

**Third International Conference  
on  
Computational Intelligence  
& Communication Technologies**

*CICT-20*

**Edited By  
Dr. Abhinav Juneja & Dr. Vishal Jain**





# **Proceedings**

**Of**

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Intelligence & Communication Technologies**

**CICT-20**

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Sonepat, India

**Editor(s)**

**Dr. Abhinav Juneja  
Dr Vishal Jain**

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**B.M. INSTITUTE OF ENGINEERING & TECHNOLOGY**

Bahalgarh Road, Behind Fazilpur Power Sub Station, Sonepat-131001 (HARYANA)

## Table of Contents

Organizing Committee

Advisory Committee

Technical Program Committee

Message from the desk of Chairman, BMIET

Message from the desk of Founder-CEO, BMIET

Message from the desk of Deputy-Director, BMIET

Message from the desk of Principal, BMIET

## INDEX

Paper ID	Session	Name	Title
116	S1	Rasleen Kaur, Abhishek Bansal, Vikas Kuchhal	Accident Detection And Prediction With Notification Alert System
119	S1	Abhay Rana, Nikhil Sharma, Tarun Nagar, Vikas Kuchhal	Automated Teller Machine Fraud Prevention
121	S1	Gagandeep Kaur Suri, Anurag, Ayush, Ashima Arya	Criminal Suspect Prediction Software Using Data
127	S1	Varchasvi Pandey, Hema Arora, Meenakshi Aggarwal	Fair And Square Online Gaming Platform Built On Javascript- A Review
148	S1	Shivani Bhargava, Sneha Sarkar, Yashika, Pardeep Tyagi	Speech To Text Voice Recognition E-mail System for Blind
125	S1	Dr Harish Mittal, Divya , Niyati	Power of Mobile Cloud Computing
118	S1	Gurminder Kaur, Vivek Pandey, Naresh Negi, Aman Gupta	Automated Face Recognition Based Attendance App
161	S1	Radhika Kundra, Parul , Simran, Ms. Bhawna	Traffic Rules Violation Detection With Computer Vision
122	S2	Banmeet Singh Kohli, Manpreet Singh, Harvinder Singh, Bhawna	Data Security In Cloud
142	S2	Priyanka Gupta, Aarushi, Yashasvi Singh, Shikha Arora	Student Education Guidance
136	S2	Dr Sapna Juneja, Alankriti Sharma, Amisha Kalra	Online Banking And Security
149	S2	Shradha Awasthi, Priyanka Kumari, Bhawna	Voice Controlled Home Automation System
150	S2	Rajat Mehta, Dr. Vishal Jain	Smart Fit : A Leap In Human Fitness
145	S2	Dr. Vishal Jain	The Internet Of Energy: Predictive Maintenance With Big Data In Improving Power Industry
123	S2	Vatsala Sharma, Sukreeti, Mansi Agarwal	Design And Development Of Agrobot Using Arduino
138	S2	Pardeep Tyagi, Kunal, Baljit Kaur, Sumit Paropkari	Secured Smart Home Using IoT
156	S2	Nitin, Sudhir, Sonika	Security: A Big Challenge in Internet of Things

151	S2	Shilpi Saxena, Sandhya Pal	The Internet Of Things And Revolutionaize Laboratory Practice
131	S3	Vatsala Sharma, Kamal Nayanam, Mansi Agarwal	Literature Review Of Advances In Microstrip Patch Antenna
124	S3	Ravinder Kumar, Himani Tomar, Sakshi	Design And Development Of Complementary Split Ring Resonator For Ism Band Operation
146	S3	Dr. Anita Dahiya, Ms. Babita Antil	Theorems In Generalized Metric Spaces
162	S3	Shashibala Agarwal, Dr. Maria Jamal, Dr. Parmod Kr.	Propagation Of Neuronal Signal Under Physiological Stress
163	S3	Kritish Kumar, Akshay Verma, Ankit Srivastava, Rohit Anand	Advanced System For Transport Management And Challan Detection
152	S3	Shilpi Saxena, Navtresh Batra	A Review Of Renewable Resources And Future Aspects
140	S3	Sandeep Singh, Dr. Umesh Gupta	Solar And Peltiers Plate Based Hybrid Power Generation
141	S3	Dr. Ankit Bansal, Dr. Umesh Gupta, Mohit Kumar Agrawal	Solar Technology Using Artificial Intelligence Methods
111	S3	Pardeep Kumar, Aakash Dhall, Alok, Ajay Yadav	A Review On Ocean Energy Harvesting And Its Impact On Marine Life
144	S1	Ramandeep Bawa, Dr. Kavita Aggarwal	The Influence Of Cultural Factors On Consumer Buying Behaviour In Tricity
160	S1	Kanika Budhiraja, Dr. Meenu Gupta	Household And Family Perspective - Determinants Of Sustainable Consumption & Development"
132	S4	Vineet Kumar, Dr. Umesh Gupta	Mechanical Scheduling Using Artificial Intelligence
120	S4	Rajesh Kumar, Ajay Partap Singh	Computational Analysis Of The Effects Of Elastic Foundations On Fgm Composite Cylindrical Shell Panel With Random Material Properties For Post Buckling And Thermomechanical Loading
157	S4	Pardeep Kumar, Hemant Upadhyay, Ajay Kumar, Rajnesh Kumar	Evaluation Of Optimum Surface Roughness During Turning Of Aisi 316L Implant Material Using Cbn Tool
139	S4	Annu Dhankhar, Arsh Bir Singh, Sahib Singh	Sixth Sense- Using Arduino, Speech Recognition And Android Application
158	S4	Amarender Kadian	E-Commerce In Construction Industry

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**Rajiv Jain**  
Chairman



## MESSAGE

I am happy to note that B.M. Institute of Engineering & Technology, Sonapat is organizing its Third International Conference on Computational Intelligence & Communication Technologies (CICT-20) on 29<sup>th</sup> June 20.

The conference provides a stage for the academicians and researchers to discuss the latest developments in the field of Computational Intelligence & Communication.

My hearty greetings to the faculty members of the Institute, for organizing an International Conference on an important topic of academic interest. My best wishes for the successful conduct of the Conference.

**Rajiv Jain**

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Bahalgarh Road, Behind Fazilpur Power Sub Station, Sonapat-131001 (HARYANA)

Tel: 0130-2236911-14, Website: [www.bmiet.net](http://www.bmiet.net) E-mail [director@bmiet.net](mailto:director@bmiet.net)





**Rakesh Kuchhal**  
FOUNDER-CEO



## **MESSAGE**

I am immensely happy to learn that the Institute is organizing its Third International Conference on Computational Intelligence & Communication Technologies (CICT-20) on 29<sup>th</sup> June 20. and a souvenir is being brought to commemorate this occasion.

I sincerely hope that CICT-2020 is going to deliberate upon several important topics during the conference which will be of importance to the nation and will enhance the quality of academic and professional research. I am sure that the Institute will keep on contributing more effectively in order to promote academic research.

I convey my best wishes for the success of the conference.

**Rakesh Kuchhal**

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Bahalgarh Road, Behind Fazilpur Power Sub Station, Sonapat-131001 (HARYANA)

Tel: 0130-2236911-14, Website: [www.bmiet.net](http://www.bmiet.net) E-mail [director@bmiet.net](mailto:director@bmiet.net)



**Lt. Col Yogesh Jain**  
DEPUTY. DIRECTOR



## **MESSAGE**

I am glad to note that B.M Institute of Engineering and Technology, Sonapat is organizing its Third International Conference on Computational Intelligence and Communication Technologies (CICT-20) on 29th June 2020 on the Institute campus. Computational Intelligence is the thrust area of all sciences and has become an indispensable tool in solving the problems of Engineering and Technology. The Conference will bring like-minded individuals on one platform to discuss new challenges and trends in field of research. I am sure that the deliberations will enrich academic wisdom of the participants to enable exploration of new domains of applications in CICT-20. I hope that the delegates will have an enjoyable and fruitful stay in the BMIET campus. I wish the Conference a grand success.

**Yogesh Jain**

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Bahalgarh Road, Behind Fazilpur Power Sub Station, Sonapat-131001 (HARYANA) Tel: 0130-2236911-14, Website: [www.bmiet.net](http://www.bmiet.net) E-mail [director@bmiet.net](mailto:director@bmiet.net)



**Dr. Harish Mittal**  
PRINCIPAL



## **MESSAGE**

I am indeed most delighted to be given the opportunity to chair our Third International Conference on Computational Intelligence and Communication Technologies (CICT-2020).

As Program chairman of this event, I hope to bring together a good programme that stimulates knowledge and scientific intellect. A holistic and interactive approach has been employed in planning the Conference in which we shall discuss the latest developments in the field of Computational Intelligence and Communication Technologies.

The review process was a daunting challenge for the Program Committee. Based on the received review reports, acceptance rate was around 30%. Specifically, the program covers important aspects of Wired and Wireless Communications, Simulation & Modeling of Communication Systems, Computer Vision & Image Processing, Cloud Computing, IOT, Artificial, Biological and Bio-Inspired Intelligence, Antennas and Propagation and Control Systems.

On behalf of the organizing committee, I would like to extend a warm invitation to all the participants who have contributed in this Conference.

**Dr. Harish Mittal**

Bahalgarh Road, Behind Fazilpur Power Sub Station, Sonapat-131001 (HARYANA)

Tel: 0130-2236911-14, Website: [www.bmiet.net](http://www.bmiet.net) E-mail [director@bmiet.net](mailto:director@bmiet.net)

# Accident Detection and Prediction with Notification Alert System

Rasleen Kaur  
Student, B.Tech CSE Dept.  
BMIET  
Sonipat, India  
rasleen0209@gmail.com

Abhishek Bansal  
Student, B.Tech CSE Dept.  
BMIET  
Sonipat, India  
abhishekbansal005@gmail.com

Vikas Kuchhal  
Associate professor, CSE Dept.  
BMIET  
Sonipat, India  
vikas.kuchhal@gmail.com

**Abstract-** Road accidents are without a doubt the most incessant and lethal happenings across the nation. Every year, a huge number of individuals lose their lives and the same number or more face extreme wounds. Expanded monetary advancement has brought an expansion in the vehicle division in the nation. This led to a huge increase in street traffic and 'speed', which is one of the fundamental reasons for vehicle accidents. Drivers with different records of street petty criminal offenses, for example speeding, driving affected by liquor and utilizing cell phones while driving, have been considered as a high hazard bunch for conceivable association in street mishaps. Subsequently, Early identification of a mishappening can spare lives, gives snappier street openings, subsequently diminishes sat around idly and assets, and builds effectiveness. Right now, we propose a starter continuous self-ruling accident recognition framework dependent on computational insight procedures, that will help foreseeing the street accident that can happen, by investigating the scenes over the CCTV cameras and help the specialists to focus on not so much secure but rather more inclined regions, and thus will diminish traffic accidents happening in region.

**Keywords**—Traffic flow, accident detection, intelligent transportation systems, accident Prediction system, neural networks, tensorflow object detection , computational intelligence, machine learning

## I. INTRODUCTION

Disturbance of ordinary traffic streams brings about squandered time, higher fuel expenses and lost profitability. Authorities are working around the clock to complete the standard support exercises as quickly as conceivable to keep the streets open and give safe traffic streams. In the interim, auto collisions are among the most important causes that upset the ordinary traffic flow. Preventing a mishap is important, anyway, it is very difficult to give a mishap-free road vehicle transportation framework. Even though it may not be possible to maintain a strategic distance from mishaps inside and out, early recognition of and reaction to mishaps are significant in sparing lives and reducing mishap related expenses. This paper means to provide such a framework where ongoing traffic-stream information is monitored and the event of mishaps is anticipated before any official

accident warning lands from the scene. for example, help regional authorities to dispatch crisis groups to prospective clumsy zones, forestall mishaps by taking extra-measures, oversee costs effectively, and be well prepared for future occasions by and large.

After this section, the remainder of the paper is as per the following. In Section 2, the related examinations concerning the traffic stream, car crash recognition utilizing distinctive approaches, methodologies are given. The information, area and huge information preparing strategies utilized right now clarified in Section 3 followed by Section 4 that gives the information examination and highlights extraction subtleties. Our Accident Detection and Prediction system will work on such an algorithm that can analyse the collision of vehicles and accidents, over the CCTV cameras, and in turn predict the areas that are prone to such mishappenings and also, the likelihood of the occurrence of an accident.

We have included:

- A. Tensorflow object Detection API (object detection)
- B. Socket.io (for real time communication)
- C. Node.js (server side programming)
- D. Prediction Models

## II. PREVIOUS WORK

There has been a lot of research about traffic and transportation frameworks; anyway a large portion of them are focused on foundation advancement and improvements on physical foundations. Then a few investigations center around some specific keen transportation framework segments, for example, the subjects of mishap avoidance, traffic stream estimation, occasion location, course enhancement, and so on. These previously mentioned examinations are for the most of our anxiety.

In one investigation, Lee focused on breaking down traffic information quality gathered through different street sensors and watched the challenges of getting mistake free, dependable information [9]. He gave strategies to recognizing a portion of these mistakes and tried these

models utilizing genuine information. Wang recommended utilizing Street Traffic Microwave Sensors (RTMS) for progressively solid traffic information for Traffic Management Systems and secured a few models that are being utilized in Ontario [17]. Bosses et al [12] broke down an early traffic occasion location framework called COMPASS, actualized in the Toronto region, which depended on calculations utilizing thickness, street inhabitants and speed planning to recognize oddities from the information. Feng et al [5] utilized comparable information to compute the normal outing time utilizing Bayes model. Pascale et al [13] focused on street limit estimations and recommended techniques to build effectiveness. Vehicle Ad Hoc Networks are additionally utilized in rush hour gridlock information assortment models [8], [19], [20], yet keeping up the correspondence and information feed isn't simple under various street conditions. Scientists additionally study traffic stream and occasion/mishap recognition. Baiocchi et al [2] recommended a traffic stream estimation framework utilizing GPS information and got victories. In a comparable report Terroso-Saenz et al [16] assessed the stream thickness. Hojati et al [6] gave a model to evaluating the outperformed time interim between the event of a mishap also, clearing it relying upon various street conditions and foundation contrasts. Computational insight systems have likewise been a piece of a portion of the proposed frameworks for traffic stream estimation, mishap identification, and so forth. Neural systems [4], [11], [18], Support Vector Machines [10], [15] and Hidden Markov Model [1] are utilized in these investigations. The principle inspiration for this approach is to have the option to give a continuous traffic observing framework that can recognize mishaps following the episode so as to play it safe as ahead of schedule as could be expected under the circumstances.

### III. DESIGN AND SPECIFICATION

The following diagram represents the flow of the project pipeline with all the necessary steps followed.

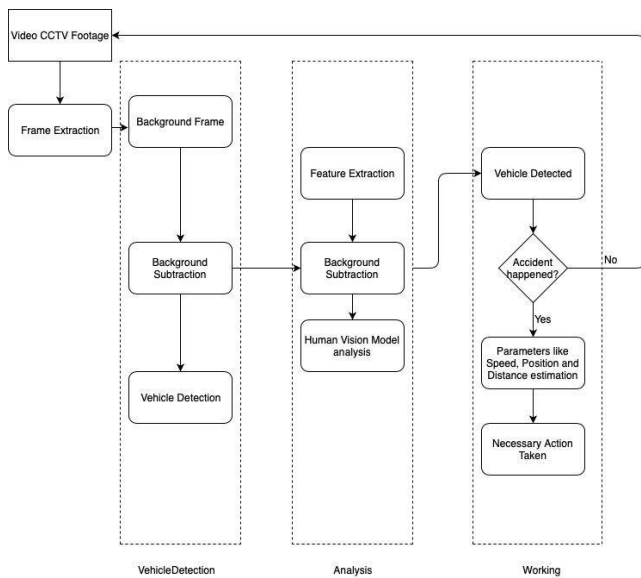


Fig1. Data flow diagram for the software.

### IV. DATA PRE PROCESSING

The data used in this study is generated using the google images and also applied some scraping algorithms in order to generate the different accident dataset suitable for the model training as per the Indian road standard. The dataset for the prediction module is taken from ARCGIS and extracted in a geo-json file. There are approximately 400 different CCTV footage that feed data throughout the city area, however to implement the preliminary version of our model, we chose to isolate the data from the footage of distinct regions with high quality cam shots. The reason for this is due to there are ill maintenance like- no traffic lights, sharp turns, stop signs, etc. on highway. Hence, our assumption was if any slowdown or stoppage is seen in the traffic, it should be due to a disruption on the road (an accident, road work, handicapped car, etc.).

The following data items are collected from the initial dataset.

- Number of cars passing from the particular road section.
- Average speed of the vehicles passing by.
- Average occupancy ratio of the lane.
- Date/Time information of the accidents in the neighborhood including the different incidents that are used in our study.

The event database has the date/time, the location, serious accident, minor accident, road work, handicapped car in the presentable report.

### V. ACCIDENT DETECTION MODEL

The Detection Module contains two major models first for collision detection and second for licence plate detection. To perform the collision we developed an algorithm such that it can first detect the cars travelling on the over the road and calculate the total surface area of the rectangle formed around them. Then it calculates the collision threshold by enumerating the areas of two rectangles of a car forming a bigger rectangle together at the time of collision. The threshold is the  $0.6 * \sqrt{\text{area of rectangle of two cars}}$  and if this threshold came out to be greater than the area of two rectangles together then we can say that these two cars had a collision since they have the overlapping planar coordinates with threshold.

For licence plate detection we used frozen\_text\_detection model to detect the number plate and pytesseract to convert the detected number plate into string. The Licence plate is detected by converting the image into monochrome and marking out the bounded rectangle plate and have text inside it with a probability rate of detection.

TensorFlow is a computational framework for building machine learning models providing different tools and toolkits to construct models at your preferred level of data

hiding. You can use lower-level APIs (like tf.estimator) to build models by defining a series of mathematical operations. Alternatively, you can use higher ones, consisting of APIs

to specify predefined architectures, such as linear regressors or neural networks.

#### A. Tensorflow object Detection API

The TensorFlow Object Detection API is an open source framework built on top of TensorFlow that makes it easy to construct, train and deploy object detection models.

We planned to feed the real-time video footage coming straight from the CCTV to our model to predict the probability of accidents. The model we used for the detection purpose is 'ssd\_mobilenet\_v1\_coco\_11\_06\_2017'. The model is fed with real time videos and images as well, and it detects the accident by the cars that are colliding into each other. Wherever an accident is detected, a rectangle is seen over the collision of the cars which depicts that an accident has occurred over there. The model accuracy has increased in case of the detection module and hence, accident detection is made possible in our project on real time systems that can be really helpful to the authorities and organisations using it.

#### B. License Plate Recognition

The license plate detection and text recognition algorithm is done using OpenCV and PyTesseract Library. The Detection algorithm helps in detecting the license plate in any kind of image, be it blurry, low light or even a high quality image. The plate's **Region of Image(ROI)** is then masked out and cropped automatically with correct dimensions and improved accuracy. The dataset for testing the license plate algorithm is then preprocessed using image thresholding algorithms and segmentation algorithms in OpenCV and using scikit-learn library of Python. The Text on the detected license plate is recognized using Tesseract-OCR, a Google API. It is easily implemented using PyTesseract API that is a wrapper library for **Tesseract Google-OCR API**.

### VI. NOTIFICATION ALERT SYSTEM

Whenever an accident takes place, a lot of time is wasted for it to be reported, so the concerned department doesn't even get to know that such a crucial incident had taken place and hence it gets unnoticed, which further blocks the road and is the major reason for traffic these days.

Alerting with the location of the accident took place and time, properly generated report, can help the Government and the concerned authorities to keep a firm check on the danger locations, as this algorithm will mark the danger prone areas and vicinities, so that authorities can pay more attention to these marked positions and hence, can take

action at the right time by providing medical aid and reducing the amount of traffic that gets accumulated after any chaos happens. Our Algorithm will help them to be informed about the accidents succumbed recently, even the authorities can install this system on their part to place a keen and firm vision on the roads to avoid nuisance.

#### A. Socket.io

After the detection of the accident, we want the authorities to get informed with the accident that has taken place along with the coordinates of the location where it happened. Socket.io is a JavaScript library for realtime web applications. It enables real time, bi-directional communication between web clients and servers. It has two parts: a client-side library that runs in the browser, and a server-side library for Node.js. Using Socket.io, we are sending a notification, live to the mobile phones of the authorities or person whose number is verified with Twilio.

#### B. Twilio

Our Accident Detection System helps the authorities to stay aware everytime and get alerted whenever the public needs their help and reach the accident locations in time!

Twilio is an API through which we are able to send notifications and alerts, just like a report in which the location of the accident, the time at which it took place is notified, also, along with the valid and correct location coordinates. Socket.io helps communicate with Twilio API and the alerts are sent to the people on their phones.

### VII. ACCIDENT PREDICTION MODEL

#### A. Objectives

The main objective of the Road Accident Prediction System: to analyze the accidents already occurring in the area which will help us to determine the most accident prone area and help us to establish the immediate necessary support for them. Making predictions based on weather, pollution, road structure etc.

#### B. Problem statement

There are many problems with current practices for the prevention of accidents occurring in areas. The database we use is officially available by many institutions and government websites. The data collected will be analyzed, integrated and grouped together based on various constraints using the most favorable algorithm. This estimate will be helpful in analyzing and identifying the causes of faults and accidents. It will also be helpful when constructing roads and bridges as a reference to avoid similar problems encountered earlier. The forecasts made will be very useful for planning the management of such problems.

#### C. Logistic Regression

Logistic regression, or most commonly, the sigmoid function, is the regression analysis and dependent upon the variables is binary numbers i.e. (0s and 1s), All regression analysis, the logistic regression is a prediction analysis, helps in contributing and predicting continuous values variables. Logistic regression is used to details about data and to graphically explain the relationship between dependent binary variable and more nominal, ordinal, interval independent variables. Sometimes logistic regressions are difficult to describe the statistics tools are easily conducted and analyze the datasets, then in others plain words are as it is displayed in the output.

#### D. Random Forest Model

Random forest, consists of a large number of individual decision trees clubbed together that operate as an ensemble and is worked on the principle of ensemble learning. Each individual tree in the random forest spits out a class prediction and the class with the most votes becomes our model's prediction. The ultimate concept behind this algorithm is simple that a large number of relatively uncorrelated models (trees) operating as a committee will outperform any of the individual constituent models, and the decision score is the average of individual scores from the tree..

### VIII. RESULTS

All models are very accurate in detecting and predicting accidents, however the number of false positives are considerably high. But, to deal with Bias-Variance tradeoff, we increase the bias for decreasing these FA false alarms, the positive recall value starts going down. The end result in predicting road accidents is to find out the percentage of accidents in a particular area. Having a low number of features helps in rapidly modifying the algorithm and increasing accuracy. The end result in predicting road accidents is to find out the percentage of accidents in a particular area. Then we apply logistic regression on these characteristics and obtain the least error. The random forest model then underwent a logistic regression model to give better accuracy.

### IX. CONCLUSION

We have demonstrated a promising approach for an Intelligent traffic accident detection and early prediction system. This can provide early response to accidents and save lives and valuable time/resources.

The preliminary results indicate that it might be possible to use such a system in real-time at the Traffic Departments. Several different computational intelligence models can be adapted and tested for early prediction.

