the IP localization mechanisms such as the underlying method for geo location, must be very accurate. Therefore, next to highlighting, the benefits of including geo based information and providing our architecture in order to do so, this paper also investigates accuracy and reliability of geo in-formation and provides its own geo location architecture and a corresponding prototype, including an evaluation.

Index Terms—Attack traceability, attribution, geo location, geo reputation, IT forensics, preincident preparation.

I. INTRODUCTION

Although research is being conducted intensely in the field of network security for several decades, current well-established security mechanisms are becoming less and less suitable to counter new threats. Over the last few years, both quantity and quality of attacks on information and communication technology have reached a new peak, with examples such as the hack of the Sony Playstation Network, Stuxnet, Gauss, or the compromise of RSA impressively show [1]. With the recent evaluation from McAfee's worldwide network of threat sensors (Global Threat Intelligence) vividly demonstrated, malware signatures are currently seen less than ten times worldwide on average [2]. Because of that and the increasing sophistication of attacks (e.g., distributed attacks with a very low profile for individual connections), proportionately fewer attacks can be identified and blocked before they can cause harm [1].

A. Definition of Terms

As a consequence, forensics, and particularly network forensics, the capture, recording, and analysis of network events in order to discover the source of security attacks [3] is constantly gaining importance as its main task is to trace back the source of the attack so that cybercriminals can be prosecuted. In the area of network

forensics, the concept of “strategic preincident preparation” was receiving higher attention throughout the last years [4]–[6]. Strategic preincident preparation generally refers to all measures, which, in anticipation of a potential incident, can support the investigation of an incident, so that e.g., significantly more/additional data is available for a forensic examination. Among other things, this includes detailed documentation of IT systems (e.g., network diagrams), as well as central log servers, where besides the logging data of IT applications and underlying operating systems monitoring data such as those of intrusion detection systems (IDSs) is stored as well.

B. Network Security Versus Network Forensics

Since some tools, such as Wireshark or Snort, are used in the field of network security and in the area of network forensics, at a first glance, the separation of these two areas is slightly difficult [7]. However, network forensics is not another term for network security [8]. Network Forensics Analysis Tools synergize with IDSs and firewalls in two ways: They preserve a long-term record of network traffic and allow quick analysis of trouble spots. Network security products look for possible harmful behavior and ideally prevent the intrusion before it is taking place (*ex ante*), whereas network forensics is postmortem investigations (*ex post*) usually started after crime notification specifically addressing one particular

attack [4], [7], [8]. For example, Snort can either be used to ward off an attack in advance (*intrusion detection*) or to analyze an existing network capture as part of a forensic investigation (e.g., *replay-capability*) [9], [10].

C. Goal and Outline of This Paper

Following the ideas of the strategic preparation, the central idea of this publication is to create, *in advance*, an optimal starting point on which a forensic investigation will be based on (preincident). For this purpose, in the course of this paper, we show how, with the use of geolocation, a good database can be created in advance that then allows much more comprehensive analysis of intrusions. Similar to the concept of IP reputation, we define the concept of georeputation, which serves as the basis to determine the degree of the data recorded.

II. NETWORK FORENSICS AND GEOLOCATION

With the increasing sophistication lately seen, more and more attacks are distributed using different IPs to stay under the detection threshold of security systems [11]. Geolocation, which is the mapping of a network entity with its geographical position [12], can support the process of network forensics.

A. Georeputation

To be able to identify and combine fractions, geolocation can be crucial, because the geographical proximity of a connection to another may be one way to discover correlations. The real-world applicability of this concept, using geolocation as a classification dimension within the forensic analysis (*georeputation*) is, for example, shown in a recent investigation from the security company Mandiant [13], claiming to analyze China’s Cyber Espionage Units and revealing that “a large share of hacking activity targeting the United States could be traced to an office building in Shanghai.” Following this analysis, with the help of geolocation, the amount of actual malicious data connections from China to United States could be reduced very quickly to the office building in Shanghai.

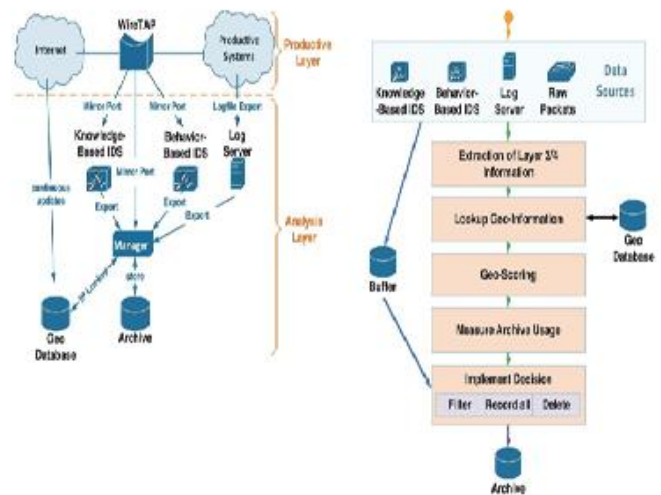


Fig.1.Overview of the architecture for geobased strategic preincident preparation

B. IP Fluctuation

A severe problem for reliable geolocation of IP addresses can be their fluctuation. Based on the rapid growth of the Internet, the technical community realized at least back in about 2005 that the pool of unallocated IPv4 addresses is going to be exhausted within a few years. Although the successor of IPv4 was announced already back in 1998, still no broad usage has been realized yet. While all major operating systems and devices support IPv6 nowadays, the share of the overall traffic is still below 1%. For example, only 0.5% of all traffic transferred during the past 12 months by the Amsterdam Internet Exchange was IPv6 traffic [14]. Here, the incompatibility of IPv6 to its predecessor or the increasingly efficient use of the IPv4 address space may be reasons for the slow dispersion of IPv6:

III. GENERAL ARCHITECTURE

The central idea of this publication is to create, *in advance*, an optimal starting point on which a forensic investigation will be based on (preincident). Even before an incident has occurred, strategic preparation starts to build a solid fundament on which a forensic investigation will be based upon. Due to the problem of: i) sophisticated, distributed attacks driven by several different IPs/IP networks (georeputation); and ii) the fluctuation of IP address ranges (IP Fluctuation), the level of logging is determined. Next to this, the geo information that is valid at the time of the logging entry has to be saved as well. These considerations are at the heart of this publication.

A. Overview of the General Architecture

Fig. 1 shows the architecture developed for this purpose of geobased strategic preincident preparation. Within the productive layer, the components for end-to-end communication are located. These are network components (such as routers, switches, firewalls, etc.), as well as end-systems (hosts respectively server, indicated by clouds). This productive layer is enhanced with an analysis layer. Although not depicted, of course, other security devices can be also directly integrated within the link between the border gateway and the network of productive systems; the analysis layer is almost completely separated from the productive layer in order to prevent any influence or disruption of the productive layer. To generate the required 1:1 copy of the network packets for the analysis layer, mirror ports of manageable switches can be used. However, when a switch is operating at full capacity, the mirror port may not be able to replicate all packets when the backplane of the switch has a higher capacity than the (configured) mirror port. To avoid this, a network TAP (WireTAP) can be used, which copies all network data including errors on Layer 1, supplying a perfect copy for the analysis.

However, in this particular case, the architecture has provided valuable services for crime investigation. Based on the analysis of the origin of the IP (with which the attacker has accessed the server), the IP has been identified as particularly suspicious and, based on this, other precautions have been taken automatically

IV. RELATED WORK

This section gives an overview of different IP geolocation strategies (for a more in-depth introduction, e.g., see our previous works [24], [25]). This includes a brief summarization regarding significance and eligibility as well.

A. IP Geolocation

According to Padmanabhan and Subramanian [12] IP geolocation is the process of estimating the geographical location of a given IP address. However, determining the physical position of a network device is challenging, since there is no inherent relationship between an IP address and its physical location [12], [26]. Applications relying on geointelligence, such as advertisement (most online advertising firms offer their customers nationally or even regionally differentiated advertising), video-on-demand (Providers such as CinemaNow, Disney, or YouTube are using geolocation

because sports associations and film publishers bind their content to territorial boundaries) or language/currency services (Google and many other personal-ize their offers leading users automatically to the page of their language, respectively, their currency) may become unfeasible, if the estimated location is inaccurate [24]. Considering that, existent strategies are based on different mechanisms ranging from active measurements to geodatabases [27]. Following Endo and Sadok, all geolocation approaches can be assigned to one of two categories [27]:

- 1 IP address mapping based (*passive*);
- 2 Measurement based (*active*).

Table I provides a brief overview of methods and approaches for geolocation discussed in the following. Considering the development in the field of IP geolocation research, an exact classification of a certain approach is sometimes challenging. Since some strategies are combining different procedures, a third category, known as hybrid approaches, has been introduced

B. Scenario

At this point, a small scenario should help to understand both the necessity of our approach and the workflow within the architecture (see also Fig. 3). The scenario is based on a real attack, as it emerged mid-2013 in the network of our university. Within the attack, a vulnerability that is now known as CVE-2013-2251 (e.g., see [22] for more details), was exploited at one of our web servers.

TABLE I
COMPARISON OF DIFFERENT GEOLOCATION
APPROACHES CONCERNING ACCURACY

METHOD	LOCALISATION LEVEL	ACCURACY
IP2GEO	Country/ISP	98%
(GeoPing, GeoCluster, GeoTrack) [50]	Region	75%
CBG [47]	City	63%
	Western Europe (<i>Median Error</i>)	below 25 km
	U.S. (<i>Median Error</i>)	below 100 km
OCTANT [51]	<i>Median Error</i>	22 miles

V. GEOLOCATION ARCHITECTURE

As shown in the previous section, each geolocation strategy suffers from certain limitations, ranging from proprietary methodologies to obtain data up to the necessity of a substantial infrastructure concerning delay measurement. In previous works [24], [25], [30], we have already introduced a new algorithm, combining different active and passive IP geolocation techniques to estimate a certain location for single IP addresses. However, due to the restriction to IPv4 on one hand, and the limitation to single IP address queries on the other hand, our previous approaches are neither suitable for building comprehensive sets of IP-to-location mappings in

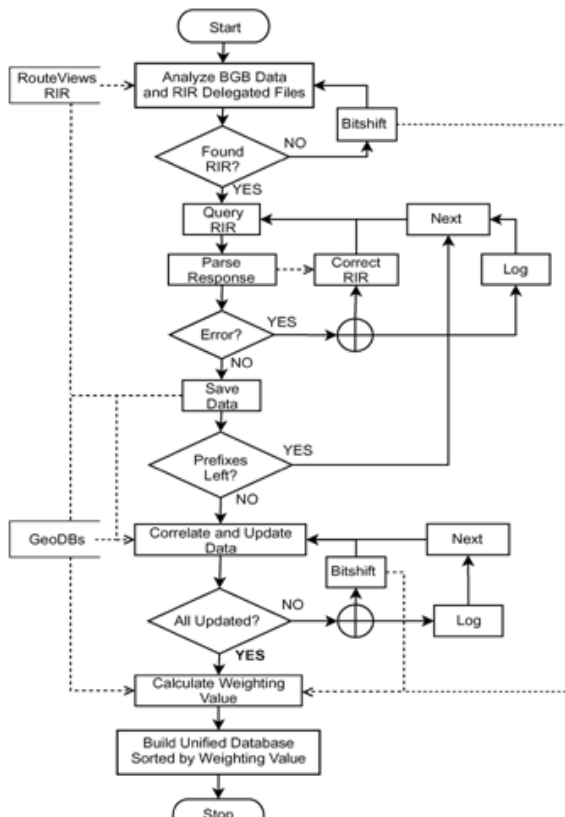
a short period of time, nor a future-oriented solution according to IPv6. Thus, we are introducing a new algorithm for the geolocation of both IP versions, enabling location estimations of single IPv6/IPv4 addresses, as well as IP ranges.

A. Components of the Algorithm

For the lack of access to specific information needed, strategies such as GeoCluster are not considered within the architecture and the corresponding PoC. This also applies to approaches that have been discontinued. Since measurement-based methods are requiring a comprehensive set of landmarks and a complex infrastructure, they are also unsuitable [24], at least for the basic architecture. Our approach will provide a database covering all obtained and processed information from each geolocation procedure involved, supporting our architecture (see Section III) with real-time geolocation features.

Our new algorithm is built from components as follows.

- 1) **Geodatabases:** Geodatabases are providing correct geographic locations at country level in 96% to 98% of the cases, at least in terms of



IPv4. Fig. 2. Flowchart of the applied algorithm.

In terms of IPv6, to the best of our knowledge, only the research work of Zander [22] has been published, but by this, it can be assumed that trustworthiness and accuracy of the location estimations provided are almost the same as IPv4. Although this is quite a good value to start with, we have decided to verify the given information with other geographic data, hence trying to improve the results. Current investigations have shown that three out of four geodatabases (MaxMind, HostIP, IP2Location and IPInfoDB [20], [23]–[25]), used by a former approach of ours [24] to limit the possible solution space in a first step, are discontinued or due to technical or administrative reasons not available any longer. Thus, and for the lack of reasonable alternatives, only the services of MaxMind are left for an adoption within the scope of the PoC. Indeed, MaxMind has been evaluated several times and is also the only provider, which has been analyzed in terms of IPv6.

