ADVANCED METERING INFRASTRUCTURE IN SMART GRID: AN OVERVIEW

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ABSTRACT

Advanced Metering Infrastructure (AMI) is the most important technology used in smart grid. Apart from measuring energy consumption, it also provides additional information to the utility company and the consumers for effective energy management. Integration of many technologies provides an intelligent connection between consumers and system operators. This paper outlines the benefits, impacts and applications of AMI. In addition, it introduces some basic communication technologies used in smart grid like Power Line Carrier (PLC) , zigbee, wifi etc.

Key words*: *AMI, Home Area Network (HAN), Smart Grid, Smart Meter

I. INTRODUCTION

A smart grid is a modern electrical grid in which electricity and information flows in two-way to improve reliability, efficiency, sustainability and economics of the grid. By utilizing modern information technologies, the smart grid is capable of delivering power in more efficient way and it could respond to events that occur anywhere in the grid. One of the important way to modernize the present electric grid into a smart grid is by integrating AMI in to existing electric grid. AMI uses variety of sensors, control devices and supportive communications infrastructure. It gathers information from the users or load equipment and calculates the energy usage of consumers therefore provides additional information to the power company and / or the system operator [1].

AMI network is shown in figure 1. It is in fact the collective term to describe the whole infrastructure that includes smart meters, two-way communication network and control center equipment. The control center equipment is connected to all the applications that gather and transfer energy usage information in real-time.

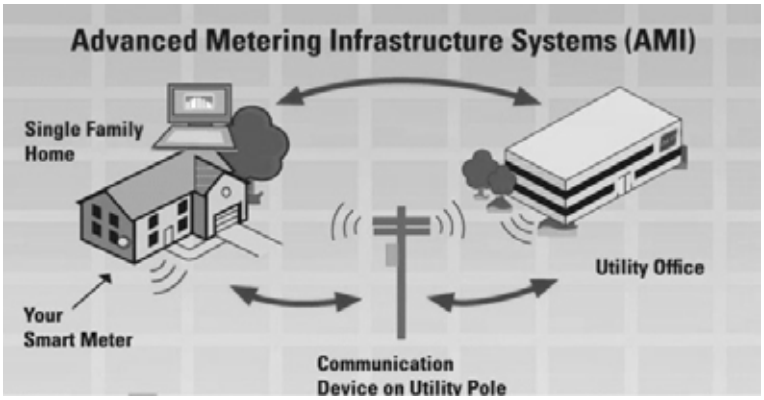

Fig.1 Advanced Metering Infrastructure

AMI makes two-way communications with customers and is the backbone of smart grid. The objectives of AMI are remote meter reading with error free data, network problem identification, load profiling, energy audit and partial load curtailment in place of load shedding [2].

The objectives of AMI are remote meter reading with error free data, network problem identification, load profiling, energy audit and partial load curtailment in place of load shedding. AMI is comprised of various hardware and software components which include smart meters, communication network, Meter Data Acquisition System (MDAS), Meter Data Management System (MDMS) and Home Area Network (HAN) [3].
The remaining paper is scheduled as follows. Section II describes smart meter design, functions and benefits; section III outlines different communication network technologies; section IV aims MDAS; section V explains about MDMS; section VI explains HAN; section VII gives benefits of AMI; section VIII explains the challenges of an AMI and conclusions are drawn in Section IX.

II. SMART METER

A smart meter is usually an electronic device that records consumption of electric energy in intervals of an hour or less and enables real-time communication of energy usage data between customers and their utility companies for monitoring and billing purposes. The vast majority of these meters are installed at the residential level. In order to carry out a meter reading using a conventional meter, the meter reader needs to physically visit the customer premise and take the reading. This reading will be sent to the utility company for billing. But in case of smart meters this can be done automatically. The system operator will create a meter read request from the utility company office thus avoids manual intervention during meter reading and provides more accurate, real-time data to the utility company.

Fig.2 Smart meter

A smart meter consists two units. One unit of the metering device is in the custody of the distribution or utility company and the other is the display unit which is at consumer's place. A smart meter has designed with built-in-technology to disconnect and reconnect certain loads remotely. Smart meters are implemented to monitor as

well as to control end users and appliances to manage demand and load flow in the future. Smart meter's data comprises the unique meter identifier, data timestamp, the electricity utilized values and so on.

Smart meters can gather diagnostic information about the distribution grid and home appliances and measures energy consumption from them to identify parameters and transfer the data to utilities and send back to the command signals in order to calculate the customer's bill and power consumption accordingly. Sometimes, a smart meter can also communicate with the other smart meter. Figure 2 shows the original model of a smart meter. Smart meters, which enable real-time communication of energy usage data between consumers and their utility companies, generate electric usage readings for every 15 minutes or one hour[4].

The main functions of a smart meter

Generally, smart meters are expected to have the following features like:

1. Two-way communication
2. Data collecting, recording and storing
3. Load control function
4. Programming function
5. Security function
6. Display function
7. Billing function

III. THE COMMUNICATION TECHNOLOGIES

The AMI communication infrastructure supports continuous interaction between the utility and controllable electrical load. It must employ open bidirectional communication standard at highly secure. AMI various architectures can be employed with one of the most common being local concentrators that collect the data from group of meters and transmit the data to a central server.

The communication structure can be wired like Power Line Carrier (PLC), Broadband Over Power Lines (BPL) or wireless like Global System Mobile (GSM), ZigBee and Radio Frequency (RF). The chosen way must take into account the distance between the devices and existing infrastructure [5].

3.1 Power Line Carrier Communication (PLCC*)*

PLCC systems consist of a high frequency signal injection over the electrical power lines. This technology has been widely developed mainly due to the new modulation techniques used for wireless telecommunication systems. An advantage is that there are no additional cost pertaining to cables and related infrastructure. Disadvantage is that it may require several mega watts for information transmission [6].

3.2 Broadband over Power Line (BPL*)*

Communication system can deliver high speed voice data and video communication to end users by transmitting radio frequency, BPL technology is more practical in recent years. The existing infrastructure for BPL is the most considerable area of this technology .BPL is also used in management of power distribution grids by monitoring and facilitating control of them remotely. The advantage of BPL technology is its vast geographical coverage. Access BPL technology can potentially provide broadband services for rural areas which do not

access to such service now. Another interesting aspect of BPL is its ability to potentially connect all electric devices in a communication net work [7].

3.3 Radio Frequency (RF)

The collected data from end users is transmitted to data collector through wireless radio frequency using smart meters. Then, the data is processed and delivered in several methods to utility data systems at a central collection location. The utility billing, outage management and other systems use these data for operational and business purposes [8].

3.4 Cellular networks

Public cellular networks use in smart grid is slowly gaining a acceptance and acceleration across the world. Cellular network is now commonly seen as an additional connectivity option just like PLCC and RF mesh. Global System for Mobile communication (GSM) is a digital mobile telephony system that digitizes and compresses data before sending it. The main advantage of the GSM is its widespread use throughout the world and the use of Subscriber Identity Module (SIM) cards to send Short Message Service (SMS).

3.5 ZigBee

ZigBee is a low-cost, low-power, wireless mesh networking standard. It is best suited for local coverage such as Home Area Networks (HANs). Smart grid considers ZigBee as a main communication as it controls the appliances automatically. ZigBee installation and upgrade cost is low, in addition it offers meter-to-meter communication and remote monitoring ability of whole home conditions [10].

Smart energy meters using both ZigBee and GSM technologies should have a transmitter and a receiver with both technologies. The meter can read the energy and send it to the receiver using GSM or ZigBee. The data management system collects and stores the data and uploads it to the internet. So, the consumer can check his information from the internet using a developed android program or through a website portal. The receiver can also send the consumption information to the user by an SMS message through the GSM network [9].

IV. METER DATA ACQUISITION SYSTEM (MDAS)

MDAS will do real-time data acquisition from the deployed Data Concentrator Unit (DCU)s, and organize the data in the database in a Common Data Format (CDF). It will do real-time monitoring, summary reports and Graphs. MDAS application mainly consists of three components [10]:

(1).Communication server application: Communication server application will establish communication with modem associated to DCU and process the data sent by the device.

(2). OPC Server application: OLE for Process Control (OPC) where OLE stands for Object Linking and Embedding. OPC server will read the raw data which was received by communication server application and convert the raw data to actual meter data.

(3). User interface using web based application: Web server provides web based user application which will access using public IP where user should be able to login and get to know the details of their meter status and

data. Utility Operation/Dashboard user will have the interface for supervisory activities involved in meter data acquisition, processing and analysis. The business logic tier would service the requests made by the client tier. These requests could be automated, based on user-defined schedules or on-demand from the user. The collected data can be viewed in the form of customized reports. User can take print outs of these reports, export the data into spread sheets, or convert the data in the form of flat files.

It has two modules. One is User module and the other is Meter Module. The user module has feature to Add/Delete/Modify user and the rights. Each user can read the meter to see the meter data. Each user can generate a report for meter information for a single meter with graph. Meter module has feature to Add/Delete/Modify meter information. Meter Master Information contains Meter type, make, date of manufacture and the modem.

V. METER DATA MANAGEMENT SYSTEM (MDMS)

This system analyzes the data collected and sent by the Smart Meter to set electric power costs and to let consumers use energy efficiently. Collecting the metered data from consumers in real time makes it possible for electric power suppliers to understand how electricity is being used. Plus, it improves the efficiency of recovery work after natural disasters or accidents happen to the power grid itself. Consumers can use the data managed by MDMS to help them use electricity more efficiently. MDMS will do real-time data acquisition from the deployed "DCU"s, and organize the data in the database in a Common Data Format (CDF). MDAS will do realtime monitoring, summary reports and Graphs. Online Alerts, dynamic formation for observation groups of suspicious meters or just area, zone, consumer indices etc. in normal circumstances.

An MDM system will typically import the data, then validate, cleanse and process it before making it available for billing and analysis. An MDM system performs long term data storage and management for the vast quantities of data delivered by smart metering systems. This data consists primarily of usage data and events that are imported from the head end servers that manage the data collection in Advanced metering infrastructure (AMI) or Automatic meter reading (AMR) systems. It provides Meter-to-Cash system, workforce management system, asset management and other systems. Also an MDMS may provide reporting capabilities for load and demand forecasting, management reports, and customer service metrics [11].

VI. HOME AREA NETWORK

HAN is a dedicated network connecting drives in a home such as displays, load control devices ultimately “SMART APPILANCES”seamlessly into the overall smart metering system. HAN extends smart grid capabilities into the home using different networking protocols. HAN technology enables to control many automated digital throughout the house. Integration of smart meter with HAN helps to communicate peak energy use times to digital devices.

Basic components of HAN are network portal or gateway that connects some information to the HAN and the access point or network nodes that form the wired or wireless network itself. Different technologies used in HAN are Zigbee and wifi [12].

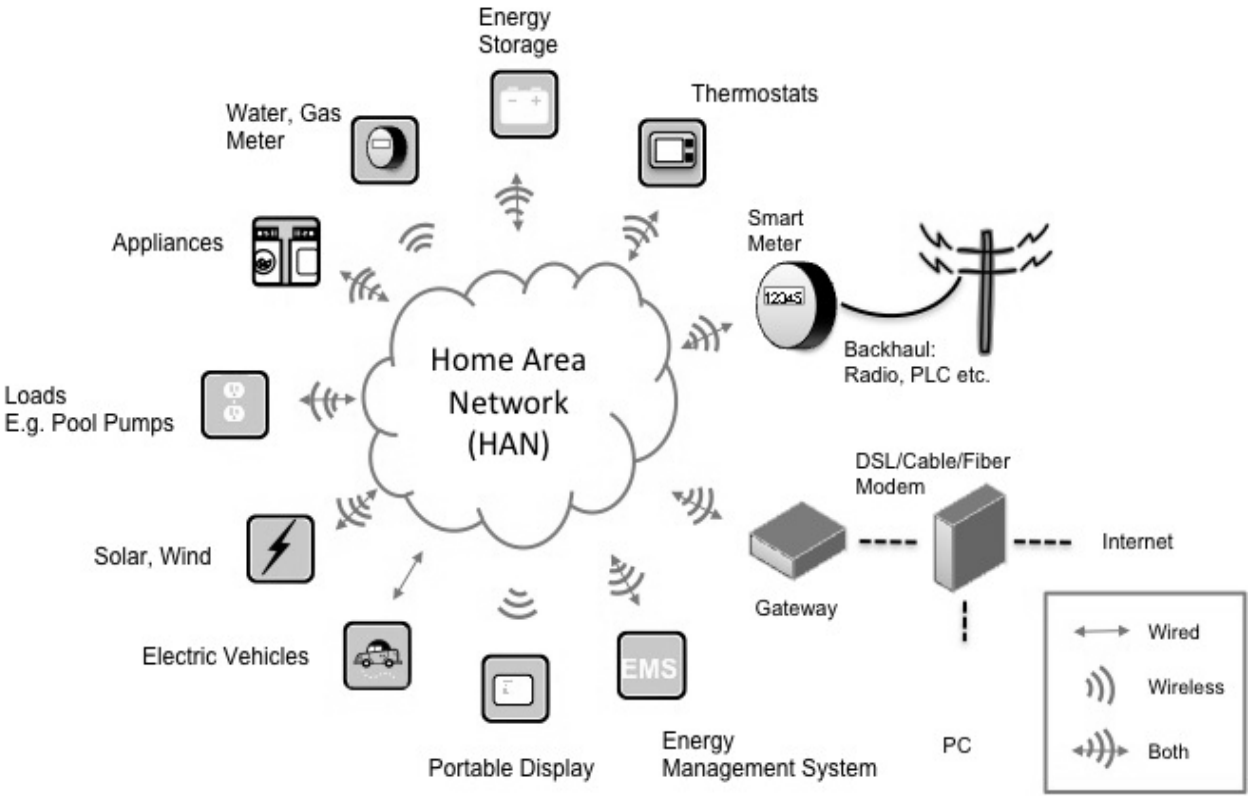

Fig: 3 Home Area network

VII. BENEFITS OF AMI

AMI advantages are multi-fold and can be generally categorized as:

1. Operational Benefits – AMI benefits the entire grid by improving the accuracy of meter reads, energy theft detection and response to power outages, while eliminating the need for on-site meter reading.

2. Financial Benefits – AMI brings financial gains to utility, water and gas companies by reducing equipment and maintenance costs, enabling faster restoration of electric service during outages and streamlining the billing process.

3. Customer Benefits – AMI benefits electric customers by detecting meter failures early, accommodating faster service restoration, and improving the accuracy and flexibility of billing. Further, AMI allows for time-based rate options that can help customers save money and manage their energy consumption.

4. Security Benefits – AMI technology enables enhanced monitoring of system resources, which mitigates potential threats on the grid by cyber-terrorist networks

VIII. CHALLENGES OF AMI

Despite its widespread benefits, deploying smart meters presents three major challenges that include:

1. High Capital Cost: A full scale deployment of AMI requires expenditure on all hardware and software components, smart meters, network infrastructure and network management software along with cost associated with the installation and maintenance of meters and information technology systems.

2. Integration: AMI is a complex system of technologies that must be integrated with utilities information technology system, including Customer Information Systems (CIS), Geographical Information Systems (GIS), Outage Management Systems (OMS), Work Management Systems (WMS), Mobile Workforce Management (MWM), SCADA system, Distribution Automation System (DAS) etc.

3. Standardization: Interoperability standards to be defined, which set uniform requirements for AMI technology, deployment and general operations are the keys to successfully connecting and maintaining an AMI based grid system.

IX. CONCLUSION

This paper reviews several important aspects of AMI. It presents various hardware and software components of AMI, which includes smart meters, communication network, Meter Data Acquisition System (MDAS), Meter Data Management System (MDMS) and Home Area Network (HAN). Moreover, research related to different communication technologies is presented in brief. Finally, the paper arises various challenges to be met by the AMI.

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ENERGY-OPTIMUM THROUGHPUT AND CARRIER SENSING RATE IN CSMA BASED MULTI-HOP NETWORK

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ABSTRACT

The application model for the energy consumption of a node as a function of its throughput in a wireless CSMA network. We first model a single-hop network, and then a multi-hop network. We show that operating the CSMA network at a high throughput is energy inefficient since unsuccessful carrier sensing attempts increase the energy consumption per transmitted bit. Operating the network at a low throughput also causes energy inefficiency because of increased sleeping duration. Achieving a balance between these two opposite operating regimes, we derive the energy-optimum carrier-sensing rate and the energy-optimum throughput which maximize the number of transmitted bits for a given energy budget. For the single-hop case, we show that the energy-optimum total throughput increases as the number of nodes sharing the channel increases. For the multi hop case, we show that energy-optimum throughput decreases as the degree of the conflict graph corresponding to the network increases. For both cases, the energy-optimum throughput reduces as the power required for carrier-sensing increases. The energy-optimum throughput is also shown to be substantially lower than the maximum throughput and the gap increases as the degree of the conflict graph increases for multi-hop networks.

KEYWORDS*: *CSMA, Node communication, Energy consumption, Throughput performance

I. INTRODUCTION

Improve the battery lifetimes of wireless devices and due to environmental considerations, the energy efficiency of wireless communication protocols has to be improved. There are many wireless communications protocols that employ a variant of the carrier sense multiple access protocol (CSMA) due to its simple and distributed nature. Here find the optimum carrier-sensing rate and throughput which maximizes the number of transmitted bits in a wireless CSMA network for a fixed energy budget. Recently, carrier-sensing rate adaptation algorithms have been devised to achieve throughput-optimality in a CSMA network. In these algorithms, each node senses the channel at a rate which increases with its packet queue length (or virtual queue length). As packet queues grow, the nodes may sense the channel at arbitrarily high rates. However, the increased energy consumption due to such increased carrier-sensing rate has not been investigated to the best of our knowledge. We here aim to quantify the relationship between sensing rate, throughput and energy consumption in a CSMA network. However, the proposed analysis is still applicable even when nodes perform idle listening between transmission attempts. We are interested in the following question: What is the optimum value of λ which maximizes the number of transmitted bits for the lifetime of the node which is limited by its energy budget sensing rate, this minimizes the energy consumption per transmitted bit. The energy-optimum rate exploits the trade-off between

the energy consumed for sleeping and energy consumed for carrier sensing. The energy-optimum rate leads to an energy-optimum throughput, which gives the energy-optimum operating load for the network. To maximize the number of transmitted bits for a given energy budget, the network. The analysis to a multi-hop network with a random regular conflict graph. For both scenarios, we analyze the energy consumed in various states such as sleeping and carrier sensing. We derive the energy-optimum carrier sensing rate and the corresponding energy-optimum throughput which minimize the energy consumption per transmitted bit. The energy-optimum throughput exploits a balance between the energy consumed in the states of sleeping and carrier sensing per transmitted bit. The multi-hop case, we show that the energy optimum throughput depends on the degree of the conflict of graph of the network and on the power consumption of carrier sensing. We find that the energy-optimum throughput reduces as the degree of the conflict graph increases, i.e., as the interference increases. the energy-optimum carrier sensing rate and the energy optimum throughput increase as the power required for carrier sensing reduces.