For future work, it might be possible to add other independent features such as meteorological parameters, road topology information, relative location and/or condition of the road (direction of the sun, nearby buildings, road signs, service roads, inclination, existence of emergency lanes, etc.).

Also more analyses need to be performed on the data itself, domain experts can be involved in the careful elimination of outlier points.

Other machine algorithms can be adapted. The model can be represented as a time series problem, time warping can be used, recurrent neural network models can be implemented.

Finally, the results from a combination of different approaches can be consolidated to have better prediction performance.

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# Automated Teller Machine Fraud Prevention

Abhay Rana  
Information Technology  
B.M. Institute Of Engineering &  
Technology  
Sonepat, Haryana, India  
abhayr958@gmail.com

Nikhil Sharma  
Information Technology  
B.M. Institute Of Engineering &  
Technology  
Sonepat, Haryana, India  
nikhilsharma79491@gmail.com

Tarun Nagar  
Information Technology  
B.M. Institute Of Engineering &  
Technology  
Sonepat, Haryana, India  
tarunenrique688@gmail.com

Vikas Kuchhal  
Associate Professor CSE  
B.M. Institute Of Engineering &  
Technology  
Sonepat, Haryana, India  
vikas.kuchhal@gmail.com

**Abstract**— the purpose of this research paper is to introduce concept of OTP (one time password) in ATM transactions. In present, there is a single factor authentication in ATM i.e. using the card and pin, which not very efficient. The customer is informed through SMS after the transaction is done. SMS is the one of the offline mode of information and OTP is a secure way for two factor authentication. This research paper allows us a way to be informed each time our ATM bank account is accessed. The aim of this paper is to introduce more secure way of ATM transactions.

**Keywords**— OTP, ATM, ATM Card, Two Factor Authentication (2FA).

TABLE I. ABBREVIATIONS AND ACRONYMS

Acronyms	Words
ATM	Automated Teller Machine
OTP	One Time Password
2FA	Two Factor Authentication
PIN	Personal Identification Number
CVV	Card Verification Value

## I. INTRODUCTION

An automated teller machine is an electronic device that enable the customer of financial sector to perform financial transaction particularly cash withdrawal. On most modern ATMs, the customer is authenticated by inserting a plastic smart card with a chip in the card reader of ATM machine that contains a unique card number and some security information such as an expiration date or CVVC (CVV)<sup>[2]</sup>.

Authentication is provided by the customer entering a personal identification number (PIN). Using an ATM, customers can access their bank accounts in order to make many types of transactions such as cash withdrawals, check balance, or credit mobile phones, If the currency being withdrawn from the ATM is different from that in which the bank account is denominated the money will be converted at the current official exchange rate. Thus, ATMs often provide the best possible exchange rates.



Fig. 1. Automated Teller Machine (ATM)

Source: newbecca.com

The research of this paper is based on the fact that the ATM card details and the pin both can be hacked and the fraud can easily withdraw cash from the customer's account. The research also offers one of the ways of preventing the fraud.

## II. IMPORTANT TERMS

### A. OTP (One Time Password)

OTP is a one-time pin or dynamic password that is valid for only one login session or transaction, on a computer system or other digital device [3].



Fig. 2. OTP (One Time Password)

Source: learnmorekerala.com

### B. Two Factor Authentication (2FA)

2FA is a way to add additional security to your account. The first "factor" is your usual password that is standard for any account. The second "factor" is a verification code retrieved from an app on a mobile device or computer i.e. OTP [4].

## III. LOOPHOLE IN CURRENT ATM SYSTEM

In present system, the ATM transactions can be carried out using the ATM Card and pin, which is not much secure. If anyone has your ATM Card and know your pin, then he/she can easily empty your account. And the loophole in this system is that the customer is informed after the fraud.

Neither the customer is provided the information of fraud at that time nor does he/she have the power to stop it.



Fig. 3. ATM Fraud by cloning ATM cards

Source: economictimes.indiatimes.com

## IV. MAIN IDEA

The idea provided by this paper not only prevents the fraud, but it informs the customer whenever his/her account is accessed and also gives power to the customer to block the fraud transaction and stop the fraud. The main idea of this paper is that the customer should be provided with 2FA [1], where during second factor authentication i.e. OTP, the customer would be informed that his/her account is accessed and if it is not the customer who have accessed the account, then the customer can request the bank to block all the transactions from his/her account. Meanwhile, the transaction initiated by the fraud person will be on standby until the correct OTP is entered on the ATM screen. This helps the customer to protect his/her ATM transactions from frauds.

More features can be added to this idea, such as when the ATM machine receives the request to block the transaction and at the same time if it takes the picture through the front camera of the person doing the fraud, it would be more secure.

## V. HOW DOES THE IDEA WORKS ?

### Step. 1.

The customer inserts the ATM Card in the ATM Machine and then enters the pin.

In the current system, the customer would be directed to transaction type page, but according to the idea in this paper the next would be the following.

### Step. 2.

A page appears on the ATM Machine, which is asking to enter the OTP. And a SMS will be send to the customer's registered mobile number containing the OTP that will be valid for 2-3 minutes and the customer care number along with the warning that if it is not the customer then he/she can call the provided customer care number using the registered mobile number to block the current and further transactions.

### Step. 3.

Now if it is not the customer, i.e. the OTP is incorrect or the given time to enter the OTP is over, then a SMS would be send to the customer's mobile number that someone is accessing their account using ATM, and to secure their account or to block the further transactions they have to call the customer care number with the registered mobile number.

And if it is the customer who initiated the transaction, then after authenticating the customer will be directed to the transaction type page to use the provided options on the transaction page. And after the details

of each activity performed whether it is balance enquiry or pin change, the customer is informed of the activity through SMS.

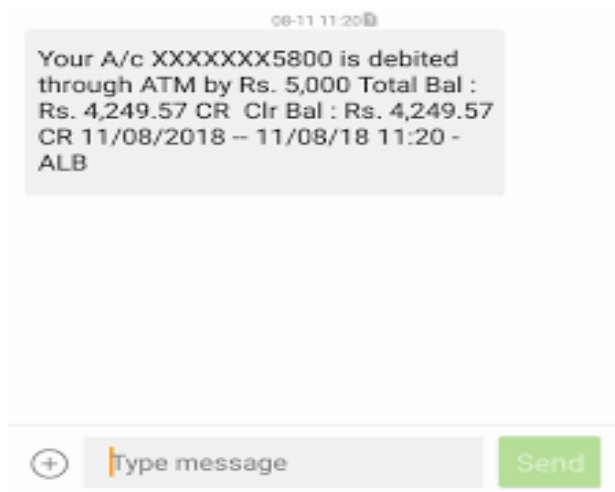


Fig. 4. Cash Withdrawal SMS  
Source: consumercomplaints.in

## VI. APPLICATIONS OF IDEA IN CURRENT

The 2FA authentication is used in various online transactions and login processes. Google uses 2FA to login into Google account, OTP verification is done for online transactions using cards. The application of 2FA is vast and very secure. Although, 2FA was not used in ATM transactions, which requires the equal security as the online transactions, until SBI Bank ATMs applied new rule from January 1, 2020 between 8 pm and 8 am that customers will receive OTP on their registered mobile number only when they withdraw cash over and above Rs 10,000. The facility not requires any major change in the present process to withdraw cash from SBI ATMs. But this rule does completely satisfy the idea in this paper.

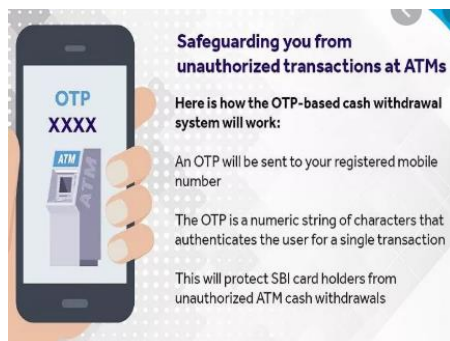


Fig. 5. SBI OTP System  
Source: telugu.news18.com

## VII. ADVANTAGES OF IDEA

1. The biggest advantage of this idea is that it increases the security of ATMs.
2. It also increases the trust of the customer on the bank.
3. It keeps the customer updated with every activity in their ATM account.
4. The customer will have more control over their ATM account.

## VIII. DISADVANTAGES OF IDEA

1. OTP increases one more step in the ATM transactions, therefore, it increases time for a transaction.
2. It also increases overhead for the banks.

## IX. CONCLUSION

The sole idea of this paper is to make the transactions more secure and increase the role of the customer in the transaction process. For this, 2FA using OTP is one is quickest and easiest option. However, there are other options, for example, fingerprint verification that are established in some ATMs, but that may not be very efficient as sometimes the fingerprints scanner would not authenticate the customer because the fingerprints are not clear due to roughness on the fingers caused by some physical work. So, in present, OTP is one of the best choices for 2FA for ATMs.

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# *Criminal Suspect Prediction Software using Data Analytics*

<sup>1</sup>Gagandeep Kaur Suri  
Student, B, Tech, CSE Dept.  
B.M. Institute of Engineering and  
Technology,  
Sonipat,India  
[surigagan842@gmail.com](mailto:surigagan842@gmail.com)

<sup>2</sup>Anurag  
Student, B, Tech, CSE Dept.  
B.M. Institute of Engineering and  
Technology,  
Sonipat,India  
[acemourya@gmail.com](mailto:acemourya@gmail.com)

<sup>3</sup>Ayush  
Student, B, Tech, CSE Dept.  
B.M. Institute of Engineering and  
Technology,  
Sonipat,India  
[ayushrajput102@gmail.com](mailto:ayushrajput102@gmail.com)

<sup>4</sup>Ashima arya  
Assistant professor,CSE Dept.  
B.M. Institute of Engineering and  
Technology,  
Sonipat,India  
[ashiarya@gmail.com](mailto:ashiarya@gmail.com)

*Abstract—The goal and the objective of this project is to predict the criminal suspects for a crime committed as well as to identify where the crime can take place by analyzing criminal records and finding criminal hotspots. Investigations in India regarding larceny are very futile in nature and seldom result in apprehension of the criminal. Our software is for police officials to lead their investigation effectively and work towards capturing the unrighteous using data analytics thereby uncovering theft and criminal trends. Such trends lead to uncovering dimensions for an investigation which are difficult to recognize through manual inspection techniques. Such software is not only helpful for the police for effective and smart work in case of low-profile crimes but also the increase in arrests for larceny would ultimately lead to low crime rate and a lawful society. The inclusion of technology through the use of such software for police work in the hope of reduction in crime rate is a progressive step forward for Digital India.*

*Keywords—prediction, investigation, crime, technology, India.*

## I. INTRODUCTION

In the previous years, an expanding number of police powers the world over have received programming that utilizes measurable information to manage their basic leadership: prescient policing. This methodology implies that police divisions examine measurable noteworthy information to anticipate in what geographic regions there is an expanded possibility of crime. This kind of data can be utilized by law authorities to effectively convey their assets to forestall criminal conduct [2]. Prescient policing doesn't supplant customary policing techniques (for example issue situated policing, insight drove policing or hotspot policing) yet upgrades these customary practices by applying progressed factual models and calculations [1]. The utilization of factual models can be of huge incentive for decreasing wrongdoing and guaranteeing the security in urban areas. To give a definition, Prescient policing is the assortment and investigation of information about past wrongdoings for recognizable

proof and factual expectation of people or geospatial zones with an expanded likelihood of crime to help create policing intercession and avoidance techniques and strategies.

The undertaking targets discovering plausible suspects for a functioning criminal examination for little scale wrongdoings in regards to larceny (Larceny is a wrongdoing including the unlawful taking of the individual property of someone else or business). This is finished by investigating past criminal records of the wrongdoing indicated, the subtleties of the wrongdoing including the day and date of wrongdoing, group and condition of the district during the hour of wrongdoing, sex and age of the person in question and parts of the like.

The main key component of prescient policing is the use of a wide assortment of information. There is general understanding that prescient policing is principally busy with clear investigation that have the expect to uncover and comprehend wrongdoing patterns by preparing a wide assortment of (un)unstructured information. Conceivably this could help law implementers in their vital and strategic arranging and how they can adequately send their assets. For sure, it is contended that this kind of policing technique utilizes information mining strategies to gather information that can help in the basic leadership of law requirement organizations. This demonstrates all information is pertinent, though the customary policing strategies just depend on criminal information.

A subsequent key component of prescient policing is the association with pre-emptive policing, which is the idea that law authorities act before crimes occur to keep wrongdoing from happening [3]. It is contended that prescient policing can be viewed as a type of pre-emptive policing that is for the most part relied upon factual information. Thus, law implementers should work with different entertainers in the public arena to remove factors that cause criminal conduct: security becomes co-creation. This is a hypothetical proviso,

nonetheless, as meager writing contend how prescient policing can use in a way that forestalls crime by removing factors that cause it, in the soul of upstream avoidance.

The primary change that this venture highlights is the part of Geographic area being vital to locate the plausible criminal suspects as about precise as could reasonably be expected. Geographic data instruments show, store, oversee, and examine geospatial information and related data. These apparatuses are key segments in the developing study of prescient policing, which consolidates wrongdoing mapping, factual examination, and law requirement skill to give estimates of where and when violations will doubtlessly happen. Given the budgetary requirements of many police offices, prescient policing programming arrangements may serve to build police adequacy and at last diminish wrongdoing by assisting with controlling the key organization of officials in the field.

Crime examiners have since quite a while ago utilized GI mapping programming for:

- Plotting and envisioning the areas of unlawful exercises
- Identifying wrongdoing designs
- Assisting with planning procedures for distinguishing suspects, sending officials, and making captures.

As of late, this training has been expanded by the presentation of an increasingly logical way to deal with wrongdoing battling regularly alluded to as prescient policing. The objective of prescient policing is to apply factual displaying systems to wrongdoing and non-wrongdoing information, for example, climate and time of day, so as to decide the hidden causes or patterns of criminal conduct and utilize this data in future wrongdoing battling endeavors and investigation. With this methodology, law implementation organizations might have the option to forestall wrongdoing just as increment efficiencies.

## II. LITERATURE REVIEW

Albert Meijer and Martijn Wessels (2019), "Predictive Policing: Review of Benefits and Drawbacks" This writing audit enlightens the conceptualization of prescient policing, and furthermore it's latent capacity and acknowledged advantages and downsides. The audit shows a disparity between the impressive consideration for potential advantages and disadvantages of prescient policing in the writing, and the exact proof that is accessible. The observational proof offers little help for the guaranteed advantages of prescient policing. While some observational examinations reason that prescient policing methodologies lead to abatement in wrongdoing, others discover no impact.

Vikas Grover, Richard Adderley and Max Bramer(2016), "Current Crime Prediction Techniques"

Police inspectors are required to unroll problems in information to help operational workforce in capturing guilty parties and coordinating wrongdoing avoidance procedures.. This paper analyzes the present methods that are utilized to foresee wrongdoing and culpability. They are packed into three classes: factual strategies, these chiefly identify with the excursion to wrongdoing, period of culpable and culpable conduct; methods utilizing topographical data frameworks that distinguish wrongdoing problem areas, rehash exploitation, wrongdoing attractors and wrongdoing generators; a different gathering which incorporates AI systems to recognize designs in criminal conduct and studies including reoffending.

Mohler, G. O. et. al.(2015), "Randomized Controlled Field Trials of Predictive Policing" The centralization of police assets in stable wrongdoing hotspots has demonstrated viable in decreasing wrongdoing, however the degree to which police can upset progressively changing wrongdoing hotspots is obscure.

Kump, P. et. al. (2016), "Measurement of repeat effects in Chicago's criminal social network" The "close rehash" impact is a notable criminological marvel in which the event of a wrongdoing episode offers ascend to a brief rise of wrongdoing hazard inside close physical vicinity to an underlying occurrence. Embracing an interpersonal organization point of view, the authors rather characterize a close to rehash as far as geodesic separation inside a criminal informal community, as opposed to spatial separation

Lyria Bennett Moses,(2016), "Algorithmic prediction in policing: assumptions, evaluation, and accountability" The objective of prescient policing is to gauge where and when wrongdoings will occur later on. The thought has caught the creative mind of law implementation offices around the globe. Numerous offices are acquiring programming devices with the objective of diminishing wrongdoing by mapping the imaginable areas of future wrongdoing to manage the sending of police assets.. This paper gives a survey of the hypotheses, strategies, and suppositions installed in different prescient devices and three key issues about the utilization of algorithmic expectation. Suspicions.

M. Camacho-Collados,(2015), "A Decision Support System for predictive police patrolling" A Decision Support System (DSS) can assist with upgrading viable utilization of the rare HR accessible. Right now present a DSS that union prescient policing ability with a watching districting model, for the structure of prescient watching regions. The proposed DSS, created in close cooperation with the Spanish National Police Corps (SNPC), characterizes parcels of the domain under the locale of a region that are effective and adjusted simultaneously, as indicated by the inclinations of a chief.

Inayatullah, S. (2013), "The futures of policing: Going beyond the thin blue line" proactive and predictive policing possible? Based on an examination of drivers and emerging issues related to law enforcement, this article explores the alternative futures of policing. Four scenarios are posited: (1) Policing that is unable to adapt but no one cares, (2) Policing value in question, (3)

Policing fragmented, and (4) Prevention in Policing. The essay concludes by linking general policing futures with the 'Pearls in Policing' action learning process as one way to move policing from reactive to preventive.

Walter L. Perry,(2013),”The Role of Crime Forecasting in Law Enforcement Operations” Prescient policing is the utilization of investigative strategies to distinguish promising focuses for police intercession with the objective of forestalling wrongdoing, understanding past violations, and recognizing potential guilty parties and exploited people.

Martin A Andresen,(2008),”Ambient populations and the calculation of crime rates and risk” This paper utilizes uninhibitedly accessible spatially referenced populace information, the LandScan Global Population Database, which gives an elective proportion of the populace in danger in crime percentage estimations, the surrounding populace. Determined crime percentages utilizing the private and encompassing populaces display a frail factual relationship. This gives a solid positive ramification to the utilization of this information with the end goal that their usage may give a progressively exact delineation of exploitation, especially while thinking about brutal wrongdoing

Bilal Benbouzid, (2019),”To predict and manage. Predictive policing in the United States”This article offers a point by point assessment of the substance of prescient policing applications. Wrongdoing expectation machines are utilized by governments to shape the ethical conduct of police.

### III. RATIONALE

The world is advancing at a high pace. The populace is rising; mechanical advancements are picking up energy as are episodes of wrongdoing. With an ever increasing number of individuals battling for lesser and lesser assets accessible, the crime percentage is on the ascent. In a period where innovation is driving pretty much every domain of our lives, would it be advisable for us to not bountifully utilize it to guarantee we have more secure days and evenings with lesser occurrences of wrongdoings? With a product acknowledging prescient policing models into genuine causing us to investigate better, get ready better, plan better; it is time we stretch its advantages to guaranteeing higher open security too. The present situation is empowering policing offices worldwide effectively guzzling dynamic highlights in their working with the purpose of accomplishing higher open wellbeing and speedier reaction. This results in empowering the police to accomplish 'Keen Policing'. Prescient policing utilizes information on the occasions, areas and nature of past violations, to give knowledge to police strategists concerning where, and at what times, police watches should watch, or keep up a nearness, so as to utilize assets or to have the best possibility of dissuading or forestalling future wrongdoings.

Police may likewise utilize information gathered on shootings and the hints of gunfire to recognize areas of shootings. For instance, the city of Chicago utilizes information mixed from populace mapping wrongdoing

measurements, and whether to improve checking and recognize designs.

### IV. OBJECTIVES

**To discover the wrongdoing designs:** This involves comparable violations perpetrated inside a characterized zone or area concerning subtleties of the wrongdoing as of now dedicated utilizing past various records. This prompts acknowledgment of the wrongdoing patterns which are determined or repeating examples of wrongdoing.

**To discourage crime percentage:** This incorporates utilizing the calculations and investigation from the product to endeavor to deflect wrongdoing and crooks.

### V. PROPOSED ARCHITECTURE

This section covers all the steps which are required for analyzing the suspects of a criminal and able to predict them.

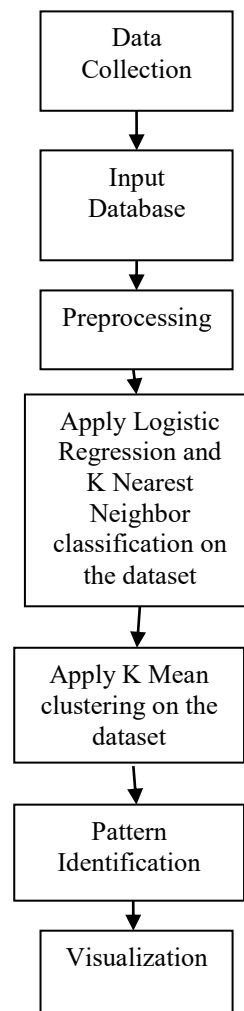


Fig 1: Flow Chart of the prediction of suspects

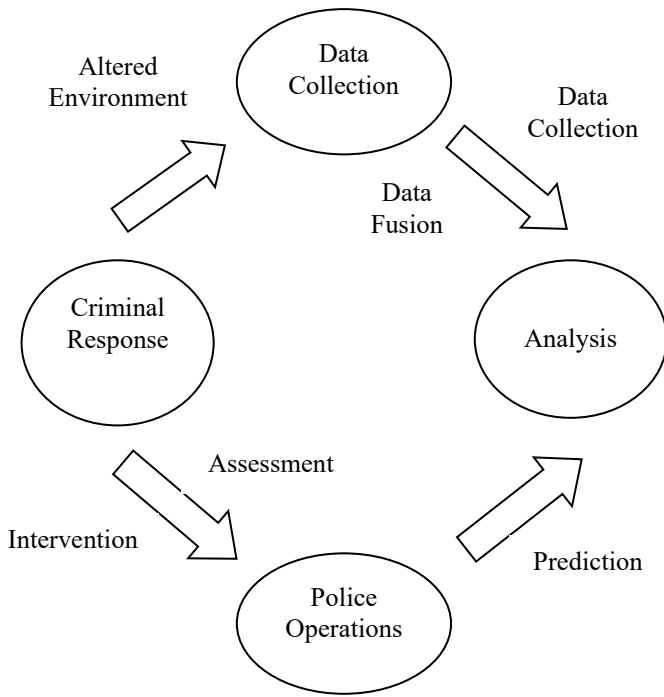


Fig 2: Architecture of Prediction System

### V. IMPLEMENTATION

The software we are developing is only for official use, which means, for police officials only. However, there still needs to be a convenient user end for inference results efficiently and getting more work done leading eventually to better investigation of numerous pending cases.

Currently, the software analyses the dataset of previous criminal records as available to the government, classified in a very specific format with carefully designed attributes. This helps in increasing the accuracy of the result of finding suspects for the crime committed.

The data will be processed using the given accurate attributes and then the K nearest neighbour and logistic algorithm will be applied on the attributes to classify the data, which further gone through the process of clustering. The clustering process includes the collection of similar or dissimilar objects, returned by the classification process and this whole clustering process is done using k-mean algorithm.

Input Design – includes getting information of the crime and its details given in Figure 3.

Fields have been carefully devised so as to get optimized results while effectively using the database.