- 2) **Databases of RIRs:** Next to geodatabases, RIR data is used for verification and cross-checking procedures. Therefore, the free Whois-service is integrated into the algorithm. Currently, the five distinct RIRs are using different query and output schemes. It has to be differentiated where the address is registered to execute a correct direct query. Thus, pattern matching and RIR specific regular expressions are used to analyze and extract the geoinformation from the resulting sets. Particularly for IP ranges allocating only a few IP addresses for host assignment, the provided location tends to be accurate [17]. In addition, the latest delegations of each RIR are used as well. The address block data provided includes additional location information and is used to reduce the amount of queries, which have to be conducted, thus limiting the runtime of our approach.

- 3) **Routing Data:** Since classless interdomain routing is now deployed all over the Internet, allowing to aggregate certain address blocks to a single prefix, the size of routing tables can be improved and optimized. This may be also used in advantage to reduce Whois queries, because those prefixes are announced by each AS border router and thus are a valuable starting point for targeted queries. This means to work these prefixes off may be faster than querying the whole address.

- 4) **A. Algorithm** Considering that each resource involved in the geolocation process suffers from certain limitations, the results have to be cross-checked and verified. Thus, our PoC compares different location estimations and performs a weighting according to predefined aspects. To create a basic data set, the algorithm outlined as flowchart in Fig. 2 starts with analyzing BGP messages to ascertain IP prefixes, which are currently announced and thus tend to be in use. Therefore, we are using the data provided by the Route Views Project. Since there is no indicator of which RIR is responsible for a

certain prefix, the latest delegations of the five registries are used to conduct longest prefix matching.

This results in tuples of IP prefix to RIR mappings. Additional information such as country codes and ASN provided by BGP messages and the latest delegations are also extracted for later usage. If no responsible RIR is found in first place, bitshifting is applied. For each (IP prefix, RIR)-tuple a RIR specific query is conducted. The Response is parsed by RIR-specific regular expressions. Caused by bitshifting or the fluctuation of IP addresses (see Section II), it may occur that the queried registry is not responsible anymore. In our former algorithms, we have not taken this into account, resulting in less data. Hence, we integrated fallback methods to overcome this problem. Further-more, the algorithm is now exploiting additional attributes of certain Whois records in order to find more IP addresses or prefixes, which are allocated and aligned, but missing in our base data. With this step, we are, e.g., addressing the problems of Route Views that are not providing all currently announced prefixes.

The saved raw data for each IP is afterwards correlated with different geodatabases providing location and additional information such as ASN. At this point, we have integrated a possibility to add more geoservices than the actually used ones to enhance the verification capabilities by, e.g., commercial geoservice provider such as Quova [24]. This correlation procedure relies on the information obtained by BGP messages and latest delegations, as well. In addition, also bit shifting may be applied. The last step before unifying, sorting, and storing, a weight-ing value for each set is calculated and used, e.g., for sorting purposes at the end. This value is based on the source providing a certain information,

B. Known Shortcomings

Since geodatabases are commonly based on proprietary methodologies, reliability, scalability and maintainability have to be analyzed [25]–[27]. Prefixes provided by geodatabases are not related to a certain IP prefix advertised by the routing system [26].

VI. EVALUATION

To verify the accuracy of our PoC, an evaluation procedure based on tuples of known IP address to location mappings has been applied. For lack of missing ground truth, it is ISPs, personal connections or in cooperation with other sources providing the required information. Research networks can be acquired as such a resource, particularly with respect to IPv6. Considering that, three active measurement projects with public available nodes have been identified:

- 1) *Archipelago (Ark)* maintained by the Cooperative Association for Internet Data Analysis (CAIDA)[21];
- 2) RIPE Atlas, a new measurement project entering productive state at the end of 2013 [22];

TABLE III
ACCURACY IN PERCENT—CONTAINING
MATCHES IN FIRST AND SECOND
PLACE—IN COMPARISON TO MAXMIND GEOLITE
AND WHOIS ONLY

	OUR APPROACH	MAXMIND GEOLITE	WHOIS
IPv4	99.22	97.55	96.66
IPv6	96.55	92.52	92.64

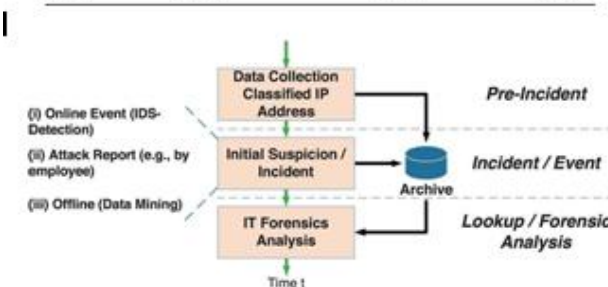


Fig. 3. Possible triggers and workflow for IT forensics analysis based on strategic preincident preparation.

VII. CONCLUSION AND FUTURE WORK

Strategic preincident preparation is an important aspect of network forensics. In order to support attack traceability and attribution, an optimal environment for a subsequent investigation has to be created even before the attack is launched. While this is currently mainly reduced to enabling logging capabilities (such as activating security logging capabilities, generating own event IDs, and messages or using a central logging server), this paper suggests to make use of geolocation within the strategic preincident preparation as well. With regard to network forensics, geolocation i) offers the possibility to set the degree of logging based on georeputation even before an attack was detected (so suspicious connections are investigated in-depth and corresponding packets can even be captured fully); ii) allows to correlate attacks within the forensic process in a better way (geolocation supports attack correlation); iii) assists to reconstruct the attack path; and (iv) helps to determine the ISP to whom the IP was assigned to. Since the distribution of IP addresses is not static, but, in fact, even at a higher level quite fluctuating, obtaining geospatial information within the forensic process (ex post) may be insufficient (as relevant geospatial information might be unobtainable or falsified in the meanwhile). Taking all these aspects into account, within this publication, a corresponding architecture that uses geolocation and applies it to the topic of IT forensics

was presented. The prototype and the evaluation have shown that the approach is useful in practice and therefore has a clear added value. On the other hand, we have also managed to increase the accuracy of the underlying geolocation algorithm significantly.

Our next work will include a more comprehensive model of how geolocation can be used in advance to set the corresponding log level. Here, we are also planning to develop a self-learning algorithm, so that both the risk assessment of the IDSs as well as geolocation is considered in an automated way. Finally, we will make use of vendor-independent IDS Message Exchange Protocols and think about introducing a feedback mechanism between the Manager and the sensors (IDSs, Log Server, etc.) to allow a more dynamic setting of log levels.

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Sankar Ram.N received the Bachelor of Engineering degree in Computer Science and Engineering from the University of Madurai Kamaraj, and Master of Engineering from Madurai Kamaraj University and Ph.D from Anna University. His key aspects of research activity are Software Architecture and Data

Mining. Among other things, he is a member of the Indian Society of Technical Education and Computer Society of India

ABOUT AUTHORS



Arun.G is currently a student of Bachelor of Engineering degree in Computer Science and Engineering from the University of Anna, Chennai.

His area of interest is Artificial Intelligence and Network Security. He is a member of Computer Society of India.



Saravanan S received the Bachelor of Engineering degree in Computer Science and Engineering from the University of Bharathiyar, Coimbatore and Master of Engineering from Anna University. He is currently a Research Scholar with the Anna University. His key aspects of research activity are network

security, cyber defense, intrusion detection. Among other things, he is a member of the Indian Society of Technical Education.

Car Pooling Android Application

^[1] Kapil Kamble ^[2] Mohd. Irfan ^[3] Suraj Phalake ^[4] Sandeep Kamble
^[1] ^[2]^[3] Student ^[4] Professor

^[1]^[2]^[3]^[4] Department of Computer Engineering,
Vidhyalankar Institute of Technology, Mumbai

Abstract— In today's scenario, there are lots of people commuting from place to place. And lot of times, it happens that people travel via car or bike and there is vacant space to take a fellow employee along with him to give a ride. But the problem is there is no easy way to know with how many people a person can share their ride also co-ordination is a huge issue because there is no efforts taken by people to help others by giving them lift, if sharing of ride is done they can save the environment by reducing fuel usage and doing traffic reduction with fewer vehicles etc.

The Carpooling is an android application which will provide the advanced searching techniques that can give most relevant results for carpooling in the city. This will be helpful in reducing the costs involved in repetitive or long distance driving by sharing cars and the rental charges, or paying the main car owner.

Carpooling is the sharing of car journeys so that more than one person can travel in a car. Carpooling reduces each person's travels costs such as fuel costs, tolls, and can also prove to be an environment friendly measure. By sharing cars passengers travelling in same direction can distribute the fare among themselves. Carpooling is also seen as a more environment friendly and sustainable way to travel as sharing of journeys can help in reducing carbon emissions, traffic congestion on the roads, and the need for parking spaces. The authorities often encourage carpooling, especially during high pollution periods and high fuel prices. We intent to make an ANDROID based application that will enable to let people know if vehicles are available for carpool in their desired path they can create account on app and send request to owner who create the car pool. By using this application people would be getting an option to share expense by sharing hired a cab and making new connections. People having this application on their devices can easily carpool with unacquainted people without worrying about security.

Keywords—Car pooling; Android; GPS;

I. INTRODUCTION

Nowadays, transportation is one of the major issues. One of the most used means of communication in roadways. One of the prime forms of road transport consists of the private cars. These cars are generally used with only a single rider. An overabundance of cars creates various problems which include increased traffic, increase pollution, parking congestion and many more also in recent years, the problems of global warming and the energy crisis have aroused widespread public concern.

A few methods devised to reduce the impact were public transport, non-conventional fuel resources and walking/cycling is used to reach destination. The merits of the above solutions are reduction in the amount of pollution as well as lowering of road congestion. However, public transport is not a well-developed system in India and apart from the inconvenience with respect to time, it has also been usually unreliable. Though non-conventional fuel resources attempt to stem pollution, no proper measure has been devised in a cost effective manner which can harness the automobiles.

Our intended to make a system which aims to remove all of the above discrepancies. We plan to create a carpooling application which gives users the same kind of

flexibility that a private car gives which can reduce the number of vehicles being used at the same time. The recommended solution for reducing the harmful effects of the above problems is carpooling. This type of transportation service could make a big difference if they are organized on a large scale by government or big companies, particularly large corporations with many branches or sub companies can favor the most.

Carpooling schemes are designed in such a way that they encourage commuters to share travel expenses and resources with colleagues. Carpooling is the sharing of cars by the driver and one or more passengers, usually for commuting. Carpooling arrangements and schemes involve varying degrees of formality and regularity.

Car sharing aims at solving this problem by targeting all the vacant seats in the private cars [6]. Employees of the same area or the students going to the same school can carpool; this can be done because they know each other and can communicate [6]. But when going on an intercity trip you are not aware if some other person also intends to make the same journey. Thus the applications helps you in seeing people and journey schedules and make an informed decision about do you wish to travel alone or save money and travel with a safe company. Furthermore, carpooling has documented social and environmental benefits that include: It helps in

reducing traffic congestion as number of vehicles on the road can be reduced significantly.

- ❖ Miles of travel of a particular vehicle and emission of gases by the vehicles can also be reduced.
- ❖ As the system aims at the empty seats it increase vehicle occupancy.

More efficient land use as parking requirement is reduced. Thus also helps in saving cost of building and maintaining infrastructure.

II. PROBLEM DEFINITION

There is an acute problem of traffic on roads these days and the increasing fuel prices add to the misery of daily users of private vehicles. Also use of vehicles causes pollution which has its adverse effects on environment. Car sharing is a solution but few issues like security and trust come into picture.

The purpose of our project is to create an android based application in which users can register as Owner (who create a car pool) and passenger (who request for car pool).

The owner can accept and deny the request from passenger as per their choice. The Car pooling application would enable its user a safe and secure way to share ride. This could include both short daily journeys such as going to workplace or schools within the city and also long inter-city trips.

III. LITERATURE SURVEY

The growth of urbanization is propagating rapidly and hence people are preferred to travel in their own vehicle rather than using a public transport system. Therefore the problems in global warming, traffic congestion, depletion of fuel arises. A social based community for carpooling has been proposed for both the rider and the passenger in order for reduction of fuel costs by sharing among the fellow passengers [5]. The implications for environment sustainability are sufficiently high [5]. The system elaborates about the usage of carpooling android application and also discusses about the major advantages of carpooling. The System architecture for carpooling is greatly identifies and major implementation of android application relies on GPS based navigation devices, smart phones, social media for trust and accountability [5]. A proposed system for carpooling has been efficiently discussed by prototype design, route matching algorithms and it also discusses about the advantages and disadvantages of carpooling [5].

The paper which we have referred has mainly discussed about the current scenario of metropolitan cities.

It also includes a brief calculation of growth of motor vehicles and cars in the cities and also the distribution of population and vehicles in those cities. It mainly deals with doing a proper data analysis of the total number of cars. Impact of revenue has also been calculated. The paper mainly describes the innovations that have taken place in ridesharing service relying on advanced mobile technologies. This type of ridesharing attempts to provide an added flexibility to ridesharing arrangements by allowing drivers and passengers to arrange occasionally shared rides. It also discusses about the advantages, disadvantages, economic challenges, social/behavioral challenges, Institutional challenges, technological challenges, opportunities and challenges of ridesharing. The Rideshare challenges in a series of economic, behavioral, institutional and technological obstacles.

In general there are a wide range of algorithms for finding the shortest path but Dijkstra's algorithm for finding the shortest path is efficiently which is one major advantage for reducing the fuel content and hence being used. The road networks and congestion of cities has been discussed with the statistics of average number of cars, vehicles that run in Delhi. The system seemingly provides all the advantages using GPS based navigation system and also has some additional SMS based alerts in order to provide transparency with both the rider as well as passengers. This system is user friendly.