II.SYSTEMARCHITECTURE

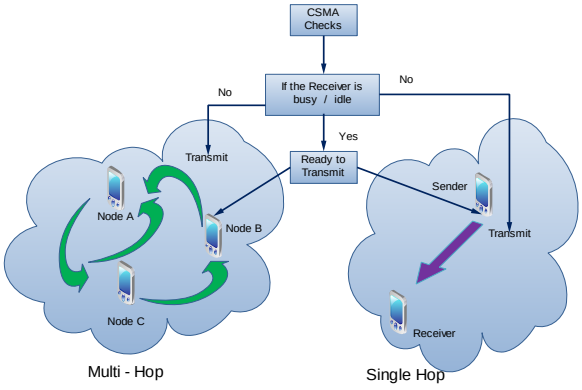

Fig 1. CSMA System Architecture

III.LITERATURE SURVEY

3.1. RI-MAC

A Receiver-Initiated Asynchronous Duty Cycle MAC Protocol for Dynamic Traffic Loads in Wireless Sensor Networks

3.1.1 Objective

Receiver-initiated data transmission in order to efficiently and effectively operate over a wide range of traffic loads. RI-MAC attempts to minimize the time a sender and its intended receiver occupy the wireless medium to find a rendezvous time for exchanging data, while still decoupling the sender and receiver's duty cycle schedules.

3.1.2 Techniques

Receiver-Initiated MAC (RI-AC)

3.1.3 Advantages

RI-MAC significantly improves throughput and packet delivery ratio. Even under light traffic load for which X-MAC is optimized, RI-MAC achieves the same high performance in terms of packet delivery ratio and latency while maintaining comparable power efficiency.

3.1.4 Disadvantages

Low throughput

More sleeping time

Increased sleeping cost

3.2. Random Access Transport Capacity Of Multi –Hop AF Relaying: A Throughput-Reliability Tradeoff

3.2.1 Objective

To compute the random access transport capacity, we analyze the exact outage probability of multi hop transmission with AF strategy in a Poisson field of interferers without neglecting the noise at all of the nodes.

3.2.2 Techniques

Multi – hop amplify-and-forward (AF) strategy.

3.2.3 Advantages

Maximize their random access transport capacity, and this helps us to predict and manage the maximum available number of transmitting nodes per unit area to maximize their performance.

3.2.4 Disadvantages

Not Flexible

Take long time to distribute the data

Increased sleeping time.

IV. CARRIER SENSING MULTIPLE ACCESS

Carrier sense multiple access is a probabilistic media access control(MAC)protocol in which a node verifies the absence of other traffic before transmitting on a shared transmission medium, such as an electrical bus, or a band of the electromagnetic spectrum..Carrier sense means that a transmitter uses feedback from a receiver to determine whether another transmission is in progress before initiating a transmission. That is, it tries to detect the presence of a carrier wave from another station before attempting to transmit. If a carrier is sensed, the station waits for the transmission in progress to finish before initiating its own transmission. In other words, CSMA is based on the principle "sense before transmit" or "listen before talk".

Multiple access means that multiple stations send .

V. NON – PERSISTENT CSMA

Propose a protocol-independent energy-consumption analysis of the non-persistent- CSMA protocol for both single-hop and multi-hop networks. Our results provide closed from expressions describing the change of the

energy-optimum operating point of CSMA networks as a function of the number of odes (for single-hop networks) and network degree (for multi-hop networks). Besides, to investigate the change in the energy optimum operating point as the ratio of powers required for carrier-sensing and sleeping changes.

VI.METHODOLOGY

6.1. Csma Based Node Sensing

In a wireless CSMA network each node senses the channel, the channel is busy or not. If the channel is busy the node wait until the channel is ready to receive the packet from the node. If the channel is idle the node sends the packet to the receiver. The main work In the CSMA is to check the channels which channel is idle and which the channel is busy.

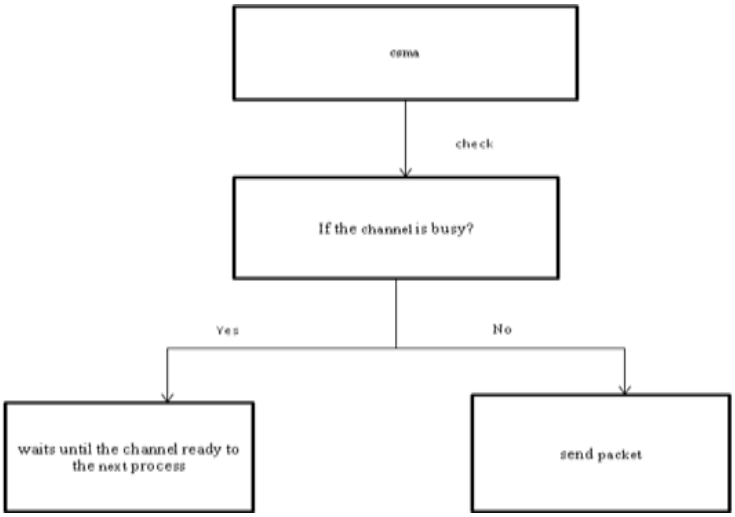

Fig 2 . CSMA Node Sensing

6.2. Node Communication

After sensing the CSMA network each node communicates with in the channel. The CSMA sense the channel if the channel is busy or not. If the channel is busy the node didn't send the data packet to the receiver it wait fraction of seconds until the receiver node can ready to receive the data from the sender node. During this time the node didn't wait long time just waits fraction of second. The receiver node is idle the sender node sends the data packet to the receiver. In this module the waiting time is decreased. And the performance is higher

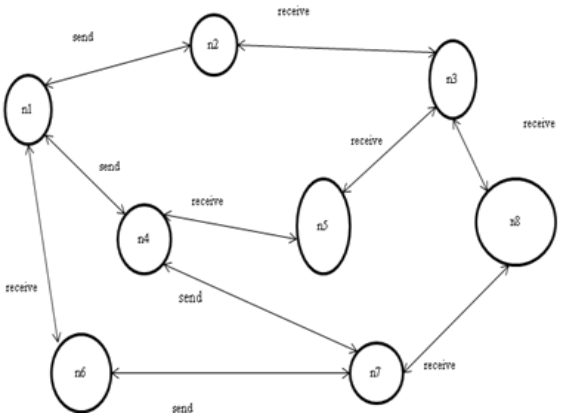

Fig3. Node Communication

6.3. Energy Consumption During Node Communication

The sender node sends the data packet to the receiver some energy are used during this communication. The energy consumed per transmitted bit. Energy spent for transmission, sleeping and carrier sensing per transmitted bit. In CSMA based node communication, the energy usage level is lower than other sensing techniques and methods .Transmit the maximum bits within the energy budget. Each node transmits and receives packets with in a time.

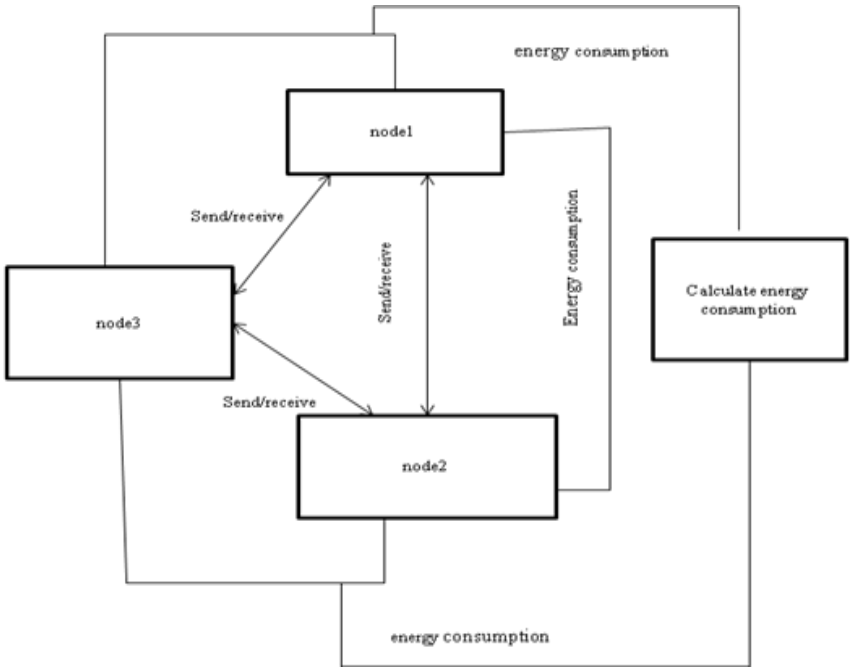

Fig 4. Energy Consumption

6.4. Energy Optimum Throughput Performance

Energy consumed while carrier sensing the total energy consumption at high throughputs to maximize the number of transmitted bits for a given energy budget. The energy optimum throughput is based on the carrier sensing rate. If the carrier sensing attempts are successfully sensed then the energy consumption of the transmitted bits are decreased. Each successful carrier sensing attempts can decrease the energy usage of the node and the performance automatically improved.

VII. CONCLUSION AND FUTURE ENHANCEMENT

In future each node sense the channel if the node is busy or not. After sensing the node sends the packet to the receiver. During this transmission some energy consumed. Every transmission of the node send the packet with some energy limits each node send the packet with automatically calculate energy usage of the particular data packet transmission. Data packets are sending based on the particular energy of the size of the data packet. In this module to avoid the data packet drops.An energy consumption model of a node in a CSMA network. The proposed model shows that the number of failed carrier sensing attempts significantly increases at high throughputs causing energy waste. On the contrary, at low throughputs, nodes sleep during most of their lifetimes which also results in energy waste as far as the energy per transmitted bit is considered. Derive the energy-optimum carrier sensing rate and the corresponding energy-optimum throughput for both a single-hop network and a multi-hop network. For single-hop networks, we observe that the energy optimum throughput

increases with the number of nodes sharing the channel. On the other hand, the energy optimum throughput reduces with the degree of the conflict graph for multi-hop networks. For both the single-hop and multi-hop case, our results suggest that as the power required for carrier sensing increases, the energy-optimum sensing rate and throughput reduce for the design of adaptive optimal-CSMA algorithms. We observe a dramatic increase in the carrier-sensing rate as the throughput approaches its limit; as a result, the energy consumption also increases significantly. The trade-off between the energy consumption and throughput has to be considered in the design of adaptive MAC algorithms.

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BIOGRAPHY NOTES

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COOPERATIVE CACHING FOR TIMELY AND SECURE DATA ACCESS IN DISRUPTION TOLERANT NETWORKS

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ABSTRACT

Disruption Tolerant Networks (DTNs) consist of mobile devices that contact each other opportunistically. Propose the original approach to support cooperative caching in DTNs, which enable the sharing and coordination of cached data among multiple nodes and reduces data access delay. The fundamental idea is to intentionally cache data at a set of network central locations (NCLs), which can be easily access by other nodes in the network. Propose an efficient method that ensures appropriate NCL selection based on a probabilistic selection metric and coordinates multiple caching nodes to optimize the tradeoff between data accessibility and caching overhead. The selected NCLs attain high chances for prompt response to user queries with low overhead in network storage and communication. A utility based cache replacement scheme to dynamically adjust cache locations based on query history, A Contact Duration Aware Approach a novel caching protocol adaptive to the challenging surroundings of DTNs. To derive an adaptive caching bound for each mobile node according to its specific contact pattern with others, to limit the quantity of information it caches. Extensive trace driven simulations show that our cooperative caching protocol can significantly improve the performance of data access in DTNs.

Keywords - Cache Scheme, Cooperative caching, Data Access, Disruption Tolerant Networks, Network Central Location.

1. INTRODUCTION

Disruption Tolerant Networks (DTNs), movable nodes connect to each other using opportunistic contacts. Due to the low node density and unpredictable node mobility, only intermittent network connectivity exists in DTNs, and the subsequent difficulty of maintaining end-to-end communication links makes it necessary to use "carry-and-forward" methods for data transmission, which greatly impairs the performance of data access. In such networks, node mobility is exploited to let mobile nodes carry data as relays and forward data opportunistically when contacting others. It is to determine the appropriate relay selection strategy. Although forwarding schemes have been proposed in DTNs there is limited research on providing efficient data access to mobile users, despite the importance of data accessibility in many mobile applications.

The destination of data is, hence, unknown when data are generated. This communication paradigm differs from publish/subscribe systems in which data are forwarded by broker nodes to users according to their data subscriptions. Appropriate network design is needed to ensure that data can be promptly accessed by requesters in such cases. A common technique used to improve data access performance is caching, to cache data at appropriate

network locations based on query history, so that queries in the future can be responded with less delay. Although cooperative caching has been studied for both web-based applications and wireless ad hoc networks, to allow sharing and coordination among multiple caching nodes, it is difficult to be realized in DTNs due to the lack of persistent network connectivity. First, the opportunistic network connectivity complicates the estimation of data transmission delay, and furthermore makes it difficult to determine appropriate caching locations for reducing data access delay. This difficulty is also raised by the incomplete information at individual nodes about query history. Second, due to the uncertainty of data transmission, multiple data copies need to be cached at different locations to ensure data accessibility. The difficulty in coordinating multiple caching nodes makes it hard to optimize the tradeoff between data accessibility and caching overhead.

To efficiently support cooperative caching in DTNs. The basic idea is to by design cache data at a set of network central locations (NCLs), each of which corresponds to a group of mobile nodes being easily accessed by other nodes in the network. Every NCL is represented by a central node, which has high reputation in the network and is prioritized for caching data. Due to the incomplete caching buffer of central nodes, several nodes near a central node may be involved for caching, and ensure that popular data are always cached nearer to the central nodes via dynamic cache replacement based on query history.

II. LITERARTURE SURVEY

2.1 Epidemic Routing

Efficient relay selection metrics to approach the performance of Epidemic routing with lower forwarding cost, based on prediction of node contacts in the future. Some schemes do such prediction based on their mobility patterns, which are characterized by filter or semi-Markov chains. In some other schemes, node contact pattern is exploited as abstraction of node mobility pattern for better prediction accuracy based on the experimental and theoretical analysis of the node contact characteristics

2.2 Predict and Relay Method

Routing is the most important challenging in disruption tolerant networks (DTNs) because of short lived wireless connectivity environment. Most of the previous work focused on the prediction of whether two nodes contact would have a contact, without considering the time of the contact.

Proposed the predict and relay (PER), a routing method for DTNs that relies on predicting future contacts. We use a model based on a time homogeneous semi - markov process model to predict the probability distribution of the time of contact.

2.3 Asymmetric Cooperative Cache Approach

Asymmetric cooperative cache approach, where the data requests are transmitted to the cache layer on every node, but the data replies are only transmitted to the cache layer at the intermediate nodes that need to cache the data.

This solution not only reduces the overhead of copying data between the user space and the kernel space, it also allows data pipelines to reduce the end-to-end delay. Cooperative caching which allows sharing and coordination cache data among multiple nodes has been applied to improve p2p networks.

2.4 Maxprop A Protocol

MaxProp comes in determining which messages should be transmitted first and which messages should be dropped first. In essence, MaxProp maintains an ordered-query based on the destination of each message, ordered by the estimated likelihood of a future transitive path to that destination. . At the core of the Mayprop protocol is a ranked list of the peer's stored packets based on a cost assigned to each destination. The cost is an estimate of delivery likelihood. In addition, MaxProp uses acknowledgments sent to all peers to notify them of packet deliveries. MaxProp assigns a higher priority to new packets, and it also attempts to prevent reception of the same packet twice. The remainder of this section presents the details of destination cost estimation, our other mechanisms, and buffer management.

2.5 Rapid Protocol

RAPID this is an acronym for Resource Allocation Protocol for Intentional DTN routing, RAPID, like MaxProp, is flooding-based, and will therefore attempt to replicate all packets if network resources allow.

The protocol is composed of four steps:

- Initialization: Metadata is exchanged to help estimate packet utilities.
- Direct Delivery: Packets destined for immediate neighbors are transmitted.
- Replication: Packets are replicated based on marginal utility (the change is utility over the size of the packet).
- Termination: The protocol ends when contacts break or all packets have been replicated.

2 .6 A Hybrid Caching Scheme

The performance analysis showed that Cache Path and Cache Data can significantly improve the system performance. To Cache Path performs better in some situations such as small cache size or low data update rate, while Cache Data performs better in other situations. To further improve the performance, we propose a hybrid scheme Hybrid Cache to take advantage of Cache Data and Cache Path while avoiding their weaknesses. Simulation results show that the proposed schemes can significantly reduce the query delay and message complexity when compared to other caching schemes.

2.7 Multicast Forwarding Algorithm

Delegation forwarding (DF) in DTNs multicast and compare it with single and multiple copy multicast models, which are also proposed in this paper. From the analytical results, we have the following conclusions: (1) although the single copy model has the smallest number of forwarding's, its latency is much longer than the other two

models. (2) Among these three models, the delegation forwarding model has the least delay. The effectiveness of our approach is verified through extensive simulation both in synthetic and real traces multicast in DTNs with single and multiple data items, investigate the essential difference between multicast and uncast in DTNs, and formulate relay selections for multicast as a unified knapsack problem by exploiting node centrality and social community structures. Extensive trace-driven simulations show that our approach has similar delivery ratio and delay to the Epidemic routing, but can significantly reduce the data forwarding cost measured by the number of relays used.

III. SYSTEM ARCHITECTURE

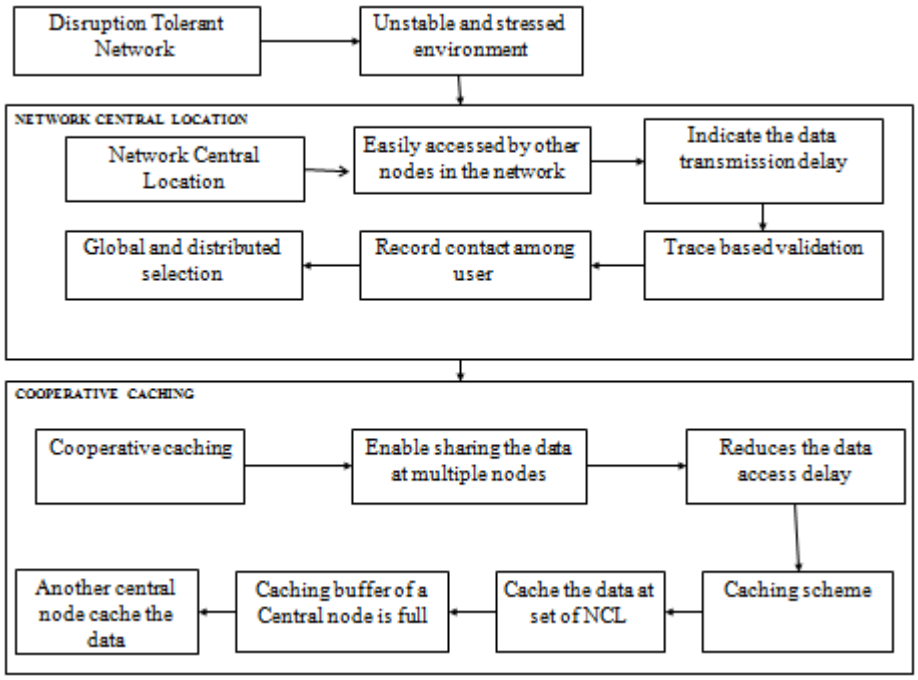

Fig.1: Architecture Design

IV. COOPERATIVE CACHING TECHNIQUE

The cooperative caching in DTNs, which enables the sharing and coordination of cached data among multiple nodes and reduces data access delay. The basic idea is to intentionally cache data at a set of network central locations (NCLs), which can be easily accessed by other nodes in the network. Propose an efficient scheme that ensures appropriate NCL selection based on a probabilistic selection metric and coordinates multiple caching nodes to optimize the tradeoff between data accessibility and caching overhead. Propose a novel scheme to address the aforementioned challenges and to efficiently support cooperative caching in DTNs.