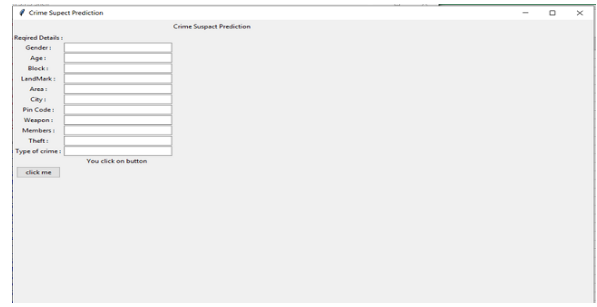


Fig 3: Input Details

### Database Design

Case ID	Address No	Name	Gender	Age	Guardian	House No	Block	Street	Landmark	Area	City	Pin Code	State	Contact	Weapon	Partner	Theft	Type
1	1001	1.2045-11	Asmit	11	Vinod	1990	D	Mulien	Asafpur	WEST	Delhi	110011	India	873489150	Knife	1	Mobile	Swag
2	1002	1.2045-11	Arunag	23	Sudash	2000	B	Raknet	Model Town	WEST	Delhi	110010	India	235454780	Gun	2	Blade	Roak
3	1003	1.2045-11	Gagan	34	Kanesh	3013	D	Guru Dwarra	Asafpur	WEST	Delhi	110011	India	234548800	Gun	5	Mobile	Roak
4	1004	1.2045-11	Kamal	45	Moham	3980	B	Muaji	Udan Nagar	WEST	Delhi	110013	India	361521280	Gun	1	Car	Swag
5	1005	1.2045-11	Sparsh	43	Sarath	4884	J	Jyoti Mandir	Model Town	WEST	Delhi	110010	India	456762187	Knife	2	Mobile	Swag
6	1006	1.2045-11	Omash	21	Abhismit	4563	A	Asafpur	WEST	MP	110011	India	324567800	Gun	1	Money	Roak	
7	1007	1.2045-11	Shubham	76	Saravathia	6754	M	Model Town	WEST	Haryana	110010	India	367564350	Knife	4	Jevelry	Swag	
8	1008	1.2045-11	Prathiv	40	Sarath	8075	F	Asafpur	WEST	Delhi	110011	India	907890007	Gun	3	Car	Muaji	
9	1009	1.2045-11	Karan Talwar	45	Saravathia	6765	G	Udan Nagar	WEST	Punjab	110013	India	235457646	Knife	6	Mobile	Roak	
10	1010	1.2045-11	Karan Gidani	9	Sarath	9876	B	Model Town	WEST	Delhi	110010	India	456789100	Gun	2	Money	Swag	
11	1011	1.2045-11	Saif	32	Sarath	9875	D	Asafpur	EAST	Punjab	110011	India	367891020	Knife	3	Jevelry	Muaji	
12	1012	1.2045-11	Rishi	13	Saravathia	4529	A	Model Town	NORTH	Delhi	110010	India	987654320	Gun	1	Blade	Roak	
13	1013	1.2045-11	Ravi	11	Saravathia	8240	H	Asafpur	SOUTH	Delhi	110011	India	987654321	Knife	2	Mobile	Swag	
14	1014	1.2045-11	Alkhayyaq	34	Saravathia	7629	D	Udan Nagar	WEST	Punjab	110013	India	446071530	Gun	2	Money	Muaji	
15	1015	1.2045-11	Ushank	30	Saravathia	6720	F	Model Town	EAST	UP	110010	India	367891000	Knife	5	Jevelry	Roak	
16	1016	1.2045-11	Abhismit	23	Saravathia	6320	L	Asafpur	NORTH	Delhi	110011	India	987654321	Gun	3	Car	Swag	
17	1017	1.2045-11	Sakhi Kamal	23	Saravathia	3034	H	Model Town	SOUTH	MP	110010	India	2412005413	Knife	4	Mobile	Muaji	
18	1018	1.2045-11	Rahul	22	Saravathia	2310	G	Asafpur	WEST	UP	110011	India	765432100	Gun	5	Money	Roak	
19	1019	1.2045-11	Rahul Singh	54	Saravathia	3000	D	Model Town	NORTH	Delhi	110010	India	367891000	Gun	1	Car	Muaji	
20	1020	1.2045-11	Bansmit	32	Saravathia	1900	K	Asafpur	SOUTH	UP	211100	India	244807400	Knife	2	Blade	Roak	
21	1021	1.2045-11	Mahipmit	21	Saravathia	5784	C	Udan Nagar	EAST	Delhi	110013	India	647101010	Knife	2	Jevelry	Swag	
22	1022	1.2045-11	Rahul Singh	54	Saravathia	3000	D	Model Town	NORTH	Delhi	110010	India	367891000	Gun	1	Car	Muaji	
23	1023	1.2045-11	Bansmit	32	Saravathia	1900	K	Asafpur	SOUTH	UP	211100	India	244807400	Knife	2	Blade	Roak	
24	1024	1.2045-11	Mahipmit	21	Saravathia	5784	C	Udan Nagar	EAST	Delhi	110013	India	647101010	Knife	2	Jevelry	Swag	
25	1025	1.2045-11	Rahul Singh	54	Saravathia	3000	D	Model Town	NORTH	Delhi	110010	India	367891000	Gun	1	Car	Muaji	
26	1026	1.2045-11	Bansmit	32	Saravathia	1900	K	Asafpur	SOUTH	UP	211100	India	244807400	Knife	2	Blade	Roak	
27	1027	1.2045-11	Mahipmit	21	Saravathia	5784	C	Udan Nagar	EAST	Delhi	110013	India	647101010	Knife	2	Jevelry	Swag	
28	1028	1.2045-11	Rahul Singh	54	Saravathia	3000	D	Model Town	NORTH	Delhi	110010	India	367891000	Gun	1	Car	Muaji	
29	1029	1.2045-11	Bansmit	32	Saravathia	1900	K	Asafpur	SOUTH	UP	211100	India	244807400	Knife	2	Blade	Roak	
30	1030	1.2045-11	Mahipmit	21	Saravathia	5784	C	Udan Nagar	EAST	Delhi	110013	India	647101010	Knife	2	Jevelry	Swag	
31	1031	1.2045-11	Rahul Singh	54	Saravathia	3000	D	Model Town	NORTH	Delhi	110010	India	367891000	Gun	1	Car	Muaji	
32	1032	1.2045-11	Bansmit	32	Saravathia	1900	K	Asafpur	SOUTH	UP	211100	India	244807400	Knife	2	Blade	Roak	
33	1033	1.2045-11	Mahipmit	21	Saravathia	5784	C	Udan Nagar	EAST	Delhi	110013	India	647101010	Knife	2	Jevelry	Swag	
34	1034	1.2045-11	Rahul Singh	54	Saravathia	3000	D	Model Town	NORTH	Delhi	110010	India	367891000	Gun	1	Car	Muaji	
35	1035	1.2045-11	Bansmit	32	Saravathia	1900	K	Asafpur	SOUTH	UP	211100	India	244807400	Knife	2	Blade	Roak	
36	1036	1.2045-11	Mahipmit	21	Saravathia	5784	C	Udan Nagar	EAST	Delhi	110013	India	647101010	Knife	2	Jevelry	Swag	
37	1037	1.2045-11	Rahul Singh	54	Saravathia	3000	D	Model Town	NORTH	Delhi	110010	India	367891000	Gun	1	Car	Muaji	
38	1038	1.2045-11	Bansmit	32	Saravathia	1900	K	Asafpur	SOUTH	UP	211100	India	244807400	Knife	2	Blade	Roak	
39	1039	1.2045-11	Mahipmit	21	Saravathia	5784	C	Udan Nagar	EAST	Delhi	110013	India	647101010	Knife	2	Jevelry	Swag	
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41	1041	1.2045-11	Bansmit	32	Saravathia	1900	K	Asafpur	SOUTH	UP	211100	India	244807400	Knife	2	Blade	Roak	
42	1042	1.2045-11	Mahipmit	21	Saravathia	5784	C	Udan Nagar	EAST	Delhi	110013	India	647101010	Knife	2	Jevelry	Swag	
43	1043	1.2045-11	Rahul Singh	54	Saravathia	3000	D	Model Town	NORTH	Delhi	110010	India	367891000	Gun	1	Car	Muaji	
44	1044	1.2045-11	Bansmit	32	Saravathia	1900	K	Asafpur	SOUTH	UP	211100	India	244807400	Knife	2	Blade	Roak	
45	1045	1.2045-11	Mahipmit	21	Saravathia	5784	C	Udan Nagar	EAST	Delhi	110013	India	647101010	Knife	2	Jevelry	Swag	
46	1046	1.2045-11	Rahul Singh	54	Saravathia	3000	D	Model Town	NORTH	Delhi	110010	India	367891000	Gun	1	Car	Muaji	
47	1047	1.2045-11	Bansmit	32	Saravathia	1900	K	Asafpur	SOUTH	UP	211100	India	244807400	Knife	2	Blade	Roak	
48	1048	1.2045-11	Mahipmit	21	Saravathia	5784	C	Udan Nagar	EAST	Delhi	110013	India	647101010	Knife	2	Jevelry	Swag	
49	1049	1.2045-11	Rahul Singh	54	Saravathia	3000	D	Model Town	NORTH	Delhi	110010	India	367891000	Gun	1	Car	Muaji	
50	1050	1.2045-11	Bansmit	32	Saravathia	1900	K	Asafpur	SOUTH	UP	211100	India	244807400	Knife	2	Blade	Roak	

Fig 4: DataBase Design

### Output Design

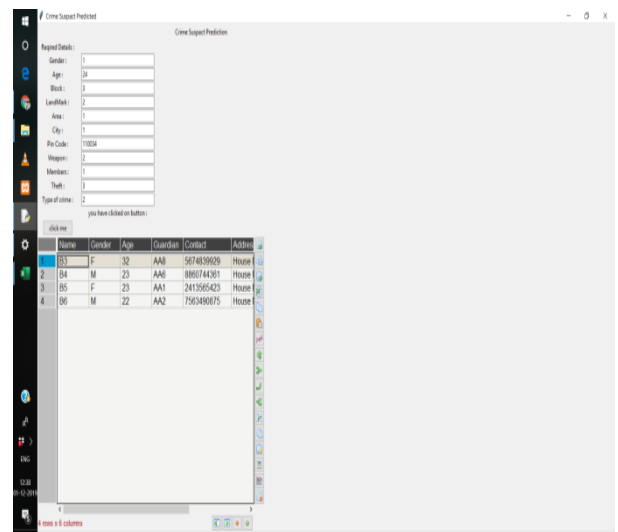
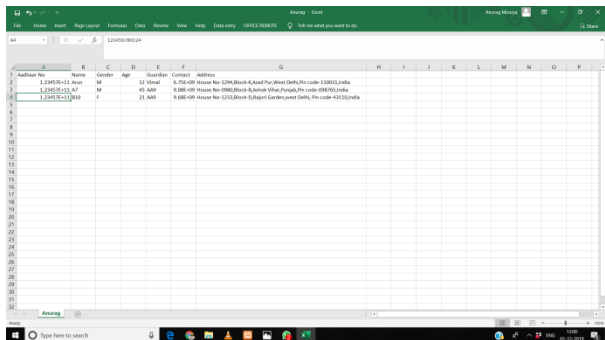


Fig 5: Output Design

## Features of the Software Include

1. Zoom In
2. Zoom Out
3. Save Table generated in CSV, Excel, etc. Format
4. Copy table to Clipboard
5. Load Excel File
6. Import .csv



Address No.	Name	Gender	Age	Quantity	Contact	Address
123456789	L. JONES	M	30	5	555-1234	12345 Main St, M, 30, 555-1234
987654321	M. SMITH	F	25	3	555-5678	98765 Main St, F, 25, 555-5678

Fig 6: Output for Suspect Prediction

Output – as seen above gives a list of predicted suspects inferred through thorough analysis of details of crime and historic criminal data.

## VII. RESULT

The software provides a technologically advanced solution to help solve low to mid level criminal investigations in regard to larceny. The software can be customized in the sense of attributes that are most suitable to finding trends of criminal activity in the specific area. Generating trends through data mining and prediction techniques is the core of the software in association with huge datasets with information of previous criminals and thus results in giving a list of possible suspects for the particular crime

## VIII. CONCLUSION

The majority of the writing operationalize prescient policing as a strategy that applies quantitative systems to anticipate in what geological zones there is an expanded possibility of criminal conduct, yet in addition which people and gatherings – through prescient profiling – are bound to be engaged with crimes. These models help to design an ideal sending of assets (for example watch courses of officials) to decrease wrongdoing most proficiently and successfully. As for the advantages of prescient policing, there are confounds distinguished in the writing. There are numerous possibilities depicted of prescient models, as it plans to diminish wrongdoing through increasingly proficient and compelling policing systems. In any case, genuine assessments of the utilization of these models practically speaking lead to blended outcomes. There is a requirement for a more grounded observational evaluation of these ways to deal

with comprehends the connection between highlights of the methodologies and accomplishment in diminishing certain types of wrongdoing. There is proof that critical thinking approaches increment network fulfillment with the police, we discovered little consistency in critical thinking policing. These examinations include subjective or correlational plans that make it hard to draw causal inductions about run of the mill effects of these methodologies. When there is more proof accessible to back-up the guaranteed advantages and downsides of prescient policing, it very well may be dispassionately decided how viable prescient policing techniques are and how they can add to the customary policing strategies. In this way, researchers are encouraged to assess diverse prescient policing models to expand our comprehension of what kind of prescient techniques appear to be productive and under which conditions. To assess the asserted disadvantages of absence of straightforwardness or responsibility, it ought to be considered how prescient models are utilized practically speaking. In the event that systems that are gotten from prescient calculations are not executed appropriately or esteemed by officials, this undermines their adequacy. Moreover, it very well may be helpful to assess to what degree there is an excessive amount of spotlight on connections rather than setbacks by law authorization offices. It will be beneficial to examine how these prescient policing models can lessen wrongdoing through counteraction rather than the controlling of geospatial territories and people. It ought to be assessed how these prescient models can be utilized to determine basic factors that lead to an expanded danger of crime.

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# Fair And Square Online Gaming Platform Built on Javascript- A Review

Varchasvi Pandey<sup>1</sup>,  
Student, CSE Dept.  
BMIET  
Sonipat, India

Hema Arora<sup>2</sup>,  
Asst.Prof. CSE Dept  
BMIET  
Sonipat, India

Meenakshi Aggarwal<sup>3</sup>  
Asst.Prof., CSE Dept  
BMIET  
Sonipat, India

**Abstract**—Online gaming is the new trend and is growing rapidly since last few years. Many organizations are getting into the development of this field by creating more and more resources and making them available on different platforms. This paper talks about the drawbacks of these already existing, trendy platforms and how Fair And Square will stand out. This application will be best for the people living in the region with limited access to the internet. It also talks about how JavaScript is used with Phaser.io to create offline-online gaming platform. This application is a progressive web application which allows user to save huge amount of storage on their mobile devices.

**Keywords**—online-gaming; drawbacks; game-development; modern-javascript; progressive-web-application

## I. INTRODUCTION

Fair And Square is a platform which is being developed to provide a competitive arcade platform to all those people who enjoy competing and comparing their gaming skills with others, all over the world. It has a simple interface made using modern UI technologies like Bootstrap. The entire platform is written in JavaScript including both frontend and the backend. The application is highly inspired by some of the popular online gaming platforms including Miniclip. Fair And Square can be considered as a minified version of these gaming giants. This application will have both web application and native application for both desktops and smartphones in the form of an executable file and PWA respectively.

This application is created in order to overcome some of the major drawbacks of the already existing gaming companies. Unlike other applications with a bunch of games, this application is an event-based platform which carries around three to four games at a time. The games will be updated iteratively according to the public poll.

The first update of the game after the global release may entirely change the way the application works by introducing React.JS. The application might get converted into a complete MERN stack-based application.

## II. TECHNOLOGIES INVOLVED

Fair And Square web application is created using some of the most popular and modern web technologies.

- **Bootstrap 4**- Bootstrap 4 is the latest version of the world-famous framework of CSS. Bootstrap is powered by JavaScript and JQuery which help them to expand its capabilities further. Bootstrap comes with pre-declared classes. Each class is responsible for performing a certain action. These classes are mostly not tag dependent. That means a button class can be applied to a simple division to make that division work as a button. Further, a developer can access some complex animations and functionalities easily with the help of a few lines of code in JavaScript or JQuery. These lines of code are simple running commands which are already declared in the framework.
- **JavaScript and JQuery**- JavaScript is one of the most powerful languages when it comes to development. JavaScript is a high-level, just-in-time compiled programming language which is natively supported by all the web browsers on the client-side by default. JQuery is a JavaScript library which increases the front-end scripting speed by a noticeable amount of time. JQuery is mainly used to make DOM manipulation simpler and quicker. JQuery is one of the most used libraries in 2019.
- **Phaser.io**- Phaser is a JavaScript based HTML 5 framework for efficiently developing 2D games. This framework supports both Canvas and WebGL rendering and can switch accordingly based on the web browser accessing the game. This support allows Phaser to work perfectly on both smartphones and desktops. Phaser.io makes use of Pixi.js library for rendering the games. Phaser provides support for various image and audio formats and comes with various in-built functions for altering and triggering them inside the game based on the event.
- **Node.js**- Node.js is a JavaScript runtime which is built on chrome's V8 engine. With the development of Node.js, developers got the option to use JavaScript at the back-end as well. Node.js works on a single-thread asynchronously which allows multiple users to access a single server at the same time while maintaining the accessing speed. This runtime for JavaScript keeps track of the latest ECMAScript versions and keeps on getting updates so that developers can use all the

features of ES next. It is primarily used as a server-side scripting language due to its cross-platform nature.

- MongoDB- MongoDB is the most popular NoSQL database which makes use of JSON- like document schema. It is used by the developers when they want to keep the database access simpler by eliminating tabular schemas and dependencies. MongoDB provides numerous functions which can be used to perform CRUD operations efficiently. It is also supported by a larger community of developers as compared to the SQL database. This technology is licensed under the Server Side Public License (SSPL).

### III. USER INTERFACE AND USER EXPERIENCE

#### A. Front-end Development

The application comes with a high-speed, menu-driven interface which is unique as-well-as easy to understand and navigate. The frontend of this application is created by heavily using Bootstrap classes. The frontend has dynamic behaviour which is created using a pinch of JQuery. A user can navigate to different sections of the application from a single landing page. A modular view is provided to fit an ample amount of information in a very little space.

Future updates of the application will be created using React which is a very powerful JavaScript framework. This will lead to a better development algorithm because it will make use of the entire MERN stack.

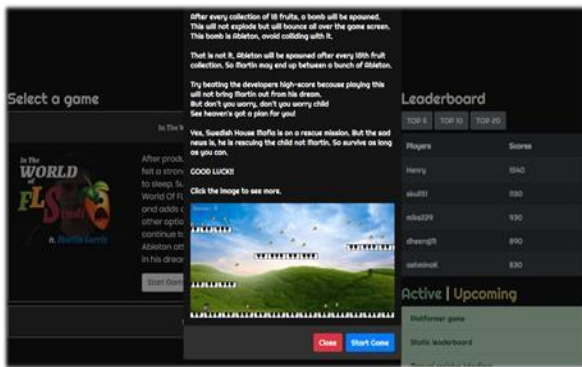


Figure 1: Fair And Square GUI

#### B. Back-end Development

The backend of the application is created using Node.JS. In order to maintain high-scalability, the use of modern, single threaded JavaScript is made so that user gets best experience. The database is created using MongoDB which is one of the most popular NoSQL databases.

The use of Express.JS is made for creating routes and connection with the database server (10). Express.JS is a Node.JS library which decreases the size of the code by a significant amount. Express.JS is considered as the major part of MERN stack as it is the E of MERN. This further allows the application to be called upgrade ready as a developer can add a ton of libraries to make complex processes like authentication and validation easier.

### IV. GAME DEVELOPMENT

Phaser.io version 3 is used and will be used for making all the games. Instead of making Java-based applications and games and linking it to a web-server and web-application, a JavaScript-based HTML 5 (5) game engine is used to code all the games. These games require a mid-ranged device with normal graphics and RAM specifications. Games are compatible with both Canvas and WebGL (6).

Game graphics including the environment, sprites and sprite sheets are all made using Adobe Photoshop. The graphics are not vectored images hence a defined screen size is required to play the games. Every pixel of the game will run fine on 1280 x 720 pixels screen or better.

Sound effects and background music of the all the games are made using Image-Line Fruity Loops Studio 12.3. These audio files are in minified mp3 format to improve game performance by reducing both game load time and assets launch time.

### V. DRAWBACKS OF OTHER PLATFORMS

Various tests were performed on some of the existing gaming web applications. Considering the tests done on Miniclip which is the top gaming web application, it was found that the application failed to load the assets when accessed from a low-speed internet connection. Although it is fine for the countries having excellent internet services, for countries like India, good internet is not that widely available.

Offline gaming is not possible on these platforms. The games are too heavy to be stored in some temporary memory and the list of games is too big to maintain. Companies like Miniclip started pushing native applications of the games that are available on their web-applications. Users were now able to play the games directly without visiting the parent web application. This also enabled offline practice mode on games. But for the users having less storage space found it difficult to install native applications on their low storage smartphones. A single native game application occupies more than a 100MB.

### VI. ARCHITECTURE TO OVERCOME DRAWBACKS

To provide a low data requirement based gaming platform, it was a good option to start the planning of the initial architecture of the application.

Instead of making games backend dependent, the games are made a part of the frontend, making them pseudo backend dependent games. Due to the lightweight of the games, all the assets and JS code files are stored along with the front end files and are accessed using simple links. This makes the use of cache memory simpler. If a user successfully loads a game using any internet connection then he or she can play the game again without even having an active internet connection. The games once loaded gets stored in the cache memory. This memory gets wiped when a device is switched off or cached memory is cleared.

Since this is a progressive web application, it allows users to make use of all the standard features while saving a huge amount of storage space on their smartphones. Once a user

creates a shortcut to the application via any modern browser by adding it to the home screen, the user will get a fully functional native application. This application can run all the games available on the server according to the event.

### VII. DATAFLOW DIAGRAMS

#### A. 0-level DFD

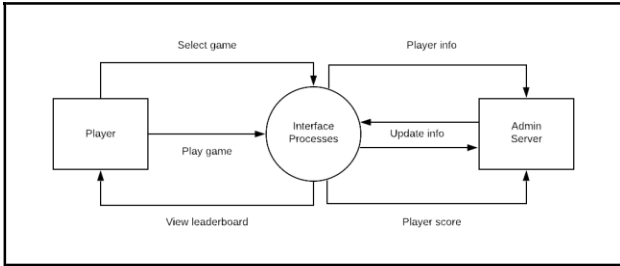


Figure 2: 0-Level DFD showing the basic routing

#### B. 1-level DFD

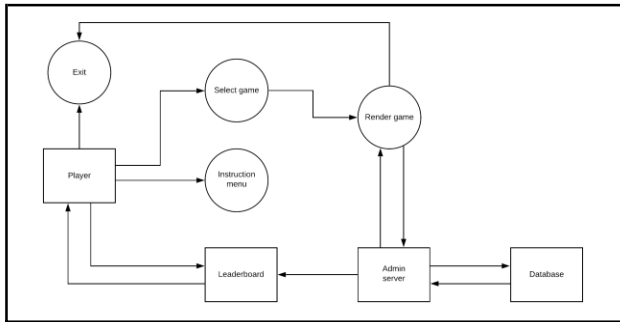


Figure 3: 1-Level DFD showing the complete routing

### VIII. FUTURE SCOPE

Gaming is one thing which is growing continuously since the past few years. This application is providing more

resources to users who find it difficult to access and enjoy online games. Since the application is user-friendly and requires minimum storage space on the user’s device.