IV. PROPOSED SYSTEM

In today's world dynamic carpooling is limited to a few standardized pickup and drop-off locations, as that is the only mechanism available for route coordination. But that severely limits the geographic areas and the set of people who will find it convenient to ride with others [4]. In case of OLA cabs and Uber the traveler sign in into their respective account and they can easily book a cab by choosing their destination, but the problem here is the remaining or the seats which are vacant would be waste. Sharing with other people those who want to travel towards the same destination is not possible yet. So, in our system we will try make an application which can be used by everyone, those who are ready to share their vacant seats with people those who are travelling towards the same route. We have also taken into account security of passengers as well as drivers. At the time of registration both the passenger and driver have to upload their id proof in the form of driving license or PAN card, Aadhar card etc. anyone of these.

In near future we have come across many incidents regarding security of lady passenger. Our module will be implemented in such a manner that after all the seats are filled details of no. of male and female passengers would be sent to all passengers as per that if anyone is

feeling discomfort for the journey would easily back off by just cancelling their reservation from journey.

The cost of the journey for particular distance is fixed and if any passenger wish to get down after that fixed point he/she would have to pay as per the algorithm which we would be implementing i.e. Dijkshtra's algorithm, as per this algorithms cost would be specified.

A. Registration

In this module user can register them by provideing their information like Name, Address, Profile picture, PAN no, Email and password (if having car then car no., car type and car photo).

B. Login

In this application registered users can login into the system as follows:

- ❖ Login as Owner
- ❖ Login as passenger

C. Create car pool

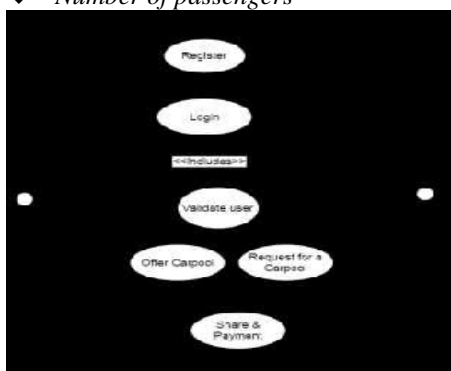
In this owner can create the car pool by providing the details as follows:

- ❖ Starting location
- ❖ Start time
- ❖ Destination
- ❖ Number of available seats The owner can accept or deny the car pool request.

D. Request for car pool

In this passenger can request for car pool by providing the details as follows:

- ❖ Starting location
- ❖ Start time
- ❖ Destination
- ❖ Number of passengers



Use case diagram for carpooling system:

V. ACKNOWLEDGMENT

We take opportunity to express our deep gratitude towards all the people who help us in this project. The report is finished under guidance of Prof. Sandeep Kamble

(VIT dept. of computer engg.). We would be very grateful to him for his help in the entire process.

VI. CONCLUSION

Carpooling android application is very effective means to reduce pollution and the congestion of vehicles in cities. It also enables people to travel in an eco-friendly way to travel. It also provides an opportunity to meet new people. As today most people prefer private vehicle to travel compared to public transport due to the delay caused in public transport system and also luxuries are provided in private vehicles. Preregistration is the part that ensures that only identified people get into the vehicle so that trust can be established.

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Subjective Answer Evaluation System

^[1] Jincy Johnikutty ^[2] Varun Vasudevan ^[3] Imran Chaudhary ^[4] Rashmi Badhe ^[5] KalpanaWani
^{[1][2][3][4]} U.G. scholars ^[5] Assistant Professor
^{[1][2][3][4]} Department of Computer Engineering
Fr. C. Rodrigues Institute of Technology, Vashi
^[1] jjincy243@gmail.com ^[2] kuthully.varun@gmail.com ^[3] chaudhary.imran619@gmail.com
^[4] rashmisbadhe@gmail.com ^[5] kjwani82@gmail.com

Abstract— In recent years we have seen that a large number of examinations have gone online. However we have observed that these examinations cater only objective or multiple choice questions and provision to subjective answer and its evaluation is still an open problem. Automation of descriptive answer evaluation process will be helpful for various universities and academic institutions to efficiently handle the assessment of exam answer sheets of students. Aim of our system is to check the degree of conceptual knowledge of the student by evaluating the subjective answers submitted by the student written online. The key step in our approach is keyword extraction which is used to evaluate subjective answers. Keywords are the important words present in a document. Along with the keywords, marks will be allotted based on the grammar, length and the synonyms of the keywords written by the student in the answer.

Keywords:-computer, assessment, descriptive, processing, evaluating, grammar, database, extraction.

I. INTRODUCTION

In recent years we have seen that a number of governments, semi government examinations have gone online, for example [IBPS Common Written Examination (CWE)]. This system or any other such systems are advantageous in terms of saving resources and time. However we have observed that these systems cater only multiple choice questions and there is no provision to extend these systems to subjective questions. [2]. We have studied a number of problems for which these systems cannot be used in board examination, university examination where student writes subjective answers so we have proposed this software to reduce the usage of resources. The major issues with online objective answers are students coming from various educational backgrounds have difficulties with grammar, formation of correct and complete sentences. Natural language is very rich in expressing the sentences; therefore the same meaning can be conveyed in different forms using different set of words. Similarly for evaluating answers for the same question, different teachers may have different views. So to avoid such problems we have proposed this system which can be adopted easily and will also reduce the evaluation time.[1,2]

The techniques for automatic marking of free-text responses are basically categorized into three main kinds, Statistical, Information Extraction and Full Natural Language Processing.

A. Statistical Technique:

It is only based on keyword matching, hence considered as poor method. It cannot tackle the problems such as synonyms in student answers, nor does it takes into account the order of words, nor can it deal with lexical variability. [3,6]

B. Information Extraction (IE) Technique:

Information Extraction consists of getting structured information from free text. IE may be used to extract dependencies between concepts. Firstly, the text is broken into concepts and their relationships. Then, the dependencies found are compared against the human experts to give the student's score.[4,6]

C. Full Natural language processing (NLP):

It involves parsing of text and finding the semantic meaning of student's answer and finally comparing it with standard answer and assigning the final scores.

NLP is the application of computational methods to analyze natural language. NLP uses tools such as syntactic parsers to find the linguistics structure of a text and rhetorical parsers to find the discourse structure of a text. The combination of these techniques improve the use of statistics by involving a deep text parsing and a semantic analysis in order to gather more information to effectively assess the student's answer. Most NLP applications such as information extraction, machine translation, sentiment analysis and question answering, require both syntactic and

semantic analysis at various levels. [4,5,8]

II. THE PROPOSED SYSTEM

Many architectures and features have been proposed for descriptive answer evaluation. There is no standardized software to award marks/grades for the answer given. The approaches are mainly based on keyword matching, sequence matching and quantitative analysis, but semantic analysis of descriptive answer is still an open problem. Considering the general structure of text analysis in natural language processing, most of the work has been done for syntactic analysis but semantic, pragmatic are still not being explored.

Scope of System

Subjective Answer Evaluation System is a system that is developed with an intention to evaluate subjective answers written online. This system would reduce the manual efforts required for correcting answers. The following steps explain the working of the system:-

- ❖ The user has to login with the essential details and the system will authenticate the same-The login module authenticates both the user and the admin. Once the authentication is done, the user and admin can perform their individual activities.
- ❖ After authentication, questions will be displayed to the user
- ❖ After answering the question it will be submitted to the system
- ❖ The submitted answer will then be evaluated by the system and marks will be allotted- The evaluation of the answer is done by comparing the student's answer with the standard answer stored in the database.

The system will not be able to evaluate mathematical equations as well as answers with diagrams. The system can check only five different answers of the students.

III. ARCHITECTURE DIAGRAM

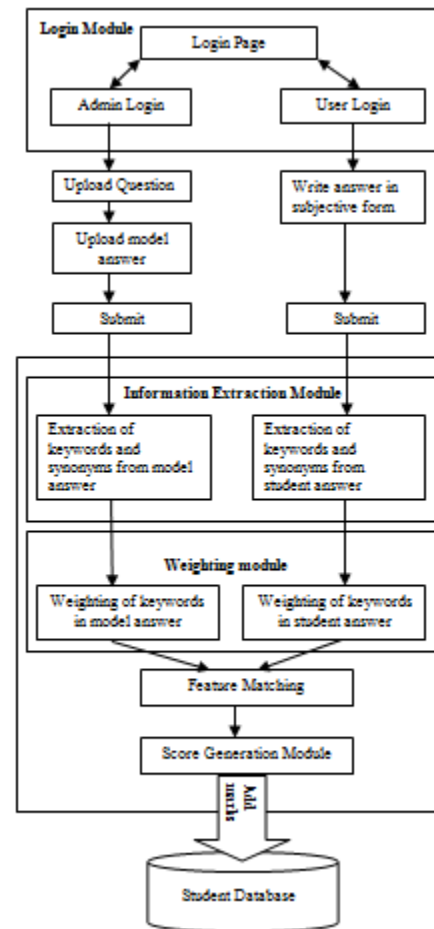


Fig 3.1: Architecture of the proposed system

IV. METHODOLOGY

The system comprises of four modules and they are Login module, Information extraction module, Weighting module and Score Generation module.

A. Login Module:

The login module authenticates both the user and the admin. Once the authentication is done, the user and admin can perform their individual activities.

1. Admin Login:

The admin needs to enter the username and the password for authentication. Once authenticated, the admin can now create the question and store the answer for the same in the database. The admin can also add students, subjects and tests for those subjects. The admin should keep all the keywords present in the answer in capital

letters. Thus admin should store the answer with a subject expert helping him to identify the keywords present in the answer. The question will be displayed to the user and the answer stored will be used as the standard answer for comparing with the user's answer.

2. User Login:

The user login enables the user to write the answer for the question displayed. The user is asked to enter his login id and test id. If all the credentials are satisfied then the student is redirected to the page where the question and a text box for the answer is displayed. Once the user has completed writing the answer, he/she can submit the answer for evaluation.

B. Information Extraction Module:

Information extraction module is a module where the process of extracting the keywords from the standard answer and the user submitted answer will take place. Along with the keywords, the synonyms of the keywords submitted by the user will also be extracted. The keywords are the words that provide the key concept or are of great significance in a document. The keywords that get repeated very often in a document are given less importance. But the keywords which occur rarely in a document will have great importance. The synonyms of the keywords will be extracted from the dictionary stored in the database. [6].

C. Weighting Module:

1. Keywords

The keywords of the model answer must be written in capital letters while storing the database. These keywords are extracted by our system and stored in a multidimensional array. Now these words are checked in the student's answer and depending on the percentage of keywords present in the student's answer, marks will be given. First of all, the student's answer is broken down into strings and is stored in a multidimensional array. Now the keywords extracted by the system from the admin's answer are checked with the array of the student's answer one by one.

2. Synonyms

Synonyms are required in-order to analyze the similar sentences written by the user instead of the sentences mentioned in the standard answer. Using Wordnet, the similarity of the sentences can be mapped between the user's answer and the standard answer. Thus, even though the student's answer does not contain the exact keywords or sentences, sentences having similar meaning will also get marks.

3. Grammar

Grammar is used to form the structure of a sentence. There is a possibility that the user may only write the keywords without the sentences. Thus checking grammar plays an important role in subjective answer evaluation. In order to secure maximum marks the user must specify the keywords along with the proper sentence formation. Grammatically incorrect sentences in the student's answer will be given less marks even if there are a lot of keywords.

4. Length

Length of the answer is also important as the student may write the answer very shortly with all keywords and grammatically correct sentences. Such an answer would get all the marks for grammar and keywords but it will get less marks for the length.

Following table explains the marking scheme based on keywords and length of the answer:-

Table I
Marking Scheme Table

Keywords matched in Percentage	Marks obtained out of Max marks for Length
80-100	100% of Max marks
60-80	90% of Max marks
40-60	80% of Max marks
20-40	50% of Max marks
5-20	30% of Max marks
1-5	10% of Max marks
0	0% of Max marks

D. Score Generation Module:

The score or mark is generated depending on the above factors and the total marks will be sum of all the marks obtained from individual sections. Depending upon the priority, keywords are given 40% priority followed by grammar 30% and then synonyms 20% and finally the length of the answer 10%. The marks for length are dependent on the percentage of keywords matching and a marking scheme is tabulated for giving marks to the length. Thus if the student writes a completely different answer with no keywords matching, then marks for length won't be allotted.

V. CONCLUSION AND FUTURE SCOPE

Examinations play a very important role in colleges, universities and various other educational institutes. Many educational institutes have their examinations conducted online. But these exams only contain multiple choice questions which are proving to be very efficient in testing the student's aptitude, on the other hand fail to measure the conceptual knowledge a student or learner must possess. Therefore subjective answers must be included in online examinations. The proposed system attempts to evaluate the subjective answers. The proposed system evaluates the answer based on the keywords. By comparing the standard answer and the student's answer marks are awarded to the student. Maximum marks are awarded if the student utilizes all the keywords mentioned in the standard answer. Hence the said system could be of great utility to the educators whenever they need to take a quick test for revision purpose, as it saves them the trouble of evaluating the a bundle of papers. Also this system totally evacuates any circumstance of biasness.

In future we are planning to evaluate subjective answers with diagram and mathematical expressions.