The basic idea is to intentionally cache data at a set of network central locations (NCLs), each of which corresponds to a group of mobile nodes being easily accessed by other nodes in the network. Each NCL is represented by a central

node, which has high popularity in the network and is prioritized for caching data. Due to the limited caching buffer of central nodes, multiple nodes near a central node may be involved for caching, and ensure that popular data are always cached nearer to the central nodes via dynamic cache

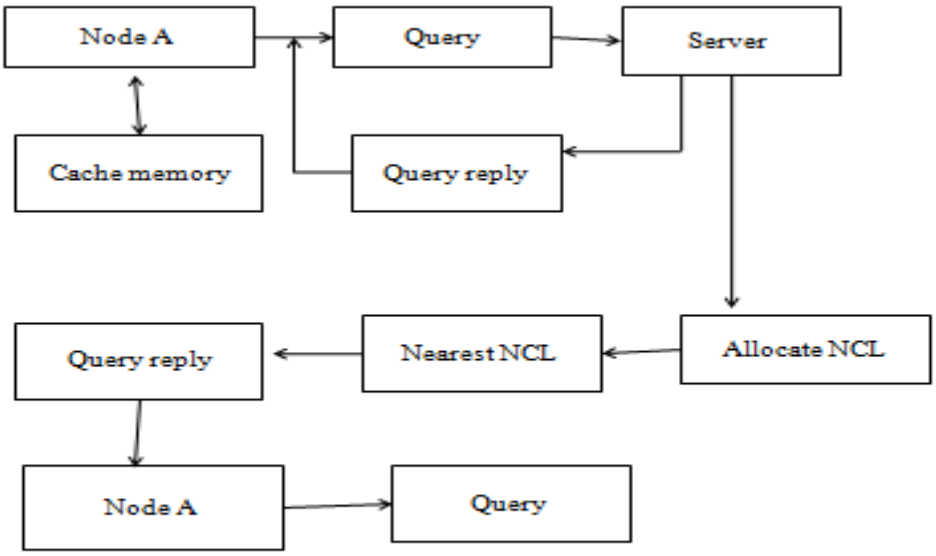

Fig .2: Network Central Location

Replacement based on Query history. To develop an efficient approach to NCL selection in DTNs based on a probabilistic selection metric. The selected NCLs achieve high chances for prompt response to user queries with low overhead in network storage and transmission.

The propose a utility-based cache replacement scheme to dynamically adjust cache locations based on query history, and the scheme achieves good tradeoff between the data accessibility and access delay.

Data are only requested by mobile users whenever needed, and requesters do not know data locations in advance. The destination of data is, hence, unknown when data are generated. This communication paradigm differs from publish/subscribe systems in which data are forwarded by broker nodes to users according to their data subscriptions. Appropriate network design is needed to ensure that data can be promptly accessed by requesters in such cases. A common technique used to improve data access performance is caching, to cache data at appropriate network locations based on query history, so that queries in the future can be responded with less delay. Although cooperative caching has been studied for both web-based applications and wireless ad hoc networks, to allow sharing and coordination among multiple caching nodes, it is difficult to be realized in DTNs due to the lack of persistent network connectivity.

V. CONCLUSIONS

To support cooperative caching in DTNs. The basic idea is to intentionally cache data at a set of NCLs, which can be simply accessed by other nodes. To ensure appropriate NCL selection based on a probabilistic metric; our approach coordinates caching nodes to optimize the tradeoff between data accessibility and caching overhead. To identified the effects of the contact duration limitation on cooperative caching in DTNs. The theoretical analysis shows that the marginal caching benefit that a caching node can provide diminishes when it caches more data. Based on this observation, have designed a contact Duration Aware Caching (DAC) protocol, exploits social network concepts to address the challenge of the unstable network topology in DTNs. Trace-driven simulations show that by adopting DAC, the performance of data access can be significantly improved.

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THREE-DIMENSION (3D) ASSITED FACE RECOGNITION: DEALING WITH EXPRESSION VARIATION

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ABSTRACT

One of the most critical sources of variation in face recognition is facial expressions, especially in the frequent case where only a single sample per person is available for enrollment. The face recognition framework is proposed in which the widely-encountered single sample problem for identification of faces with expressions is targeted by augmenting the dataset with synthesized images. Several expressions are simulated for each enrolled person on an anima table model which is specifically generated based on the 3D face scan of that subject. Methods that improve the accuracy in the presence of such variations are still required for a reliable authentication system. In this paper, we address this problem with an analysis by- synthesis-based scheme, in which a number of synthetic face images with different expressions are produced. For this purpose, an anima table 3D model is generated for each user based on 17 automatically located landmark points. The contribution of these additional images in terms the recognition performance is evaluated with three different techniques (principal component analysis, linear discriminate analysis, and local binary patterns) on face recognition grand challenge and Bosporus 3D face databases. Significant improvements are achieved in face recognition accuracies, for each database and algorithm

I.INTRODUCTION

The main advantage of this three dimensional authentication process is used for identification of a human. This provides the security of the user device and helps to secure the stored information. This application mainly designed for user authentication becomes easily when authorized the persons enter with different levels of expression. This application has analyzed the human mentality using the facial expression. This will help to authentication when the person in any mindset. This application continuously analyzes the expression of the human which mainly used for alert the person about their current mentality. This 3D face Detection is an Android application which is helpful to analyze the human f. This application used for detect the human face for authentication purpose. This application has analyzed the human mentality using the facial expression. This will help to authentication when the person in any mindset. This application continuously analyzes the expression of the human which mainly used for alert the person about their current mentality. This application gave the information continuously and gave the alert message while the user in abnormal condition**.**

System Architecture

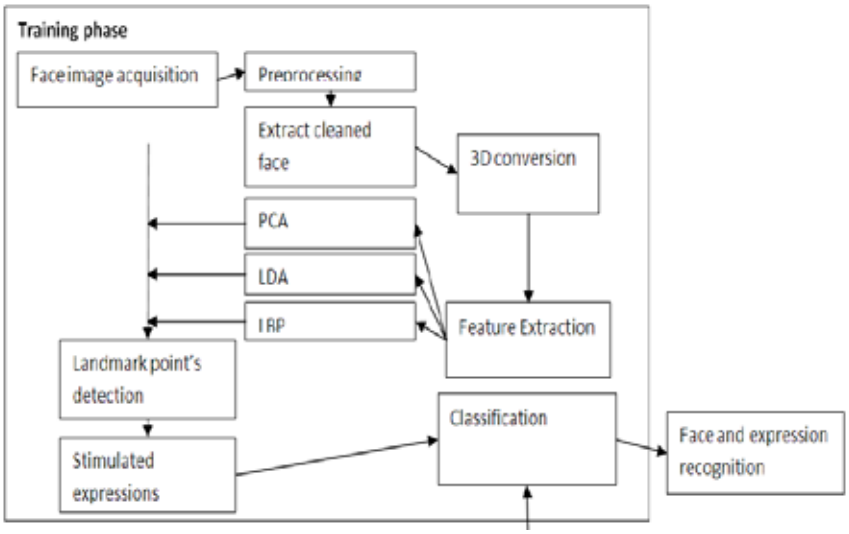

Fig .1: System architecture

II. LITERATURE SURVEY

2.1 Novel System for Face Recognition to Identify Occlusions and Restoration of Image

The acquisition of a large number of occluded faces and their annotation with a ground truth are costly A practical face recognition system needs to work under different imaging conditions, such as different face poses and illumination conditions. Hence before the face is subjected to any face recognition system preprocessing steps such as normalization, feature extraction has to be carried out in order obtain efficient face recognition results. This paper involves obtaining a 3D facial image and the occluding object separately. A patch of the occluding object is applied over the face to generate the occlusion. We generate and time intensive operations. Moreover, several in-depth analyses may not be possible because information about the regions covered by the occlusions is not available..

Disadvantages:

Registered regions are irregularly resample

The recognition method used is dependent of restoration

2.2 Three-Dimensional Occlusion Detection and Restoration of Partially Occluded Faces

An innovative three dimensional detection and restoration strategy for the recognition of three dimensional faces which may be partially occluded by unforeseen, extraneous objects. No apriority knowledge about the occluding objects is required. These may be glasses, hats, scarves and the like, and differ greatly in shape or size, introducing a high level of variability in appearance. The restoration strategy is independent of the method used to detect occlusions and can also be applied to restore faces in the presence of noise and missing pixels due to acquisition

inaccuracies. They first detect the regions occluded by the glasses and then generate a natural looking facial image without glasses using Principal Component Analysis (PCA) reconstruction.

Advantages:

The reliability with respect to occlusions of any 3D recognition system, even when low computational resources are available

The non-occluded regions correspond to nearest neighbor classifiers, which are then combined using fusion methods such as the sum of the scores, the product, Borda count

Disadvantages:

- This method is not expected to provide high accuracy in the case of emphasized facial expressions

2.3 Regional Registration for Expression Resistant 3-D Face Recognition

The novelty of the approach is that it requires a single registration for a given test face. The probe is registered in a two-pass algorithm: First, rigid registration to an average model, followed by registration to individual avrms. The algorithm is preceded by a novel automatic Landmark localization module, which provides the initialization. The registration of facial parts to a generic model significantly speeds up the identification time because it is sufficient to perform only a single alignment to a generic model per facial region. Since all the gallery/training samples are previously registered offline to the same generic model, single alignment provides the dense correspondence information to every gallery image by default. Lastly, and most importantly, since dense correspondence is established and 3-D features are represented as an ordered feature vector, it is possible to utilize advanced pattern recognition tools either at the level of feature extraction or at the level of pattern classification. Traditional approaches like pair wise matching of two 3-D point sets are limited in that sense, since the 3-D point sets are unordered and the similarity can only be computed by means of geometrical measures.

Advantages:

- Better registration under local facial surface deformations,
- Fast search in identification mode,
- The applicability of statistical feature extraction methods for unordered 3-D point data.

Disadvantages:

- High sensitivity sensor that has a high capture time.

.

2.4 A Survey of 3D Face Recognition Methods

The main purpose of this overview is to describe the recent 3D face recognition algorithms. The last few years more and more 2D face recognition algorithms are improved and tested on less than perfect images. However, 3D models hold more information of the face, like surface information, that can be used for face recognition or subject discrimination. Another major advantage is that 3D face recognition is pose invariant. A disadvantage of most presented 3D face recognition methods is that they still treat the human face as a rigid object. This means that the methods aren't capable of handling facial expressions. Therefore, some face recognition methods originally developed for 2D face recognition have been extended for 3-dimensional purposes. Using 3D models one can deal

with one main problem in 2D face recognition: the influence of the pose of the head. Also the surface curvature of the head can now be used to describe a face.

Advantages:

- Major advantage is that 3D face recognition is pose invariant.
- Calculation times could become prohibitive for practical applications

Disadvantages:

- Aren't capable of handling facial expressions
- Head poses and other poses leads high error rate.

III METHODOLOGY

3.1 Face image Acquisition

This module used to capture the face image or upload the datasets. The uploaded datasets contains 3D face images. In face registration we can identify the faces which are captured by web camera.

3.2 Preprocessing

In perform the preprocessing steps such as gray scale conversion, invert, and border analysis, detect edges and region identification. The edge detection is used to analyze the connected curves that indicate the boundaries of objects.

3.3 Facial points description

This module used to divide the examined image into cells. For each pixel in a cell, compare the pixel to each of its 8 neighbors. This can be used for face recognition or texture analysis.

3.4 Expression Recognition

Classifications are supervised learning models with associated learning algorithms that analyze data and recognize patterns, used for classification and regression analysis

IV CONCLUSION

Automatic emotion recognition from facial expression and face recognition are one of the most intensively researched topics in affective computing and human–computer interaction. However, it is well known that due to the lack of 3-D feature and dynamic analysis the functional aspect of affective computing is insufficient for natural interaction. In this project, we present automatic face recognition with expression variations approach from real time datasets based on a landmark point's controlled 3-D facial model. The facial region is first detected with local normalization in the input dataset. The 17 landmark points are then located on the facial region and tracked through algorithms such as PCA, LDA and LBP. Depending on the displacement of the lank mark points may be used to synthesize the input expressions. So we easily recognize faces under various expressions. In our future work, we plan to develop alternative initial alignment techniques. Furthermore, the automatic occlusion detection stage can

also be improved: As a future direction, we plan to model occlusions better, so that the overall performance of the system can be increased.

V. FUTURE ENHACEMENT

We extend our work to less limited registration approach and Independent of nose visibility. Then Occlusion invariant recognition system has following aspects,

- Automatic occlusion detection and removal
- Discriminative features other than depth information

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BIOGRAPHY NOTES

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SMART VEHICLE CONTROLLED SYSTEM

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ABSTRACT

The ARM7 controller is used in many applications. In this paper it is used as the core controller, to control the entire vehicle. A voice recognition module will be used for human interaction with the vehicle. This module will be at the transmitter side i.e. with the person, which gives the desired commands. The controller used at the transmitter side is PIC controller. This signal will be received by the controller at the receiver end placed on the vehicle for controlling. In controlling mainly four operations will be performed i.e. forward, stop, left, right in this prototype. To provide safety IR sensors will be used which gives feedback at the receiver end whenever there is any obstacle. For real time operation µcos-ii will be used to enhance the performance of system.

Keywords: Control system, Embedded, LPC2148, PIC 16F876A, Wireless Robot, µcos-ii.

I. INTRODUCTION

Improvements in hardware technology have resulted in low-cost controllers which are composed of a single chip with embedded memory, processor, and peripherals. The advancement in technology is in a rapid progress. New ideas are proposed every time in different sectors. If we consider the automobile field there is a tremendous rise in light and heavy vehicle. Many automobile companies are coming with new ideas in order to increase their sales and to gain top level in market.

ARM architecture is designed to allow very small, with high performance implementation. This simplicity leads to very small implementations which allow devices with very low power consumption. Now a day's most industries are using this controller to develop their product. One of the examples includes the I-phone 5 mobile which uses ARM 7 processor.

ARM is a RISC architecture which has the following features:

- A large uniform register file.
- A load-store architecture, where data processing operations only operate on register content, not directly on memory contents.
- Simple addressing modes.
- Uniform and fixed length instruction fields.
- High performance, low code size.
- Low power consumption and silicon area.

ARM based embedded system has good performance and portability; therefore it has been widely used in various industries. Different operating systems can be ported easily on this controller.

- Directly on memory contents.

- Simple addressing modes.
- Uniform and fixed length instruction fields.
- High performance, low code size.
- Low power consumption and silicon area.

ARM based embedded system has good performance and portability; therefore it has been widely used in various industries. Different operating systems can be ported easily on this controller.

II. CONTRIBUTION BY THE PREVIOUS RESEARCHERS

Here different papers are studied and analyzed based on the approaches used by the different researchers and modifications are made to provide more reliability in the proposed system.

Chunru Xiong and Jufang Hu, invented the Smart Vehicle Control System based on ARM and μC/OS-II"

Approach used here is that the system uses LPC2138 of ARM 7 as the core controller in the smart vehicle so as to achieve a real-time operation system (OS) μC/OS-II. The real-time μC/OS-II enhances the performance of control and simplifies the design and management of software. In addition, this system uses voice-driven principle, improving the human interaction between machines and operators. The utilization of high-precision of ultrasonic sensors on obstacle avoidance robot provides a guarantee for safety. And the usage of LCD as the machine interface facilitates the debugging and control of robot.

Zhaohui Wu, Qing Wu, Hong Cheng, Gang Pan, Minde Zhao, and Jie Sun invented a semantic and adaptive middleware platform, i.e., ScudWare, for smart vehicle space.

Approach used here present ScudWare, which is a semantic and adaptive middleware platform for the smart vehicle space in ubiquitous computing environments. It achieves the synchronization and the adaptability aspects of the smart vehicle space at the multiagent, context-aware, and adaptive component level according to the semantic information. It also presented a mobile music prototype system and gave a scenario in the smart vehicle space, which demonstrates the ScudWare's performance.

Shufu Mao and Tilman Wolf briefly introduce monitoring subsystem that operates in parallel with the embedded processor. The monitor verifies that only processing steps are performed that match up with the originally installed application.

Through the literature survey it has come to know that designing of smart vehicle and its control system was based on various processors and with wired system for the control signals. This carries lots of disadvantages as wire itself was the problem in addition to the hardware requirement along with processor.

III. PROPOSED SYSTEM

Fig 1 Below Shows the working of voice controlled system using the real time microcontroller.

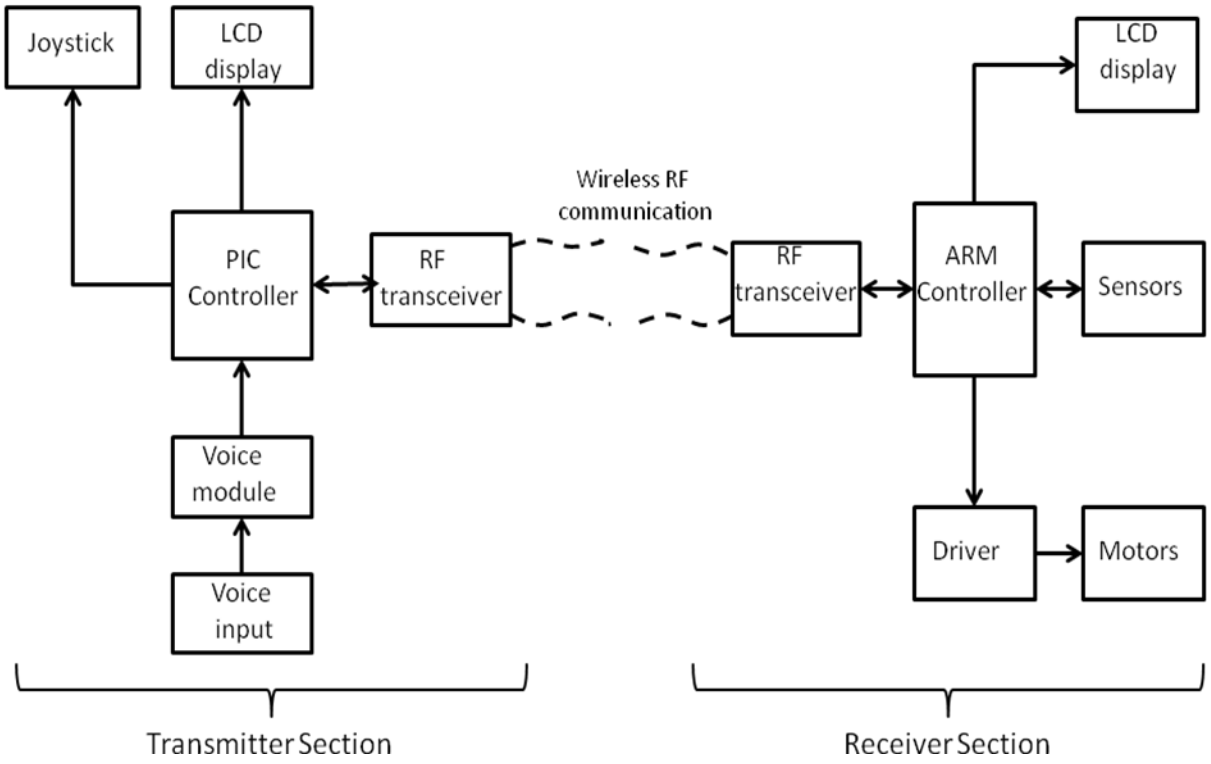


Fig. 1: System Block Diagram

3.1. Transmitter side

As shown in fig 1 the user will give the voice commands to the voice recognition module. Initially the voice module is programmed to the commands which will be accessible. The commands will be processed in PIC controller and the signals will be transmitted wirelessly by RF module which is basically a transceiver. This transceiver will also receive the signals coming from receiver end. This signal commands will be displayed on LCD connected to the controller. A joystick is also connected to the controller for controlling the vehicle if voice commands are not required.