Moreover, this application is entirely built on JavaScript which is the second most popular language in 2020 and is the most dominating web-development scripting language. Hence, we can expect only the betterment of this application in the future.

### IX. CONCLUSION

Fair And Square online gaming platform is a modern gaming solution for today’s generation. It can provide a competitive playground for those who enjoy playing games online and compete. It is developed using JavaScript which is one of the most powerful languages in 2020. The platform comes with an online application, a desktop application and an option to create a progressive web application. This gaming platform can only improve its performance, compatibility and stability over time.

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Major reference from various articles and documentations was taken in order to build different components of this application.

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# Speech To Text Voice Recognition E- mail System for Blind

Shivani Bhargava  
Computer Science Engineering  
B.M. Institute Of Engineering &  
Technology  
Sonapat, Haryana, India  
shivaniibhargava11@gmail.com

Yashika Sharma  
Computer Science Engineering  
B.M. Institute Of Engineering &  
Technology  
Sonapat, Haryana, India  
yashikasharma789@gmail.com

Sneha Sarkar  
Computer Science Engineering  
B.M. Institute Of Engineering &  
Technology  
Sonapat, Haryana, India  
sarkarsneha740@gmail.com

Pardeep Tyagi  
Associate Professor CSE  
B.M. Institute Of Engineering &  
Technology  
Sonapat, Haryana, India  
Tyagipardeep308@gmail.com

**Abstract**—today the internet has become one of the basic using everywhere. Our daily life depends on checking messages, Email, and various social networking. E-mail is one of the main components that used daily even for the official used. Every human being is widely accessing knowledge and information through the internet. However, blind people face difficulties in accessing these text materials, also in using any service provided through the internet. The advancement in computer-based accessible systems has opened up many avenues for the visually impaired across the globe in a wide way.

**Keywords**—voice email; blind person; text-speech; speech-text; E-mail

Table 1. Abbreviations and Acronyms

Acronyms	Words
SMTP	Simple Mail Transfer Protocol
GUI	Graphical User Interface
API	Application program interface
gTTS	Google Text-to-Speech

## I. INTRODUCTION

We have seen that the Internet has dramatically changed and used a daily basis. We all know the importance of the internet and their usage also increases every day for normal people it is easy and

convenient to use but if we are talking about a differently-abled person it becomes difficult. But in our project, we are talking about visually impaired. One of the main fields that the Internet has revolutionized is communication. And talking about communication over the Internet, the first thing that comes in our mind is E-mail. E-mails are considered to be the most reliable way of communication over the Internet, for sending or receiving some important information. But there are special criteria for humans to access the Internet and the criteria is you must be able to see [4]. In our system, we connect it to the G-mail user need to open the simple GUI and just click. By simple voice command, it works and sends the email. You just need to say your message which converts voice to text and sends it to the receiver.

## II. VOICE BASED EMAIL SYATEM

### A. Python

Python is a deciphered, elevated level, broadly useful programming language. Made by Guido van Rossum and first discharged in 1991, Python's plan theory underscores code lucidness with its remarkable utilization of critical whitespace. Its language builds and item arranged methodology plan to assist developers with composing clear, consistent code for little and enormous scope ventures.

Python is powerfully composed and trash gathered. It underpins different programming ideal models, including procedural, object-situated, and practical programming. Python is frequently portrayed as a "batteries included" language because of its extensive standard library.

Python was considered in the late 1980s as a successor to the ABC language. Python 2.0, discharged in 2000, presented highlights like rundown cognizance and a trash assortment framework equipped for gathering reference cycles. Python 3.0, discharged in 2008, was a significant amendment of the language that isn't totally in reverse good, and a lot of Python 2 code doesn't run unmodified on Python 3.

The Python 2 language, for example Python 2.7.x, was authoritatively stopped on 1 January 2020 (first got ready for 2015) after which security patches and different upgrades won't be discharged for it. With Python 2's finish of-life, just Python 3.5.x and later are upheld.

Python mediators are accessible for some working frameworks. A worldwide network of software engineers creates and looks after CPython, an open source reference execution. A non-benefit association, the Python Software Foundation, oversees and coordinates assets for Python and CPython improvement.

### B. Speech-Text

In our undertaking client order convert which is voice direction to content. The client needs to send the message which is voice order then it changes over to content showcase in GUI. This message sends to the beneficiary. This discourse to content is changed over with the python library utilized in the framework. PyAudio is required if and just in the event that you need to utilize amplifier input (Microphone). PyAudio rendition 0.2.11+ is required, as prior adaptations have known memory the board bugs when recording from receivers in specific circumstances.

### C. Text-Speech

Content Speech converter used when new mail gets we need to change over the sender nuances and message into voice. This is another module we are managing this. At this moment customer gets new mail they get a notification, by then the customer has taught to open. By then, sender nuances and messages are changed over from substance to voice. There are a couple of APIs open to change over substance to talk in python. One such APIs is the Google Text to Speech API consistently known as the gTTS API. gTTS is a very easy to use instrument which changes over the substance entered, into sound which can be saved as a mp3 record.

## III. G-MAIL CONNECTION

At the present time email is truly connected with the G-mail system. Python, being an astounding language since it has an alternate library which encourages made by the relationship as we saw that it viably makes a relationship with the E-mail using smtplib.

Python, being a historic language needn't waste time with any outside library to import and offers a nearby library to send messages "SMTP lib". "SMTP lib" makes a Simple Mail Transfer Protocol client meeting object which is used to send messages to any considerable email id on the web. Different destinations use assorted port numbers. we are using a Gmail record to send a mail. The port number used here is '587'. Likewise, in case you have to send letters using a site other than Gmail, you need to get the looking at information [4].

Fundamental Mail Transfer Protocol (SMTP) is a show, which handles sending email and guiding email between mail servers. Python gives the smtplib module, which portrays a SMTP client meeting object that can be used to send letters to any Internet machine with a SMTP or ESMTP crowd daemon. To send the mail you use smtp Obj to interface with the SMTP server on the neighborhood machine and afterward utilize the Send Mail technique alongside the message, the from address, and the goal address as parameters (despite the fact that the structure and to addresses are inside the email itself, these aren't constantly used to course mail)[5].

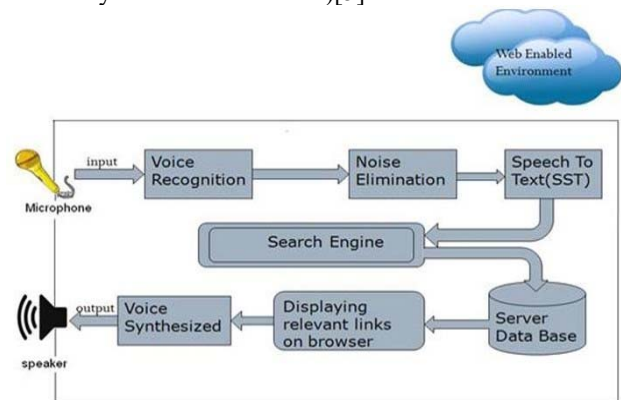


Figure-1: Voice recognition diagram

“Voice Based Search Engine and Web page Reader”. In International Journal of Computational Engineering Research(IJCER)

## IV. PROPOSED SYSTEM

### A. Gmail API Connection

- Connect the user email id and password with the Gmail. Doing this with the help of smtplib set the connection with the help of it. So it shows the connection establish or not.
- User id and password must be correct which already mentions in the software to ease the user don't need to write again and again.
- User will have some list of sender detail so it can send most of the email for new sender we need to upgrade software
- We are working on it to upgrade and establish the connection and send the email detail using a voice message.

### B. GUI

With the assistance of Tkinter library, we made GUI which is exceptionally useful for the visually impeded individual. For start, they have to tap on the straightforward screen and it prepared to send an email and get the email to.

Tkinter is the standard GUI library for Python. Python, when joined with Tkinter, gives a quick and simple approach to make GUI applications. Tkinter gives an amazing itemarranged interface to the Tk GUI toolbox [5]. Tkinter gives different controls, for example, catches, names and content boxes utilized in a GUI application. These controls are regularly called gadgets.

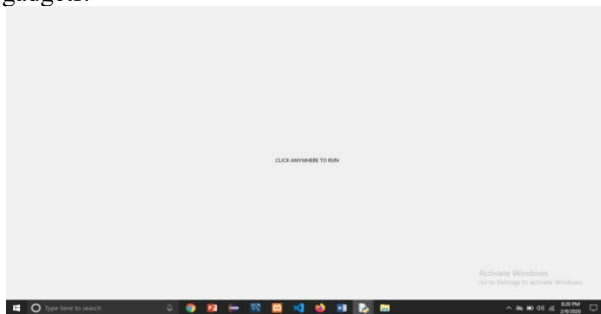


Figure-2: Graphical User Interface

### V. SENDING E-MAIL

- First you heard the voice and then follow the step according to it.
- User command by saying "Send Email"
- Record the message

All this done by voice to text converter which send the email to the sender by follow the command said by the user.

All this is done by different modules and they're used at the same time. We made this project to

ease the blind person special. That why our GUI looks like this because the been blind people don't know where to click and how to use all the computer keyword their need to learn but we work on in it we can use this system in many projects and software.

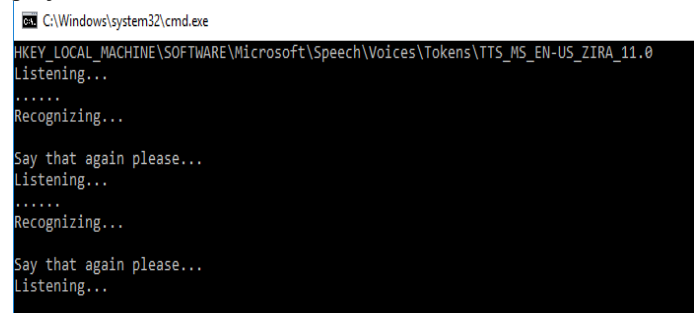


Figure-3: Email sent

### VI. FUTURE SCOPE

We build this system for other email systems also and added more features like attachment, subject, deletion and more GUI Based system for the visually impaired. Posture and gesture movement may be added to the visual impaired system which adding another point in it.

We construct this framework for other email frameworks additionally and included more components like connection, subject, cancellation and more GUI Based framework for the visual debilitated. Stance and motion development might be added to the visual debilitated framework which including another point in it.

For individuals who can see, messaging is not a serious deal, yet for individuals who are not honored with an endowment of vision, it acts a key concern as a result of its crossing point with numerous professional duties. This voice-based email framework has incredible application as it is utilized by dazzle individuals as they can comprehend where they are [2].

There are many screen per users accessible. In any case, individuals needed to recall mouse clicks. Or maybe, this task will diminish this issue as mouse pointer would peruse out where he/she lies. This framework concentrates more on ease of use of a wide range of people including regular persons, outwardly undermined individuals just as uneducated.

### VII. FIGURES

1) Voice reconigition system : It used to convert text-speech and visa versa.It describe howit work describe the mechanism. First voice recorded, noise eliminate, speech convert in text with the help of

search engine and then text convert into command and follow it.

2) GUI: it is graphical user interface it is how our project front end look like User need to just click on the anywhere to start the program easily.

3) Project Working:It is working of our project show how it work listen recongising voice and check for login work and record message convert it into text and send to the user.

## VIII. CONCLUSION

There are many screen readers available. But people had to remember mouse clicks. Rather, this project will reduce this problem as mouse pointer would read out where he/she lies. This system focuses more on user friendliness of all types of persons including regular persons, visually compromised people as well as illiterate [3].

## IX. ACKNOWLEDGMENT

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# Power of Mobile Cloud Computing

Divya  
M.Tech. Scholar  
Deptt of CSE, Vaish College of  
Engineering, Rohtak  
Email: [mittald8.dm@gmail.com](mailto:mittald8.dm@gmail.com)

Mrs. Niyati Jain  
Vaish College Of Engineering ,  
Department of Computer Science and  
Engineering, Rohtak, India

Dr Harish Mittal  
B M Institute of Engineering and  
Technology  
Sonepat, Delhi-NCR, India  
Email: [mittalberi@gmail.com](mailto:mittalberi@gmail.com)

Mr. Bijender Bansal  
Vaish College Of Engineering ,  
Department of Computer Science and  
Engineering, Rohtak,India

Dr Pankaj Gupta  
Vaish College Of Engineering ,  
Department of Computer Science and  
Engineering, Rohtak,India

## Abstract:

Smartphones are offering ubiquitous communication services. But their mobility, miniature nature, light weight, battery life, storage capacity limit their processing abilities. Mobile Cloud Computing (MCC) overcome these limitations. In this paper an extensive analysis of Mobile Cloud Computing of some leading research papers is done, specifying their proposed architecture and their contribution. Mobile Cloud Computing provides various benefits but there are several serious challenges like privacy, trust, security, energy efficiency which are not fully tackled with present Mobile Cloud Computing Architectures. Issues for future research are provided in the last section. In this paper, Challenges / issues in MCC are fully discussed. Research Papers of various researchers to tackle the issues of Privacy, Trust and Security; Energy Efficiency; Data management and synchronization; Band width and Data transfer and Heterogeneity is studied. An extensive analysis of some leading Mobile Cloud Computing research papers is given in tabular form, specifying their proposed architecture and their contribution in MCC. A mobile application using Google's Android operating system which provides management of patients health records and medical images is studied.

**Key Words:** Mobile Cloud Computing Architecture, privacy, trust, security, energy efficiency

## I. INTRODUCTION

Mobile Cloud Computing is a hot topic these days. Smartphones are offering ubiquitous communication services. But their mobility, miniature nature, light weight, battery life, storage capacity limit their processing abilities. Mobile Cloud Computing (MCC) overcome these limitations. MCC is a combination of mobile computing and cloud computing. There are many benefits of MCC but issues like privacy, trust, security, energy efficiency, data management, synchronization, band width, data transfer, deter the users to adopt this technology. These challenges must be addressed to adopt mobile cloud computing. In mobile computing the major criteria is mobility and hence mobile devices are designed with limited hardware and software. Cloud computing provide massive computing capabilities. There are many mobile cloud computing research architectures since 2010. Jia et al., 2011[7] and Liang et al.,2011[8] proposed architectures to enhance for privacy, trust and security. Choi et al., 2013. [3] proposed architecture to enhance energy efficiency. Kosta et al., 2011[5] proposed architecture to enhance energy efficiency. Zhou et al, 2015.[11] proposed architecture to enhance energy efficiency and which can reduce execution cost up to 70%.Sanaei et al.,2014[10] proposed architectures for heterogeneity issue. Barbera et al., 2013 [1] proposed architecture to enhance energy and band width. Survey of MCC is given by Chetan et al., [2], Fernando et al,2013[6] and Shiraz et al,2014[9] . A mobile application which uses Google's Android operating system is developed which provides management of patients health records and medical images by Doukas et al.,2010[4].

In section 2 various issues of Mobile Cloud Computing are discussed. Various architectures of Mobile Cloud Computing are discussed in Section 3. In Section 4 analysis of some leading papers is given in tabular form. Section 5 deals with future research work

## II. ISSUES OF MOBILE CLOUD COMPUTING.

(1)Privacy, Trust and Security: Mobile owners store data on the cloud and thereby lose control on their data. This can be a threat to its privacy and security. Privacy is required to ensure trustworthy environment, whereas security is required to protect against network threats. Due to dynamic and distributed nature of MCC environments privacy, trust and security is a major challenge. There is a need for efficient technique to ensure privacy, trust and security of mobile user.

(ii)Energy Efficiency: Smartphones require huge amount of computational power and energy. Smartphones have capabilities like GPS, WiFi, cameras, In mobile devices energy is consumed in CPU, Blue tooth, wireless network interface card and other sensors. There is a strong need for an efficient technique to increase energy efficiency.

(iii)Data management and synchronization: As hardware in mobile devices are limited, MCC allows computation off-loading and some tasks are shifted to the cloud data center, which requires a proper data management. Data centers synchronize data. An efficient data management and synchronization technique is needed.

(iv) Band width and data transfer: MCC provides several benefits leading to more communication overhead because of the increased bandwidth consumption and data transfers. It leads to additional hidden cost for mobile users. A technique which support efficient bandwidth utilization without additional cost is needed.

(v)Heterogeneity: Heterogeneity in MCC is the existence of differentiated hardware, architectures, software technologies, infrastructure and wireless networks. An efficient technique is needed to deal with heterogeneity in mobile devices i.e., software, hard ware and technology variation among mobile devices. There is a need to remove heterogeneity in clouds as different cloud vendors provide services on different platforms. Furthermore a technique is needed for homogeneity in wireless networks.

## III. ARCHITECTURES OF MOBILE CLOUD COMPUTING.

### 3.1 Architectures to enhance privacy trust and security.

(i) Jia et al., 2011[7] proposed architectures to enhance for privacy, trust and security.

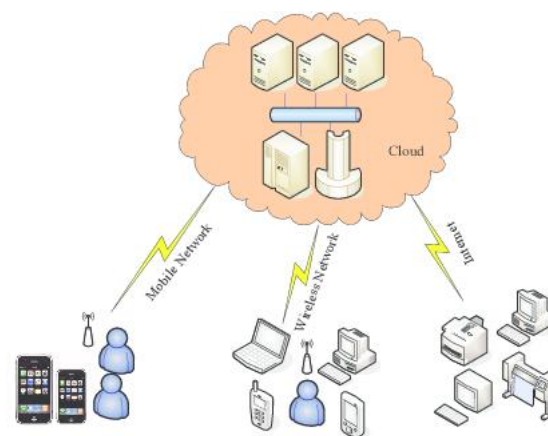


Figure 1: Architecture of mobile cloud computing

### Salient Features:

1. It is a secure Data Service Mechanism (SDSM).
1. Mobile user sends encrypted data file to the cloud either for sharing or for personal use.
2. Data sharer who wants to access data is authorized to decrypt the file.
3. Cloud has no idea about the contents of the file.

(ii) Liang et al.,2011[8] proposed architectures to enhance privacy, trust and security.

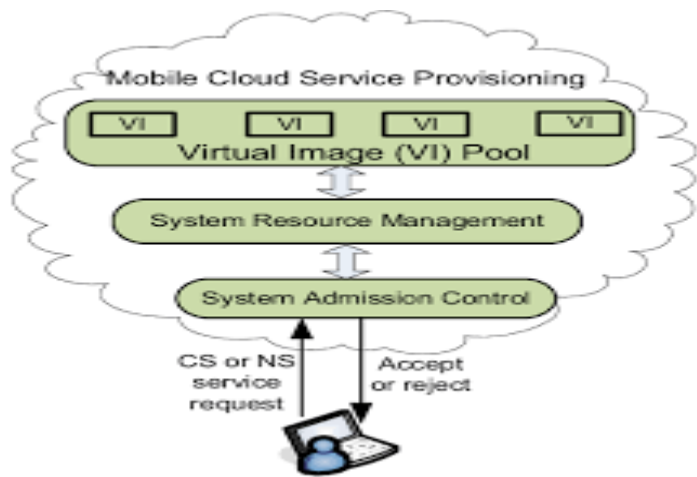


Figure 2: Reference Model of Mobile Cloud Computing

Salient Features:

1. Encryption, decryption, authentication etc., are performed in the cloud
2. Two basic security services are provided , Critical Security (CS) and Normal Security(NS). NS security service uses basic security like authentication, while CS security service provides more security like confidentiality, digital signature, anti-virus scanning etc..
3. User can choose either CS or NS.
4. The cloud can decide whether to accept the request based on its currently available resources.
5. Cloud resources are allocated to maximize its rewards based on its expenses and incomes. Semi-Markov Decision Process (SDMP) is used to maximize the rewards.

### 3.2 Architectures to enhance Energy Efficiency.

(i) Choi et al., 2013. [3] proposed architecture to enhance energy efficiency.

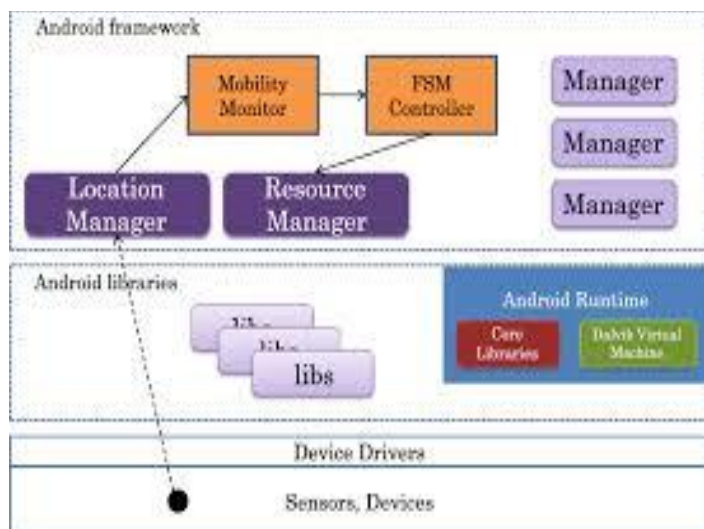


Figure 3: Energy-efficient Mobile Cloud Computing framework architecture for PUC

Salient Features:

1. It is for smart phones which need Pervasive and ubiquitous computing (PUC) .
2. It is based on Location Based Service (LBS) and mobile cloud convergence.
3. It is based on Android platform but it is applied for other mobile platforms.
4. it reduces the power dissipation by substituting power-intensive sensors with less power-intensive sensors , when the smart phone is in static stage.
5. Connection handover approach is based on end-to-end architecture between server and smart phone.

(ii) Kosta et al., 2011,[5] proposed architecture to enhance energy efficiency.

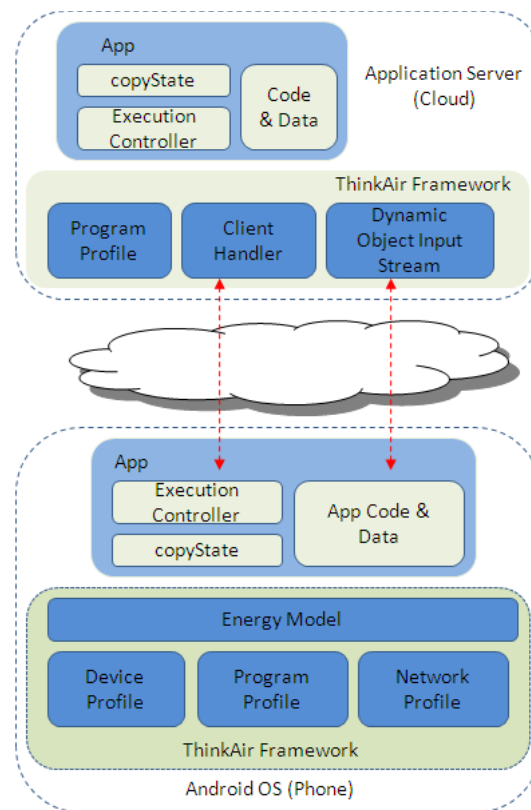


Figure 4: Overview of the Thinkair framework

Salient Features:

1. It is Think Air Architecture for offloading mobile computation to the cloud.
2. It explores the perception of smartphone virtualization in the cloud and provides method level computation offloading.