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GSM Based Automation

^[1]Santosh S Sonmankar ^[2] Shrikant J.Patro ^[3] Harsh Desai ^[4] Umesh Kulkarni

Vidyalankar Institute Of Technology

^[1] ssonmankar@gmail.com ^[2] shrikantpatro123@gmail.com, ^[3] harsh.desai235@gmail.com

^[4] umesh.kulkarni@vit.edu.in

Abstract-The automation is a technological advance that is changing the life of the person drastically. The market trend is in favor of such technological advances that ultimately enhance the life. This paper is about the introduction to the newer technology that contributes to the field of the automation. Also, how it is used to develop the exceptionally advance product. The aim is to motivate the research in this area. The methodology that is being used to develop the content of this paper is the information being collected from the different sources like the existing research paper, along with the observation of the latest trend in the market in the same field. The pace of the development is very fast but it is not being used in industry widely and at the small scale. The content of the paper will make industry aware of the technology like GSM can also be used to automate the electrical appliances at the different scale .

Keyword-GSM ,Android, Arduino, automation..

I. INTRODUCTION

The Term “automation” is very common terminology that we come across very often. It is Terminology that is being used in order to represent the automated activities across the globe. It refer to the automation of the several electrical appliances like light, fan, Television, Air conditioner, Refrigerator . This automation of electrical appliances makes life of the human stress free. Also, Make thing easily accessible and easy to operate. The electricity is the resource that is very scarce, expensive. So, there is need to prevent it and use it wisely. Automation will be helping us to achieve our goal of using electrical appliances wisely, saving electricity and make life of human easy.

The paper is about the “Automation of electrical appliances using GSM” .This paper include the information regarding the automation of the electrical appliances across houses using the Technology like GSM, Android and Arduino as connectivity, software and hardware component respectively. The GSM is a technology that is being used since the long back. This technology is also considered as one of the reliable services from the expert.As of 2014 it has become the default global standard for mobile communications - with over 90% market share, operating in over 219 countries and territories. Android is mobile based operating system that is used by wide range of people. An April–May 2013 survey of mobile application developers found that 71% of developers create applications for Android and a 2015 survey found that 40% of full-time professional developers

see Android as their priority target platform, which is comparable to Apple's IOS on 37% with both platforms far above others .Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

The scope of existing automation system is restricted to the class of the people without any disability. This is not being developed for the disabled people across the globe. The same is true for the old age people . Since the technology is currently being used by general people only. There is need to introduce the same technology for the disable and old aged people across globe. This paper is to propose the overall architecture about the usage of the automation in context of disabled people. The description regarding the design and implementation of the automation for the disabled people. This architecture, design and implementation part include the Android, Arduino, and GSM as technology.

The building of the smart home technology is also required to provide the full fledged service to disabled and old aged person similar to that of general public .This area of service is neglected by the existing company that build the automation of the product.In that context the paper provide the brief overview of services that will overcome the drawback of the existing home automation system. Also, still there is no such automation system that provides any service associated with blind person. This paper also provide the brief idea about the building of the automation

system that is voice operated and even blind person is also able to handle every electronic appliance without any other person help. So, by reading this paper the user will have complete idea about the design and the implementation of such system for the disabled and old age personal.

II. PROBLEM

While automation is far from mainstream , more and more smart home technology is starting to appear in the market. Energy supplier Npower recently started offering Nest, the smart central heating controller from Google in the UK, and last year, rival British Gas launched its internet-connected central heating system, Hive. But beyond the big energy providers, a new industry is emerging to integrate computer control into the home. In the past, companies such as Lurton were synonymous with intelligent lighting installed in high-end homes. But it currently suffer from series of problem that are to be listed in the same section in detail

The problem with the existing automation system is with respect to the range over which operate depending on the technology that is being used either it is WI-FI, Zig-bee, Bluetooth .This feature are currently being used in SmartPhone, tablets, Camera, Digital audio player. The automation based on Wi-Fi can connect to a network resource such as the Internet via a wireless network access point. Such an access point (or hotspot) has a range of about 20 meters (66 feet) indoors and a greater range outdoors. But there is no such restriction are provided in context of usage of GSM for the connectivity.

The interface of the current automation system is such that it is only suitable for the general user’s to interact with the electronic .There is no such privilege that even disabled and old age person are allowed to use such system. This paper will provide the complete overview of designing of the interface along the technology being used to develop. The interface is such that even blind person are also allowed to use the system as efficiently as general user because for such user the interface will be voice operated. The same feature that is being used by the general user is also used by blind person.

Another major problem with the existing system is that the services provided by the system are very less and in contrast the prices are very high comparatively. For example here are few devices that currently exist in market and being used as well. This include Smart Lighting The above-mentioned smart outlets are great for controlling your “dumb” lamps and light stands, but smart home automation has progressed beyond that The most-recommended solution is the Philips Hue Lightbulb, which is an LED bulb designed to use up to 80% less energy than a traditional bulb. Using the smartphone app, you can control it remotely or set it to trigger according to a timer. One bulb is currently priced at \$20. Smart Outlets The most basic smart home component is the smart outlet or

smart plug, which are both the same thing: an extension to your wall outlets that provide better control over the appliances and devices plugged into said outlets .The Belkin WeMo Switch is the most popular one by a long shot, not because it’s the cheapest (it costs \$45) but because it has the best marketing and promotion surrounding it, plus it’s easy to use and has a great name. Smart sensor another key component of smart home automation is the sensor. There are a plethora of available sensor types depending on the smart home hub that you choose, ranging from motion sensors to temperature sensors, from humidity sensors to weight sensors.

Standard	Family	Downlink (Mbps)	Uplink (Mbps)	Coverage
WiFi	802.11	11/54/150/300		100m
WiMAX	802.16e	144	35	10km
UMTS (3G) /HSPA (3.5G)	3GPP	14.4	5.76	30km
LTE (4G)	3GPP	360	80	30km

Fig.1

III. SOLUTION

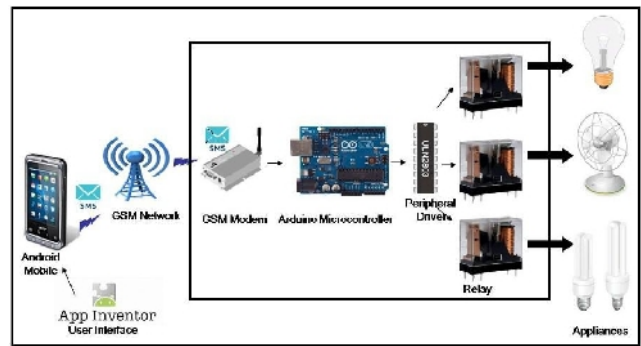


Fig.2

The problem regarding the area being covered by the existing home automation is restricted as it is described in previous section. But this problem is overcome in this paper by using the GSM over other technology as described previously. Since the GSM is not restricted by coverage area as we all use cell phone they are always connected irrespective of the position in world. So the solution being provided to overcome the given problem is to automate the devices using GSM and stay connected and always updated about the status of the device. If required to change the state of the device even a normal SMS services

in case of ordinary phone and in case of android based smart phone through your application you can change the state of the devices immediately. Also the application will provide complete view of the available appliances based on that they will be selecting whether the appliances are turned ON/OFF. For example, You are employee of certain organization and you leave from the office at evening say 5:00 pm. So, you can instantly turn on air conditioner of your room from office itself so that till you reach your home the room temperature is already appropriate as per your requirement.

The cost of the system that is being proposed is very less as compared to the existing system and provide the centralized control over the entire devices available in house with proper classification of the no of the devices available in room .So there is no problem regarding the selection of the device.

The proper module is provided in android based application for the classification of the application based on house module or the factory module that industry owner will propose. In one touch you can change your access to the specific room to specific device and that to with the specific authentication and authorization. The user will just need to send SMS regarding the activity or action that is intended to perform. But most interesting thing about this system is that every message is required to generate is actually coded internally along with the corresponding AT Command. So user need to press ON/OFF button available in user interface and SMS will automatically generate internally and action is performed.

This provide the extension to the Non-Smartphone user such that, They are also allowed to control automation system from any part of the world through Normal SMS services. They are also updated if the notification service is ON. For Smart Phone user will receive the notification regarding the current status if they had activated the notification for the automation application. If they had not activated the notification than they are not unnecessarily disturbed, they will receive notification when they turn on their application.

The advantage of the existing system is not an headache for user since the user need not to request for the customization of the application. Because the application is already designed with the expected customized module as per classification of user belonging to the different. But, in extreme cases the customization if needed can be done based user expectation. The initial module is held with the module consisting of the classification as 1BHK, 2BHK, 3BHK and 1RK flat.

IV. DETAIL

The existing home automation systems that are based on Wi-Fi and Bluetooth have support from the various programming language and cross platform across several mobile phone. The paper provide the detail about

the architecture of the automation using the GSM along with continue the support to the system by the latest rising mobile platform like Android. So, now the new platform that are being used for the automation is based on GSM over Wi-Fi and Bluetooth. Since the overall architecture include Android application including the Smart phone ,Tablet and an 8 bit microcontroller based relay driver circuit with GSM Modem, which is able to communicate with the Home Appliances over GSM Network.

The system is based on serial data transmission using SMS over GSM Network in order to facilitate the appliances control in a global network environment. The data being exchanged is exchanged over the GSM network that is very much secured then the existing platform. A user interface (UI) on the Android enabled mobile phone offers system connection and control utilities. Arduino IDE [19] for compiling C Language Code and burning HEX file into microcontroller ,serial 900 type GSM and ULN 2803 relay driver being used in development of proposed automation system. In order to control the relay the Atmega 328, a 8 bit micro-controller is used.

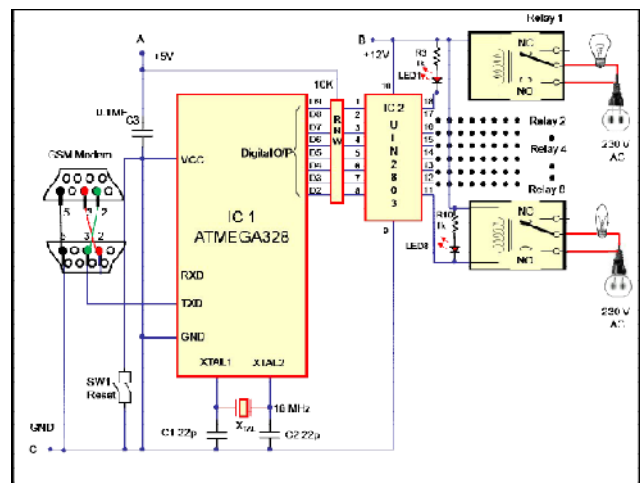


Fig.3

V. DEVELOPMENT PLATFORM

This section provides the detailed description regarding the platform that is to be used in order to develop the proposed automation system model. This include the Android, Arduino and GSM

A. Android

Android mobile operating system that is widely used in world today for the touch screen handsets, Tablets. It provide the virtual keyboard to user type the text/content. It support the general action over it like touch swap to manipulate the screen object.

B. Arduino IDE:

The open-source Arduino environment makes it easy to write code and upload it to the I/O board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and it is based on Processing, avr-gcc, and other open source software. The Arduino development environment contains a text editor for writing code, message area, text console, and toolbar with buttons for common functions, and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them. Arduino programs are written in C or C++. Arduino IDE with features such as syntax highlighting, brace matching, and automatic indentation, and it is also capable of compiling and uploading programs to the Board with a single click. Software written using Arduino is called sketches. These sketches are written in the text editor. Sketches are saved with the file extension '.ino.' It has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino environment including complete error messages and other information. The bottom right-hand corner of the window displays the current board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor. As the Arduino platform uses Atmel microcontrollers, Atmel's development environment, AVR Studio or the newer Atmel Studio, may also be used to develop software for the Arduino.

C. GSM Modem:

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities.

VI. CONCLUSION

The paper includes the information about the different technology existing in automation. Then, the drawback about the existing technology in the market. Introduction to GSM and its usage in field of automation in different aspect. This also provides the brief description about its design and implementation.

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Live Interactive Authentication using Remoting Techniques (L.I.A.R)

^[1] Rakshit Ogra ^[2] Namrata Shivaneekar ^[3] Pawan Deshmane ^[4] Sanket Godbharle ^[5] Prof. H.K Kaura

^{[1][2][3][4][5]} Department of Information Technology

Fr. C. Rodrigues Institute of Technology, Vashi

Navi Mumbai, India

^[1] ro3184@gmail.com ^[2] namratashivaneekar@gmail.com, ^[3] pawandshmn@gmail.com

^[4] sanketgodbharle10@gmail.com ^[5] hkkaura@gmail.com

Abstract- The process of authorizing an individual is usually based on username and password and also by using message based system. A remote authentication system is handled generally through remote systems itself without any manual / operator assistance. Presently there are many authentication mechanisms deployed on various applications on the internet which deal with financial transactions. In a transaction involving payment through credit card, authentication involves entering credit card, authentication involves entering credit card number, name on the card, Card Verification Value (CVV) number, expiry date. Further to this OTP (One Time Password) is used in which person to be authenticated can have access is required to enter a code which is provided by remote systems to user on his mobile phone. CAPTCHA (Completely Automated Procedure to Tell Computers and Humans Apart) is used for the authentication. The proposed system is an interactive remote authentication system which can be deployed in addition to the broadly available authentications only for high value and critical financial transactions. This involves verification / authentication of remote user by human operator on the authentication system-end. This involves two levels of authenticating remote user. At the first level remote user is asked to capture his image using webcam or any other camera (Mobile) and then send the image to the system. The human operator on system-end verifies the captured image of the remote user comparing it with the image stored in the system database. If it matches, the second level of verification is initiated by human operator. Human operator will ask the remote user to perform some action such as turn face left, right or up, touch your nose, remove the cap, etc. and capture the picture of his modified face as per an instruction and send to human operator. If the new image is as per an instruction of human operator that verifies the remote user is authenticated.