3.2. Receiver side

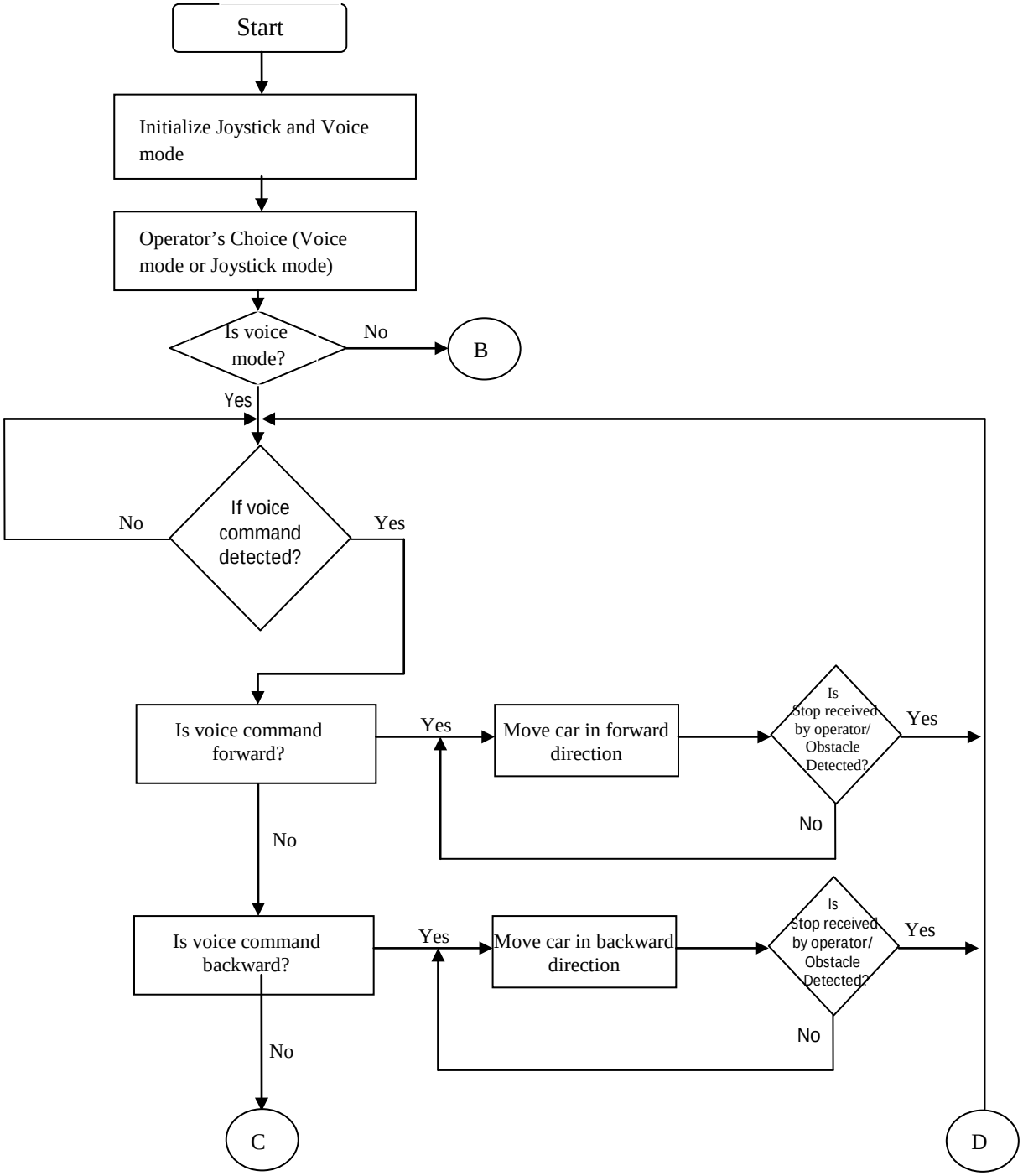
As shown in the fig 1 the signals or the commands transmitted from the transmitter side will be received at the receiver end to the RF module. These signals will be processed by the ARM controller placed on the vehicle. As per the commands the driver- motors will be controlled i.e. to move forward, backward, left or right. A sensor is attached to the vehicle which is used to detect if there is any obstacle in front of the vehicle. If an obstacle is detected the sensor will be on and the controller will send a signal to transmitter end through RF. The LCD on transmitter side will give a display as obstacle detected and the corresponding action will be taken by the user. The controller is also connected to an LCD to display the commands given to it.

IV. SYSTEM FLOWCHART

The system flowchart is shown in Fig 2. The flowchart is divided into two parts based on the operator's choice. At the transmitter side, initialization of voice module and joystick module takes place once the system is

powered on. Depending upon the operator's choice voice mode or joystick mode the system will operate accordingly at the receiver side. Consider operator's choice is voice mode. Voice command is taken as input to the voice module; if the voice is not detected then voice command will be taken again. If the voice is detected then depending upon the command i.e., forward, backward, right or left the vehicle will move accordingly. The vehicle will move in the respective direction until it receives stop command or if an obstacle is detected. The vehicle will stand still once reached the destination.

Consider operator's choice is joystick mode; the system will work according to the flowchart B as shown in the Fig 2. Initially the joystick position will be detected and depending upon the position of joystick i.e., forward, backward, right or left the vehicle or the system at the receiver side will move in respective direction until the operator stops it.



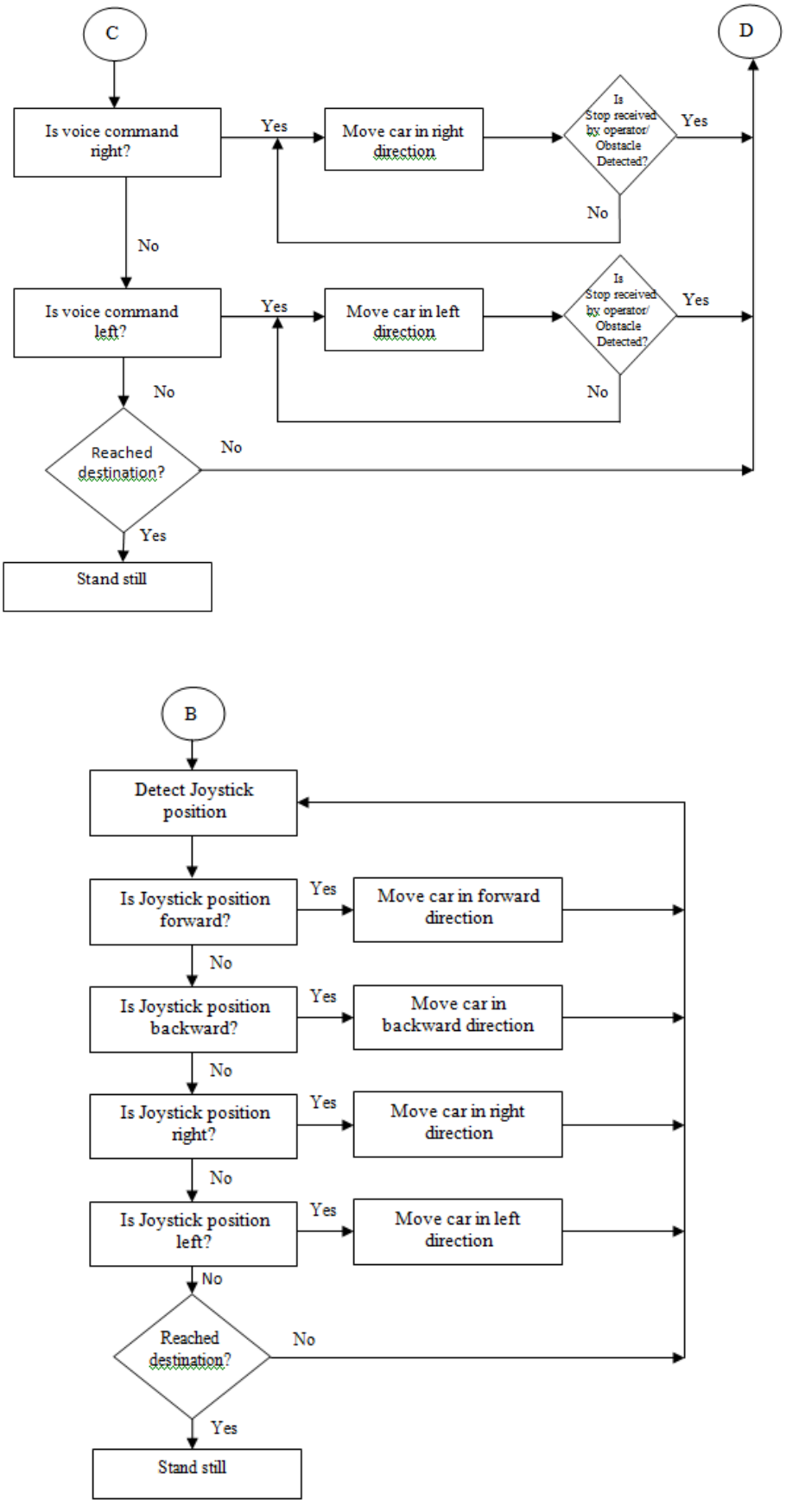


Fig 2 – System Flow Chart

V. CONCLUSIONS

These system uses voice driven principle which improves human machine interaction and makes the control of the system simple. The use of IR sensors helps the vehicle to prevent from damage. Use of ARM microcontroller LPC 2148 and real time ucos-ii improves the speed of operations.

The system can be used as a carrier of the mobile robot, residential patrol, bomb detecting and diffusion, site investigation and many other areas.

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EXPERIMENTAL STUDY ON FLEXURAL BEHAVIOUR OF REINFORCED CONCRETE HOLLOW CORE SANDWICH BEAMS

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ABSTRACT

Nowadays research efforts are continuously looking for new, better and efficient construction material and method. We have responsibility to reduce the effect of the application of concrete materials to environmental impact. The concrete should be used as efficiently as much as possible. In this article, we focus on structural material optimization by introducing hollow core using Expanded Polystyrene Foam in tension zone of RC beams. By material optimization, we can reduce the dead loads which contribute to seismic effect in high rise structures. In addition, the hollow core will act as vibration dampers during earthquake and heat insulator. This paper presents details of the studies carried out on flexural behavior of Hollow Core Sandwich RC Beams with different core shapes. The experimental program consists of casting and testing of RC beams of size 1500mmx150mmx200mm with and without hollow core in tension zone. To study the flexural behavior, all beams are tested after 28 days curing by applying loads at 1/3rd points. The performance of Hollow Core Sandwich Beams under flexure shows better when compared with conventional solid beams.

Keywords: Ductility Factor, Flexural Behaviour, Hollow Core, Optimization, Strain Behaviour

I. INTRODUCTION

Concrete materials are still a dominant material for construction due to its advantages such as workability, low cost and fire resistance as well as its low maintenance cost. It is formed from a hardened mixture of cement, fine aggregate, coarse aggregate, water and some admixture. Massive exploration of the natural for producing concrete affect to the environment condition and global warning. We have responsibility to reduce the effect of the application of concrete materials to environmental impact. The concrete should be used as efficient as possible. Nowadays researches efforts are continuously looking for new, better and efficient construction method. Various theories related to the analysis of structural elements reduced the self-weight of element for a given load- carrying capacity. By structural material optimization can reduce the dead load which contribution of seismic effect in high rise structures and also very good at the vibration dampers and heat isolation. According to its natural behavior of the concrete, strong in compression and weak in tension. Our assumption to design the R.C beams the contribution of tensile stress of the concrete is neglected. The flexural capacity (MR) of the beam is influenced only by compression stresses of the concrete and the tensile stress of the steel reinforcement [11].

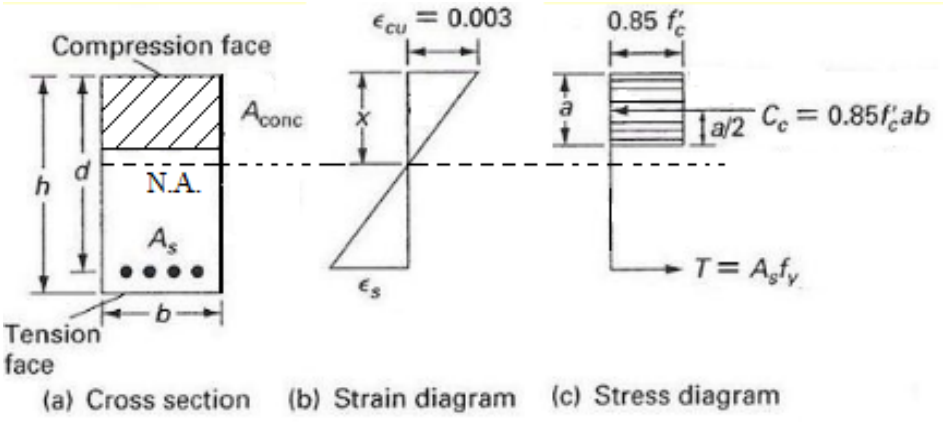

Fig. 1: Flexural Action of Reinforced Concrete beam

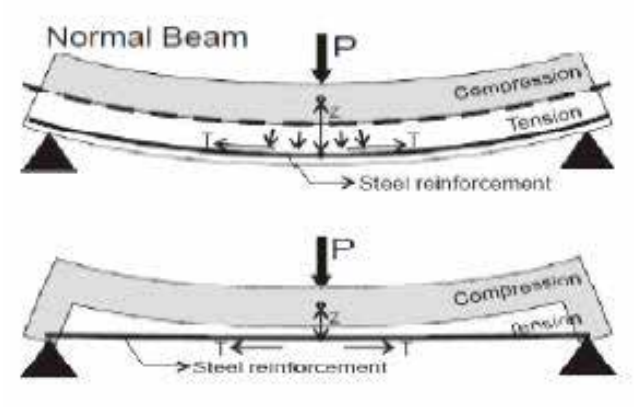

Fig. 2 Effect of without Concrete in Tension Zone

In order to efficiently use the concrete materials, then the compressive strength of the concrete on the tensile stressed zone may be reduced, or the concrete on the tensile stressed zone may be removed. Yasser, Rudy Djamaluddin and Herman Parung [10] presents an experimental study on fully removed concrete in tensile zone, it will affect to the flexural mechanical action between the tension stress and the compression stress of the concrete beam section. As the results, the flexural capacity of the beam decreases. If necessary to keep the lever arm (z) constant between compression force and tensile force of the beam as shown in Figure 2. Kocher Watson and Birman [1] presents a theoretical approach to study several issues related to the design of sandwich structures with a polymer frame reinforced with hollow core using a simple analytical models that describes the contribution to the stability of the structure in hollow at the core. Ezzar H. Fahmy and YousryB.I.Shaheen [2] studied a applying the Ferro cement concept in construction of concrete beams incorporating reinforced mortar permanent forms.

This paper investigates the flexure behaviour of hollow core beam with 25% removal of concrete in tensile zone by expanded polystyrene foam as shown in Figure 4. A series of the experimental specimens were prepared to clarify the effect of the hollow core in the in tension zone of the concrete beam. Besides the control specimens of normal beam (CC-CB), there were two types of beams were prepared. They were the beam with circular shape hollow core portion (CC-HSB-C) and the beam with square shape hollow core portion (CC-HSB-S). The area of hollow core portion is same for all types of beam as shown in Figure 3.

II. MATERIALS AND EXPERIMENTAL PROGRAM

2.1 Experimental Program

The test program consists of casting and testing six beams in given size 150 x 200 x 1500mm out of which two are cement concrete control beams[CC-CB], next two are circular shape hollow core sandwich beams [CC-HSB-C] and other two are square hollow core sandwich beams [CC-HSB-S] the beams designed as under reinforced section according to IS 456-2000.It is reinforced with 2-12Dia at bottom, 2-10 Dia at top using 6mm Dia stirrups @ 125mm c/c casting process is performed according to the basic standards and concrete treatment process is performed for 28 day. Casting specimen concrete was done by placing the reinforcement in the opposite position [tensile reinforcement at upper] in the form work to easily create the hollow on the half height of the concrete beams on the specimens CC-HSB-C and CC-HSB-S. Both beam and with length of 150mm were casted fully for the support during testing. All the beam specimens were submitted to a four point bending test. Three main aspects were examined; flexural strength, center span deformation and strain behaviour of beam.

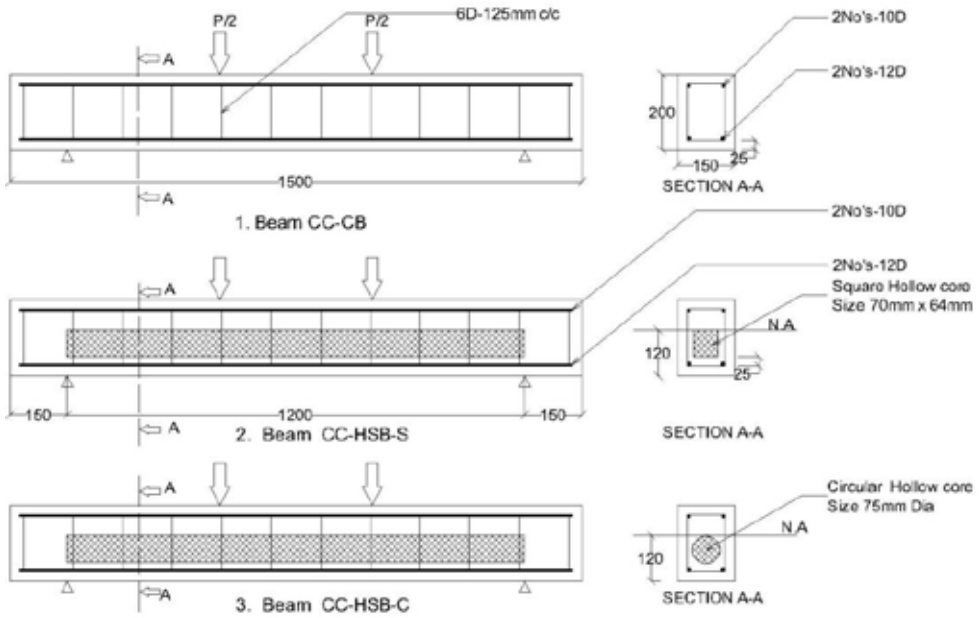

Fig. 3: Detail of Beam Specimens

2.1.1 Control Specimens

To check the concrete properties of concrete mixtures, 150mm x 300mm cylinders, 150mm x150mm cubes and 100mm x 100mm x 500mm prism were cast Cubes were used to determine the compressive strength; cylinders were used to determine the split tensile strength and modulus of elasticity and prism were used to determine the flexural capacity of concrete. The tests were carried out according to the corresponding Indian codes.

2.2 Materials

2.2.1. Concrete

Concrete used for the beam specimens was normal concrete (M25) using Portland pozzolanic cement, fine aggregates, coarse aggregates and potable water. Portland pozzolana cement conforming to IS 1489 (part

1):1991 was used obtained from Ramco Cement. Locally available river sand was used as fine aggregate. They were tested as per IS 2386.crushed aggregate with maximum grain size 12mm and down was used as coarse aggregate and characterization tests were carried out as per IS 2386. Fresh potable water, which is free from acid and organic substance, was used for mixing concrete. To increase the workability of concrete adding super plasticizer (Conplast SP 430 (FOSROC, Mumbai). The detail the properties of concrete are presented in Table 1.