(iii) Zhou et al., 2015.[11] proposed architecture to enhance energy efficiency and which can reduce execution cost up to 70%.

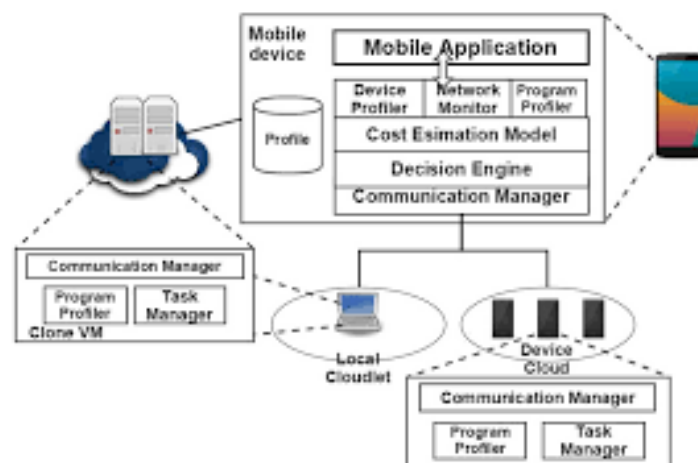


Figure 5 System Architecture

Salient Features:

1. It adopts client-server communication model.
2. There are three components on the client side context monitor, a communication manager and a decision engine and three components on the server side communication manager, program profiler and a task manager.
3. It is based on Think Air Architecture.
4. It is a context-aware offloading decision algorithm.

### 3.3 Architectures to enhance Bandwidth.

Barbera et al., 2013.[1] proposed architecture to enhance energy and band width.

Salient Features:

1. in this paper the feasibility of both mobile computation offloading and mobile data backups in real life, is studied.

2. It is assumed that each smartphone is associated to a software clone on the cloud.

3. Two types of clones are considered off-clone and back-clone. Off-clone for computation offloading and back-clone for backups.

4. Inference of the paper is that mobile cloud computation can be sustained by continuous update of software clones in the cloud with a reasonable overhead in terms of bandwidth and energy costs., especially if the sync intervals are not too short.

### 3.4 Architecture to tackle Heterogeneity.

Sanaei et al.,2014[10] proposed architectures for heterogeneity issue.

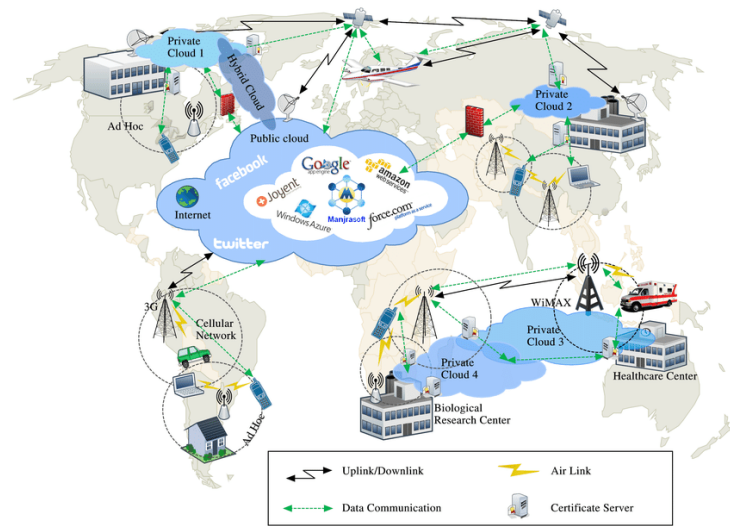


Figure 6: A conceptual view of Mobile Cloud Computing

Salient Features:

This paper the taxonomy of heterogeneity roots in MCC is devised.

Heterogeneity roots are taxonomized as hardware, platform, feature, API, and network.

Heterogeneity of cloud computing, mobile computing and wireless networks is classified in two classes vertical and horizontal.

Heterogeneity handling approaches e.g., virtualization, middleware, and service oriented architecture are discussed.

### 3.5 Architecture to develop application for Healthcare in MCC.

A mobile application which uses Google's Android operating system is developed which provides management of patients health records and medical images by Doukas et al.,2010[4].

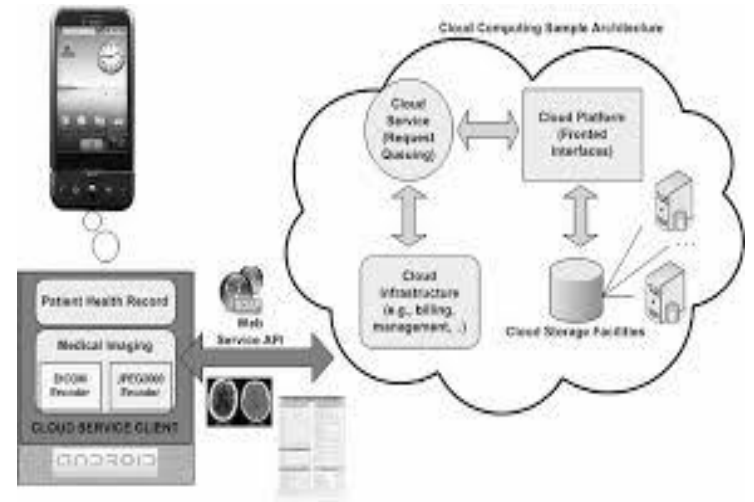


Figure 7: Illustration of the proposed system architecture

Salient Features:

1. This paper presents a mobile application to enable electronic healthcare data storage, update and retrieval using MCC.
2. It is on Android platform'
3. It provides management of patient health records and medical images.
4. it supports DICOM format and JPEG2000 coding
5. It is evaluated using Amazon's S3 cloud service.
6. It is lacking enough security

## IV. ANALYSIS OF SOME LEADING RESEARCH PAPERS.

S.No.	Research Paper	Architecture	Contribution
1	Jia et al., 2011.[7]	Proposed a Secure Mobile user-based data Service Mechanism(SDSM)  Architectures for <b>privacy, trust and security</b> issue	To enhance Privacy, Trust and Security.
2	Liang et al.,2011[8]	Proposed a Security Service Admission Model (SSAM) based on Semi-Markov Decision Process (SDMP).  Architectures for <b>privacy, trust and security</b> issue.	To enhance Privacy, Trust and Security.
3	Choi et al., 2013. [3]	Proposed energy efficient location based services(LBS)  Seamless connection handover mechanism between different access networks, based on end-to-end architecture between and smartphone.	To enhance energy efficiency.
4	Kosta et al., 2011 [5]	Proposed Think Air Architecture.  <ul style="list-style-type: none"> <li>• Developed a framework for offloading mobile computation to the cloud.</li> <li>• Focused on the elasticity and scalability of the server side and enhances the power of MCC by parallelizing method execution.</li> </ul>	To enhance energy efficiency.
5	Zhou et al., 2015. [11]	Proposed a system based on Think Air Architecture  Architectures for resource management and	To enhance energy efficiency.

		<p>optimization issues.</p> <ul style="list-style-type: none"> <li>• Offloading system that considers multiple cloud resources.</li> <li>• Context-based offloading decision algorithm to achieve improvement in the performance of mobile devices.</li> </ul>	The system can reduce execution cost up to 70%.
6	Sannaei et al., 2014.[10]	Proposed Architecture to devise taxonomy of heterogeneity roots in MCC.	Categorized heterogeneity.
7	Barbera et al., 2013. [1]	Proposed Architecture to enhance energy and band width.	To enhance energy and band width.
8	Doukas et al.,2010 [4]	<ul style="list-style-type: none"> <li>• Architecture for developing and deploying the mobile healthcare applications that utilize cloud computing</li> <li>• Architectures for <b>data management and synchronization</b> issues</li> </ul>	Presented @Health Cloud: a prototype implementation of a mobile healthcare information management system.

## V. CONCLUSION AND FUTURE RESEARCH ISSUES.

In this paper Challenges / issues in MCC are fully discussed. Architecture of various researchers to tackle the issues is studied. An extensive analysis of some leading Mobile Cloud Computing research papers is given in tabular form, specifying their proposed architecture and their contribution in MCC. Mobile Cloud Computing provides various benefits but there are several serious challenges like privacy, trust, security, energy efficiency which are not fully tackled with present Mobile Cloud Computing Architectures.

Issues for future research work:

- To test the feasibility of extrapolating concepts from cloud computing in the domain of large-scale computers to the realm of mobile world.[2]
- Evaluation of cost policy so that it may not be a hindrance to the growth of MCC [2]
- Improving security by implementing advanced user authentication techniques on the mobile device.[4]
- Improving programmer support for parallelizable applications.[5]
- Improving application parallelization support as a key direction to use the capabilities of distributed computing of the cloud.[5]
- Intercommunication between different cloud resources.[11]
- To improve the performance of the prototype system by studying handover policies for decision making in terms of device failure tolerance.[11]
- Enhancing virtualization techniques in MCC.[10]

The incorporation of distributed client/server architecture of distributed applications with the elastic features of the traditional offloading frameworks to address the issue of current Distributed Application Processing Frameworks (DAPF'S) for MCC.[9]

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# Automated Face Recognition based Attendance App

<sup>1</sup>Gurminder Kaur  
Associate Professor, CSE Dept.  
B.M. Institute of Engineering and  
Technology,  
Sonipat,India

<sup>2</sup>Vivek Pandey  
Student, B. Tech, CSE Dept.  
B.M. Institute of Engineering and  
Technology,  
Sonipat,India

<sup>3</sup>Naresh Negi  
Student, B.Tech, CSE Dept.  
B.M. Institute of Engineering and  
Technology,  
Sonipat,India

<sup>4</sup>Aman Gupta  
Student, B, Tech, CSE Dept.  
B.M. Institute of Engineering and  
Technology,  
Sonipat,India

**Abstract**— With the new age came the modern attendance system which greatly improved the efficiency of the process of attendance taking and managing. But, at the cost of faster attendance, these systems are either costly or hard to install. Thus, we need a system that is easy to implement and cost-conscious. In our Automated Face Recognition Attendance App, a mobile app will be able to recognize multiple students at once using their face biometrics data which will be collected from the mobile device's camera in image format and send to a Machine Learning model to perform the task. Attendance will be updated to the online server and the same app will provide features to display all aspects of it for analysis. As mobile cameras nowadays have a very high resolution, a single image of a group of people can be identified with very high accuracy. Thus, this system is easy to install, easy to use and low-cost.

**Keywords**—Data Mining, Machine Learning, K NN Algorithm.

## I. INTRODUCTION

There has always been a need to record attendance to analyze a person's commitment to work. Let's view it in light of a college. The attendance of a student tells the parents or faculty about the amount of effort the student is putting to understand the subject.

The Older Attendance System(OAS) would require manually calling out each student's name to mark its attendance. This process takes up a lot of time of the lecture which can be utilized to summarize today's lesson or teach a new concept or give a precap to tomorrow's lesson. Thus, came the Modern Attendance System (MAS). MAS makes use of new technologies to ensure the attendance does not take much of the teacher's time. Although MAS makes the process faster than OAS, these systems have additional requirements such as the installation of high-resolution cameras or RFID cards assigned for each student or make individual students give the image of their faces to a camera, etc. This makes MAS both costly and hard to install.

Automated Face Recognition based Attendance App (AFRAA) provides the benefits of all MAS with the advantage of being low-cost and easy to use. AFRAA uses the mobile device's camera to capture images of a group of

people. These images used by our Machine Learning model to evaluate the best matches of the face from the existing faces to mark that person's attendance. Thus, the attendance is updated onto the database for the concerned person to view.

## II. LITERATURE REVIEW

### A. Fingerprint-based attendance system

B. K. Mohamed et al. [1] proposed a Fingerprint-based attendance system in which a portable fingerprint device needs to be configured with the person's fingerprint earlier. After that, the student will have to mark their attendance using their fingerprint on the configured device either during the lecture, before or after it. The problem with this approach is that during the lecture time it may distract the attention of the students and also does not save much time as an individual student has to scan their fingerprint. The same can be said for the *Iris-based attendance system* which scans the iris of an individual to identify him/her and mark attendance.

### B. RFID(Radio Frequency Identification) based attendance system:

Arulogun et al. [2] and T. Lin et al. [8] proposed an RFID based existing system where the student needs to carry a Radio Frequency Identity Card with them and place the ID on the card reader to record their presence for the day. The system is capable of connecting to RS232 and record the attendance to the saved database. There are possibilities for fraudulent access may occur. Some are students may make use of other students' ID to ensure their presence when the particular student is absent or they even try to misuse it sometimes thus making the system unreliable.

### C. Iris-based attendance system

S. Kadri et al. [9] and A. Khatun et al. [10] proposed an attendance system which uses the data of the user's iris to identify them and mark their attendance. This system is much more secure than previously mentioned and can be used in places where security of attendance is the major concern. But, as we cannot identify multiple iris at once, this system is slow. Moreover, it requires a high

resolution image of a person’s iris which increases data storage cost.

*D. Face recognition based attendance system*

Nandhini et al. [1], Yohei et al. [4] and Roshan-Tharanga et al.[7] proposed a face recognition system that detects the face of the students using a very high-resolution camera installed in the room. This method is effective as it does not require students or the teacher to do anything. The system takes care of the complete process. Thus the complete time of a lecture can be utilized. But, this system’s hardware requirement makes it quite expensive. The high-resolution camera needs to be installed in every classroom which is a complex process for an attendance system.

III. PROPOSED SYSTEM

The task of the proposed system is to capture the face of a group of students at once and store it in the database for their attendance. The face of the student needs to be captured in such a way that all the features of the student’s face can be recognized and evaluated by the Machine Learning model to find the best match. We are using a smartphone camera for taking the student dataset and not use any external hardware like High-resolution surveillance cameras etc.

The teacher is supposed to take an image of the classroom or a couple of images, where all the students are sitting in front and looking towards the smartphone’s camera using our Android application. These images will be uploaded to an online server which will be fed as input to the ML-model. This model will process those images, detect, recognize the faces. The attendance of the identified students will be updated on the online database. The app will process and format this data to present all necessary aspects of attendance to be viewed by anyone for analytics.

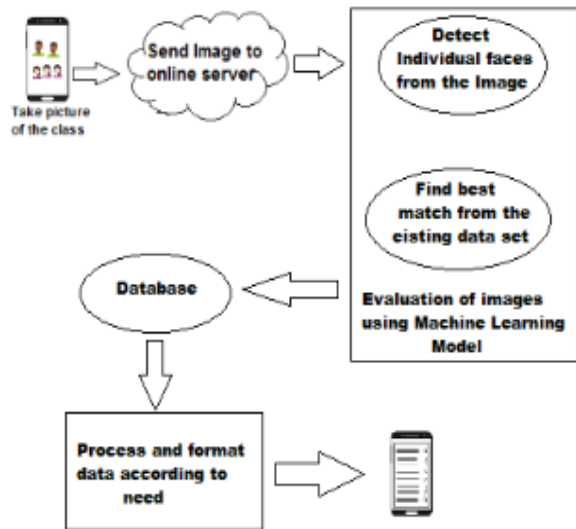


Fig. (1)

Fig 1: Architecture

AFRAA can be implemented in larger areas like seminar hall or labs where it helps in the detecting faces of every person to mark their presence quickly. Sometimes the poor lighting condition of the classroom may affect the image quality which indirectly degrades system performance. This limitation can be overcome by post-processing the images for improving its quality using some algorithm. This way we can be sure that the ML-model can correctly identify error-prone data sets.

IV. RESULTS AND DISCUSSIONS

The main working principle of the project is that the teacher captures the picture of the classroom and submits it to the Android app where the detection and recognition phases are being done and attendance is marked. The recognized image of the student is provided to the online database to mark their present and the rest of the students of that class will be marked as absent.

A. Creating Dataset

We are using a smartphone camera for taking the student images to create our dataset. In our Android application the student of the given an option to provide Face Data, so as to create the dataset of that particular student. The app’s camera will create a short video of the student showing his/her face. This video will then be used to extract images out of each frame in order to create our dataset.

B. Face Detection

Face Detection is the process where the image, given as input (image) is searched to find any face from the pre-existing data set which could past evaluation of faces or the training data set used earlier. Python’s Facial Recognition library is being implemented to detect the faces which find the Face encodings in the input image and returns the coordinates of the detected Faces.

C. Face Recognition

After the completion of detecting and processing the face, it is compared to the faces present in the student’s database to update the attendance of Student

D. Post-Processing

The post-processing mechanism involves the process of updating the names of the students in the attendance Database. Students can view their attendance records in the Android Application in the VIEW ATTENDANCE module.

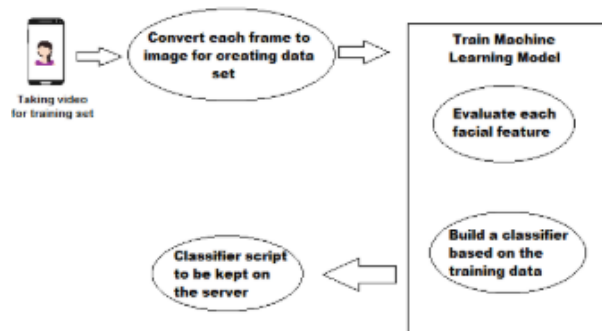


Fig. (2)

Fig 2: Attendance System



**Fig. (3)**

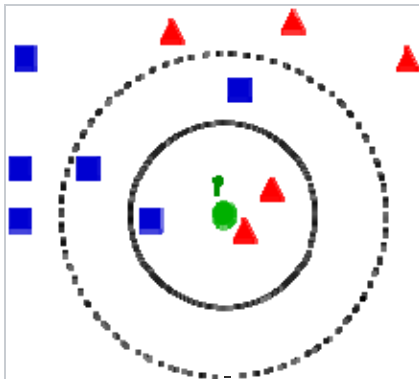
Fig 3: Predicting Output

## V. ALGORITHM

The algorithm we are using in this project is **kNN** (K-Nearest Neighbour). The kNN classifier is first trained on the set of labelled (known) faces and can then predict the face of unknown person in the image by finding the  $k$  most similar faces i.e., images with the closest face feature under the euclidean distance, in its training set and performing a majority vote (possibly weighted) on their label.

For example, if  $k=3$ , and the three closest face images to the given image in the training set are 1 image of Vivek and 2 images of Naresh, then the result would be “Naresh”.

This implementation of algorithm uses a weighted vote, such that the vote of closer-neighbours are weighted more heavily. For continuous variables the most common distance metric used is the Euclidean Distance but other metrics can also be used such as Hamming Distance for discrete variables such as Text Classification.



**Fig 4: Hamming Distance**

Example of  $k$ -NN classification. The test sample (green dot) should be classified either to blue squares or red triangles. First we have to decide the value of ‘ $k$ ’ which we generally take as an odd number because in some cases there might be equal number of neighbouring classes. In this case we are taking the value of ‘ $k$ ’ to be 3, so the new member will be assigned to the classes of red triangles because it has 2 nearest points of red triangles and 1 of blue squares. If we took the value of ‘ $k$ ’ to be 5 then the new

member will be allotted classes of blue squares as among 5 nearest points it has 3 blue squares and 2 red Triangles.

## VI. CONCLUSION

Thus, the aim of this paper is to take images of the classroom, relate it with the database to ensure the presence or absence of the student, and mark the attendance of the students. The Automated Face Recognition Attendance App helps in increasing the efficiency and speed ultimately achieve high-precision real-time attendance to meet the need for automatic classroom evaluation without the demerits of older systems (like proxy attendance).

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# TRAFFIC RULES VIOLATION DETECTION WITH COMPUTER VISION

<sup>1</sup>Radhika Kundra  
Department of Computer Science  
BMIET  
Sonipati,India  
[radhikakundra35@gmail.com](mailto:radhikakundra35@gmail.com)

<sup>2</sup>Parul  
Department of Computer Science  
BMIET  
Sonipati,India  
[parulsajwan1999@gmail.com](mailto:parulsajwan1999@gmail.com)

<sup>3</sup>Simran Dhingra  
Department of Computer Science  
BMIET  
Sonipati,India  
[simrandhingra2409@gmail.com](mailto:simrandhingra2409@gmail.com)

<sup>4</sup>Ms. Bhawna  
Department of Computer Science  
BMIET  
Sonipati,India#  
[bhawna.bmiet@gmail.com](mailto:bhawna.bmiet@gmail.com)

**Abstract**—# This research paper presents a classifier for counting of vehicles that combines video and image processing methods like object detection, edge detection along with frame differentiation and the Kalman filter. The implementation of the technique that has been proposed has been performed here using a programming language called Python. The implementation of the technique that has been proposed has been performed here using a programming language called Python. This paper describes the objective, aim as well as methodology too that has been used for image processing to carry out traffic flow counting along with classification using various libraries as well as algorithms with real time image. Apart from it, the traffic violations will be detected and the information of the persons getting penalized will also be visible. Successful implementation will lead to improvement in management of law and order and proper management. The process of Vehicle counting gives appropriate information about the flow of traffic flow, occurrences of vehicle crash and the peak times of traffic in roadways. A technique is presented here to accomplish these goals with the help of image processing methods on the video outputs recorded on the cameras installed at different locations.

## I. INTRODUCTION

The increasing number of vehicles everywhere, especially in the cities, can lead to high volume of traffic which further leads to more number of traffic violations. This leads to severe destruction of property and also accidents that may impose danger to the lives of all the people. To solve this problem which is increasing at an alarming rate and prevent such unfathomable consequences, traffic violation detection systems like these are needed. For which the system enforces proper traffic regulations at all times, and apprehends those who do not comply. A system for traffic detection and violation detection is required in real-time to reduce the workload of the authorities who are deployed on the roads [4]. Hence, the traffic authorities will not only find it easy to implement the rules with not only accuracy but also efficiency; as this automated traffic detection system detects all the violations at a speed faster than humans. This system can detect three types of traffic violations in real-time that include parking violation, signal violation as well as wrong direction violation. An interface that is quite user friendly graphical is present in the system to make the usage simple so that the user can easily operate the system, monitor traffic and take action against the defaulters who violate the traffic rules.

## II. OBJECTIVE

The goal of the project is to make the traffic rules violation detection system [5] automated and make it convenient for the traffic police department to monitor the traffic and take action against the vehicle owner who violated the rules in a fast as well as efficient way. Detection and tracking of vehicles along with their activities with utmost accuracy is the priority of the system.

## III. SYSTEM OVERVIEW

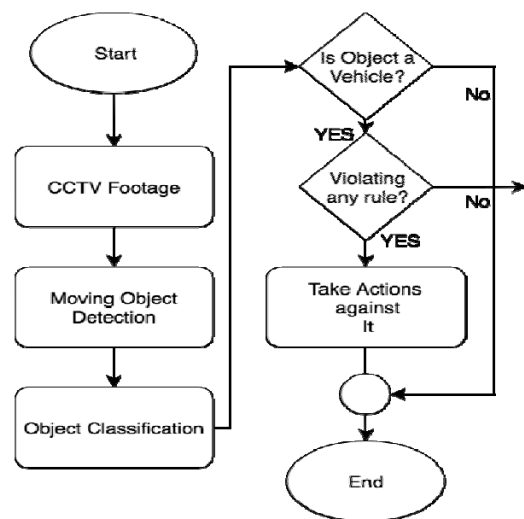


Figure 1: Flowchart of system overview

There are two main components in the System:

1. A Vehicle detection model
2. Graphical user interface (GUI)

First the CCTV camera footage that is recorded in real time is sent to the violation system. From the footage, the vehicles are detected. The activity of vehicles is tracked and determines if there's any violation or not. There are different types of violations that have different algorithms for determining the violation. A system flowchart 1 shows how the system works. The Graphical User Interface (GUI) makes the system an interactive one for users to use. Users can monitor the traffic footage and get the alert of violation



with the captured vehicle image. Users can take further action with the help of GUI.