Keywords: *Authentication, remote, verification, operator.*

I. INTRODUCTION

1.1 Background

Authentication means verifying the identity of someone (a user, device, or an entity) who wants to access data, resources, or applications. Validating that identity establishes a trust relationship for further interactions. Authentication also enables accountability by making it possible to link access and actions to specific identities. Many consumers have started to put faith on these organizations which guarantees products and services due to which there has been an increase in online transactions and the online market has been now valued in trillions.. But there have been disadvantages and flaws in this system. Increase in online transactions have also led to the rise of increased issues of hacking and stealing which has made developers to think of undertaking various security measures to tighten up the security in the unknown waters of Internet. OTP (One-Time Password)¹, Biometric systems² (face, voice recognition, fingerprinting.) are all popular authentication mechanisms deployed on various

systems but they have been cracked and their flaws have been exposed on various occasions which has led to the increase in the need for a change in existing systems. Our proposed system of authentication focuses on following steps. Capturing the user's image and checking with stored image by human operator and authenticating the user by carrying out live interaction with him/her. While signing in system, user has to capture his/her image and send to human operator on system side which he will compare the image. Human operator at system-end will manually check the new image with already stored image in database. If they are same then only next step will be activated. Human operator will ask the user to do random physical action such as turn face to left, turn face to right, etc. Then take the picture by webcam or mobile. After getting new image with action performed human operator will again check the image manually. If the current image is as per the specified physical actions then only user will be authenticated and allow to get access to do transactions.

1.2 Motivation

The real motivation of choosing this project topic was to create a new authentication system using a combination of existent systems as well as utilizing the flexibility and platform independence of the currently available technologies. Also, due to some shortcomings in the existing systems, there was the need to innovate and create a new platform for authenticating the users in order to achieve safe and secure authentication

This research aims to study the existing authentication systems and to design and develop an improved mechanism, to empirically test its security & usability, and to compare it with existing deployed schemes. The extent of previously discussed problems and their effect on individuals and organizations give raise to a number of research questions:

- ❖ What is the security and usability performance of authentication systems in actual use?
- ❖ Are facial recognition schemes as reliable as credit card credentials or OTP and CAPTCHA schemes?

This research will provide secure, reliable user authentication mechanisms to help the users who carry out online transactions. It is a better authentication method which cannot be easily manhandled by an unauthorized user.

1.3 Scope

Live Interactive Authentication Using Remoting Techniques is a system that will be developed for users who want to get authenticated while carrying out online financial transactions. With the help of this system, the reliability of authenticating a user increases. This system can be used in addition of already implemented authentication methods like OTP(One-Time Password).The scope of this project is to design and implement a new, efficient, robust and highly secure remote authentication system which will authenticate the users through the means of any deployed image capturing device on the computer or mobile. The main reason behind this project idea was to eliminate/minimize limitations and flaws in the currently existing and deployed authentication mechanisms and to place a new system which could provide the users with a more secure, robust and reliable way of authenticating themselves. This system when deployed, will help to prevent any fraudulent financial transactions carried out by the hackers and therefore will help to save the data integrity and will also eliminate the heavy loss of money of the original users.

1.4 Issues and Limitations³

- ❖ Both the user and human remote operator have to present and attend the session at the same time.
- ❖ If the user suffers from any kind of changes in facial anatomy due to age or accidents, then the

human operator will face difficulties to identify the user.

- ❖ This method is expensive for carrying out small-value transactions.

II. LITERATURE SURVEY

There are many different authentication systems are present that we can use in day-to-day life. But One Time Password is most widely used than any other authentication systems. CAPTCHA schemes is also used with password to check whether system is used by human or a machine. There are existing remote authentication systems which are discussed as follows. A password is a word or string of characters used for user authentication to prove identity or access approval to gain access to a resource (example: an access code is a type of password), which should be kept secret from those not allowed access. Password-based authentication is the protocol where two entities share a password in advance and use the password as the basis of authentication. Existing password authentication schemes can be categorized into two types: weak-password authentication schemes and strong-password authentication schemes. When compared to strong-password schemes, weak-password schemes tend to have lighter computational overhead, the designs are simpler, and implementation is easier, making them especially suitable for some constrained environments.

A one-time password (OTP) is an automatically generated numeric or alphanumeric string of characters that authenticates the user for a single transaction or session. A common technology used for the delivery of OTPs is text messaging. Because text messaging is a ubiquitous communication channel, being directly available in nearly all mobile handsets and, through text-to-speech conversion, to any mobile or landline telephone, text messaging has a great potential to reach all consumers with a low total cost to implement. However, the cost of text messaging for each OTP may not be acceptable to some users. OTP over text messaging may be encrypted using an A5/x standard, which several hacking groups report can be successfully decrypted within minutes or seconds, or the OTP over SMS might not be encrypted by one's service-provider at all. In addition to threats from hackers, the mobile phone operator becomes part of the trust chain. In the case of roaming, more than a single mobile phone operator has to be trusted. Anyone using this information may mount a man-in-the-middle attack. A card security code (CSC), (also called card verification data, card verification number, card verification value, card verification value code, card verification code, verification code (V-code or V code), card code verification, or signature panel code (SPC) are different terms for a security feature for "card not present" payment card transactions instituted to reduce the incidence of credit card fraud. The CSC is in addition to the bank card number

which is embossed or printed on the card. The CSC is used as a security feature, in situations where a PIN cannot be used. The PIN is not printed or embedded on the card but is manually entered by the cardholder during a point-of-sale (card present) transactions. Contactless card and chip cards may electronically generate their own code, such as CVV or Dynamic CVV⁴.

Biometrics refers to metrics related to human characteristics. Biometrics authentication (or realistic authentication) is used in computer science as a form of identification and access control. It is also used to identify individuals in groups that are under surveillance. Biometric identifiers are the distinctive, measurable characteristics used to label and describe individuals. Biometric identifiers are often categorized as physiological versus behavioral characteristics. Physiological characteristics are related to the shape of the body. Examples include, but are not limited to fingerprint, palm veins, face recognition, DNA, palm print, hand geometry, iris recognition, retina and odour /scent. Behavioral characteristics are related to the pattern of behavior of a person, including but not limited to typing rhythm, gait, and voice. Some researchers have coined the term *behaviometrics* to describe the latter class of biometrics.

III. PROPOSED SYSTEM

We propose a reliable remote based authentication system under the name (L.I.A.R) which will be using live interaction with the users remotely using Internet as a medium for authenticating them. This project will consist of two phases in the process of authenticating the user using webcams and live image sharing mechanisms.

- ❖ Capture of user facial image and manual checking of the captured photo by the remote manual authenticator using the stored photo of the same user in system database.
- ❖ Authenticating the user by carrying out live interaction (through checking and verifying of physical actions as ordered by the remote authenticator) with that user.

3.1 Image Checking:

Suppose a user is carrying out a high-value online transaction on a bank website or any other website, he has to enter all the necessary credentials of the credit card as the first process and then has to follow the OTP procedure to get through the transaction. Our system will be deployed in addition to the OTP service and it will need a basic webcam and HTML-JavaScript support to access the system. In the first phase, a secure connection will be established between the user and a remote authenticator situated at random location and also allocated randomly. Through that secure connection, the remote authenticator will be able to view the images sent by that user and will be able to transmit messages to the client for the live interaction. The user will be clicking an image of himself and will be sending to the remote authenticator who will be

cross-checking with the stored image stored in the database manually. This manual checking of the image will be the first step in our system and will confirm whether the user is the correct registered user or not.

3.2 Live Interaction:

After the image checking phase, the remote authenticator will instruct the user through live text sending. The user will be told to perform certain simple and feasible actions such as “Turn left”, “Turn right”, “Show a V symbol” etc. These actions will be viewed by the remote manual authenticator through the images sent by the user in which the actions will be recorded and will be confirmed to authenticate and complete the transaction, if and only if, the actions are as per the request. If the actions are not as per demanded, then the remote authenticator has full right to cancel the entire transaction process. This phase will determine whether the correct user who is carrying out the transaction is a live person or not.

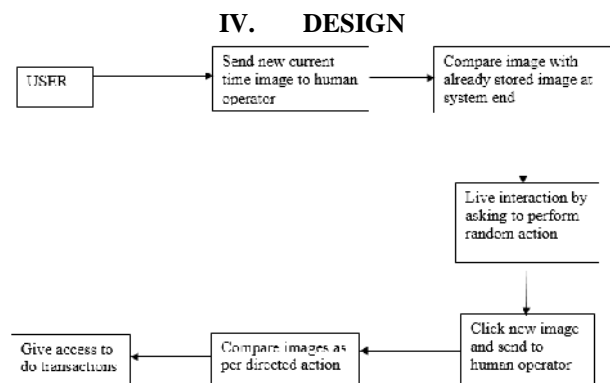


Fig. 4.1 Flow Chart Diagram

- ❖ To send new image at current time to remote side from the user who wants to get authorized.
- ❖ Image is compared with an already stored image at the remote end.
- ❖ User is asked to perform random actions according to instructions given by the operator.
- ❖ If the current image is as per the specified physical action, then user would be authenticated and allowed to get access to do transactions.

V. SOFTWARE AND HARDWARE REQUIREMENTS

On Computer:
At user side:-

- ❖ A general purpose personal computer with basic configuration with a webcam with min 2 MP resolution

At server side:-

- ❖ A general purpose computer with basic processing capability along with access to the Internet with Microsoft .Net framework support.

Operating Systems supported:

- ❖ Various Linux distributions: Fedora, Red Hat, Ubuntu. etc
- ❖ Windows: XP/7/8/8.1/10

On Mobile:-

- ❖ Basic smart phone configuration with standard ROM, RAM, processor with Internet Access along with supported browser

Operating System:

- ❖ Android: 3.0 and above versions
- ❖ Windows
- ❖ iOS

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VI. CONCLUSION

It is a secure way of getting authenticated as human operator performs live interaction with the remote user. It can provide alternative for the tedious procedure of approaching the bank for the authentication while registering and also answering multiple customer service calls. It will be very useful when it comes to carrying out high-value transactions on the Internet. It is very easy to deploy with minimum system configuration needed. It is very robust, efficient, and scalable than any other authentication system. It also eliminates flaws and limitations of current existing schemes and also will provide employment to the needy.

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Performance Estimation of Bilinear Color Interpolation in Matlab & VLSI

^[1] Rohan C. Patil ^[2] Assoc. Prof. Avinash M. Ghorpade
^{[1][2]} Dept. of Electronics and Communication
Maratha Mandal Engineering College
Belgaum, India
^[1]rohan.patil.e@gmail.com ^[2]avighorpade@gmail.com

Abstract:- in our day to day life Digital Image Processing (DIP) applications have become common. For the real time applications the exploitation of digital image processing systems require efficient computing techniques, the algorithm which is proposed to this system indeed works on very large scale integration focuses mainly on chip based design and its implementation for DIP applications where its real time image processing works better. In the agricultural fields the farmers uses fertilizers for the growth of crops & farmers purchase these crops without any knowledge, all the fertilizers are made by usage of chemicals which are harmful to human health to avoid these problems and to identify the pest affected crops or not affected crops we are using VLSI method of Implementation. Designed system with high computational speed with research work proposed in this method will help to customers as well as farmers. With portable equipment to measure the results quickly and display in very short time. Using High Quality Interpolation Algorithm, Edge Detection, Filtering Methods, Matching Edge Algorithm in Mathematical Laboratory (Matlab) and VLSI implementation in Xilinx software. For hardware implementation cyclone III kit using Field Programmable Gate Array (FPGA).

Keywords:--exploitation; filtering; crops; Xilinx; FPGA

I. INTRODUCTION

Now a day's Human beings very much get affected with Hazardous diseases which destroys the human life and couldn't be diagnosed. Pest affected Crops and leaves may harm to pets as well as human life which couldn't be found of manually. For the growth of crops farmers use the fertilizers which made up of strong chemicals and these chemicals only affect the human health. These crops and fertilizers purchase the farmers and customers without any knowledge which cause the health problem for human as we pets. To overcome these hazardous diseases of crops we had an implementation based on Digital Image Processing (DIP) which is time consuming process. So it then proposed with high speed and accuracy using very large scale integration (VLSI) technology. A technology with rapid progress and a digital era, traditional cameras are been used which are made up of a complementary metal oxide semiconductor and charge-coupled device a still digital cameras uses the sensor into it, sensors will effect for the light intensity. When capturing the images sensor must be occupied with the color filter and it will be responsible for the color differences. Red, Green and Blue are the three main principle colors in color filtering. Red,

Green and Blue, and are set before three sensors, so that the RGB values caught individually by the three sensors can be joined to frame a full-shading picture. Nonetheless, considering the high cost of utilizing three sensors and the vast space they take up, a shading channel cluster is normally made out of standout sensor. Accordingly, every pixel just obtains the power (splendor) of one of the three-shading components R, G and B while losing the other two shading components. Subsequently, an interjection must be performed on the outcome acquired through the Color Filter Array (CFA), in order to remake the missing shading components in every pixel. The procedure of remaking the missing shading components is called demosaicking or CFA addition. In the blink of an eye, the most widely recognized CFA in advanced still cameras utilizes a shading game plan in view of the Bayer design. Bayer CFA involves 25% of R channels, half of G channels and 25% of B channels, wherein columns of then again arranged R and G channels and lines of on the other hand arranged B and G channels are on the other hand orchestrated, so that the R, G and B channels are consistently appropriated in all aspects of the CFA. It merits saying that there are more G channels in a Bayer CFA than the other two shading channels on the grounds that the human eye can perceive a more extensive scope of green than the other two essential hues. What's more, with

this shading course of action, more force changes and points of interest can be recorded to encourage more exact picture remaking. This projects works al about working on matlab to process the digital image and then VLSI coding is done to match the results of both. For compression we need to estimate the following edge detection, Gaussian filtration, conversion to grayscale; overall the procedures to perform and plot the result we use VLSI coding where it gives us the PSNR value.