Table 1: Characteristics of Concrete

Concrete Strength Parametric	Value (N/mm^2)
Compressive strength	27.5
Split Tensile strength	3.45
Flexural strength of concrete	3.98
Modulus of Elasticity	24150

2.2.2. Reinforcing Steel

The longitudinal steel reinforcement was provided using Fe415 steel rods and shear stirrups were provided using Fe 250 grade steel rods. The proof stresses of the reinforcement are 0.2 %. Steel reinforcement tensile strength was determine according to IS code. Three tensile tests were made for each bar diameter longitudinal tensile reinforcement (12mm), longitudinal compression reinforcement (10mm) and stirrups bars (6mm).

2.3 Mix Proportions and Mix Details

Concrete mix design was designed as per IS 10262:2009 [7] for M-25 grade concrete.

Table 2: Mix Design Proportions

Volume of Concrete	Cement	Water	Fine Aggregate	Coarse Aggregate	Super Plasticizer
By weight (kg/m^3)	391.05	187.70	708.58	1085.8	3.91
By volume	1	0.48	1.81	2.77	0.5% of Cement

2.4 Test Setup and Instrumentation

A set of 6 “demec” points was placed on the side of the specimen to allow measuring the strain versus load during the test. Demec points were centered on the centerline of the specimens as shown in Fig (5). The testing is setup as shown in Fig (6). The specimen is mounted on beam testing frame of 50 ton capacity. The beams are simply supported over a span 1200mm, and subjected to two concentrate loads placed symmetrically on the span. A Linear Variable Data Transformers (LVDT) was placed under the specimen at the center to measure the deflection versus load. Load was applied by a Hydraulic Power pack system attached with jacks. The strains are recorded demec point by using demec gauge. An Automatic Data Acquisition system with PC Interface is used to collect the data from load cell and LVDT during test. At the time of testing, the specimen was painted with white cement to facilitate the visual crack detection during testing process. Cracks were traced throughout the sides of the specimen and then marked with color markers. The first cracking load of each specimen was recorded. The load was increases until complete failure of the specimen was reached.

Fig. 4: Beam with Circular Expanded Polystyrene Foam in Tension Zone

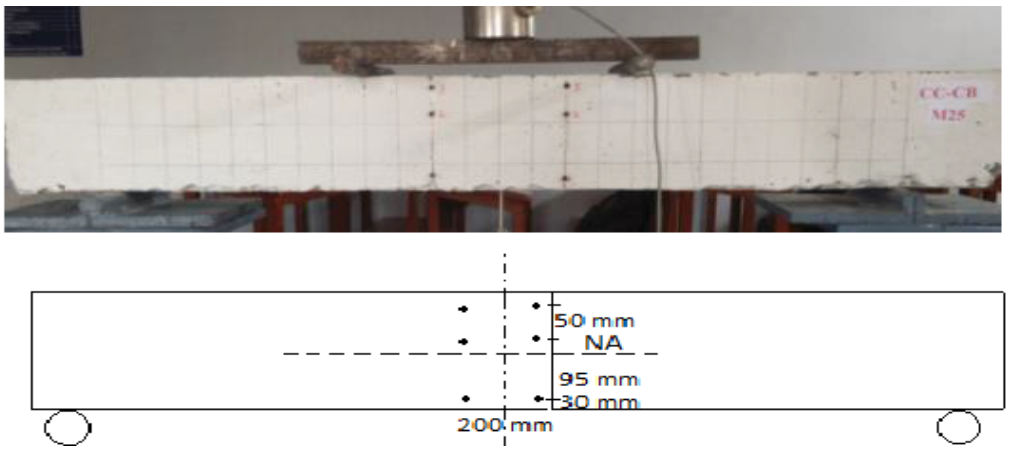

Fig. 5: Location of the Demec Points

Fig. 6: Beam Loading Method

III. RESULT AND DISCUSSION

3.1 Loads- Deflection Response

The load-deflection curves for three beams are shown in Figure-7. All the beams followed the same pattern of load-deflection response. In general the load-deflection curve will consist of three regions; the first region up to

concrete was crack, the second region till the steel reinforcement yields and the third region after yielding of steel reinforcement where there is an enormous rate of increase in deflection for subsequent loads.

Table-3 Load and Deflection at Salient Stages

S.NO	Specimen Designation	First Crack Load (kN)	Ultimate Load (kN)	Deflection at First Crack (mm)	Ultimate Deflection (mm)	Companion Specimens Compressive Strength (N/mm^2)	
						Rebound Hammer test	UPV Test
1	CC-CB	20.5	57.5	1.8	19.7	29	30
2	CC-HSB-S	19.0	53.5	1.9	14.2	27	30
3	CC-HSB-C	20.5	56.0	1.7	18.5	29	29

The summary of salient load-deflection results is presented in Table-3. The first crack loads and ultimate load showed almost equal to all beams.

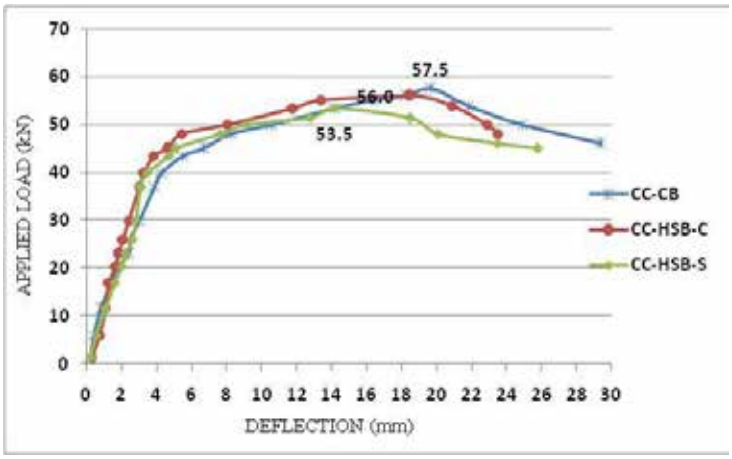

Fig. 7: Load-Deflection responses of beams

Fig. 8: Specimen under Loading

3.2 Ductility Factors and Stiffness Factor

An attempt was made in the investigation to obtain the stiffness and ductility factor for all the beams. The value of the stiffness factor and ductility factor for all beams is presented in Table 4. It was observed the ductility behavior of circular hollow core beam is equal to control beam but stiffness behavior shown increase in CC-HSB-C beam with compare to CC-CB. The Load Vs Ductility response and Stiffness response for all the tested beams are shown in Figure 9, 10.

Table 4: Stiffness and Ductility values

S.NO	Specimen Designation	Stiffness Factor	Ductility Factor	Stiffness Factor Ratio	Ductility Factor Ratio
1	CC-CB	2.92	10.9	1.00	1.00
2	CC-HSB-S	2.94	9.60	1.01	0.88
3	CC-HSB-C	3.03	10.9	1.03	1.00

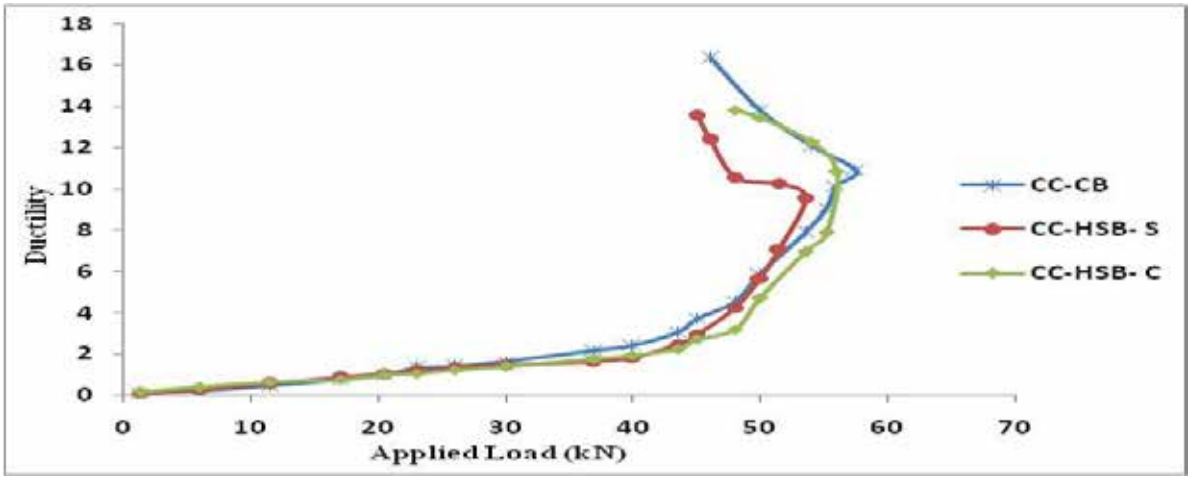

Fig. 9: Load Vs. Ductility Response of the beam

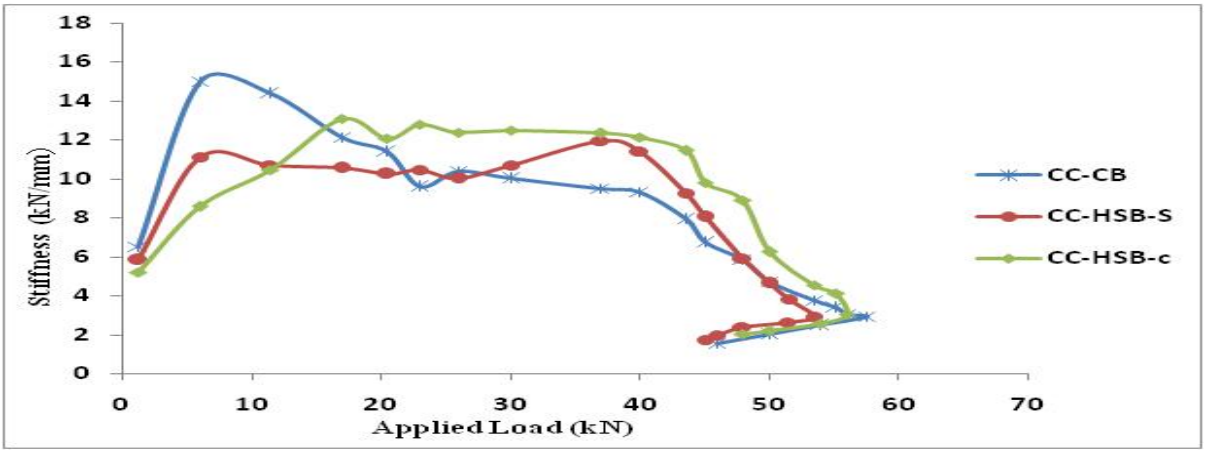

Fig. 10: Load Vs. Stiffness Response of the beam

3.3 Strain Behavior

Strain value of the beams in shown in Fig 11, 12, and 13. The strain distribution over the cross section is plotted for the first crack load and ultimate load. This indicates the N.A is shifted from compression zone to tension zone at failure stage. All the beams showed the strain distribution almost equal.

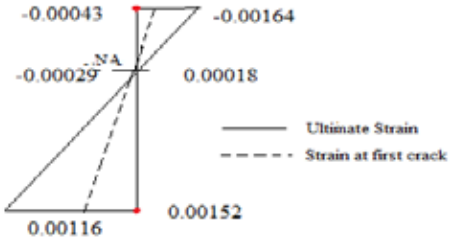

Fig. 11: Strain Distribution for the CC-CB

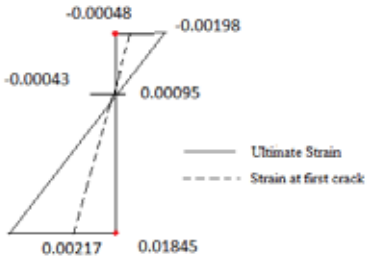

Fig.12: Strain D istribution for the CC-HSB-S

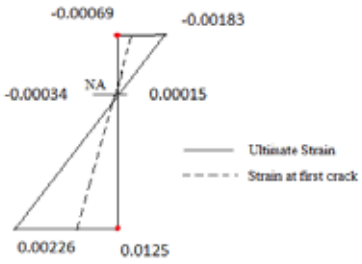

Fig. 13: Strain Distribution for the CC-HSB-C

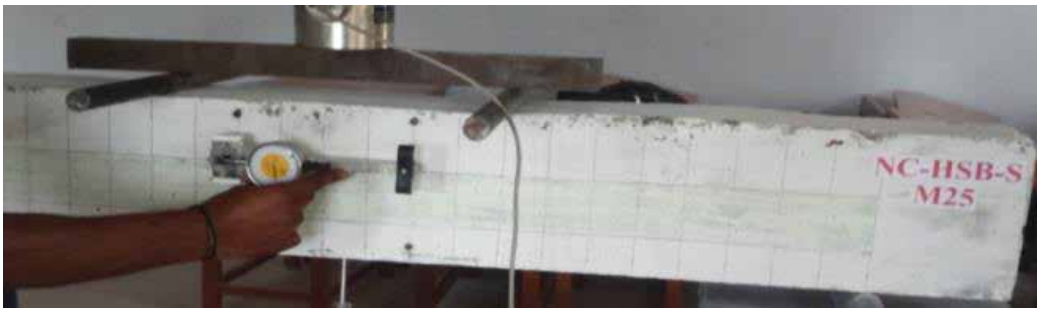

Fig.14: Strain Measurement under Loading

3.4 Crack Pattern

Initial stages of loading, all beams were un-cracked beam. When the applied load reached to the rupture strength of the concrete on specimens, the concrete started to crack. The failure pattern in the all the tested beams was observed as a flexure-shear failure. The beams showed initial cracking in the constant bending moment region and then the cracks patterns in the vertical direction as the load was increased. At about 60 to 70% of the ultimate load, shear crack appeared near the supports and processed towards the compression zone. At the stage of ultimate failure, the shear cracks extended till the loading point and the crushing of concrete at that point of loading. All the beams showed the same pattern of failure and the failure modes are shown in Figures 15.

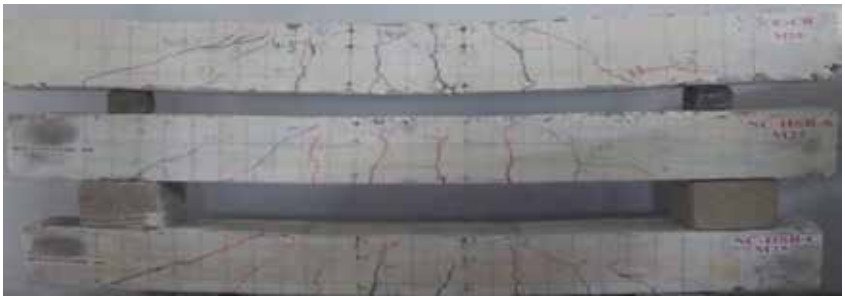

Fig. 15: Crack patterns and failure mode of beam specimens

IV. CONCLUSIONS

Based on the experimental study conducted on hollow core RC beams and test result obtained, the following conclusions were drown:

1. The flexural strength, deflection at yield and at ultimate stage of RC beams with circular hollow core (CC-HSB-C) is same when compared with RC solid beams (CC-CB).
2. The flexural strength and yield deformation of RC beam with square hollow (CC-HSB S) is less compared with RC solid and RC circular hollow beams.
3. By introducing hollow core in tensile zone up to 25% on the beams, the behavior of beam is not affected with respect to flexural strength, deflection and strain measurement.
4. The propagation of crack in hollow core sandwich beams was relatively slower than RC solid beams. Also the number of cracks is less when compared with cracks in RC solid beams. This may be caused due to the fact in bending effect in tensile zone is restricted by introducing core using polystyrene foam sandwich.
5. The strain values are same at all stages in RC hollow core sandwich beams at all salient point when compare with RC solid beams.

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BIOGRAPHICAL NOTES

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DESIGN AND IMPLEMENTATION OF VARIOUS CONTROLLERS FOR VIENNA RECTIFIER

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ABSTRACT

A regulation on input harmonics and power factor necessitates the use of front end active power correction for all converter applications. Vienna rectifier has become a popular choice for the three phase active power factor correction circuit for all converter applications. The three phase three-level boost type converter is an interesting switch mode topology for the mitigation of power quality problems generated by commonly used nonlinear loads. Vienna rectifier is simulated using MATLAB/SIMULINK. This thesis aim in design, analysis and implementation of Vienna rectifier. The closed loop has been simulated using pi controller.

Key words: Vienna Rectifier, Voltage Controller, Power Controller, Digital to Analog Converter.

I. INTRODUCTION

Vienna Rectifier as was originally developed at the Technical University Vienna. It comprises a semiconductor switch, say, a MOSFET in each phase leg of a 3-Phase diode bridge. By adjusting the width of the pulse that turns ON the MOSFET, corresponding line current is forced to be sinusoidal and in phase with the Voltage. When the MOSFET is turned ON the corresponding phase is connected, via the line inductor, to the center point between the two output capacitors. The phase current rises, through the MOSFET, during that pulse period, charging the capacitor. When the MOSFET is turned off, current tapers through the diode half bridge (upper or lower depending on direction of the current flow).

In Vienna Rectifier configuration, the output capacitor is split in two parts as two equal value capacitors, C1 and C2, connected in series. Across the output capacitors the –Vdc and +Vdc are developed as 3-Phase peak detected outputs. A switch for each phase is connected, such that when “ON”, it connects the line phase to the center node of C1 and C2 through a series inductance. For a short switching period,(assuming 10 microseconds), the capacitors charge linearly. This offsets -Vdc and +Vdc. The offset depends on the corresponding phase voltage and the switch “ON” time duration. The common node of C1 and C2 will have Voltage with triangular wave shape, having three times the mains frequency and its amplitude will be one quarter of the phase voltage. Vienna rectifier has become a popular choice for the three phase active power factor correction circuit for all converter applications. The three phase three-level boost type converter is an interesting switch mode topology for the mitigation of power quality problems generated by commonly used nonlinear loads such as electrical devices and other electronic devices.

II. MODULES OF VIENNA RECTIFIER

2.1 Vienna Rectifier

Many high power equipments derive electrical power from three-phase mains, incorporating an active three-phase PFC front end can contribute significantly in improving overall power factor, reducing line pollution, lowering component stresses and reducing component size(e.g. the filter capacitor). Stationary operational behavior of three-phase/switch/level PWM rectifier was analyzed for asymmetrical loading of the output voltages. Maximum admissible load of the neutral point that is capacitive output voltage center point was calculated.

This topology mentioned known as the VIENNA rectifier and the three-level power structure results in a low blocking voltage stress on the power semiconductors and a small input inductor value and size. Therefore, Vienna is an ideal choice for the implementation of a medium power, unity power factor rectifier that also has a high power density .Three-phase AC to DC diode rectifier with three low-power and low frequency, four quadrant switches, with high power factor was presented . The main features were low cost, small size, high efficiency and simplicity. The high power factor was achieved with three active bidirectional switches rated at a small fraction of the total power, and gated at the line frequency.

2.2 Switch Realiztion Constraints

The ideal SPTT switch can be realized using different combinations of controlled switches and diodes. One of the realizations is the unidirectional topology with reduced count of controlled switches is the Vienna Rectifier.