#### IV. LITERATURE REVIEW

In[1] this author presented the automatic vehicle identification system using vehicle license plate is presented. The system uses a series of image processing techniques in order to identify the vehicle from the database stored in the PC. Matlab is used for the implementation of the system. Moreover, the performance is tested on the real images that have been captured. The simulation results show that the system robustly detects and also recognizes the vehicle using license plate and that too against different lighting conditions. It can be used at the entrance to the areas that have strict restrictions.

The implementation works quite well however, there is still room for improvement. The camera used in this project is sensitive to vibration and fast changing targets as the shutter time has a long duration. The robustness and speed of the system can be increased if a camera having high resolution is made use of. The OCR methods that have been used here for the recognition are pretty sensitive to misalignment along with different sizes, the affine transformation can be used to improve the OCR recognition from different size and angles.

The statistical analysis can be brought into use for defining the probability of detection and recognizing the number plate of the vehicle.

In[2]this author presented application software designed for the recognition of car number plate. Firstly they extracted the plate location by performing the morphological operation and area criteria tests, the edge detectors are then applied and finally template matching based on optical character recognition templates was applied to recognize the number plate characters. A comparison of edge detectors sobel, prewitt, canny, log operators was performed. The results have proved that the canny edge detector's performance is far better than the other three operators. Although the proposed algorithm is concerned with the number plate of Indian cars, many parts in the algorithm are readily extended to use with the number plates of other countries.

In[3]this paper author have checked and evaluated the accuracy of the OCR technique. The Template matching affects the accuracy of number plate recognition. We have found that there are some factors which affect the effectiveness of template matching based on OCR technique i.e. font type, noise in image, tilting etc. In future the work can be done on these factors and efficiency may be increased further for better results.

#### V. METHODOLOGY

##### A. Image Processing

1. Grayscale and blurring - This step is the foremost step. As a part of the preprocessing part, the input frame is captured from the CCTV footage. The

image is converted to grayscale and is blurred with a method called Gaussian Blur method.

2. Background Subtraction -The method of Background subtraction method is used to subtract the current frame from the given reference frame in order to get the desired object's area. Equation (1) shows the method.  $dst(I) = \text{saturate}(|scr1(I) - scr2(I)|)$
3. Binary Threshold - Binarization method is used to remove all the holes as well as noises from the frame and get the desired object area with utmost accuracy. equation (2) shows how the binary threshold works.  $dst(x, y) = \text{maxVal}$  if  $scr(x, y) > \text{thresh}$  else 0.
4. Dilation and find the contour. After the threshold image is captured, it will be dilated to fill up the holes after which the contour will be found from the image. A rectangle box will be drawn over the contours of desired moving objects.



Figure 2: Signal violation camera representation

##### B. Violation detection

After detecting the vehicles three violation cases arises

- Signal violation: If a vehicle is seen crossing a predefined line present on the road while the signal is still red, a signal violation will be detected.
- Parking violation: If a vehicle is seen standing in a no parking zone for a particular time, a parking violation will be detected.
- Direction violation: When a vehicle is seen coming from the wrong direction, it will be detected. The direction of the vehicle will be determined using the current position of the vehicle and previous few positions.

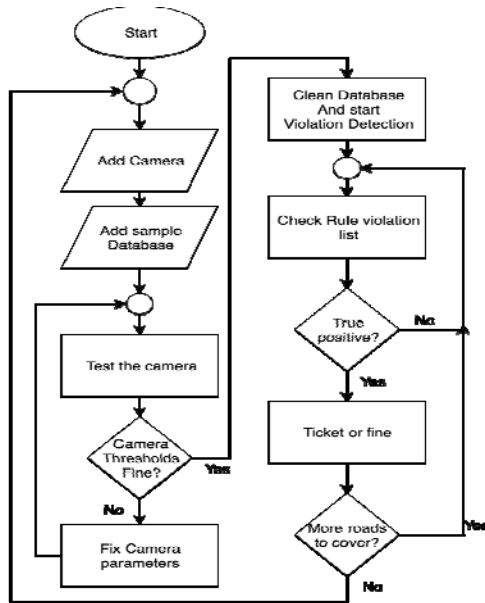


FIGURE 2: SIGNAL VIOLATION FLOW CHART

## VI. IMPLEMENTATION

### A. Image Processing and Computer Vision

OpenCV computer vision library is used in Python programming language for image processing purposes. In order to implement the vehicle classifier with, a machine learning framework called Tensorflow is used.

### B. Graphical User Interface (GUI)

The user interface consists of all the options that are required for the administration along with other debugging purposes so that we do not need to make changes in the code due to any reason. For example, if we need to add some sample cars or camera in the database, we can do it with the menu item.

Actually, this all is required to start up the system. After the camera is added, the software will be started automatically and will detect the violations of traffic rules. Then the camera will get opened by selecting it with the drop down menu, and the detection rules and violations.

The GUI is made so that someone can supervise the group of cameras. He can see the entire list that contains rule violations as well as the details of the cars that have violated any rule. Clicking on the detail button will open a new window where the user will be able to file the report or send/print ticket to the car owner.

Also the admin/user can delete the records if he gets a false positive. The database has a marker that keeps the file has been archived. If we wish to retrieve any record from the records that have been deleted, then the admin will have to go to the archive window. In the window, the person can easily restore any record he wishes to. The user can also search for a vehicle, with its license number, the color of the

vehicle, or date of a rule violation. The license number has text prediction so the user will be sure while typing a license number that it exists.

### C. Rules Violation Video Representation In UI

There are currently 3 rules we are concerned with.

1. Signal Violation
2. Parking Violation
3. Direction Violation.

For Signal Violation, In order to catch a Signal Violation, a straight line has been used in the picture.. When the traffic light turns red and a car is trying to cross the straight line, an image of that car will get registered in the database along with some environmental values. The user can see in the live preview which car are being detected real time and tested if they are crossing the line.

For Parking violation, we have prefigured a rectangle, which is the restricted area for car parking. If there is a vehicle in the rectangle for more than a predefined time, then a image with other environmental values is being registered to the database.

For direction violation, some lines are drawn to divide into regions. As soon as a car moves from one region to the other one, its direction will be monitored. If the direction is found to be wrong, then it will be registered as previous records.

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# DATA SECURITY IN CLOUD

Banmeet Singh kohli  
Student, B.tech, Cse Dept.  
BMIET,  
Sonipat, India  
[banmeetsinghkohli@gmail.com](mailto:banmeetsinghkohli@gmail.com)

Manpreet Singh  
Student, B.tech, Cse Dept.  
BMIET,  
Sonipat, India  
[manpreetmaewah09@gmail.com](mailto:manpreetmaewah09@gmail.com)

Harvinder Singh  
Student, B.tech, Cse Dept.  
BMIET,  
Sonipat, India  
[heharvindarsingh09@gmail.com](mailto:heharvindarsingh09@gmail.com)

Bhawna  
Associate professor, Cse Dept.  
BMIET,  
Sonipat, India  
[bhawna.bmiel@gmail.com](mailto:bhawna.bmiel@gmail.com)

**Abstract**— Cloud computing is considered the fastest growing technology. It allows business organizations to use or access different applications, store information without accessing their personal files. There is no way that one can ignore different threats to user's data on cloud storage while considering the power, stability and the security of cloud. File access assure file protection due to untrusted cloud servers. File entrance mechanism is the greater challenge in cloud storage system. This system in consequence produces unwanted copies of similar files or involves a completely reliable cloud server. Attacks from enemy/opponent user are difficult to stop in cloud storage. In the proposed system, our main focus is on implementation of the concept of multiple cloud storage alongside the enhanced security using cryptography techniques rather than storing the complete file on a single cloud system. The system will split the file in different parts then store on different cloud. The data required for rearranging that file will be stored in metadata management server for efficient retrieval of original file.

**Keywords**— Multi-cloud computing, AES, Data splitting, Cloud Storage Introduction.

## 1. INTRODUCTION

The hype in cloud computing over the last few years has created a situation which is a leading pathway to many new technologies and innovations. While many people have already heard of it, but what this is about and how we can be benefited from it is understood by substantially less. This paper attempts at clearing these issues by offering a comprehensive definition of cloud computing, and the business benefits it can bring. While studying the acceptance of the cloud services, the biggest obstacle that comes in our way is security challenges[1]. This sparked a number of researches which then resulted in an even more number of ideas and plans whose target was the various cloud security threats. Alongside the above mentioned security issues, the cloud pattern also brings a new set of unique features which pave the way towards novel security passages, architectures and techniques. This paper gives an outlook on the achievable security values by using numerous distinct clouds synchronously[2]. According to the privacy and security potentials and prospects, multiple noticeable architectures are popularized and discussed.

Cloud computing attempts at bringing drivingly expandable resources given as assistance over the internet. The third-party, on-demand, self-service, pay-per-use and easily achievable computing capitals and services offered by the cloud pattern promises to minimize capital as well as operational expense for software as well as hardware[3].

Usually, keep in mind that huge system track across numerous PCs means dividing the file into different server and client modules. In these schemes, the user interface was controlled by the client module and the

Back-end handling was provided by the server, such as, printing, entrance, record and so on. As the number of computers increased, their cost dropped, and they became associated by ever-higher bandwidth networks, dividing software systems into various components, with each one of the components running on a different computer and achieving a particular function, became even more convenient. The result of this approach meant that failure in one computer did not necessarily disable the entire system, hence, it simplified.

development, management, administration, and often improved performance and robustness.

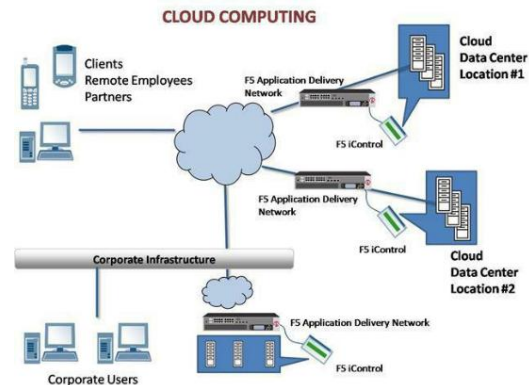


Figure 1: Computing Architecture

Since, partitioning processes are called forth on account of the client. This supports the capability of the cloud. For example, clients can find a computer (a node) inside the cloud and command a given task; while executing the task, the given computer can invoke functionality on other computers inside the cloud without letting the client know about the further phases or the computer on which they were accepted out.

With this model, the mechanism of a circulated, cloud-like system can be demolished into various well-defined packet interactions, or exchanges between distinct nodes. There are two nodes with secure characters and tasks in traditional client-server organisms. Modern-distributed organizations are allowed to have more than two nodes with dynamic characteristics. Client can be a node in one exchange, while in a different exchange, server can be the node. A client with a user who is sitting at a console and is observing the

output is the final user of the functionality in most of the cases. While in other cases, the distributed system functions unattended, performing related operations[4].

It is important to remember that there is a visitor even when the distributed system may not have enthusiastic servers and users for each specific packet exchange. There is a receiver of the call (often referred to as the server) too. Often, there is only one way sending of messages so, it is not important to have a two-way packet exchange in the request-reply format of a distributed system.

## II. LITERATURE REVIEW

In [1] the authors stated that, Cloud Computing becomes developing and standard business model attribute giving options to the benefits at hand, the previous options, in an addition, point at serious cloud specific security issues. The people whose interest is the Cloud security are still hesitant with their business to cloud computing. The prominent treats in framing a guarded and trustworthy cloud system; the use of various different cloud simultaneously. The multiple architectures are brought in and discussed according to their security and privacy abilities and possibilities. Cloud computing supply a replacement of computing with varied services models that facilitates completely different services to the users.

A new and exciting way of computing with various service models that facilitate different services to the users are offered by cloud computing as different networks remotely process and exchange all the data of an enterprise . Security is an essential parameter and the service provider must ensure that there is no unauthorized access to the sensitive data of an enterprise during the data transmission. In [10] the authors analysed security threats to cloud computing. To offer good service, cloud computing service providers must avoid threats.

An efficient way to guarantee data security in the cloud is by data access control. However, the data access control becomes a demanding problem in cloud storage systems due to the expanding data and not trustworthy cloud servers. Existing access control schemes either produce multiple encrypted copies of the same data or require a fully trusted cloud server. Hence, they are no longer applicable to cloud storage systems. Ciphertext-policy attribute-based encryption (CP-ABE) is a hopeful approach as it allows access control to the encrypted data. However, existing CP-ABE schemes are not helpful in construction of a data access control strategy for multi-authority cloud storage systems, where attributes from multiple authorities are held by users due to the incompetence of decoding and revocation. In [6] the authors proposed data access control for multi-authority cloud storage (DAC-MACS), a productive and safe data access control scheme with effective decoding and annulment. Specifically, we design a systematic attribute revocation method and also, assemble an advanced multi-authority CP-ABE strategy with effective decoding that makes it possible to accomplish both forward security and backward security. We further propose an

extensive data access control scheme (EDAC-MACS), which under weaker security assumptions is secure.

## III. RESEARCH METHODOLOGY AND IMPLEMENTATION METHOD

### A. Phases of Development

1. **Module for Registration :** In registration, user gets a username, password and email address. User generates a random verification code. New random code is generated using Next(). The user can sign in and move ahead to next step for verification of code. A mail is sent to user's email address by using a SMTP protocol. The user has access for verifying the code. If verification code is blank, then it is redirected to login page. Else, update user status field with text active and user is redirected to the home page.
2. **FTP Setting Module:** The file gets distributed at three different locations in the proposed system.
3. **Module for Uploading and Downloading:** A web interface is developed for uploading and downloading files into the cloud storage. The different files uploading links are open. The link which we want to upload on cloud can be chosen by the user. The file can be uploaded by user on cloud such as doc file, video, mp3, etc.
  - Upload file by using file uploader control we can let the user select file to be upload.
  - Get the sever path by using Server. Map Path () function to get path of server directory.
4. **File splitting and Joining Module:** In Proposed system, the file is split in different portions, encoded and stored on different cloud. Metadata management server will store the moving file after it is decrypted by meta data. Files can be joined with other files.

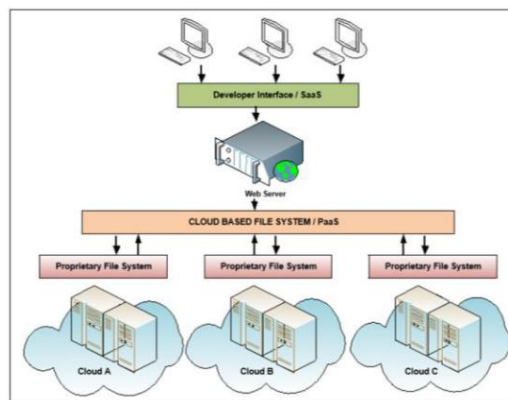


Figure 2 : System Architecture

The elementary plan is to make use of as many clouds at a particular time to reduce the dangers of petty knowledge moulding, revelation, and method interfering. This blueprint resulted in change of targets, the confidentiality of

knowledge and process logic. It provides an answer to the ensuing question: how will a cloud user avoid absolute revelation of the information or process logic to the cloud provider?

The basic idea of this design is: the applying logic must be divided into fine-grained components and these components area is unit distributed to distinct cloud. The user encrypts the information together with his public key and uploads the cipher texts to the cloud in the coding technique. To get AN encrypted result that solely the user will decode, the cloud will severally figure on the encrypted knowledge,. The keys are managed and the coding and coding operations are performed by the user (or a little trusty non-public cloud), whereas AN untrusted public cloud finishes the huge computation on encrypted knowledge [7][8].

#### IV. CONCLUSION

Many business secure and safe storage issues are resolved by implementing the cloud based storage. But on the other side many expert state that it is more risky to put the data over single cloud as it increase the adversary user attack possibilities hence by designing the proposed system, the storage cloud security is being extended by allocating and encoding the data. A web portal will let the user administer his data and the controlled data, as a block of file along with encoded should be sent over various cloud drive. Testing and demonstration of the planned system will be done over a local network or on live storage cloud server.

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# Student Education Guidance

<sup>1</sup>Priyanka Gupta  
Student B.tech(CSE)  
BMIET

Sonipat, India

[underscoreprivanka@gmail.com](mailto:underscoreprivanka@gmail.com),

<sup>2</sup>Aarsuhi  
Student,B.tech(CSE)  
BMIET

Sonipat, India

[chughaarushi2699@gmail.com](mailto:chughaarushi2699@gmail.com)#####

<sup>3</sup>Yashasvi Sing  
Student,B.tech(CSE)  
BMIET

Sonipat, India

[ingh.vash81999@gmail.com](mailto:ingh.vash81999@gmail.com)

##

#####Shikha Arora  
Assistant Professor(CSE)  
BMIET  
Sonapat,India

[shikha.work25@gmail.com](mailto:shikha.work25@gmail.com)

**Abstract-** This paper presents a mobile based application for students, SEG (Student Education Guidance), choosing best schools, courses and getting tips for future. Basically, it tries to help students at every stage of their life either be it primary education or secondary or higher education. In order to help students in selecting best schools for their career, this system offers them with the list of schools and not only the students can avail the benefit of the quiz that help them to gain knowledge. Furthermore, the students can get the information for the courses they can take after their primary and secondary education. The secondary education seekers can take benefit of the stream selection test and higher education students can take benefit of the entrance exam information.

**Keywords-** Student, Education, Guidance, Student Education Guidance, Primary, Secondary, Higher

## I. INTRODUCTION

The career is the important aspect of the today's world and the career starts from the students school life from schooling ,so the student basic schooling standard decide from the school and then the completion of the childhood the student reaching the teenager level needs to start understanding about the importance of the future , the dreams they need to fulfill. To fulfill all the dreams and to live the life happily and calmly the students had to focus on studies, study according to their passion and taking right decision at the different stages. Our system is helping the students to take the right step in right direction by providing all the basic information which they can use to get the right step for their career and proceed according to their passion.

The proposed system is better to get career knowledge as compared to others as the proposed system not just helping the student at a particular phase of study but at everystage where the students require help for their future understanding, Students try to search the internet for their support but not able to succeed to that many limit, they are trying to get the information. The students while using the proposed system for career guidance will get abundant information they require and the information

provided by the counselors for the career is sometimes biased and the information provided by them is not sometimes proper and complete which lead to a problem for the future of the student's and the students had to get the time for this schedule piece of work and the student's had to first, go to that particular place and spend that time for the counseling and then come but in the case of the system we have created the student can willingly check the courses and can apply for it anytime and the information provided is so vast and student can easily check their level where they stand by giving the test in our system and check their level of knowledge for the course, they are thinking to get for their future. Not just this counseling part is the disadvantage but in another system present the students are not provided with the complete information for the course the other systems just provide names for the courses and don't provide any relevant information, the student has to go to the web for the information and this is not the conventional method for providing information. Student Education Guidance (SEG) is useful for the following users:

**Primary Education Students-**Providing information about various schools to students and parents according to their location and also providing quizzes for various classes that allow parents to know where their ward stands and student get idea about questions been asked at the time of admission.

**Secondary Education Students-** The stream selection is the step that will decide your future. Selecting the right stream for their future is most important because this is the only step that will make you a successful person. Our system is helping students to choose the stream by giving stream selection test and seeing all the courses that they can proceed after their primary education.

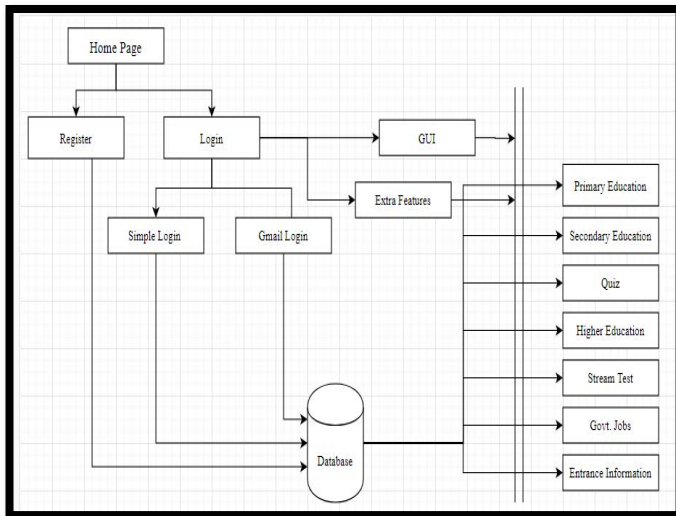


Fig. 1 Architecture Model

**Higher Education Students-** Some students after completing their secondary education tries to find some courses that are profitable and fulfill their dreams. And some students might change their streams, so, they have to see whether they will be eligible or not, due to all these problems our system is helping them to see the courses and their information they need to proceed that course. And not only this, the information and some tips regarding the various entrance exams been held.

**Job Seekers-**The users who are trying to get the government jobs can see the list of various government jobs forms and how to apply.

## II. EXISTING SYSTEM

The existing system for the students has drawbacks that the other systems not providing the complete information for the courses the students have to opt and our system just not rely on providing the names of the courses but all the relevant information the students need to know before proceeding with the course.

The second drawback if the students will not be provided with the information for the courses the student have to visit for counseling sessions which will be according to the time for the counselor and the student might not be free another disadvantage regarding counselor is that they are costly and not present in rural areas and these all disturbances lead to problems in the students' careers.

The third drawback for the existing system is that in any of the system provided there is no information related to the schools and our system is providing the data of all the CBSE affiliated schools all present in the country.

The existing system provides the stream selection on the basis of the personality which is not the right way for the stream selection, so we have created our system which provides tests for some subjects through which they can judge themselves and we also provide the result by the combination of some subjects.

The existing system another disadvantage is that the systems do not comprise of the information regarding all the stages of their career, whether school, stream selection and further information regarding career. But our system is providing all this kind of information.

## III. PROPOSED SYSTEM

The Student Education Guidance (SEG) is an android development App, made especially for the students you are student going, college pursuing and working. Every person who wants to gain standard in his/her career can use this system and the UI created is attractive and can easily be used and understandable by any person.

The proposed system consists of various modules:-

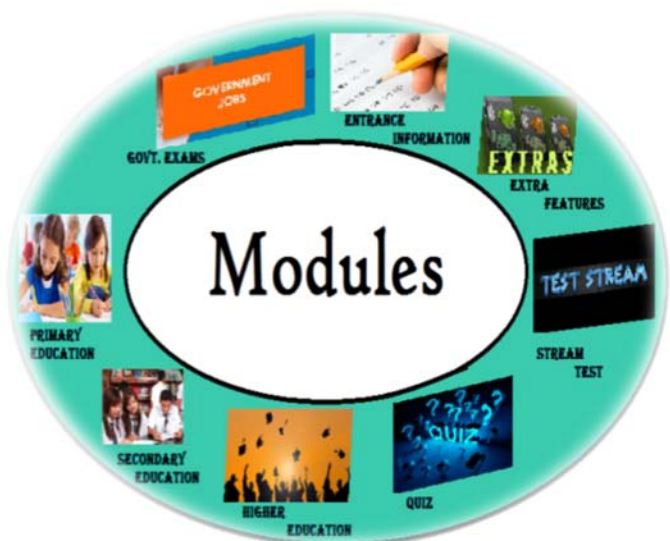


Fig. 2 Application Modules

**Welcome Page:** This page has templates which represent all the pages that the app provides to the users.

**Login:** The user is been provided with the login page and the login can be done by normal providing with email and password and can even login by Google sign in and the student provided with a UI.