II. RELATED WORK

Presently people have no idea about the healthy leaves and non healthy leaves, to know about exact healthiness of the crops we move to this proposed system. Farmers use the fertilizers at what content? In farms and also by knowing growth the crops the fertilizers are used appropriately by R. W. Schafer [4]. Bilinear interpolation is one of the easiest method to define the pixels using the RGB colors where it note that these are Three main principle color to define about the color interpolation. These images may be blurred or distorted, so avoid this B. K. Gunturk [4] proposed a model called weighted array for fixed image. The color interpolation quality must be high enough. Research work on SR primarily concentrated for knowledge gaining about the interpolation [8]. Using the discrete wavelet transform (DWT) image hallucination constructed for algorithm based on discrete format and the it is been transformed to protect the image from the noisy effects so as to remove the Gaussian filter is altered [10]. In bi-cubic interpolation technique the image flow is generated using LR or HR latching techniques. Most of research works are performed construction and proceed where it take Gaussian and back projection [12]. To determine the chemical content level into the fertilizers or pest affected leafs a PH level chemical test is carried out. Demosaicking method produces high quality of the color interpolation, in this interpolation method the 3 main color known as the principle color in color interpolation are RED, GREEN and BLUE (RGB) [11] by using the mosaic sensors we can optimize these characteristics from the interpolation information by filtration. X. Li and M. Orchard [7] is co-founder of the technique local zoom discovered in the year 2002. This method runs on gradient based computations likewise having controlled gradient for it, without executing the preliminary gradient test we can speed up the adaptive process. The scientist Chang proposed a technique called vector quantization with this technique we can interpolate the unknown pixels into the enlarged image by codebook 2hich extracts the local information about the interpolated image. Among these all technique we observed that only bilinear and the vector quantization schemes gives better results for zooming the image. A raw form image is also known as grayscale image which indeed needed for color interpolation. Color

Image Quantization (CIQ) is the technique used for only the color indexed images to compress the resolution of the image and this is the popular technique in multimedia. CIQ [13] technique has 3 procedures, 1. Designing Palette, image encode and decode. In image encoding for every pixel in color palette is searched for each closest color and then it is recorded to compress the image in CIQ using the Red, Blue and Green color. When the images are in raw format we can directly attach them for zooming operation. For the indexed color images we aim to design the good quality images for the enlarged images. Suppose in foggy area the images will not clear ones so to deduce this problem there is another fog removal method for outdoor surveillance systems. The quality of the image has to be maintained to result it for interpolation. Fog removal methods are: physical model based , in this during the poor visibility physical model improves the visibility to achieve a good quality resolution for better color interpolation. depth segmentation is to follow the apparent visibility of the image; 3dimensional structure is to extract the quality of the image; and for clear scene colors we require the interpolated image.. Chromatic atmospheric scattering is the geometric work to get satisfactory results. Haze removals is responsible for the polarization. Scattering model exploits several results for the images like fog color, a different fogs involved to recognize it we define for color; The differences in the images may define the different characteristics of images, a leaf is image as we click on digital camera and process it for run in Matlab else VLSI it most hard to defect its significant so as follow this we first go for the input images collection of the contrast images and stored in so as it will then define all the qualities of the image in better for real time input images.

III. PROPOSED SYSTEM

In the agricultural fields farmers uses the fertilizers without any knowledge but it may tend to cause the diseases to the leafs of the crops it then results into pest affection on to the leafs of the plants which farmers grows into the fields, so that the fertilizers which they use in the farm it has chemical contents involved into that and that with over dosage result to pests to the crops. To determine the chemical content level into the fertilizers or pest affected leafs a PH level chemical test is carried out. As we know the insects or pest affected crops are very harmful to human health, these results in cancer diseases or nervous system problem. Color interpolation is one main factor in this project so to identify that we use the low pass filter of the Gaussian which is based on gradient scale. To enhance the demosaicking method for state of art in image spatial correlation and spectral correlation scheme which is based on the wavelet classified one. Demosaicking method produces high quality of the color interpolation, in this interpolation method the 3 main color known as the

principle color in color interpolation are RED, GREEN and BLUE (RGB) by using the mosaic sensors we can optimize these characteristics from the interpolation information by filtration. The filtering is carried out to enhance the characteristics of intensity, chrominance and luminance. The detection of edge is done by calculating the variances of the colors accommodated in colors. to carry out this we use iteration method for performance of color interpolation, this is done to improve the schemes used for the demosaicking images for obtaining the better quality images. There another technique called CFA [1] which is used to define the high quality images which intern result for better color interpolation. But CFA method includes the parameters like memory requirement and complexity because the images which need for this algorithm are high quality. To overcome these parameters facing by CFA technique has buffer input frame memory we previously designed a VLSI based model, has architecture with low complexity, low power and low memory required. As far as by concerning about the VLSI model a speed must be decorated to achieve the good results for the interpolated high quality images. With low power and chip area consumed a model was designed to perform the color interpolation based VLSI design which takes 30 image frames per second for real time progress. Although the design is bilinear color interpolation technique is one of the simplest and fine technique of the interpolation [2]. So the image taken may contain several known and several unknown pixel values in picture to determine its linearity it encircles the unknown pixels from the image and filter out.

In bilinear technique the result fir RGB is always unsatisfactory because this technique doesn't receive the relation between RGB and it also do not care for the edge characteristics of the image. The color ratios are different for different colors but they add a fixed common proportion while they are calculated, the adjacent areas of the principle are variable in nature but these variations are minute. Mathematically for the green pixel simplifies the results for the color interpolation as an advantage in maintaining the quality of the image. Now the architecture is designed for coding in MATLAB and VLSI, where it shows the color interpolation for different crops. In light of this substitute game plan, the Bayer CFA is regularly called a mosaic, and the addition procedure to restore the three essential hues is called demosaicking. It merits saying that there are more G channels in a Bayer CFA than the other two shading channels on the grounds that the human eye can perceive a more extensive scope of green than the other two essential hues. What's more, with this shading course of action, more force changes and points of interest can be recorded to encourage more exact picture remaking. This projects works al about working on matlab to process the digital image and then VLSI coding is done to match the results of both. For compression we need to

estimate the following edge detection, Gaussian filtration, conversion to grayscale; overall the procedures to perform and plot the result we use VLSI coding where it gives us the PSNR value.

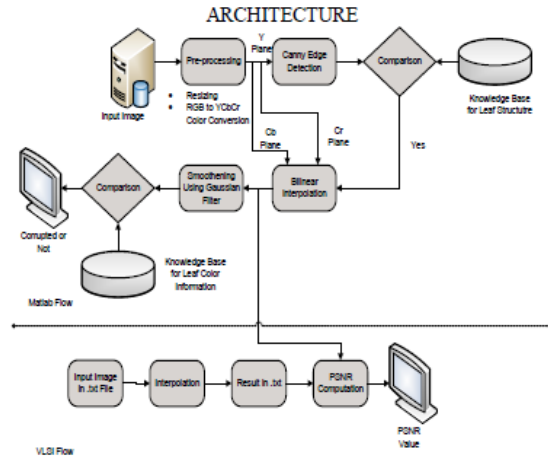


Figure 1: Block Diagram of VLSI Implementation for Color Interpolation

MATLAB Flow:

A. Input image:

It is fed as crop image or leaves by clicking with a good DSLR camera to avoid high-low resolutions by keeping the position of the camera in constant resolution the images of the crops are been taken and fed to this input image as shown in figure 1.

B. Pre-processing Unit:

This block consists of mapping operations like resizing the image by matrix method because all the images are been clicked may be same in resolution but not in size so we need to resize the every input image in the fixed format so as we design a resizing the image. The three main principle colors are RGB which exploits to produce thousands of colors from these we get intensity and luminance of the image defined as in Ycbcr where Y is for the intensity or luminance, cr and cb for the chrominance for red and chrominance for blue. As shown in figure 1 this block another procedure is done that is color conversion the colored image shows the brightness of all the colors so we unable to get exact structure of the image so for we are converting the colored image into grayscale image which gives the structure of the input image in grayscale.

C. Canny Edge Detection:

This is also known as optimal edge detection where the gray image properties will take the each value from one pixel to next and delete all other useless information from the picture. It detects for strong edge intensity differences and filters it for getting the edges then filters out unwanted edges from the image. Then it use for

gradients to remove the noisy characteristics from the image so as to smoothening the image.

D. Comparison & Knowledge Base:

Comparison is done for the input image and knowledge base image, in knowledge base it consists the data of several stored leaves into it so as per its knowledge it calculated and compare to define the input image healthy as per it knowledge or not!! It compares and passes the result of comparison to bilinear interpolation block.

E. Bilinear Interpolation:

Here in figure 1, the Ycbr planes are been converted into bilinear interpolation block with Ycbr the compared result of knowledge basement from above blocks are fed. In this block the image zooming is one the basic function operation in DIP is carried out, where digitally interpolation is applied to multimedia application. By this kind of application we pass the control to check out the image with low resolution and image with high resolution (i.e. non enlarged image and enlarged image) by zooming operation we define the image quality i.e. image having the high resolution or low resolution, infect we take high resolution image to process in bilinear interpolation [2].

$$P_{Rn} = Q_n - S^n = Q_n - 1/2(S^{(n-2)} + S^{(n+4)})$$

In above equation it is clear picture that it is interpolation difference. Two conditions occur in this case i.e. image with fixed zooming and image with adaptive zooming, in fixed image zooming we see to that it has pixel length zooming or bi-cubic zooming by doing so we can filter out the unwanted pixels from the image and we obtain the better quality image for processing. Later on in this technique blocking facts called as artifact arrives which are been scaled down and smoothen the image for processing. besides the another technique called adaptive one, in this technique the quantization operation is carried to remove the high and very low artifacts [4] occurring into the image, which result in interpolation. As compare to fixed zooming the adaptive zooming is better one. As a result it gives one powered ratio value which is been compared with the VLSI flow and displayed the crop efficiency.

F. Smoothening Using Gaussian filter technique:

While processing through the bilinear interpolation some noise will be added, before this noisy factor is been removed using the Canny Edge Detection to obtain the better edges for grayscale imaging, using the Gaussian filter we remove the unwanted factors from the image as well as noise. It is then compared again with the original database of the images and result is displayed.

VLSI Flow

G. Input image:

In bottom part of figure 1 similar input as that of matlab but instead .jpeg we take it as .text file as input because VLSI can't understand the images files in other formats instead .text; for this flow a Xilinx and Modelsim software's are used to perform the operation.

H. Xilinx:

This software is most suitable for FPGA [7] kit for dumping the code on hardware implementation, initially I file with new project is created and code is assigned in comfortable language i.e. HDL or verilog OR combination of both, an digital circuitry is designed using this Xilinx module.

I. Modelsim:

Designed code must be simulated using this software, simulation results are viewed by giving the inputs to waveforms and verification is done, to compile the code run simulation and debug the errors occurred and verify the output.

J. Interpolation:

To get the high quality image interpolation, design functionality is made such that image with high resolution is fed into system with .text image file and as results it has to give the results above mentioned for matlab flow. A code in verilog burned for this operation.

$$K_{Hi,j} = (K_{i,j-1} - K_{Hi,j})/2 + (K_{i,j+1} - K_{Hi,j})/2 + K_{Hi,j}$$

Where K represents the pixel values and K_H is the tentative pixel value of K.

K. Result:

The results will be obtained into the .txt file only, these are plotted using the high end simulation technique.

L. PSNR:

PSNR power signal to noise ratio gives one fractional value for both MATLAB as well as for VLSI, for different images it results the contrast values, hence following results are noted and a plot a common graph window which shows the result of PSNR.

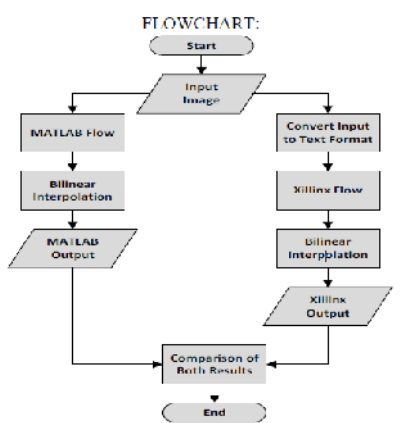


Figure 2: System flow graph

Figure 2 explains about the flow of the system, where it takes the input image which will be always a colored, majorly it is been defined in three colors Red, Green, Blue; next it fed to the matlab flow in this the images are processed to obtain the characteristics of input fed. For this we design the matlab in such way that we need to perform coding so we can extract all its characteristics like to get gray scale information edge detection is must be done we use canny edge detection in this system, for removing the unwanted materials from the edge detected image we need filter so we use Gaussian filter. Bilinear interpolation as explained in figure 2. Then a matlab output is obtained.