With assumption of continuous conduction mode (CCM), therein which case the conduction path will flow. To avoid low frequency (lower than the switching frequency) harmonics in line currents, the rectifier phase voltages must be free of low frequency harmonics except for triple harmonics, which may present on the modulation signals to increase the fundamental component without invoking over modulation. Under CCM an important operating constraint can be recognized. If continuous sinusoidal PWM is used, the polarity of the line currents and the polarity of the imposed line to neutral voltage from the switching devices have to be identical. In the past this has been referred to as the pulse polarity consistency rule (PPCR) [8]. Thus on an averaged basis, the line currents have to be in phase with corresponding pole to neutral voltages. Otherwise, low frequency harmonic distortion will occur in both line currents and pole voltages. This requirement is equivalent to the unity power factor at the rectifier poles (*NOT at the source voltages).* On the other hand, under space vector modulation mode the input power factor angle at the rectifier input terminals may lie between ($-\pi/6$, $\pi/6$[9]. Although this appears to be a drawback, realistic value of input inductors lead to a power factor at the line terminals to be greater than 0.98 for typical cases.

2.3 MOSFET

The metal–oxide–semiconductor field-effect transistor (MOSFET, MOS-FET, or MOS FET) is a type of transistor used for amplifying or switching electronic signals.

Although the MOSFET is a four-terminal device with source (S), gate (G), drain (D), and body (B) terminals ,the body (or substrate) of the MOSFET is often connected to the source terminal, making it a three-terminal device like

other field effect transistor. Because these two terminals are normally connected to each other (short-circuited) internally, only three terminals appear in electrical diagrams. The MOSFET is by far the most common transistor in both digital and analog circuits, though the bipolar junction transistor was at one time much more common. The current through the channel

$$i = v/r \qquad (1)$$

Where v is the drain source voltage.

In enhancement mode MOSFETs, a voltage drop across the oxide induces channel between the source and drain contacts *via* the field effect. The term "enhancement mode" refers to the increase of conductivity with increase in oxide field that adds carriers to the channel, also referred to as the *inversion layer*. The channel can contain electrons (called an nMOSFET or nMOS), or holes (called a pMOSFET or pMOS), opposite in type to the substrate, so nMOS is made with a p-type substrate, and pMOS with an n-type substrate . In the less common *depletion mode* MOSFET, detailed later on, the channel consists of carriers in a surface impurity layer of opposite type to the substrate, and conductivity is decreased by application of a field that depletes carriers from this surface layer.

III. MODELLING OF VIENNA RECTIFIER

3.1 Vienna Rectifier Simulation

Using MATLAB the simulation was done and tested for the given specification. There are three stages in Vienna rectifier. Firstly, the single stage was done. Later ,three stages was included.

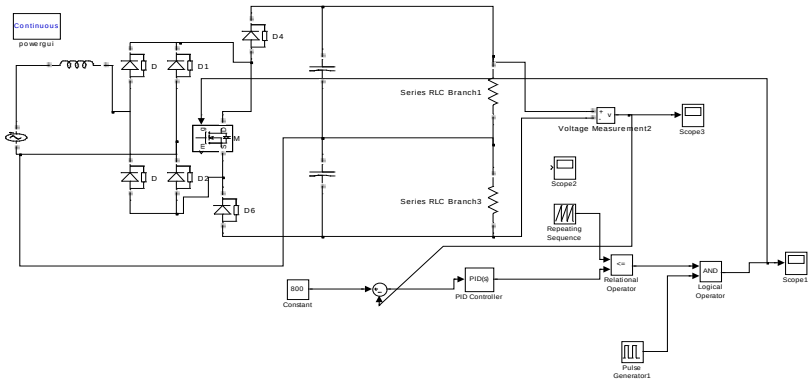


Figure 3.1 Simulation of single stage Vienna rectifier

Here ac voltage is applied and there are six diodes .To track the voltage, the controller is designed. The reference voltage is given as 800v ,so in the output 800v is tracked.

3.2 Simulation for Sinusoidal Change in Input

In this simulation, the same single stage is considered. At the input side, by using of controlled voltage source the change in sinusoidal voltage source is done .Multiply repeating sequence and sinewave source get connected through controlled voltage source.

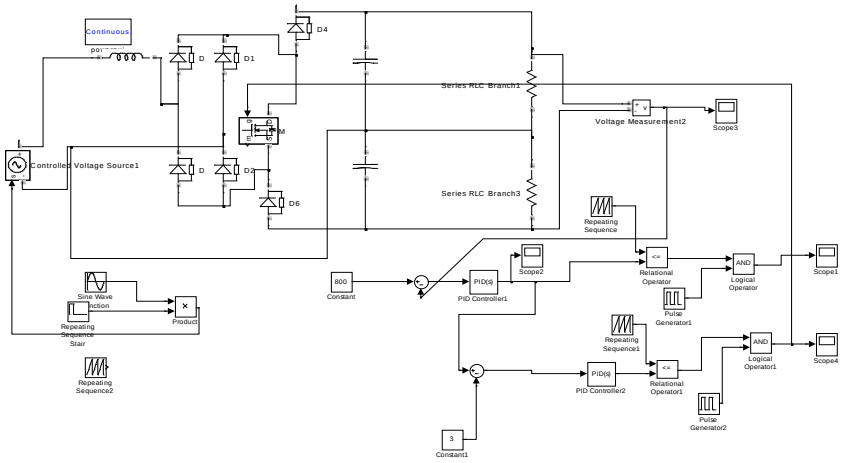


Figure 3.2 Simulation for step change in input.

Here MOSFT act as a switch. In every phase the two switches will conduct. By using voltage measurement in matlab the voltage is measured. The Vienna rectifier consists of three phases.

3.3 Simulation for Step Change in Load

In this simulation is done by either changing the resistance value or resistance is added and voltage value is noted. This simulation is done for single stage.

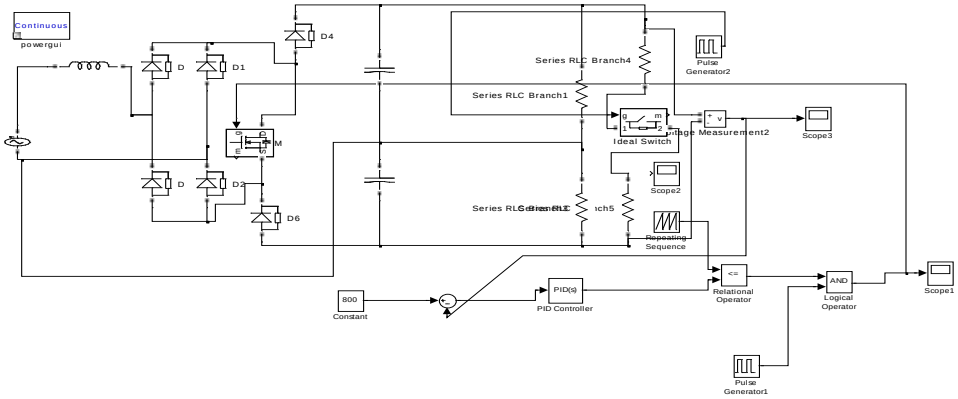


Figure 3.3 Simulation for Step Change In Load

3.4 Simulation for Three Stage Vienna Rectifier

In this stage three phases are considered. Each phase consists of individual switch and diodes. Here PI controller is designed and the switching function takes place.

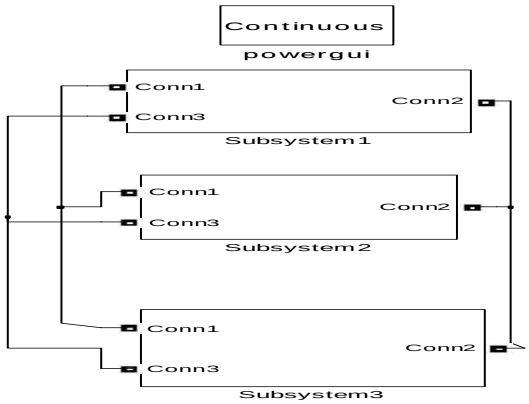


Figure 3.4 Subsystem for Vienna rectifier

Subsystem is created for every phase. I controller is designed for each phase. There are three subsystems in which they are interconnected.

3.5 Simulation for Three Stage Vienna Rectifier

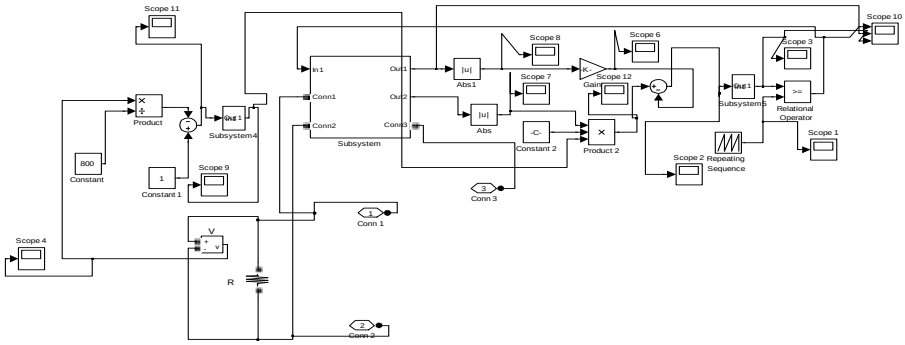


Figure 3.5 Simulation for three stage Vienna rectifier

PI controller values- Kp=.02,ki=2,proportional gain=100

PI controller values- Kp=5,ki=5000,proportional gain=100

3.6 Simulation for Inner System of Vienna Rectifier

In this simulation, voltage is measured by using voltage measurement. By this way, control flow takes place.

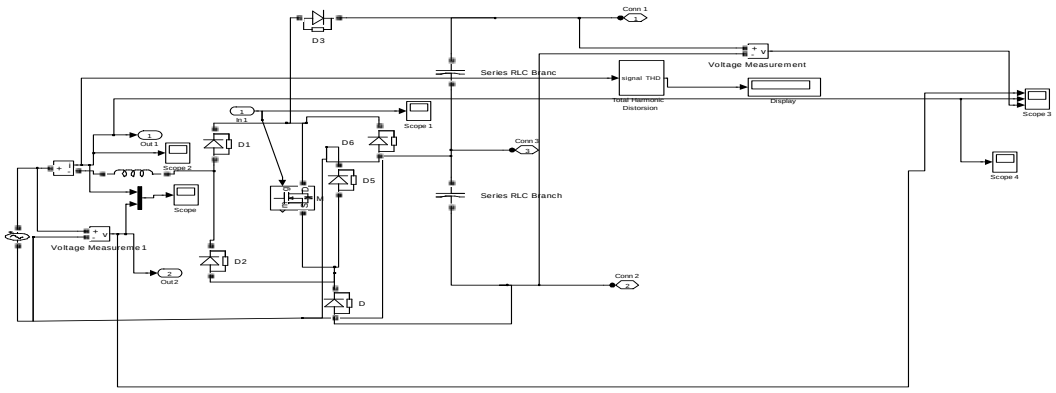
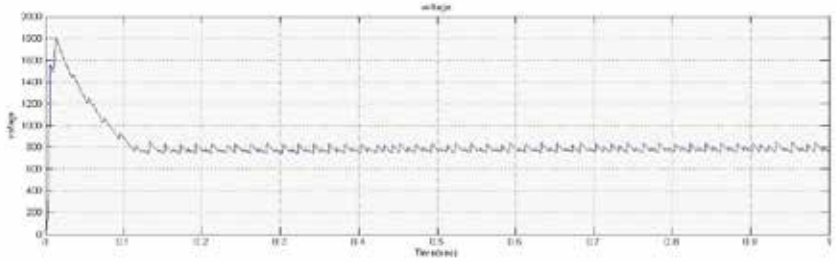


Figure 3.6 Simulation for inner system of vienna rectifier

IV. SIMULATION RESULTS

4.1 Single Stage



RESPONSE

Figure 4.1 Single stage of vienna rectifier for voltage.

The figure 4.1 shows the result of simulation of vienna rectifier in single stage.Reference value is given as 800 ,by making feedback reference to the voltage the control action takes place.The main purpose of controller is whatever value given in the reference same value is going to settle and will be the output.

4.2 Simulation For Vienna Rectifier

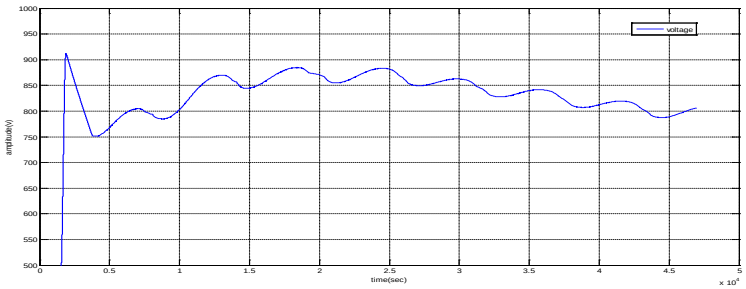


Figure 4.2 Simulation for vienna rectifier

In this simulation,voltage controller is designed.

4.3 Simulation For Three Phase Rectifier(Inner Block)

In this simulation,input and output voltages are analysed.The controller which is designed for voltage of any one phase which will be the input for next two phases.The ac voltage is given as 230 v (peak voltage is 325)

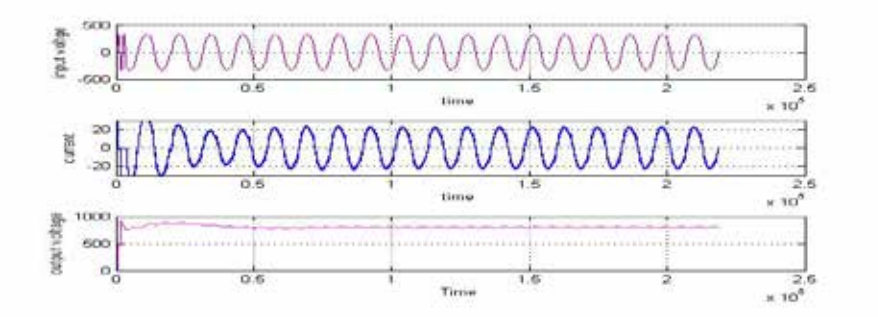


Figure 4.3 Simulation for three phase rectifier

4.4 Simulation Forthree Phase Rectifier(Outer Block)

In this part,simultion is crried out for three phase vienna rectifier

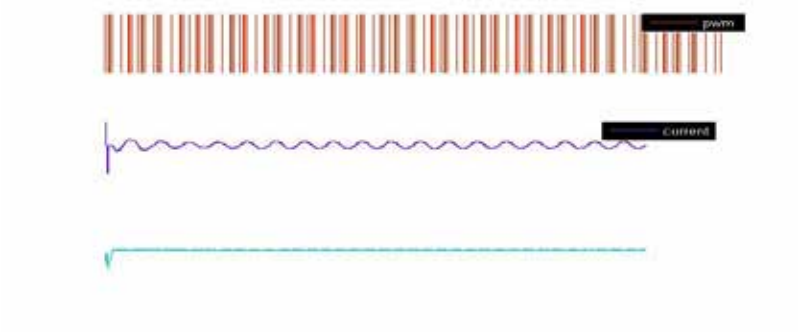


Figure 4.4 Simulation For Three Phase Rectifier

V. CONCLUSION OF THE SIMULATION RESULT

In this operation of Vienna rectifier was developed and the modeling was done. Control strategy is applied to design controller for this rectifier. Using anfis for the same system fuzzy controller was designed error and trained values are manipulated.

VI. SUGGESSIONS FOR FUTURE WORK

In future work, along with the overall hardware testing simulation of Vienna rectifier and simulation also to do in neuro fuzzy. The monitored data are sent serially to a pc for logging data continuously. Finally, it is implemented with the hardware DSPPIC3022.

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FIBER BASED LASER TRANSMISSION TO CONTROL LOAD VOICE AND DTMF COMMUNICATION IN COAL MINE

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ABSTRACT

The project "Voice and DTMF Communication Using Laser" is useful system for indoor voice and DTMF transmission. In this system voice signal is converted as voltage signal using condenser mic. By using IC 555 carrier frequency is generating up to 10 KHz. The voltage signal from condenser mic and carrier frequency is fed to mixer unit. The mixer units drive the laser source. Based on the signal strength laser intensity is modulated. The sane way DTMF is fed to mixer unit to drive the laser source. In receiver end, LDR based opto device is used to receive the laser signal. The intensity variation of laser is converted as voltage variation by using voltage divider circuit. The voice signal is observed through amplifier and speaker. The DTMF signal is observed using DTMF decoder circuit. By using this circuit's arrangement we can send the signal indoor application.

Keywords: Laser Dtmf, Laser Voice Circuit, Transmitter, Receiver

I.INTRODUCTION

Transmitter

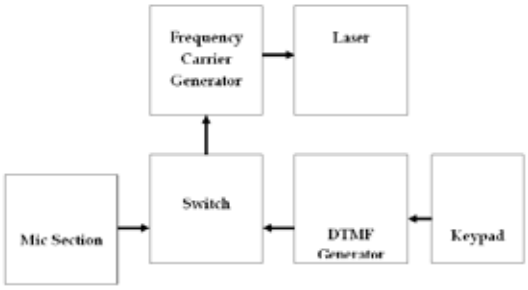

Figure 1: Block Diagram of Transmitter

1.1RECEIVER

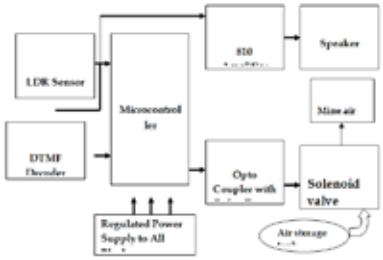

Figure 2: Block Diagram of Receiver

1.2 LASER DETECTOR

This block consists of LDR based voltage divider circuit. The light intensity variations produce potential variation at the junction of voltage divider circuit. The potential variation is latch o next amplify stage.

1.3TWO STAGE AMPLIFIERS

This block consists of transistor BC 548-based two-stage amplifier. This two-stage amplifier amplifies the very low level signal into reasonable level of voltage. The output of this stage is fed to audio amplifier.

1.4PRE AUDIO AMPLIFIES

This block consists of IC 810 based pre amplifier circuit. This amplify stage amplify the very low audio signal into available level. The output is fed to speaker.

II. SPEAKER

This block consists of 8-Ohm speaker to produce audio output to audio level.

2.1 IC 555 BASED MODULATOR CIRCUIT

This block consists of IC 555 based, square wave generator to generate square wave in the frequency range of 10 to 15 KHz. In this circuit IC 555 is wired as an astable circuit. By adjusting the timing components we can adjust frequency of square wave.

2.2DTMF GENERATOR CIRCUIT

This block consists of IC 91214B based DTMF generator circuit. By using matrix key arrangement we can generate 12 different DTMF signal. Each rows and columns have different frequency to generate different signal.

2.3DTMF TO BCD DECODER

This block consists of IC 8870-based DTMF to BCD decoder. It has the pins for receiving DTMF signal and produce BCD values. There is also acknowledgement pin for indicating signal receiving. Basically this block is used to convert DTMF into BCD system.

2.4BCD TO SEVEN-SEGMENT DRIVER

This block consists of IC 4511-based BCD to seven-segment driver. The output pins are capable to drive common cathode display. For every BCD value it produce seven segment code.