## IV. RELATED WORK

Some screenshots of our mobile based application-

**Registration:**The user provided with the registration page and where the user has to provide varied information and register to our system.

**Primary Education:**This module has information regarding various schools that are affiliated to CBSE and the schools are available state-wise and the list of the school combined together to be 20,000 schools and the students and parents can see the entire list.

**Secondary Education:**This module has various further modules and the modules comprise of the following:What you can do, Intermediate, Diploma, ITI Course, Paramedical, Short Term Courses, Others

All these modules have various courses links and after clicking these links student can read the information regarding these courses.

**Higher Education-** This module will comprise of the courses that the student can precede after 12<sup>th</sup> and the courses may range to some hundreds and they are provided in further modules:Medical Courses, Allied Health Paramedical, Engineering Courses, Humanities Courses, Management Courses, Commerce Courses, UG Courses, Law Courses, C.A, Dual Degree and integrated courses

All these modules have various courses links and after clicking these links student can read the information regarding these courses

**Quiz:** The module is been made for the students who want to check their capability and want to take admission in the schools and get the questions and can give a quiz whenever they feel like.

**Stream Selection Test:** The module comprises of the test that the students of classes 10<sup>th</sup> can take for checking their standards in the particular stream they want to proceed and the test has various subjects and the combination of varied subjects lead to a result that will be displayed after completion of the test.

**Entrance Exam:** The module has the information regarding the various entrance exams been held every year for the varied courses and the information provided will be relevant for every student. And this module will further have the preparation tips for that entrance exam and the short summary notes for the subjects that come in the entrance exam.

**Extra Features-** This has various features like- send option, share option, feedback, rate us, chatbot, notes etc.

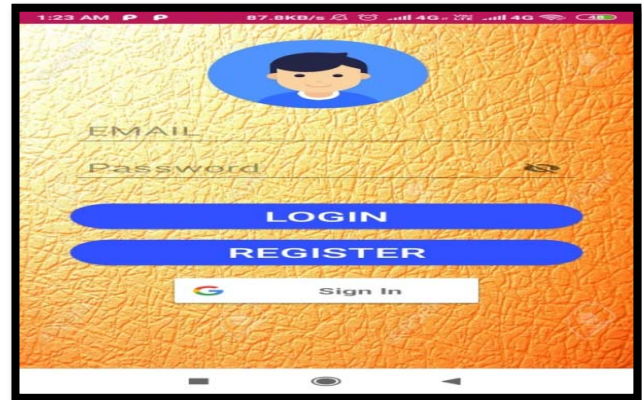


Fig. 3 Login Page



Fig. 4 Welcome Page



Fig. 5 Secondary Education



## V. CONCLUSION

Student's bright future is crucial for the development of the country. Today's students are facing a lot of problems when making decisions regarding one's career. The occupation needs to match one's potentials and personality. Therefore the decision regarding the selection of the right stream becomes the utmost importance for the student's future. This is why we have tried to present our app for guiding the student for their best appropriate pathway so that they can excel in their professional carrier. The opportunities provided by this application to students are immense and many students can make use of this platform to choose a career more appropriate to their skills. Implementing this system will help young ones to choose the right career path that best suits them.

In Student Education Guidance we have developed various guidelines for students that are school selection, stream selection, providing information onvarious courses which want to pursue after 10<sup>th</sup> and after 12<sup>th</sup>, a quiz to check where they stand and also when any student want to take admission in any school, providing information for the entrance exams, how to apply for them and how to crack it. So, our application helps them to select the right path.

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Fig. 6 Course Page

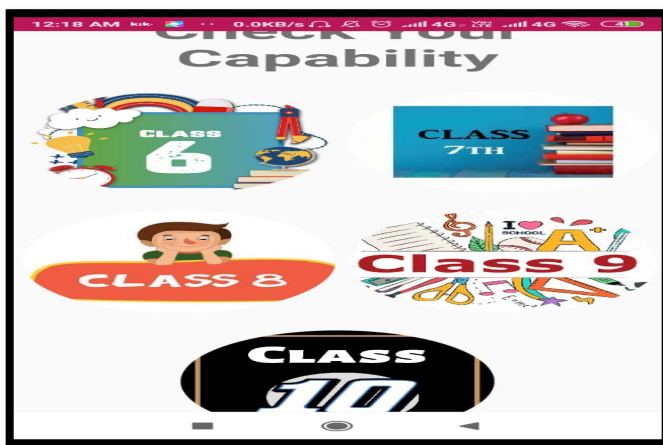


Fig. 7 Quiz Page

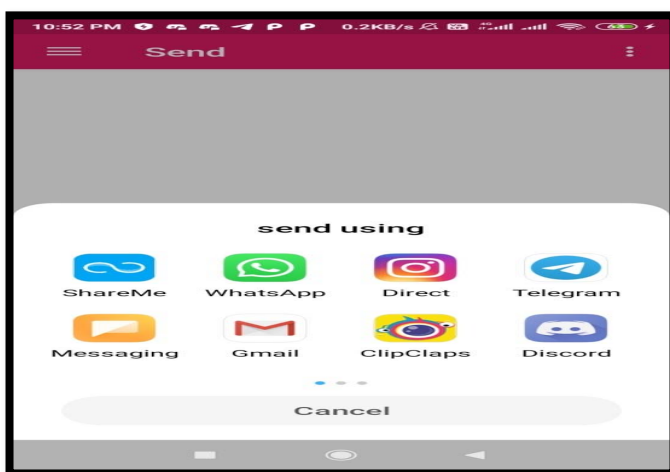


Fig. 8 Send Page

# Online Banking and Security

<sup>1</sup> Dr Sapna Juneja  
Professor, CSE Dept.  
BMIET

Sonipat, Haryana  
[sapnajuneja1983@gmail.com](mailto:sapnajuneja1983@gmail.com)

<sup>2</sup> Alankriti Sharma  
Student, B.Tech, CSE Dept.  
BMIET

Sonipat, Haryana  
[alankritisharma44@gmail.com](mailto:alankritisharma44@gmail.com)

<sup>3</sup> Amisha Kalra  
Student, B.Tech, CSE Dept.  
BMIET

Sonipat, Haryana  
[amishaklr@gmail.com](mailto:amishaklr@gmail.com)

**Abstract**--One of the primary responsibilities of a financial/banking institution is to keep its clients secured against thefts. Protection against thefts is the primary reason why people choose to keep their money with banks instead of keeping it home, in their safe. Considering security as our primary target we have created this banking application. It provides two phase security mechanism for transaction. Firstly, via verifying OTP (One Time Password), secondly via recognizing face and iris of the customer. The another reason why people choose banks over safe is easy transaction of money via online portals, debit cards, credit cards, smart cards etc. This application also provides a chat bot for easy transactions. The third thing that has been provided here is a tracking mechanism to find out the location of the transaction that has been conducted, which might keep the customers safe of the frauds or at least find out the location from where the pilfering is being conducted. (Abstract)

**Keywords**--Face Recognition, Secured Mobile Banking, Neural Network, Machine Learning, Geo-location, IP address, ISP (key words)

## I. INTRODUCTION

As the paper currency grew, so did the threat of being robbed and its management also became tough. So banking institutions came into the big picture. For decades role of financial institutes for to create, circulate and safeguard money, which still is, but earlier people had to wait in line for hours to get money. It would require long queues to get loan, deposit money and perform transactions [1].

People used to send money orders to give their loved ones who were far apart money. Today with innovation in technology e-money came into the picture. It is an easier way to transact. You can get rid of big queues and get money. Pay bills without even carrying money in your pockets.

Internet Banking- Internet banking [2] is the most convenient way to transfer your money to someone else account. It is a revolution; you can pay any kind of bills using your money online. You can roam around cash free to most of the places. You don't even have to change the currency while traveling to another country.

- It makes your life hassle free.
- You can go out with as limited cash as you want without being concerned of getting robbed.
- You don't have to count money or get a change.

**Online Banking Security Problems** [3]

Billions of financial data transactions occur online every day of the year 24 hours a day and 7 days a week as the people grow in awareness, they start moving towards cash less or an electronic mode of transaction. Now you can not only move with less cash in your pockets, you are free from theft as well. But is your money completely safe? Are all the transactions you make secure? Is your integrity always protected?

The problems with online transactions are of three sorts:  
*Sort 1:* Programmer's error- The vulnerabilities because of errors made up by programmers for example buffer overflow, might provide a backdoor to malicious users to find a way to earn profits.  
*Sort 2:* Bank's flaw- Banks did not specify or asked the programmer to keep a tight security.  
*Sort 3:* Customer's mistakes- Customer's aren't always aware of their security, they sometimes share their information with the misguided phone calls. People create passwords for their applications either too short which is too easy to identify or too long, which they usually forget.

Further about malicious users, as the security increases, so the ways to hack also increases. It is easy for hackers to hack into accounts of user's or even the bank's database. It is easy to guess passwords with attacking the vulnerabilities, also there are tool kits in kali linux to guess the passwords. Dictionary attack usually helps to find out the passwords. Taking about face recognition as password, it is easier to hack into system with face recognition by showing the image, if there is no liveness in biometric validation it is of no use, anyone can show the customer's picture and can get the authorization.

## II. WORK IN PROGRESS

### A. E-banking

Electronic banking also known as e banking, virtual banking, online banking, or internet banking, is a way in which electronics and telecommunications work in order to produce banking services to the client online. Using E-banking applications a customer can access his / her account to avail the services provided by the bank online. These are of three types:

- *Level 0* this is the basic service provided by the banks through their websites. They can send their services of their products and services through applications as well.
- *Level 1* There is no fund based transferring of money allowed. This is through applications. In this level the customer can avail the services through applications. Services like balance checking etc.

- *Level 2*- This level allows funds to transact, customers can operate services like fund transfer, bill payment, redeeming of securities and purchases etc.

More or less, almost all the banks provide their customers to avail the facility of internet banking through internet or E-delivery channels. Modern banks care E-banks only, they don't have any physical branch, they operate through applications, anywhere in a country.

### B. Authentication

Authentication refers to the process of determining if someone or something is, in fact, who or what they declares themselves to be. Authentication is a technology which provides the access control for systems by checking if a user's credentials matches to the credentials stored in the database of the authorized users at the data authentication server.

Users can usually be identified with a user ID, the authentication is accomplished when the user provides information, for example a password, that in case matches with that of the user ID. Most users are familiar with the way of using a password, which, is the most important piece of information and is known to the legitimate user only, is called a knowledge authentication factor. Other authentication factors are used for two-factor or multifactor authentication (MFA), are described further.

### C. Biometrics

Biometrics refers to matrix of biological characteristics, as bio here means human body measurements and characteristics, and matrix refers to the collection. So biometrics is a term means matrix of body measurements on which calculus might be performed. Biometric authentication is a way to authenticate and verify the legitimate user of the account. Individuals can also be recognized from the group which is under surveillance. It is done by operating the matrix using various algorithms.

Identifiers of the biometrics are distinctive, characteristics are measurable, they are used to identify and label the individuals. Biometric identifiers are usually categorized as one of the two, physiological and behavioral characteristics.

Physiological type of characteristic of the body is concerned with the shape of that body. Examples of this type include, fingerprint, palm veins, DNA, face recognition, print of the palm, geometry of the hand, recognition of iris, retina and scent/odor. Whereas behavioral type of characteristic is related more to the pattern that behavior of any person follows, examples include traits like rhythm, pitch, gait, and voice.

### D. Chatbot

A chatbot (called bot for short) is a computer program designed to mimic conversation with human users on the internet, according to Oxford Dictionaries. Using robotics and Artificial Intelligence (AI), a chatbot can assist customers without the need for a customer service agent on

the other end. Chatbots can range from simple to highly intelligent depending on how they are programmed. A rules-based chatbot can only handle very specific commands, while a chatbot that uses machine learning will get smarter with each interaction. Chatbots in banking are being used by major brands such as Bank of America and American Express.

## III. E-BANKING FACE AUTHENTICATION SCHEME

### A. Working of biometric authentication

Facial recognition<sup>[4]</sup> is way of recognizing a human face through technology. The proposed facial recognition system uses biometrics to map facial features from a photograph or video. It compares the information with a dataset of known faces to find the match. In the proposed system, the users will be using their faces to log into their bank accounts to gain faster access and enhance security. Thus, our scheme starts with acquiring the input image from the webcam. After that, face detection process is performed using method. Then features from detected face are constructed by to create dataset. The detected face is recognized and calculated to find whether the face matched or mismatched.



### B. Face Detection

AdaBoostclassifier<sup>[5]</sup> used with the Local Binary Pattern (LBP) and Haar features whereas Support Vector Machine (SVM) classifier is employed with the Histogram of Oriented Gradients (HOG) features for face detection evaluation.

Haar-like features evaluated via the utilization of a replacement image representation that generates an outsized set of features and uses the boosting algorithm AdaBoost to scale back degenerative tree of the boosted classifiers for robust and fast interferences only simple rectangular.



Fig 1: Face detection

The original LBP operator labels the pixels of a picture by thresholding the 3-by-3 neighborhood of every pixel with the middle pixel value and considering the result as a binary number. Each face image is often considered as a composition of micro-patterns which may be effectively detected by the LBP operator. To believe the knowledge of

faces, face images are divided into  $N$  small non-overlapping regions  $T_0, T_1, \dots, T_N$ . The LBP histograms extracted from each sub-region are then concatenated into one, spatially enhanced feature histogram defined as:

$$H_{i,j} = \sum_{x,y} I(f_l(x,y)=i) I((x,y) \in T_j) \quad (6)$$

where  $i = 0, \dots, L-1$ ;  $j = 0, \dots, N-1$ . The extracted histogram describes the local texture and global shape of facial images.

SVM classifier is been used with HOG features for face detection. HOG outperforms wavelets and degree of smoothing before calculating gradients damages. To perform SVM algorithm training, we'd like to formulate the statement to a difference space that captures explicitly the dissimilarity between two facial images. The results summary of above methods is stated below.

Dataset	Detection		
	Adaboost		SVM
	Haar	LBP	HOG
[1]	99.41%	95.22%	92.67%
[2]	98.34%	98.45%	94.11%
[3]	98.30%	69.80%	87.90%
[4]	96.90%	94.16%	90.58%
[5]	90.66%	88.30%	89.19%
<b>Mean</b>	<b>96.72%</b>	<b>89.18</b>	<b>90.89</b>

Table1: Face detection results summary

### C. Face Recognition

Eigenfaces considered as 2-D face recognition problem, faces are going to be mostly upright and frontal. That's why 3-D information about the face isn't required that reduces complexity by a big bit. It convert the face images into a gaggle of basic functions which essentially are the principal components of the face images seeks directions during which it's more efficient to represent the data. This is often mainly useful for decrease the computational effort. Linear discriminant analysis is primarily used here to scale back the amount of features to a more manageable number before recognition because face is represented by an outsized number of pixel values. Each of the new dimensions may be a linear combination of pixel values, which form a template. The linear combinations obtained using Fisher's linear discriminates are called Fisherfaces. LBP is an order set of binary comparisons of pixel intensities between the middle pixel and its eight surrounding pixels.

$$LBP(x_a, y_a) = 7 \sum_{n=0}^7 s(i_m - i_a) 2^n \quad (6)$$

Where  $i_a$  corresponds to the worth of the middle pixel  $(x_a, y_a)$ ,  $i_m$  to the worth of eight surrounding pixels, function  $f(x)$  is defined as:

$$f(x) = \begin{cases} 1 & \text{if } x \geq 0 \\ 0 & \text{if } x < 0 \end{cases} \quad (7)$$

### D. Dataset

Five datasets been used for above experiments. In dataset, face collection with plain green background; no head scale and lightweight variation but having minor changes in head turn, tilt, slant, position of face and considerable change in expressions.

In dataset, face collection with complex background; large head scale variation; minor variations in head turn, tilt, slant and expression; some translation in face position and significant light variation due to object moment in artificial light. In dataset, face collection with plain background; small head scale variation; considerable variation in head turn, tilt, slant and major variation in expression; minor translation in face position and lightweight variation. In dataset, face collection with constant background having minor head scale variation and light-weight variation; huge variation successively, tilt, slant, expression and face position.



Fig 2: Dataset<sup>[8]</sup>

### E. Chatbot for user's interaction

A Chatbot<sup>[9]</sup> (also known as bot for short) is a computer program which can mimic conversation with human users on the internet, it is a code that has the capabilities of conversing online with human using robotics and Artificial Intelligence (AI), a Chatbot can assist you without the need for any customer service agent on the other end. Chatbot ranges from very basic to highly intelligent depending on the way they are programmed. A rules-based Chatbot is only efficient in handling very specific commands, whereas a Chatbot that uses machine learning algorithms are trained to get smarter with each interaction they make. Chatbot in banking sectors are being used by major brands such as Bank of America and American Express.

### F. Location tracking of device using its IP Address

The location of customer who performed his last transaction can be tracked using his device's IP Address. The mapping of IP address to geographic location of the internet from the connected device is known as IP geolocation. The Internet Assigned Number Authority (IANA) is responsible to allocate large blocks of IP addresses to the Regional Internet Registries (RIR) that serves the world. These RIR's then allocate blocks of IP addresses to Internet Service Providers (ISP) who then

allocates IP addresses to the business, organizations or individual consumers.

A common way to deal with the IP Geolocation is to create and maintain a database that contains the relevant data. But such non-automated methods are undesirable. Problems that could arise can be IP addresses are dynamically assigned and not static and thus the database requires periodic updating. The switch from IPv4 to IPv6 will increase the challenge drastically.

#### Methods of IP Geolocation

- Delay Based Methods: These geolocate the target by exploiting the relationship between Internet delay and geographic distance.
- Topology-Based Geolocation Methods: within the geolocation for the target, the topology-based geolocation methods also leverage the topology additionally to the connection between Internet delay and geographic distance.

#### IV. CONCLUSION

In this study, we introduced a deep learning -based facial recognition system to provide a secured and reliable online banking. The introduction of the deep believes networks for facial authentication on devices had proven to be effective in maximizing security level when performing banking transactions. It is expected that the employment of deep believe networks for face authentication can increase the security level of banking application.

The future work on this paper is about creating new and efficient ways to make e banking safer, much more efficient and secured. Thus making people to trust it even more and taking actions against malicious users. Firstly, facial authentication of the will be expanded to count as a factor in noise due to external environments.

The authentication will also incorporate a module for recognition that will lock the banking system if it is not used by an unauthorized person which is a person who is not the genuine user. Our future work will lastly investigate the incorporation of our facial recognition scheme into a larger authentication framework. Such a framework may use the trust levels alongside other trust scores (e.g.: from touch-gestures) to produce a more robust trust score.

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# Voice Controlled Home Automation System

Shradha Awasthi  
Computer Science

B. M. Institute of Engineering &  
Technology (GGSIP University)  
Sonepat, India  
shradha.awasthi1998@gmail.com

Priyanka Kumari  
Computer Science

B. M. Institute of Engineering &  
Technology (GGSIP University)  
Sonepat, India  
priyankakumari1.pk61@gmail.com

Bhawna

Computer Science  
B. M. Institute of Engineering &  
Technology (GGSIP University)  
Sonepat, India  
bhawna.bmiet@gmail.com

**Abstract**—Internet of Things is a leading technology that enables a user to operate and control the devices around them using connectivity through wireless mediums. The age we live in demands smart work more than hard work. At a minimum usage of power, energy and an effective cost, people want control over the devices they use at the maximum level of ease and comfort. Internet of Things serves this purpose. In the recent years, a significant increase in population and consumption of energy has been observed which has led to the need of conservation of energy. A major reason for this loss is the inability to access and control devices from remote locations. Hence, a universal remote is needed. Android application can be used by the users to give instructions to these systems.

**Keywords**— Raspberry Pi 3 B+, Internet of Things, Home Automation, Google Firebase, Sensors.

## I. INTRODUCTION

The Android OS saw its inception in the year 2008 but it wasn't until the year 2009 that a working version of Android was launched by Google. Since then, it has quickly risen to great heights and has become the most popular mobile operating system in the world. It is a powerful Operating system with a vast variety of features and an omnipresent potential to grow. The expansion and vastness of the features of this operating system can not only control what is going on inside your phones, but can also influence the outside environment by controlling real world objects with a little extra hardware. Nectar is a revolutionary Android application that allows the user to control the most commonly used home appliances like lights, fans, air conditioners, coffee machines with a tap on the screen without having to actually turn on and off physical switches.

Nectar is an intelligent app as it provides feature like real-time location and ETA monitoring of its user and makes decisions to influence the nearby environment based on the data obtained from monitoring. Apart from controlling the appliances from inside the house the user can control their appliances remotely (from a location other than their house). This application is a beta version as the potential and extent of use for such an app is virtually limitless. Features like universal remote, anti-theft measures and voice/gesture commands for better user experience and ease of use can be added to build truly. Smart-Homes at an optimal and pocket friendly cost, a demand for which everybody has longed for.

Nectar also incorporates security features and hence is a complete solution for a smart home. The Quality of the System is kept up in such a manner along these lines that it tends to be very easy to use to all the clients. Our application is an android based application and it will just take a shot at the android cell phone and not appropriate for window phones. Our product is a customized software made on

request of clients and customers. The implemented hardware can only be accessed by the registered phones and moreover has authenticated access only by the authorized users.

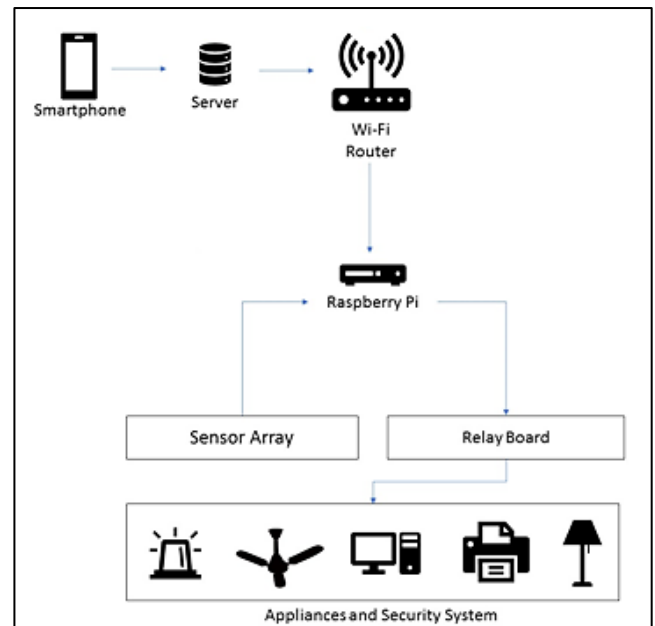


Fig 1. Home Automation System (Basic Working)

## II. RATIONALE

From various studies of home automation systems, we found that most systems use a Bluetooth connection to connect the operating system device such as the Raspberry Pi to the mobile device. This connection is temporary as Bluetooth connections are not much reliable. So, to make it more reliable, we are hosting our application over the internet using Google Firebase or AWS (Amazon web services) for connectivity and database services. This allows the user an access to the system even when he is some distance away from his home and if he has a strong internet access. The system takes advantage of various technologies and can only improve for the better with time.