Processing for VLSI This software is most suitable for FPGA kit for dumping the code on hardware implementation, initially I file with new project is created and code is assigned in comfortable language i.e. HDL or verilog OR combination of both, an digital circuitry is designed using this Xilinx module. The results will be obtained into the .txt file only, these are plotted using the high end simulation technique .To get the high quality image interpolation, design functionality is made such that image with high resolution is fed into system with .text image file and as results it has to give the results above mentioned for matlab flow. A code in verilog burned for this operation. Designed code must be simulated using this software, simulation results are viewed by giving the inputs to waveforms and verification is done, to compile the code run simulation and debug the errors occurred and verify the output. Then both results are verified and result is displayed.

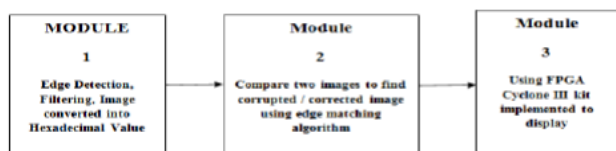


Figure 3: General block diagram to represent and verify the pest affected crops.

The interpolation algorithm is implemented such that it has low complexity with edge detection, RGB color interpolation techniques. Different methodologies are used for color interpolation; each color is interpolated with each other color like $g(i, j)$ is interpolated with red and blue colors. Three types of modules are prepared for color interpolation is shown in figure 3.

A. Module 1:

Defines the edge detection, filtering, conversion of image and so on; the edges are been detected by using the Canny’s Edge Detection technique, in this technique the colored image is converted into the grayscale image because the in colored image the edges are very difficult to define, so we convert that image to grayscale image to obtain the exact outline of the image. Some noise creation factors will get added during this phenomenon to remove those noisy factors we use the low pass Gaussian filter, which removes the unwanted noise from the image and prepares that image for good quality. In figure 3 digital image processing the colored image is always includes with decimated value but processors does not understand the decimal values so we convert it into the hexadecimal values.

B. Module 2:

Using the canny edge detection algorithm we obtain the edges of image where the image luminance and chrominance factors were added to it then it follows the procedure to define the correction and non correction of the leaves. The module1 and module2 are fall under matlab tool. This is also known as optimal edge detection where the gray image properties will take the each value from one pixel to next and delete all other useless information from the picture. It detects for strong edge intensity differences and filters it for getting the edges then filters out unwanted edges from the image. Then it use for gradients to remove the noisy characteristics from the image so as to smoothening the image shown infigure 3. comparison is done for the input image and knowledge base image, in knowledge base it consists the data of several stored leaves into it so as per its knowledge it calculated and compare to define the input image healthy as per it knowledge or not!! It compares and passes the result of comparison to Bilinear interpolation block.

C. Module 3:

This fall under the VLSI , where the field programmable gateway array with cyclone 3 kit is used to dump the entire VLSI code on to that kit to show the practical readings. Using the tool MATLAB and MODELSIM the result is displayed i.e. image is corrupted

or not. Using division and the multiplication operation in matlab and compression, low power consumption, complexity and required memory the image result is obtained. As in figure 3 Initially a DSLR camera is connected with the RS232 cable and connected then to system; an image is taken, then processed to FPGA kit by dumping it on kit we conclude the result that crop is corrupted or not.

IV. RESULTS

A. Input image:

It is fed as crop image or leaves by clicking with a good DSLR camera to avoid high-low resolutions by keeping the position of the camera in constant resolution the images of the crops are been taken and fed to this input image. As shown in figure 4 below we see the input image, about this image we are not knowing that image is healthy or unhealthy (corrupted or non-corrupted) by processing this image in we get figure 4.



Figure 4: Colored input image.

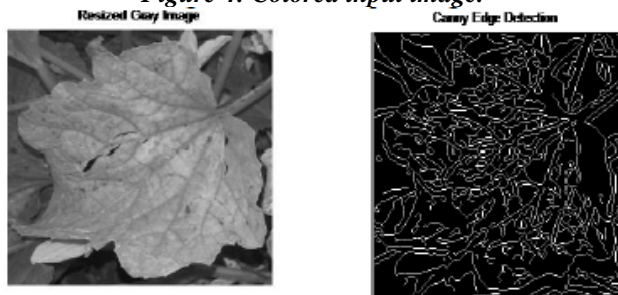


Figure 5: A) Resized Gray image.; B) Canny Edge Detection

In figure 5A, a multiplication and division operation is done to get colored image to gray image. Due to more intensity in colored image we unable to detect the edges of the leaf so we converted that colored image to gray image. To view the edges and rough outline of the gray image is designed by which we get the leaf information about the pests and it also tells that tiny and short edges are scanned.

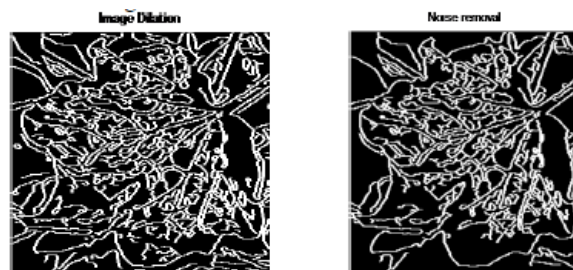


Figure 6: A) Dilated image; B) Noise removal

To remove the blur from the image or when the image is clicked in hot sunny or in dark fogs the resolution will not respond to detection so we dilate the image so that it removes the all floating part from image and sharpen the edge which have been detected and then it makes the edge thicker as viewed in figure 6A. On the other hand, to extract the exact structure of the leaf and store in the system as shown in figure 6B, unwanted noise from the dilated image should be removed to form the excellent quality form. So that when data is been kept into the software when some input is fed of different image if it's not getting match then it will result it as unhealthy.



Figure 7: A) Interpolated image; B) Result of Unhealthy image

From figure 7A and 7B, we conclude that the input image is corrupted one and has pest affection on it, may contain diseases which are harmful for both human as well as pets. In figure 8 A & B we see that the crops are healthy.



Figure 8: A) Input Healthy image; B) Result for healthy image

Now results for VLSI implementation is plated which are taken from Xilinx and Modelsim simulation.

The codes are designed and bilinear schematic diagram is drawn as show below.

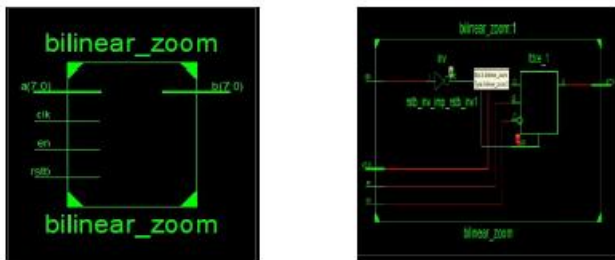


Figure 9: A) Schematic representation of bilinear_zoom; B) Internal structure of bilinear_zoom.

In figure 9A seven inputs are given i.e. a7, and similar no. of output is taken i.e. b7. A clock pulse (clk) is given to synchronies the process, input enable (en) should kept high until the process is done, after the output; reset bit (rstb) is switched to reset the enable for next input. In figure 9B represents the internal structure where the sample block is with not gate input for reset bit (rstb) it is then given for a kind of flip –flop block and operation carried out and b7 out is obtained, this is for zooming the image to determine the characteristics of the image and its quality.



Figure 10: A) status of bilinear_zoom for errors and warnings; B) simulation of bilinear Xilinx code.

From above in figure 10 A and B we deduce that no errors occurrence hence output simulation results are verified for different inputs.

V. CONCLUSION

Using the Gaussian filter technique, Edge detection technique in the base comparison of matlab flow the input image which fed for processing by examine the different characteristics of the image using several techniques a final result occurred as high quality color interpolation. The pest affected crops are been distinguished by testing their leaves structure and its healthy characteristics are calculated. Similarly for VLSI the result is concluded for both and PSNR value is obtained as threshold, results shows the leaves are corrupted or not.

Acknowledgment

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression, “One of us (R. B. G.) thanks . . .” Instead, try “R. B. G. thanks”. Put applicable sponsor acknowledgments here; DO NOT place them on the first page of your paper or as a footnote.

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The Blowfish Algorithm Simplified

Harshavardhan Talwar
M.Tech [DECS], Dept. of Electronics and Communication,
Maratha Mandal Engineering College
Belgaum, India

Abstract:- The development rate of the web surpasses than some other innovation which is measured by clients and data transmission. Web has been developing at a quick rate since its origination, on a bend geometric and at times exponential. These days, the Internet is moving rapidly in three unique headings, for example, size, preparing force, and programming complexity making it the quickest developing innovation mankind has ever made. With the quick development of web, we have to ensure the touchy information from unapproved access. Cryptography assumes a key part in the field of system security. Right now numerous encryption calculations are accessible to secure the information however these calculations devour parcel of figuring assets, for example, battery and CPU time. This paper mostly concentrates on ordinarily utilized symmetric encryption calculation (algorithm) which is Blowfish calculation (algorithm). Test results are given to illustrate the execution of this calculation.

Keywords:-- Blowfish, Cryptography, Encryption, Decryption

I. INTRODUCTION

The idea of cell automata gives the unmistakable comprehension about its mark, which is "Session of life". Cell mechanization is really a discrete scientific model speaking to the cell grid which works on the states and the guidelines are pertinent to cells after change. The Information security conveys much significance in exceptionally field of life. Particularly the Military undertakings and private business are extremely touchy in such manner. To keep information far from the entrance of unapproved clients or to make it safe from being tainted is called information security. Encryption is a vital security component. The standard of its working is to scramble the data into incomprehensible data and afterwards unscramble it for perusing utilizing a key. Encryption of the content (text) is not quite the same as that of a picture. Because of the natural characters of pictures, for example, mass information limit and high excess, encryption on picture or video objects has its own prerequisites. Numerous calculations give diverse levels of security and it depends on that they are so difficult to break, for example, we utilize Blowfish encryption calculation. On the off chance that the cost required to break a calculation is more prominent than the estimation of the encoded information, then the calculation most likely is viewed as sheltered. Be that as it may, present day top notch picture encryption techniques have a few provisos and are subjected to broad assaults by master cryptanalyst. Exhaustive study and examination between these systems are expected to quantify the execution and to pick the better one for the

proposed application. For a few applications pace of encryption might be the essential purpose of concern and for some different cases the security will be critical.

Because of the quick increment in the computerized correspondence and trade of electronic information, the security of data has turned into a critical issue in business, industry, and organization. In cutting edge period security is the significant issue for each correspondence amongst sender and collector. On the off chance that there are any security ruptures in the middle of correspondence then there will be real misfortune to them two, sender and recipient. The cryptography utilized today gives numerous key systems for ensuring information and securing data.

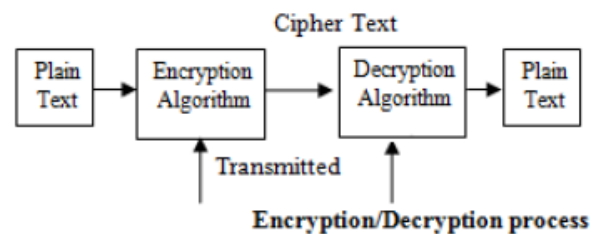


Fig 1- Text encryption and decryption

Cryptography is a crucial part for the Data Security Framework. It assumes an essential part in the security of information amongst sender and beneficiary. Cryptography gives us classification, exactness, decency, alongside information uprightness. Presently the cryptography is used routinely to secure information, which must be imparted and/or spared over long stretches,

to ensure electronic asset exchanges and grouped interchanges.

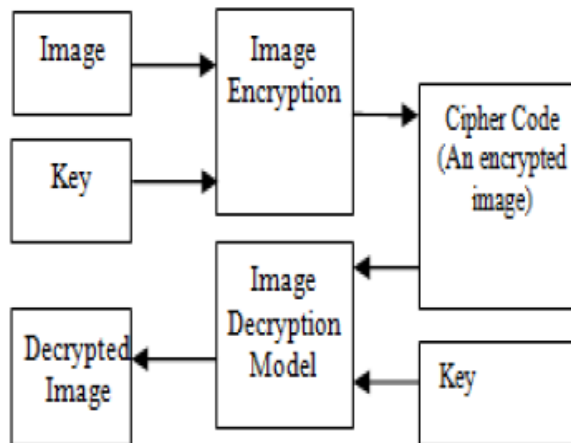


Fig 2- Image encryption and decryption

Cutting edge cryptographic strategies depend on number hypothetical or mathematical ideas. Before going on our fundamental theme we have to know in any event brief data about security patterns in cryptography, what are the different security assaults could be conceivable, what are the different security administrations and what are security instruments ought to be connected to accomplish those administrations.

A. Types of cryptography

1. Asymmetric Key Cryptography

In this kind of cryptography, there are two keys utilized: open key and private key, one for encryption and one for unscrambling reason. Well known cases are: RSA, ElGamal, Merkle's Riddles, and Elliptic Curve Cryptography (ECC). Asymmetric key cryptography is otherwise called open key cryptography. This calculation needn't bother with a secured starting trade of one or more keys between the sender and beneficiary. The calculation utilized for encryption and decoding was composed in a manner that, it makes simple for the collector to deliver the general population and private keys and to unscramble the message by private key. It is additionally simple for the sender to encode the message by using open key, and it is exceptionally troublesome for anybody to discover the private key in light of the learning of the general population key.