2.5 Display

This block consists of common cathode display. It is formed using eight LED's. The LED's are arranged in number 8 shapes. The required decimal number is formed based on Seven-segment code

III.VOICE LASER CIRCUIT

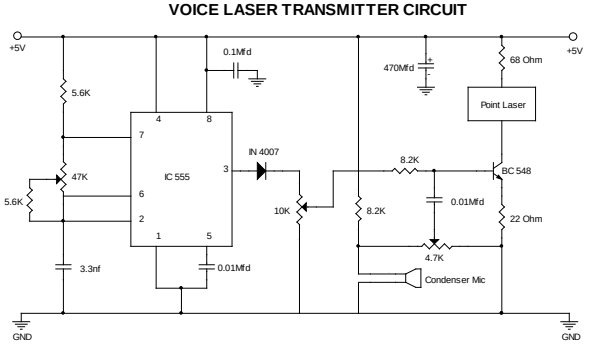

Figure 3: Voice Laser of Transmitter Circuit

3.1. Circuit Description & Operation

The circuit is designed to transmit the voice signal through laser rays. Here IC 555 based circuit provide 10 to 15 KHz carrier frequency to carry the voice signal for long distance through laser. The frequency adjustment is done by adjusting 47K preset. By using condenser mic setup, our voice signal is converted into electrical signal. The 8.2K-Ohm resistor and condenser mic from the voltage divider circuit. Depending upon the voice variation, the potential at voltage divider also vary. This potential variation is directly proportional to voice signal. The carrier frequency and voice signal are fed to transistor based mixer unit. The base current of transistor BC548 is varied with potential variation of voice signal. The point laser is connected at collector side. The intensity of point laser is depending upon the current flow through laser. The laser current is controlled by base current of transistor BC548, so the intensity of point laser is controlled by voice variation (i.e.) voice variations is directly proportional to the laser intensity.

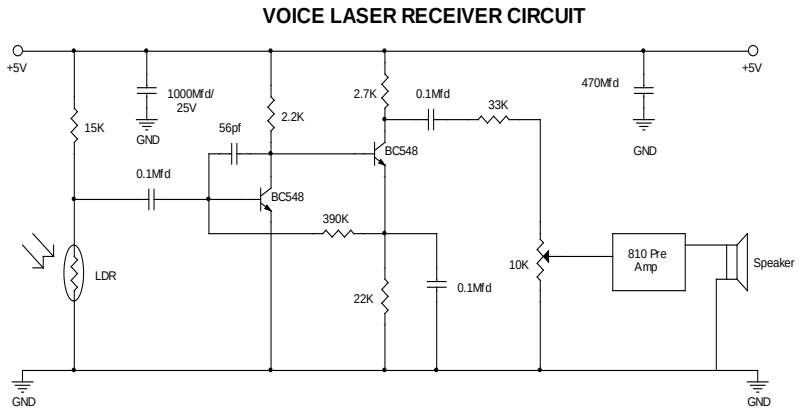

Figure 4: Voice Laser of Receiver Circuit

3.2.Circuit Description & Description

The laser voice receiver circuit consists of photo detector, two stage transistor amplifier audio pre amplifier and speaker. Here LDR is act as laser detector. The resistor 15K and LDR from voltage divider circuit. Depending upon laser intensity potential at voltage divider function is varied. The potential variation is directly proportional to the voice signal strength variation. This signal is fed to two stage transistor BC 548 based amplifiers. The 0.1Mfd capacitor allow voice signal any block DC voltage (i.e.) it acts as DC blocking capacitor. The signal application by two stage amplifier is not, so the output of two stage amplifiers is fed to IC 810 based pre – audio amplifier through 10K Pot. By adjusting 10 K resistors we can control the input signal level of audio pre amplifier. The audio output is observed at 8Wspeaker.

IV.LASER BASED DTMF CIRCUIT

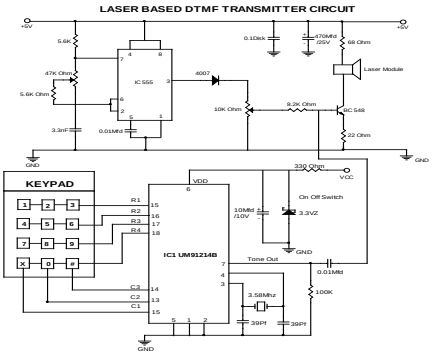

Figure 5: Voice Laser of DTMF Transmitter Circuit

V. CIRCUIT DESCRIPTION & OPERATION

The circuit consists of IC 91214B based DTMF generator circuit and modulator with mixer circuit. The dual tone multi frequency is generated using IC 91214B, which produce seven different frequency for four rows and three columns. The frequency range is in between 800Hz to 1500Hz. The base oscillation is done by 3.58 MHz crystal. This IC is powered by 3V power source, which is designed using 3.3V zener diode based regulator circuit.

The DTMF system is specially designed for telecommunication number dialing purpose. So the frequency range of DTMF signal is in audio frequency. The DTMF output is available at tone out pin by multiplying four-row and three-column frequency. By using different combination of row and column 12 different DTMF signal are generated. To select rows and columns, keys are arranged in matrix form. The different DTMF signals are generated by pressing different key.

When pass a particular key one of the row and column engaged and produce different frequency. The DTMF signal & 10 to 15 KHz carrier signal is fed to mixer unit. Depending upon the signal strength the laser intensity is varied.

The IC 555 circuit is used to generate 10 to 15 KHz square wave for modulating the DTMF signal. The LASER intensity is controlled by the base current of mixer transistor BC548. The DTMF signal & carrier signal control the base current of mixer unit consequently control laser current.

VI. MERITS

1. The signal transmission without wire reduces the wiring cost.
2. Reduce the manual risk.
3. We can design this circuit using easily available electronics components.
4. The cost of the system is comparatively less than RF signal transmission system.

VII. LIMITATION

1. The laser path should be clear if there is any obstacle the signal communication affected.
2. The critical alignment of signal path is somewhat difficult.
3. In laser communication distance is limited depending upon the strength of laser signal.

VII.CONCLUSION

The voice & DTMF signal communication through laser is working very well. Both signals are received in receiver end with minimum noise level. The noise is duce to external atmospheric lighting condition. It may be reduced by covered arrangement. To produce clarity in the voice signal the amplifier section is also designed with carefully.

In further this system may be developed by using DSP based high-end electronics.

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AN OVERVIEW ON EVOCATIONS OF DATA QUALITY AT ETL STAGE

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ABSTRACT

A data warehouse facilitates the integration of disparate operational databases in an enterprise into a single store. Data quality is one of the most important problems in data management. A database system typically aims to support the creation, maintenance, and use of large amount of data, focusing on the quantity of data. However, real-life data are often dirty: inconsistent, duplicated, inaccurate, incomplete, or stale. However, there is a rapid development and implementation of quality data warehouses specifically that of warehouse data quality issues at various stages of data warehousing. Specifically, problems a during the ETL process, data is extracted from an OLTP databases, transformed to match the data warehouse schema, and loaded into the data warehouse database. The state-of-the-art purpose of the paper is to identify the reasons for data deficiencies, non-availability or reach ability problems at the ETL stage of data warehousing and to formulate descriptive classification of these causes. We have identified possible set of causes of data quality issues from the extensive literature review. This will help developers & implementers of warehouse to examine and analyse these issues before moving ahead for data integration and data warehouse solutions for quality decision oriented and business intelligence oriented applications.

Keywords: Data Quality (DQ), Data Staging (DS), Data Warehouse(DW)

1. INTRODUCTION

1.1 Understanding Data Quality

Data are of high quality if, “they are fit for their intended uses in operations, decision-making and planning”(J.M.Juran). Furthermore, apart from these definitions as data volume increases, the question of internal consistency within data becomes paramount regardless of fitness for use for any particular external purpose. The one definition of DQ is that it’s about bad data – data that is missing or incorrect or invalid in some context. Data quality ensures clear understanding of the meaning, context and intent of the data. Understanding the key DQ dimensions is the first step to data quality improvement.

“The beginning of wisdom is the definition of terms.”

Something (data item, record, dataset or database) that can either be measured, or assessedin order to understand the quality of data. In order for the analyst to determine the scope of the underlying root causes and to plan the ways that tools can be used to address data quality issues, it is valuable to understand some common data quality dimensions. Abundant attempts have been made to define data quality and to identify its dimensions.

Dimensions of data quality include accuracy, reliability, importance, consistency, precision, timeliness, fineness;understand ability, conciseness and usefulness.Six primarily data quality dimensions shown in fig-1 are-

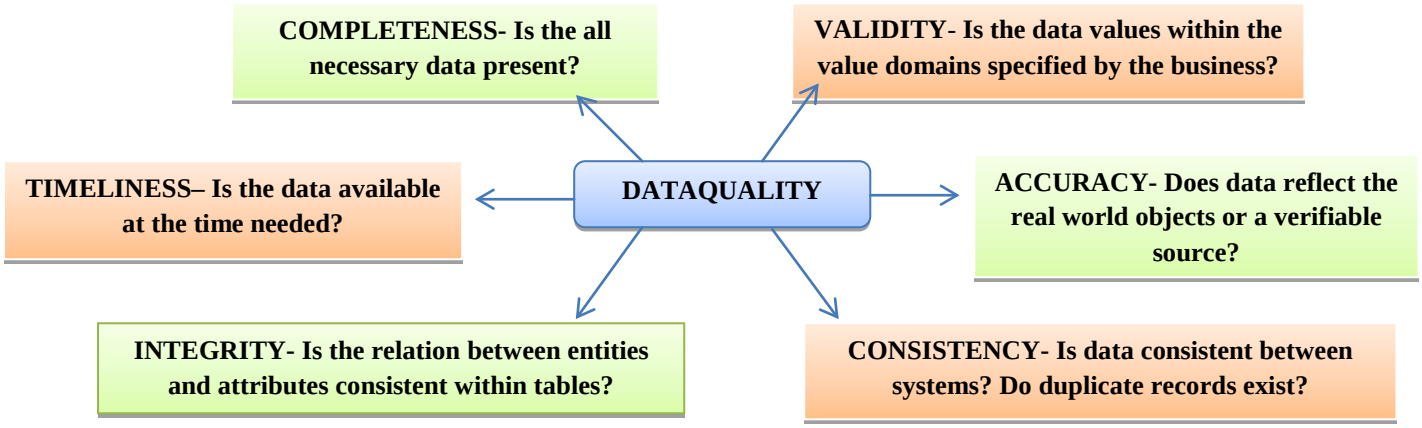

Fig. 1: Data Quality Dimensions

1.2 Data Warehousing

Data warehousing is a collection of decision support technologies, aimed at enabling the knowledge worker (executive, manager, and analyst) to make better and faster decisions. As defined by the "father of data warehouse" William H. Inmon, DW is "a collection of integrated, subject-oriented, non- volatile and time-variant databases where each unit of data is specific to some period of time. Data warehouses can contain detailed data, lightly summarized data and highly summarized data, all formatted for analysis and decision-support." Typically the data warehouse is maintained separately from the organizations operational databases, as data warehouse supports on-line analytical processing (OLAP), the functional and performance requirements of which are quite different from those of the on-line transaction processing (OLTP), applications traditionally supported by the operational databases.

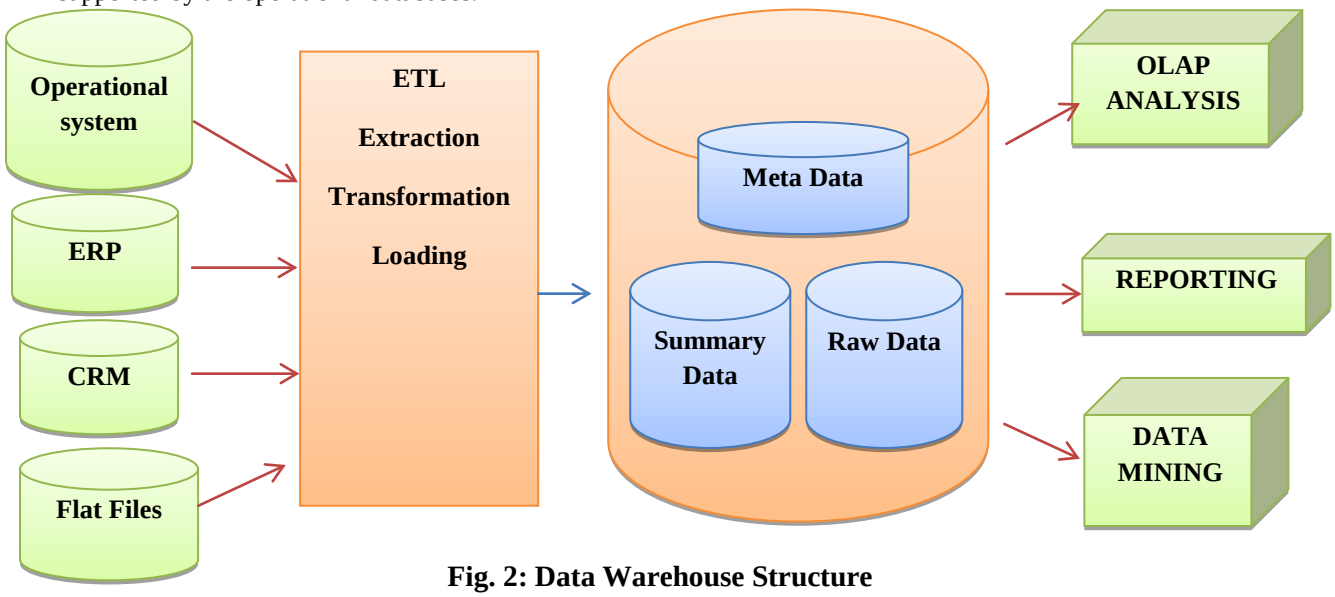

Fig. 2: Data Warehouse Structure

1.3 Phases of DW receptive to DQ problem

Quality of data can be compromised depending upon how data is received, entered, integrated, maintained, processed (Extracted, Transformed and Cleansed) and loaded. Data is impacted by numerous processes that bring data into your environment most of which affect is quality to some extent. Despite of all the efforts, there still exists a certain percentage of dirty data. This residual dirty data should be reported, stating the reasons for the failure in data cleansing for the same.

Data quality problems can occur in many different ways. The most common include:

- Poor data handling procedures and processes
- Failure to stick on to data entry and maintenance procedures
- Errors in the migration process from one system to another
- External and third party data that may not fit with your company data standards or may otherwise be of unconvinced quality.

II METHODOLOGY

The study is designed as a literature review of materials published between 1995 to the year 2014 on the topics of DQ and DW. To develop the data quality problems on an ETL phase, the IT implementations infrastructure, data warehousing literature research questionnaires, related to data quality were reviewed.

2.1 Literature Reviewed

- Channah E Naiman& Aris M. Ouksel (1995)-The paper proposed a integration problems which further may have far reaching consequences on data quality.
- Jaideep Srivastava (1999)1 -The principal goal of this paper is to identify the common issues in data integration and data-warehouse creation. Problems arise in populating a warehouse with existing data since it has various types of heterogeneity.
- -Amit Rudra and Emilie Yeo (1999)-The paper concluded that the quality of data in a data warehouse could be influenced by factors like: data not fully captured, heterogeneous system integration and lack of policy and planning from management.
- Scott W. Ambler (2001)-The article explored the wide variety of problems with the legacy data, including data quality, data design, data architecture, and process related issues.
- Won Kim et al (2002)-Paper presented a comprehensive taxonomy of dirty data and explored the impact of dirty data on data mining results.
- Ralaph Kimball (2004)-The data warehouse ETL toolkit.
- AmolSrivastava, MohitBhaduria, HarshaRajwanshi (2008)- “Data warehouse and quality issues”.
- DikshaVerma, Anjali Tyagi, Deepak Sharma (2014)-Data quality problems in data warehousing.

2.2 Phases of ETL

Extraction, Transformation and Loading (ETL) processes are responsible for the operations taking place in the backstage of datawarehouse architecture.

- **Extracts** data from homogeneous or heterogeneous data sources

- **Transforms** the data for storing it in proper format or structure for querying and analysis purpose
- **Loads** it into the final target (operational data store, data mart or data warehouse)

Usually all the three phases execute in parallel since the data extraction takes time, so while the data is beingpulled another transformation process executes, processing the already received dataand prepares the data for loading and as soon as there is some data ready to be loaded in to thetarget, the data loading kicks off without waiting for the completion of the previous phases.

2.2.1 Extraction

Extracting data correctly sets the stage for the success of subsequent processes. During extraction the desired data is identified and extracted from many different sources, including database systems and applications. Common data-source formats include relational databases, XML and flat files or even formats fetched from outside sources by means such as web spidering screen scraping. In general the extraction phase aims to convert the data into a single format appropriate for transformation processing.An intrinsic part of the extraction involves data validation to confirm whether the data pulled from the sources have the correct/expected values in a given domain (such as default or list of values). If the data fails the validation rules it is rejected entirely or in part. The rejected data is ideally reported back to the source system for further analysis to identify and to rectify the incorrect records. In some cases the extraction process itself may have to modify a data validation rule in order to accept the data to flow to the next phase.

2.2.2 Transform

The data transformation stage applies a series of rules or functions to the extracted data from the source to derive the data for loading in to the end target. Some data do not require any transformation at all; known as direct move or pass through data in technical terms. An important function of data transformation is cleansing of data that aims to pass only proper data to the target. When different systems interact with each other based on how thesesystems store data there is a challenge in interfacing/ communicating with each other. Certain character set that may include or available in one system may not be available in other. These cases must be handled correctly or eventually lead to number of data quality related issues.

2.2.3 Load

The load phase loads the data into the end target that may be simple delimited flat file or a data warehouse. Depending on the requirements of the organisations, this process varies widely. Some data warehouses may overwrite existing information with cumulative information, updating extracted data with frequently done on a daily, weekly or monthly basis. Other data warehouses (even other parts of the same data warehouse) may add new data in a historical form at regular intervals, for example hourly.As the load phase interacts with a database schema – as well as in triggers activated upon data load apply(for example uniqueness, referential integrity, mandatory fields), which also contributes to the overall data quality performance of the ETL process.

2.3 Evocations of DQ at ETL stage

In DW, data cleaning is a major part of the so called ETL process. Data cleaning also called data cleansing or scrubbing, deals with detecting and removing errors and inconsistencies from data in order to improve the quality of data. Data warehouses require extensive support for data cleansing. A data cleaning process is executed in the data staging area in order to improve the accuracy of data warehouse.A staging area or “landing

zone", is an intermediate storage area used for processing during the extract, transform and load (ETL) process. The data staging area sits between the data source and data target, which are often data warehouses, data marts or other data repositories. Staging and ETL phase is considered to be most crucial stage of data warehousing where maximum responsibility of data quality effort resides.