2. Symmetric Key Cryptography

In this sort of cryptography, same key is utilized for both encryption and decoding reason. Symmetric calculations can be partitioned into two sort stream cipher and block cipher. Stream cipher encode one piece (one bit) of plaintext at once when contrasted with block cipher which takes various bits (ordinarily 64 bits), and encrypt them as

one unit in entirety. Symmetric ciphers are liable to be hurt by the known plaintext and picked content assaults, and in addition differential and direct. A few cases of well-known symmetric calculations are: Serpent, AES (Rijndael), Blowfish, RC4, RC6, DES, 3DES. Symmetric key calculations are less computationally escalated when contrasted with asymmetric key calculations. In any case, practically speaking, asymmetric key calculations are much slower when contrasted with the symmetric key calculations. Asymmetric algorithm (also known as open key calculations) requires no less than a 3,000-piece key to attain at the same range of security as that of a 128-bit symmetric calculation.

B. Various Goals

1. Confidentiality- Data in PC is transmitted and must be a gotten to just by the approved party and not by any other person.
2. Authentication- Confirmation of the data got by any framework needs to check the character of the sender that whether the data is touching base from an approved individual or a false personality.
3. Integrity- Just the approved party is permitted to alter the transmitted data. Nobody in the middle of the sender and collector are permitted to adjust the given message.
4. Non Repudiation- Guarantee that neither the sender, nor the beneficiary of message ought to have the capacity to deny the transmission.
5. Access control- Just the approved gatherings can get to the given data.

C. Basic Terms

1. Plain Text- The first message that the individual wishes to speak with the other is characterized as Plain Text. For instance, Alice is a girl wishes to send "Hello Friend how you doing" message to the individual Bob. Here "Hello Friend how you doing" is a plain instant (text) message.
2. Cipher Text- The message that can't be comprehended by any one or a good for nothing message is the thing that we call as Cipher content (text). For Example, "Ajd672#@91ukl8*^5%" is a Cipher Text created for "Hello Friend how you doing".
3. Encryption- Encryption A procedure of changing over plain content (text) into cipher content (text) is called as Encryption. The procedure of encryption requires two things-an encryption calculation (algorithm) and a key. An encryption calculation (algorithm) implies the procedure that has been utilized as a part of encryption. Encryption happens at the sender side.

4. Decryption- A converse procedure of encryption is known as Decryption. It is a procedure of changing over Cipher content (text) into Plain content (text). The procedure of decryption needs two things-a decryption calculation (algorithm) and a key. A decryption calculation (algorithm) implies the procedure that has been utilized as a part of Decryption. For the most part the encryption and decoding (decryption) calculation (algorithm) are similar.

5. Key- A key is generally a numeric or alpha numeric content or might be an uncommon symbol. The key is utilized at the season of encryption happens on the plain content (text) and at the season of decryption happens on the cipher content (text). For instance, if the Alice utilizes a key of 3 to encode the plain content (text) "President" then cipher content (text) delivered will be "Suhylgqw".

II.EXISTING SYSTEMS

A. Triple DES (TDES):

The triple DES (3DES) calculation (algorithm) was required as a substitution for DES because of advances in key seeking. TDES utilizes three round message This gives TDES as a most grounded encryption calculation(algorithm) since it is to a great degree difficult to break 2^{168} conceivable mixes. Another choice is to utilize two distinctive keys for the encryption calculation (algorithm). This decreases the memory necessity of keys in TDES. The burden of this calculation is that it is excessively tedious.

B. Data encryption standard (DES):

DES was developed around 1974 and embraced as a national standard in 1997. DES is a 64-bit piece (block) cipher with 56-bit key. The calculation (algorithm) forms with an underlying change, sixteen rounds block cipher with the last stage. DES application is extremely well known in business, military, and different spaces in the most recent decades. In spite of the fact that the DES standard is open, the outline criteria utilized are arranged. There has been extensive contention over the configuration, especially in the decision of a 56-bit key. Data Encryption Standard) was the principal encryption standard to be prescribed by NIST (National Institute of Standards and Technology). It was produced by an IBM group

C. Advanced encryption standard (AES):

AES was produced by two researchers Joan and Vincent Rijmen in 2000. AES utilizes the Rijndael block cipher. Block length and the Rijndael key can be 128, 192 or 256-bits. On the off chance that both the key-length and block length are 128-piece (bit), Rijndael will perform 9 handling rounds. In the event that the block or key is 192-

piece (bit), it performs 11 handling rounds. On the off chance that either is 256-piece (bit), Rijndael performs 13 handling rounds.

D. Blowfish:

Bruce Schneier planned blowfish in 1993 as a quick, free other option to existing encryption calculations (algorithms). From that point forward it has been broke down significantly, and it is gradually picking up acknowledgment as a solid encryption calculation (algorithms). The Blowfish calculation has numerous points of interest. It is reasonable and productive for equipment execution and no permit is required. The rudimentary administrators of Blowfish calculation incorporate addition, table lookup and XOR. The table incorporates four S-boxes and also a P-array. Blowfish is a cipher which takes into account Feistel rounds, and the configuration of the F-function utilized sums to an improvement of the standards utilized as a part of DES to furnish the same security with more prominent rate and effectiveness in programming. It is indeed a 64-bit block cipher and also is proposed as a swap for DES. Blowfish is a quick calculation (algorithm) and can encrypt information on 32-bit microchips.

III.PROPOSED WORK

Blowfish algorithm generally categorised as a symmetric block cipher, planned by Bruce Schneier in 1993, that can be viably utilized for encryption and shielding of information. It utilizes a variable-length key, which varies from 32 bits to 448 bits, making it perfect for securing information. Blowfish Algorithm is a Feistel Network, emphasizing a basic encryption capacity 16 times.

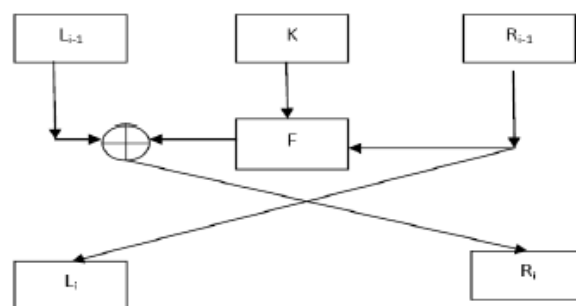


Fig 3- Feistel Network

The standard block size is 64 bits, where in the key can vary up to 448 bits. Despite the fact that there is an intricate introduction stage required before any encryption can occur, the genuine encryption of information is extremely effective on vast microchips. The remarkable components of Blowfish algorithm with impressive features and helps in my work are as per the following:

- A. It controls information in extensive pieces
- B. It comprises of a 64-bit block size.
- C. It has an adaptable key, from 32 bits to no less than 256bits.
- D. It utilizes exceptionally straightforward operations like expansion and XOR expansion.
- E. It utilizes an outline that is easy to get it. This encourages examination and expansion the trust in the calculation.
- F. It is quick as this algorithm rate on a 32-bit microchip is 26 clock cycles for every byte.
- G. It is minimized as it can be executed below 5kb memory.

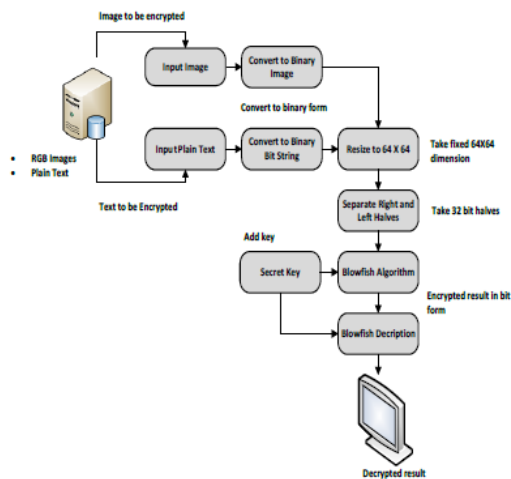


Fig 4- Block diagram of the encryption and decryption process

Blowfish algorithm comprises of a 64-bit block size with a variable key length between 32 bits up till 448 bits. It has 16-round Feistel cipher and uses substantial key-subordinate S-boxes. In structure it looks like CAST-128, which utilizes settled S-boxes.



Fig 5- Feistel Structure of Blowfish Algorithm

The chart above demonstrates Blowfish's encryption schedule. Every line speaks to 32 bits. There

exist five sub key arrays: generally one 18- entry P-array (signified as K in the outline, to stay away from perplexity with the Plaintext) and four 256-entry S-boxes (S0, S1, S2 and S3).

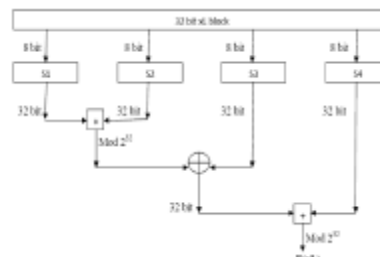


Fig 6- S-Box operation (F function) of Blowfish algorithm

Each round r comprises of 4 activities: Initially, XOR the left half (L) of the information with the rth P-array passage, second, utilize the XORed information as contribution for Blowfish's F-function, third, XOR the F-function's yield with the right half (R) of the information, and keep going, swap L and R. The F-function parts the 32-bit information to four parts of eight-bit quarters, and uses the quarters as contribution to the S-boxes. The S-boxes acknowledge 8-bit info and produce 32-bit yield (output). The yields are summed modulo 232 and XORed to deliver the last 32-bit yield (see picture in the upper right corner). After the sixteenth round, fix the keep going swap, and XOR L along with the K18 and R along with the K17 (output whitening).

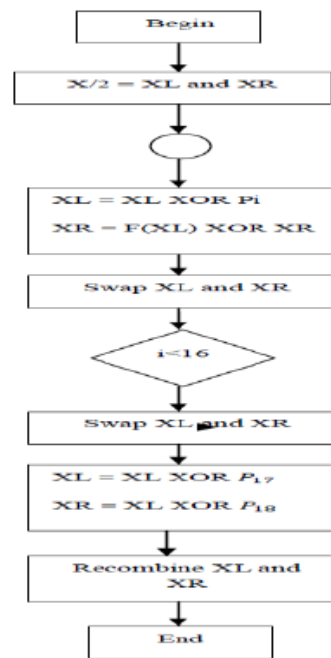


Fig 7- Flowchart for blowfish algorithm

Decoding is precisely the same as encryption, aside from that P1, P2... P18 are utilized as a part of the

opposite request. This is not all that conspicuous in light of the fact that xor is commutative and acquainted. A typical misguided judgment is to utilize backwards request of encryption as decryption calculation (algorithm) (i.e. to begin with XORing P17 and P18 to the ciphertext, then utilizing the P-sections as a part of converse request). Blowfish's key timetable begins by introducing the P-array and S-boxes with qualities got from the hexadecimal values of pi, which contain no undeniable example. The mystery key is then, byte by byte, cycling the mystery key if important, XORed with all the P-passages all together. A 64-bit each of the zero blocks is then encrypted with the calculation the way things are. The resultant ciphertext exchanges P1 and P2. The same ciphertext is now encrypted all over again with the resultant new subkeys, and the new ciphertext changes P3 and P4. This keeps going, supplanting the whole P-array and the whole S-box sections. On the whole, the Blowfish encryption calculation will run 521 times to create all the subkeys - around 4KB of information is prepared.

Since the P-array is 576 bits in length, and generally the key bytes are XORed along through all the particular 576 bits amid the introduction, numerous usage bolster key sizes up to 576 bits. While this is positively conceivable, the 448 bits point of confinement is here to guarantee that all of each subkey relies on upon the entire key, as the last four estimations of the P-array don't influence all of the ciphertext. This point ought to be taken in thought for usage with an alternate number of rounds, as despite the fact that it expands security against a thorough assault, it debilitates the security ensured by the calculation. What's more, given the moderate instatement of the figure with every change of key, it is allowed a characteristic assurance against animal power assaults, which doesn't generally legitimize key sizes longer than 448 bits.

IV.EXPERIMENTAL RESULTS

```
Select Secret Information
Secret Information is Text
Enter the word to be encrypted: Hello
```

Fig 8- Dialogue box asking for the text to enter for encryption.

As soon as you run the program the dialogue box pops up asking us whether we wish to choose text or image

encryption. When we select text encryption, the code asks us to enter the desired text for encryption.

```
Enter key = 4545
Decryption
The decrypted text is Hello
```

Fig 9-Dialogue box asking to enter the key and displaying the decryption result.

When you tap enter for the desired text to be encrypted the code asks for the secret key and if the key entered is correct, the program is executed and we obtain the decryption result.

```
Secret Image
```



Fig 10- Dialogue box asking for the image for encryption.

When you run the code a dialogue box pops up asking us to select either text or image encryption. If we choose image, the code asks us to upload a desired image to be encrypted.

```
Binary Image
```



Fig 11- Dialogue box displaying the original image converted to binary image.

When you further run the program, the original image is converted in 64X64 bits binary image.



Fig 12- Dialogue box displaying the encrypted image.

Further the binary image is encrypted using the blowfish algorithm which uses S-blocks and p-array and encrypts the selected image.

Decrypted Image



Fig 13- Dialogue box displaying the decrypted image.

Finally when you tap decryption, the further part of the code is executed and the blowfish algorithm is executed to obtain the decrypted image which is same as the original image.

V. CONCLUSION

In this paper the transition of encrypted text and image over the web we have utilized the blowfish algorithm. Already utilized algorithms like AES, DES thus more has been supplanted by the blowfish calculation, as a result of creating fruitful viability on security. Blowfish algorithm cannot be effectively broken by the programmers until they locate the right mixes. This is more complicated to shape the accurate mixes of the lock. To make the calculation more grounded number of rounds has been expanded. It requires less investment to encrypt and decrypt the required text and image than whatever other algorithms. For future upgrade propelled calculations can be design for better security and encrypt more convoluted text and image.

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