Data quality problems at this phase, from a defined literature review are as follows:-

Table 1

S.no	CAUSES OF DQ PROBLEMS AT ETL
1	DW architecture undertaken affects the DQ (Staging, Non Staging Architecture)
2	Type of staging area, relational or non-relational affects the DQ
3	Different business rules of various data sources creates problem of DQ
4	Business rules lack currency contributes to DQ problems [4]
5	The inability to schedule extracts by time, interval, or event cause DQ problems
6	Lack of capturing only changes in source files [5]
7	Lack of periodical refreshing of the integrated data storage (Data Staging area) cause DQ degradation
8	Truncating the DS area cause DQ problems because we can't get the data back to reconcile
9	Disabling data integrity constraints in DS tables cause wrong data and relationships to be extracted and hence cause DQ problems [7]
10	Purging of data from the DW cause DQ problems [5]
11	Hand coded ETL tools used for data warehousing lack in generating single logical meta data store, which leads to poor DQ
12	Lack of centralized metadata repository leads to poor DQ
13	Lack of reflection of rules established for data cleaning, into the metadata causes poor DQ
14	Inappropriate logical data map prepared cause DQ issues
15	Misinterpreting/Wrong implementation of the slowly changing dimensions (SCD) strategy in ETL phase causes massive DQ problems

16	Inconsistent interpretation or usage of codes symbols and formats [4]
17	Improper extraction of data to the required fields causes DQ problems [4]
18	Lack of proper functioning of the extraction logic for each source system (historical and incremental loads) causes DQ problems
19	Unhandled null values in ETL process cause DQ problems
20	Lack of generation of data flow and data lineage documentation by the ETL process causes DQ problems
21	Lack of availability of automated unit testing facility in ETL tools causes DQ problems
22	Lack of error reporting, validation, and metadata updates in ETL process cause DQ problems.
23	Inappropriate handling of rerun strategies during ETL causes DQ problems
24	Inappropriate handling of audit columns such as created date, processed date and updated date in ETL
25	Inappropriate ETL process of update strategy (insert/update/delete) lead to data quality problems
26	Non standardized naming conventions of the ETL processes (Jobs, sessions, Workflows) cause DQ problems
27	Wrong impact analysis of change requests on ETL cause DQ problems
28	Loss of data during the ETL process (rejected records) causes DQ problems. (refused data records in the ETL process)
29	Poor system conversions, migration, reengineering or consolidation contribute to the DQ problems [4] [6]
30	The inability to restart the ETL process from checkpoints without losing data [5]
31	Lack of automatically generating rules for ETL tools to build mappings that detect and fix data defects[5]
32	Inability of integrating cleansing tasks into visual workflows and diagrams[5]
33	Inability of enabling profiling, cleansing and ETL tools to exchange data and meta data[5]

III CONCLUSION

Data quality is an increasingly serious issue for large and small organizations. It is central to all data integration initiatives. Before data can be used effectively in a DW or in customer relation management, or business analytics applications, it needs to be analysed and cleansed. To ensure high quality data is sustained, organizations need to apply ongoing data cleansing processes and procedures and to monitor and track data quality levels on time. In this paper an attempt to collect all the data quality problems at ETL phase is made of data warehousing. Defective data also hampers business decision making and efforts to meet regulatory compliance responsibilities. These causes will really help the data warehouse practioners, implementers and researchers for taking care of these issues before moving ahead with each phase of data warehousing.

IV FUTURE WORK

Each item shown in TABLE 1 will be converted in to an item of the research instrument that can be empirically tested by collecting views about the items from the data warehousing practioners, appropriately.

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DEVELOPMENT OF AN ANDROID APPLICATION FOR ELECTRICITY BILL PAYMENT

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ABSTRACT:

Android is a mobile operating system (OS) based on the Linux kernel and is an an open-source mobile operating system currently developed by. Android is the most widely used mobile OS and, as of 2013, the highest selling OS overall. Android devices sell more than Microsoft Windows, iOS, and Mac OS X devices combined. In last few decades Mobile apps offer unprecedented opportunities for streamlining business processes - especially as they become more prolific. The appearance of mobile platforms based on open source software has rapidly increased the interest. This paper is based on building a mobile application for electricity bill payment in a simple and easy manner. Mobile phones are within an arm's reach of over 90 percent of waking hours, including times when other media are not available. So this methodology will be feasible than website payment. Moreover it provides convenience, speed and ease of use. We can also access and collect data whilst offline. The mobile app automatically synchronizes data in the background and stores it on the device, so that users can access data in the app even without connectivity. Captured data is also stored in the cloud so that no data is ever lost. This paper suggests a mobile based system to pay electricity bill and also notice lodge tour complaints to the electricity board.

Keywords: Mobile application, security, Android, mobile electronic payment, privacy.

I. INTRODUCTION

Android continues to be one of the leading mobile OS and development platforms driving today's mobile innovations and the apps ecosystem. Android appears complex, but offers a variety of organized development kits to those coming into Android with differing programming language skill sets. With the vast development and deployment of wireless mobile networks such as 3G UMTS [13], [14], WiMAX [9] and Wi-Fi [10], mobile networking applications enabling customers to gain network access anywhere and anytime have attracted more and more attention in our daily lives. When the basic functionalities of a wireless network have been in place, customers are now more interested in value added mobile applications over this network. Most mobile applications come with the emergence of electronic trading (mobile commerce or m-commerce), hence good secure mobile trading model must be designed to attract more mobile users for doing business wirelessly. With the rise of mobile devices and android applications which support the anytime anywhere feasible action, building an application for utility bill payment like electricity bill payment is mandatory. The ultimate thing is, as of now there is no live application for Tamil Nadu Electricity Bill Payment in any market. We have done a frame work on mobile application which makes use of instant payment method. Generally every human needs to stand in the queue for paying bills and online sites are also not handy as mobile application. So this application

tries to eradicate the drawbacks of existing payment methodologies such as manual and online payment by bringing the easier mobile application payment. The implementation of this application will have a great impact during peak working hours of our day to day life. And we hope that enormous number of people will get benefitted by this application

II. PROBLEMS IDENTIFIED IN EXISTING SYSTEM

Electricity bills are the ones which are unavoidable in the current society. There can be no home without electric current supply. Electricity bills should be paid once in two months and more than one lakh people should pay bill every month. This leads to long queues in TNEB office. Online website can crash sometime if there is a large load i.e., large amount of people trying to pay at the same time. Our mobile application project will solve all these problems and it will provide an easy way to pay electricity bill by staying at home or wherever you are. It is reliable, efficient and accurate to suit all the requirements.

2.1 Mobile Payment: A Journey Through Existing Procedures And Standardization Initiatives: Mobile Payment (MP) is a promising and exciting domain that has been rapidly developing recently, and although it can still be considered in its infancy, great hope is put on it. If MP efforts succeed, they will boost both e- and m-commerce and may be the killer service in 2.5G and beyond future ambient intelligence infrastructures. Simplicity and Usability, universality, interoperability, security, trust and privacy are the basic customer expectations from the mobile network.

2.2 Mobile Commerce Applications and Services: A Design and Development Approach: A new approach for designing and developing m-Commerce services and applications were given in organized based on the needs and requirements of the user. MBusiness can be seen as the natural successor to eBusiness [1] This approach relies on mobile users needs and requirements, the classification of the m-Commerce services and applications, as well as the current technologies for mobile and wireless computing and their constraints. Another important factor in designing m-Commerce services and applications is the identification of mobile users requirements. Classified based on the functionality they provide to the mobile users – (i) the directory (ii) the transaction-oriented services and applications. M-Commerce services and applications can be adopted through different wireless and mobile networks, with the aid of several mobile devices. [1]

2.3 Professional Android Application Development: By providing an open development platform, Android offers developers the ability to build extremely rich and innovative applications with a rich set of User Interfaces, support for broad range audio and video file formats. Developers and mobile handset manufacturers around the world has embraced this new platform due itsopens-source and diverse application development and running capabilities with programming language as Java. Creating various android applications and activities which are more useful in daily life have been easy by the Android development tools which provide easier way for creating User interfaces. [2] Creation of Intents, broadcast receivers, adapters and the Internet have been introduced in android applications to make the system feasible among large number of users. Peer to peer communication, data storage. retrieval and sharing can be achieved in a button click through android devices.

2.3 Android Suburban Railway Ticketing: The Android Suburban Railway (ASR) ticketing is mainly to buy the suburban tickets. [5] It was one of the first mobile application where the ASR ticket can be bought in your smart phone using a QR (Quick Response) code.

2.4 A Secure Mobile Electronic Payment Architecture: There are a few payment models proposed in the literature [2], [21], which can be classified into two categories: the traditional payment model and the micropayment model. The examples of traditional payment models include the credit card platforms [5], [1], [24], [23] and the electronic cash platforms [6], [25], [8]. The traditional payment models allow only one payment in a *payment transaction*, which has been widely adopted for the event-based applications. Since a sessionbased application usually requires multiple payments during the execution of this application, with the traditional payment model, it requires multiple payment transactions to complete a session-based application. This is inefficient because heavy signaling and computational overheads are introduced into the network. On the other hand, the micropayment models allow multiple payments in a payment transaction, which is considered more efficient than the traditional payment model. Thus, the micropayment models [32], [14], [31], [27] are often adopted for most of mobile applications.

A secure trading model named *Mobile Electronic Payment (MEP)* for wireless mobile networks, which applies the emerging ID-based cryptography for key agreement and authentication is used. Our MEP attempts to alleviate the computational cost, reduce the memory space requirement in mobile devices, and meet the requirements for secure trading: avoidance of overspending and double spending, fairness, user anonymity and privacy. [9]

III. UTILITY BILL PAYMENT MOBILE APPLICATION:

Some states in India have developed the electricity bill payment mobile application. But Bill history and complaint submission options are not available in these mobile applications. [8]

Our model proposes a system which will be feasible than website payment and the all other previous applications. Moreover it provides convenience, speed and ease of use. We can also access and collect data whilst offline. The mobile app automatically synchronizes data in the background and stores it on the device, so that users can access data in the app even without connectivity. Bill Payment is done securely. It also displays the previous bill history and allows the user to lodge complaints to the electricity board within an arm's reach. Sociological factors play a role in the choice of communication channels, methods, and overall effectiveness of any system. Social media and new technologies have been explored for their benefits to citizens and governments to improve services and communications [11].

3.1 OBJECTIVE OF THE MOBILE APPLICATION: We develop an android application to overcome all the problems slated above. The user registers himself into the application by providing his EB consumer number. Once registered a confirmation mail is sent to his email id. The registered user can pay his electricity bill via credit/debit card or net banking. The user can also view his previous bill history and number of units consumed. The general complaints can be lodged via the same mobile application.

IV. SCOPE OF THE MOBILE APPLICATION

Our application saves time and energy by allowing the users to pay electricity bills by staying at home or anywhere itself. It is secure and reliable as every user uses their unique EB consumer id and payment is securely done via net banking or credit/debit card. Complaints can be lodged via a single tap in the mobile application to the Tamil Nadu Electricity Board.

V. MODULES IN PROPOSED ANDROID APPLICATION

The admin has the rights to maintain all user records, EB bill accounts and complaints. He can add the customer as new customer is added in the electricity board. He also displays the paid and unpaid bill details along with the previous bill history.

The Users are the consumers of TNEB for whose feasibility the application is developed. The user Registers for the first time which is authenticated by the admin. This leads to account creation. The user can pay his bills securely through the mobile payment gateway of his respective bank. Net banking, credit and debit card options are available for easy transaction of monetary funds via the mobile application.

VI. THE MOBILE ELECTRONIC PAYMENT PLATFORM

In this section, we present the MEP platform which follows the general trading model. When a new user **U** or a mobile application/content provider **P** joins the MEP, the Key Distribution procedure (to be elaborated later) is executed to distribute **U** or **P** public-private key pairs denoted as ($k_{pub,u}$, $k_{pri,u}$) or ($k_{pub,p}$, $k_{pri,p}$), respectively. Then, **U** can purchase a mobile application from **P** by running a payment transaction. In a payment transaction, the signaling messages exchanged among **O**, **U**, and **P** are encrypted using three symmetric keys k_{u-o} (held by **O** and **U**), k_{o-p} (held by **O** and **P**), and k_{u-p} (held by **U** and **P**). The three symmetric keys are updated (by utilizing the public-private key pairs) at the beginning of every payment transaction. A payment transaction consists of three phases, the Withdrawal phase (where **U** obtains te tokens from **O**), the Payment phase (where **U** uses the tokes to purchase a mobile application from **P**), and the Deposit phase (where **P** redeems the obtained tokens from **O**). [12]

The Dbt algorithm is used is to operate on databases containing transactions Each transaction is seen as a set of items (an *itemset*). Given a threshold c, the Dbt algorithm identifies the item sets which are subsets of at least C transactions in the database. Dbt uses a "bottom up" approach, where frequent subsets are extended one item at a time (a step known as *candidate generation*), and groups of candidates are tested against the data. The algorithm terminates when no further successful extensions are found. Dbt uses breadth-first search and a Hash tree structure to count candidate item sets efficiently. It generates candidate item sets of length k from item sets of length $k-1$. Then it prunes the candidates which have an infrequent sub pattern. According to the downward closure lemma, the candidate set contains all frequent k-length item sets. After that, it scans the transaction database to determine frequent item sets among the candidates. The pseudo code for the algorithm is given below for a transaction database T, and a support threshold of ϵ. Usual set theoretic notation is employed, though note that T is a multiset. C_k is the candidate set for level k. At each step, the algorithm is

assumed to generate the candidate sets from the large item sets of the preceding level, heeding the downward closure lemma. $count[c]$ accesses a field of the data structure that represents candidate set C, which is initially assumed to be zero. Many details are omitted below, usually the most important part of the implementation is the data structure used for storing the candidate sets, and counting their frequencies.

Dbt(T, Є)

$L_1 \leftarrow$ {large 1 - itemsets}

$k \leftarrow 2$

while $L_{k-1} \neq ø$

$C_k \leftarrow \{ a \cup \{b\} \mid a \in L_{k-1} \wedge b \quad \in \cup L_{k-1} \wedge b \notin a\}$

for transactions t Є T

$C_t \leftarrow \{c \mid c \in C_k \wedge c \subseteq t \}$

for candidates c Є C_t

count[c]←count[c]≥Є}

$L_k \leftarrow \{ c \mid c \in C_k \wedge count[c] \geq Є \}$

$k \leftarrow k+1$

return $\bigcup_k L_k$

In addition to this the user can also view the detailed list of his previous bill history of all the paid bills. He can also lodge complaints to the Tamil Nadu Electricity Board by entering his specified consumer number and complaint.

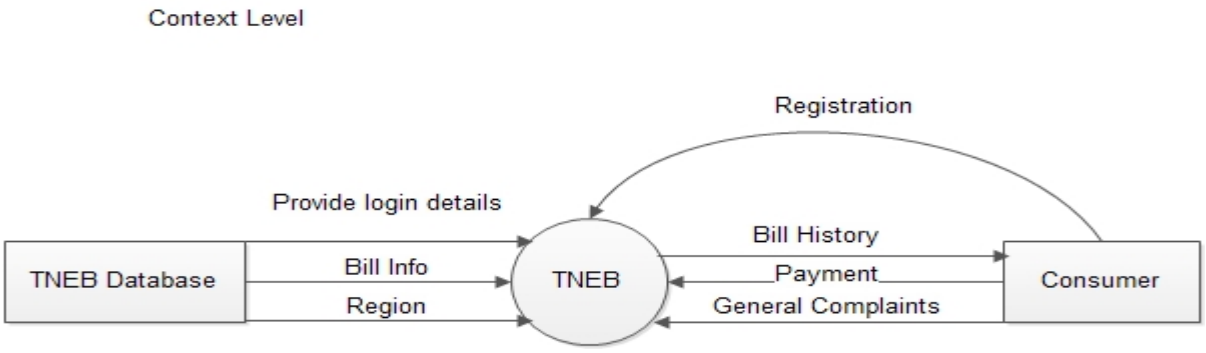

Figure 1: Context Level Diagram

Figure 1 shows the functionality of the entire system in the single context diagram. The consumer can register/login via the mobile application. After successful registration the consumer can pay bill, view previous bill history and also lodge his general complaints via the mobile application. All the consumer details are managed in the backend by the administrator.

The overall system architecture diagram is shown in figure 3. Any user can register in this mobile application can thereafter login to perform the desired operation. This eases the overhead of going to the electricity board in person and pay bill. It is also handy and useful since it helps us to pay bill instantly.

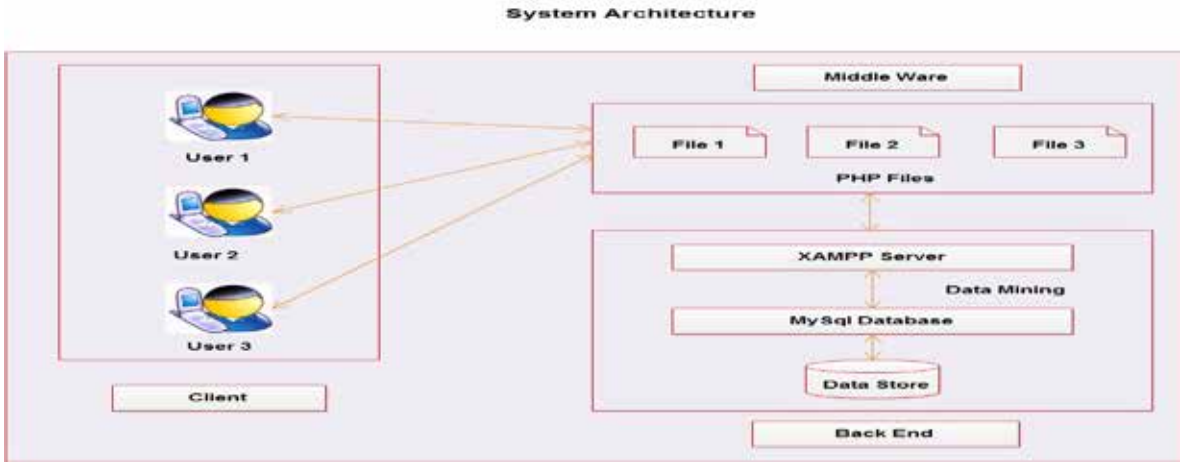

Figure 2: System Architecture

VII. EXPERIMENTAL RESULTS

Personal Communication Services refers to a wide variety of wireless access and personal Mobility Services provided through a smaller terminal with the goal of enabling communication with a person at any time, at any place, and in any form. [15] Usage of Mobile Application designed to run in smart phones also continuously expanding and providing best mobility services. Hence our application will be more useful for all the consumers. The step by step flow of each and every phase is explained in the following figure 3. The experimental results include the registration phase and login. After which the consumer can pay his bill instantly and also additionally view his bill history and lodge general complaints to the electricity board.

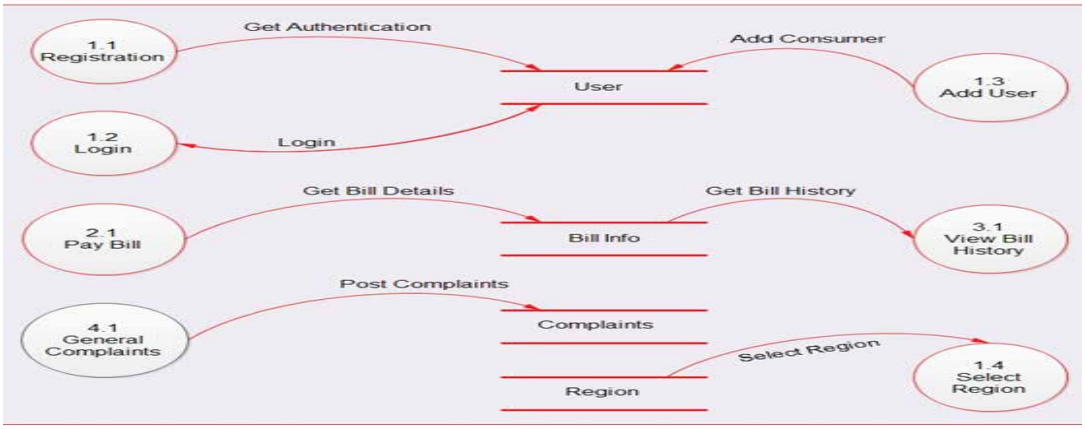

Figure 3: It shows a detail flow of each and every entity. The systematic flow in each step in shown.

With the rapid development of the wireless internet and mobile computing, more and more mobile-based services penetrate in business and personal life. We expect that our mobile payment application will provide a viable trading model for the future mobile applications and play an important role in the emerging m-commerce industries.

VIII CONCLUSION

This research focuses on the design and the integration of an optimized method for developing a bill payment application. Our thorough analysis suggests Android offers developers the ability to build extremely rich and innovative applications with a rich set of User Interfaces which will be useful to enormous number of people who will be benefitted at an arm's reach. Apart from the overheads of displaying the tariff units by using Power meter billing, Electricity bill payment mobile application has greater advantage and greater efficiency.

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