We have also added this feature of sending a notification through the application to the user regarding the switching off or switching off of the appliance. The Expected Time Arrival (ETA) feature helps us the application to know when to perform a task even before the person enters home. Also, we had made our application highly customizable according to the user's needs, which further makes it economically feasible and cost efficient. By customization we mean that our application totally depends upon the requirements of the user that what all appliances he wants to connect with the application.

### III. OBJECTIVES

The objective of this project is to develop a cost-efficient home automation system. Expected achievements in order to fulfil the objectives are:

- To switch on/off the home appliances automatically based on voice commands or touch of buttons.
- To ensure certain safety aspects like smoke or fire in the house, gas leakage, water leakage, some alert sound such as an emergency alarm, etc.
- To ensure security of its user, the application sends an emergency message to the logged in user as well as the other registered users to confirm change of plans if the user fails to reach home within additional two hours of their ETA.

### IV. LITERATURE REVIEW

We have reviewed several research papers relevant to our context which are as follows:

In [1] Chinmay Berpery et al. considered the quick headway of the Internet of Things (IoT). Life is getting simpler and less difficult in all perspectives. At present world, programmed frameworks are being preferred over the manual framework. The present world mechanization has become an indistinguishable piece of conventional family units and subjects to consistent advancement. The creators additionally watched IoT as a developing system of customary item from industry to customer that can share data and complete occupations while you are engaged with different exercises. A brilliant home mechanization framework can assist with having a brought together technique to control every single home machine. Right now, financially savvy framework is proposed to accomplish such computerization framework dependent on IoT idea. All the gadgets of this framework are associated with Raspberry Pi. The proposed framework likewise gives an office to control every home apparatus locally without the web through a neighbourhood organize. Raspberry Pi runs a web server to have a web - based control interface and a SQL database to keep up the present status of machines. The interface can be gotten to through the web or locally without the web. Other than our programmed re-start component makes the framework increasingly effective.

Accessibility of rapid portable systems like 3G, 4G and Long Term Evolution combined with less expensive and available advanced cells, versatile industry has seen a huge development regarding offering different types of assistance and applications at the fingertips of the residents. In [2] K. Venkatesh et al. examine about IoT and it very well may be utilized for acknowledging shrewd home computerization utilizing Raspberry Pi. This framework comprises of an advanced cell alongside site page which is having the home machines subtleties with ON and OFF conditions. Advanced cell is interfacing with Raspberry Pi utilizing the IP address of Raspberry Pi through Wi-Fi. The remote application is easy to understand improves effectiveness and way of life. The framework effectively conquers the disadvantages in Bluetooth and ZIGBEE innovation. It is an automation of home or house hold movement. Raspberry pi is a little PC, which was presented in the time of 2012; it is right now a standard framework subject to broad accessibility that can be utilized in home mechanization.

In [3] Shrikrushna Khedkar and Dr. G. M. Malwatkr have evaluated that up to 2020 there will be close around 50 billion virtual worlds empower gadgets accessible. Home mechanization may contain unify controller which control lightning in the house, HAVC (warming, ventilation and cooling), security locks of entryways, entryways and other framework to give improve comfort, conspiracy security and vitality effectiveness. The point of this paper is to build up a home automation application utilizing RPi and GSM. Programming has been created in python condition for RPi activity.

In [4] M. Narender and M. Vijayalakshmi have checked on that the process of automation as a well-known methods for its various applications. Home computerization is something that manages the control of local apparatuses with the assistance of nearby systems administration or by remote control. The primary point of this paper is to build up a propelled technique for home automation with the utilization of Raspberry Pi (RPi) through perusing the subject of the E-mail. A calculation for the equivalent has been created utilizing the python condition which is as a matter of course gave by Raspberry Pi. The automation process that is utilized is a planned computerization, which is finished. The outcomes show a proficiency of the calculation utilized to play out a booked mechanized. These directions give you fundamental rules for getting ready papers for meeting procedures.

In [5] Sweta Pattar and Dinesha H A, researched about controlling appliances is a principle part of automation. The primary object of home mechanization is to give a remote correspondence connection of home machines to the remote client, which depends on the idea of IOT. The Internet of Things (IoT) alludes to the ever-developing system of physical objects that component an IP address for web network, and the correspondence that happens between these articles and other web empowered gadgets and frameworks. Android has been administering the market since its origin, and dominant part of the cell phone showcase is caught by android. Henceforth we intend to utilize the most mainstream portable OS for example android to build up our home mechanization controlling application. Where the apparatuses are been controlled through voice directions.

In [6] Malik Sikandar Hayat Khiyal et al. primarily centers on the controlling of home apparatuses remotely and giving security at the point when the client is away from the spot. The framework is SMS based and utilizes remote innovation to alter the ways of life. This framework gives perfect answer for the issues looked by mortgage holders in day by day life. The framework is remote in this way progressively versatile and financially savvy. The HACS framework gives protection from interruption just as mechanizes different home machines utilizing SMS. The framework utilizes GSM innovation along these lines giving omnipresent access to the framework for security and computerized machine control.

In [7] the point of home automation is to control home gadgets from a focal control point. Right now, present the structure and usage of a minimal effort however yet adaptable and make sure about Internet based home automation framework. The correspondence between the gadgets is remote. The convention between the units in the plan is improved to be appropriate for a large portion of the

apparatuses. The framework is intended to be ease and adaptable with the expanding assortment of gadgets to be controlled.

[8] Refers to automation control implies the utilization of different control frameworks (sensors) for working gear without human impedance. Home mechanization is energizing field when it is explode with new advances like voice control. It is computerization of the home or family action. The Raspberry Pi is small(85.60mm x 56 mm x 21 mm), inexpensive(2,950 INR), compact, credit-size single board PC with help for countless peripherals like USB port, HDMI port, SD card opening and system correspondence like Ethernet port. Raspberry pi a gathering of technologies now exist that join the limit of PC, correspondence and sight and sound advancements of web and transportability of the mobile gadget.

## V. IMPLEMENTATION

### A. Android Application

The android application has an interactive User Interface which shows all connected electrical equipment and appliances. It shows the present status (or last updated status during internet connection) of all equipment. It allows the user to have control over his home electronic appliances.

### B. Firebase

Firebase Real-time Database (Google, 2011a) is a product of Google which can be used for real-time data storage and data synchronization. It is used as the primary data storage system. Relevant firebase features include:

- Real-time Synchronization: Firebase Software Development Kits sync data almost instantly.
- Offline data access: Firebase provides offline support using an on-device database. This local database enables the systems to function smoothly, when network connection is unavailable.

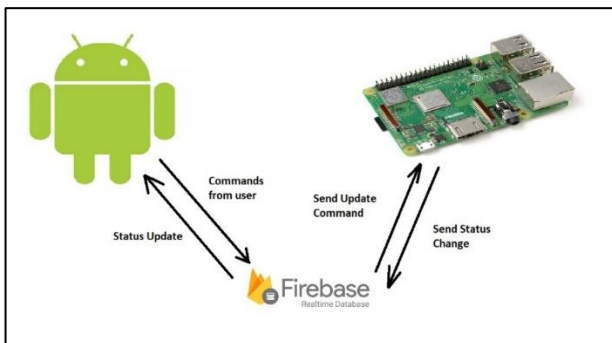


Fig 2. The communication flow diagram of the system.

- Enables server-less development: Firebase takes care of the complex authentication and networking process. A powerful set of security rules are used to control access to data. Security rules let controlling which users can access which data and applying complex validation logic to data.

The entire activation and working of the system is controlled through an application. The user can enable or disable the sensors by directly clicking buttons or through his voice commands which may be processed by Nectar.

### C. Raspberry Pi 3B+

Hardware tests are run in order to check the hardware support which is an integral part of this project. All the connections i.e. those of sensors and lights would be supported by the Raspberry Pi. After activation the application will check for hardware support. If the hardware is missing or some other hardware problem there will be error, resulting in communication failure and the application will be terminated.

If hardware responds then only the devices and sensors would be controlled properly. The project is equally dependent on hardware as well as the software. Only authorized users are allowed to access the application. Requirements have to be very clear before the project starts, because it is usually expensive to go back and make changes.

“Nectar” combines Android application, home appliances and Internet connection to enable user to operate their home appliances using their mobile phones. Rather than reaching out for each and every appliance and switching it on/off, this app only requires a command from the user regarding the operation he/she wants to perform and the appliance works accordingly.

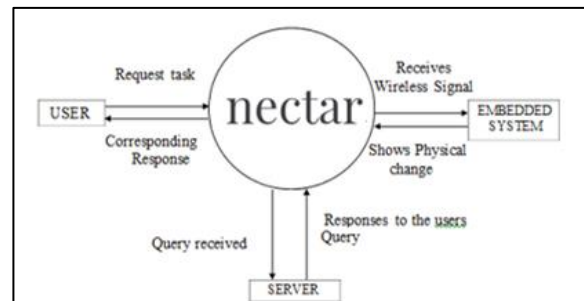


Fig 3. DFD Level-0

The user needs to install Nectar application on his/her Android mobile phone and must have a working internet connection for the working of the smart devices. After an established internet connection, the instructions are spoken to the application in a Basic English language, for example “Switch on the lights.” The voice control interpreter interprets the command and accordingly sends the instructions to the Raspberry Pi. Python code within it runs and implements the required commands.

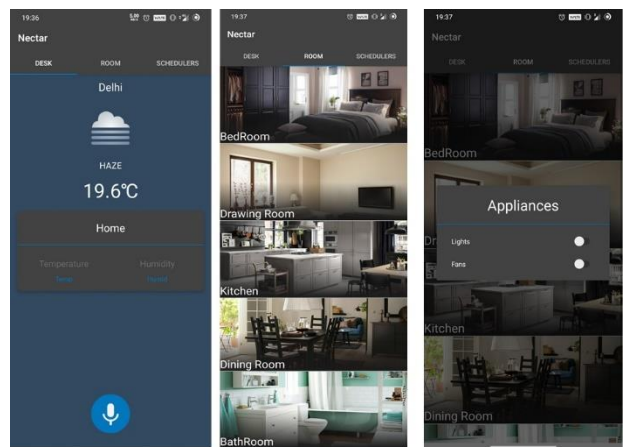


Fig 4: Layout of the app created.

Once we send commands through the application, this application sends the commands to the Firebase and further



Firestore sends the update command to the Pi. In return, the Pi sends back the status change to the firestore and a status update can be seen on our application as well as through the appliance. Google Firestore acts as database for the linking of the application along with the hardware (Raspberry Pi). Firestore has been setup so that we can give commands from anywhere (if you have a stable internet connection) and your commands can be easily executed for the proper functioning of Nectar.

Now, the additional functionality of this home automation system is its Voice Controlling System. As soon as the user taps the mic (at the bottom) and give commands to the command prompt, the Google Speech API (Speech-to-Text) is used and the application understands that command and performs the required operation. This is indeed a beneficial feature as it can easily simplify and streamline tedious jobs, thereby, saving time with increased efficiency and accuracy. Another advantage of this can be the Voice feature adds on to the future scope as it can be complied with artificial intelligence to make it function not only through smart phone applications but also, robots.

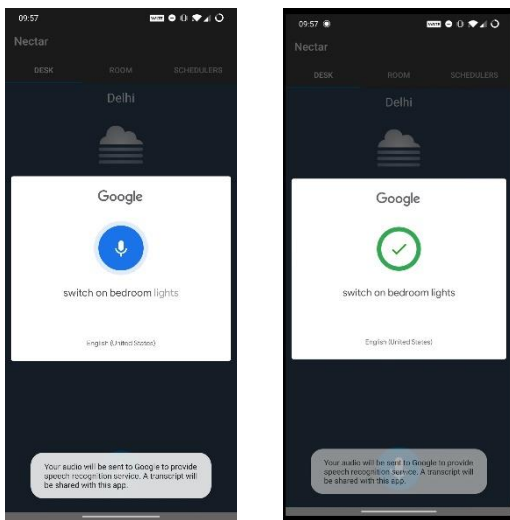


Fig 5. Voice Controlled System.

Raspberry Pi further sends the instruction to the connected device and switches on the lights or any appliance which you wish to turn on or off.

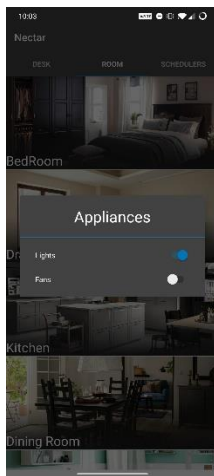


Fig 6. Voice Controlled System Operation Performed.

Not only is this but also on the main home page, the temperature and humidity of the room displayed. Gas quality

is also a main feature which is set forth on the main home screen to determine the quality of the gas within the room or the place where the sensor has been placed. All the information is within the application and the user must not worry with the connections made on the hardware.

It not only requires software application but also the hardware so that the whole connection can be easily established without any issues. The project requires commands from the user and a working internet connection to which raspberry Pi and application connects. The Expected Time Arrival (ETA) option allows the user to generate a trigger at that point of time to perform the operation which the user likes to. An alarm can also be set to switch on the lights or fans as per the user's wish. An option of both analog and digital clock has been given to make the application more user friendly.



Fig 7. ETA and Alarm.

The application lets the users turn on/off home appliances from their android application (installed in their mobile device) inside and outside the house along with features like anti-theft measures and voice/gesture commands for better user experience and ease of use. Provides security features like Keyless Entry, Smoke detection, Gas leak Detection and Motion detection which are implemented using boards and sensors like PIR sensor, Gas sensors.

## VI. ADVANTAGES

- This system at an effective cost and with minimum requirements not only ensures home security but also home automation.
- The system runs fine through an application connected to Wi-Fi at home/office.
- The smart phone application takes care of the fact that the user may also wish to control his home appliances without sensors being triggered.
- The system is simple and inexpensive as we can deploy the same set of motion sensors to serve different functions.
- To ensure security of the user, the application sends a notification to the other registered users if the logged in user doesn't reach home within his ETA.

## VII. CONCLUSION

This project will enable the user to control the in-house appliances wirelessly and many more features are also implemented keeping in mind the concept of automation. Following are the features of the product:

- **Simple:** The project is simple to understand. Basic knowledge of Android, Java, XML and SQL is enough to understand all the key aspects of the project.

- **Attractive:** The use of XML and Android Design Libraries have enhanced the looks of the project. It attracts the user attention to itself there by making it an interesting one.
- **Secure:** Security has been the basic necessity kept in mind while designing the project.
- **Easy to use:** The overview and the layout of the project makes it easily understandable and easy to use even if you have only basic knowledge.
- **In-House Appliance Control and security:** Let the users turn on/off home appliances from their android application (installed in their mobile device) inside and outside the house along with features like anti –theft measures, Augmented Reality and voice/gesture commands for better user experience and ease of use. Provides security features like Keyless Entry, Smoke detection, Gas leak Detection and Motion detection which are implemented using boards and sensors like PIR sensor, Gas sensors.

#### ACKNOWLEDGMENT

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# SMART FIT: A LEAP IN HUMAN FITNESS

<sup>1</sup>rajat Mehata  
Student, B.Tech, ECE  
BMIET  
Sonepat ,India  
rajat.mehta1998@gmail.com

<sup>2</sup>Dr. Vishal Jain  
Professor, EE  
BMIET  
Sonepat,India  
Vishal\_dehradun@yahoo.com

**Abstract-** Open parks have been a focal feature of urban life for over 100 years. From that time, technology has become integral to our lives. In any case, innovation has not truly been utilized in park settings. Regardless of the continuous conversation of the ongoing years, strategic planning in this field is still largely unexplored. This paper presents a hardware approach to utilize technology to reflect and fit inside the physical and natural surroundings. The concept 'SMART FIT' proposes to give the proximities of all the parks to a person's vicinity along with details, such as, availability of drinking water, open gym etc. The design of smart fit system is also equipped with air sensor capable of detecting air quality for an informed choice to the user for selection of park. The paper provides an insight on various factors to distinguish and select the best park to the user within the present conditions.

**Keywords:** Smart Parks, Internet of things, cloud, embedded systems, human fitness, sensors.

## I. INTRODUCTION

Most cities worldwide fail to meet WHO guidelines for safe levels of the ambient air. The polluted air leads to an additional risk of respiratory disease and other health problems. Air quality is represented by the annual mean concentration of particulate matter PM<sub>10</sub> (particles smaller than 10 microns) and PM<sub>2.5</sub> (particles smaller than 2.5 microns). A considerable amount of time is spent by the people in parks working on their fitness, but the impact on their health can be adverse if the air quality of that particular park is not good.[1]The Smart Fit system is proposed to be installed at parks equipped with air quality sensor which send the real time air index to the cloud, which could be accessed by the user at any instant of time.[2] In addition the system would present information like area of the park, availabilities of basic amenities like drinking water, open gym, live population count etc. The system is thus trained to suggest the best available park in the close vicinity. The above features could be accessed by the user in their mobile phones through an application. This Smart fit system is capable of providing informed choice on the condition of parks to the user thus promoting their better health both physically and mentally.

## II. HARDWARE USED

The basic components required for building the module includes a development board with WiFi connectivity and various sensors for detection of air quality and population inside the park. A brief introduction of these components are presented below

### A. Node MCU

It is an open source firmware developed for ESP8266 wifi chip. NodeMCU comes with ESP8266 Development board/kit. The hardware design of this kit is simple and easy to edit/modify/build. The ESP8266 is a low-cost WiFi chip developed by Espressif Systems with TCP/IP protocol. [3]

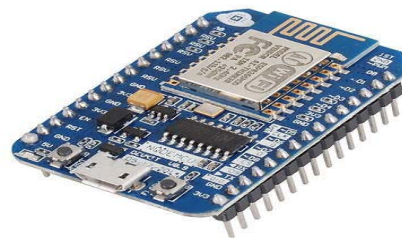


Fig.1: NodeMCU-ESP8266

### B. MQ-135 Sensor:

The MQ-135 is a Gas sensors which is widely used for the detection/ measurement of NH<sub>3</sub>, NO<sub>x</sub>, Alcohol, Benzene, Smoke, CO<sub>2</sub>. The MQ-135 sensor module has a digital pin which makes this sensor to operate even without a microcontroller and can be used when only one particular gas is to be detected. If the gases in PPM are required to be measured, the analog pin can be used. The analog pin is TTL driven and works on 5V. This sensor module can be used with most common microcontrollers and efficiently utilized in the air quality control equipments. [4]

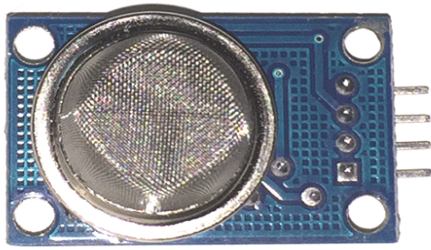


Fig.2: MQ-135 Sensor:

C. IR Sensor:

It is a very common sensor which measures the infrared radiations. An IR sensor can measure the heat of an object as well as detects the motion. IR is not visible by the human eye since its wavelength is longer than the visible spectrum. This sensor module detects these radiations in the form of thermal radiation

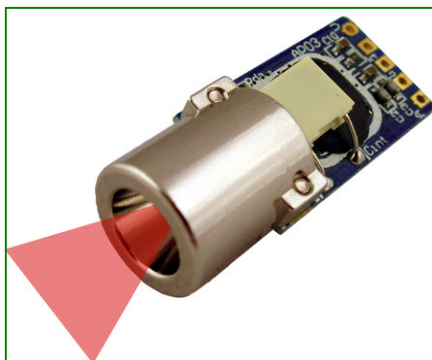


Fig. 3: IR Sensor Module

II. WORKING OF THE SMART FIT SYSTEM

The actual hardware prototype implemented to develop the Smart fit System is shown in the Fig:4 .

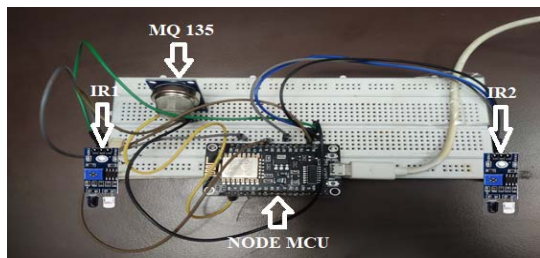


Fig: 4 Hardware Prototype of the Smart Fit system

The module is proposed to be placed at the gate of parks. The IR sensors are placed at ends of the gate. Whenever the IR sensors get infrared rays radiated by human the count of a person is incremented or decremented depending on the order of activation of these sensors. The entry of a person is incremented only when the IR1 detects the rays followed by IR2 otherwise if IR2 detects first followed by IR1 then the person count is decremented. The block diagram of the flow of information in the system is shown below.

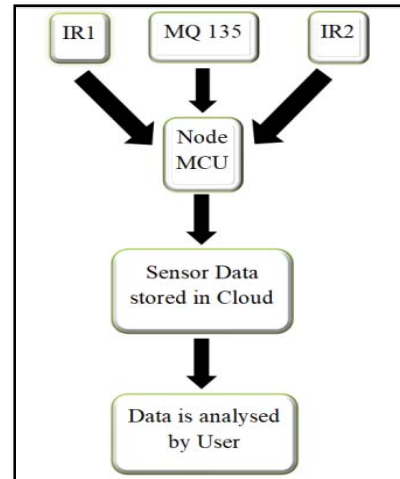


Fig. 5: Flow Diagram of the Information flow

III. INTERFACE WITH MOBILE PHONE

The data captured by the sensors are sent to the cloud which can be then accessed by the user via an application. The application used here is BLYNK which is a platform to interface the hardware project with mobile device for the purpose of controlling and monitoring.[5] The Fig: 5 show the flow chart for the data processing through Blynk App.

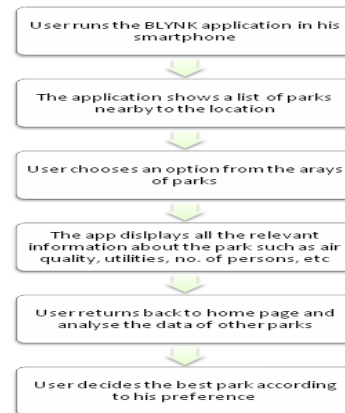


Fig .6 Flow Chart of Data Processing using Blynk App

#### IV. RESULTS & CONCLUSION

The Widgets created on the Blynk app displays the information collected by the Smart Fit module using various sensors, which enables the user to choose the best park based on the selection of data. Fig: 6 shows a screen shot of the application on the mobile phone which gives the data for various parks. Table 1 shows the indices displayed by the mobile application

Table1:Indices of park

Park	Air Index	UTILITIES	Track Length	Open Gym	Peak Hrs	No of Persons
DDA PARK	130	YES	1.2 KM	YES	5.0-7.0 pm	2

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# The Internet of Energy: Predictive maintenance with Big Data in improving Power Industry

Dr. Vishal Jain  
Professor EE,  
B.M Institute of Engineering & Technology, Sonapat

**Abstract:** *The common objective of power utilities across the world is to ensure consistent electricity as safely and efficiently as possible. In order to fulfil these objectives, every significant equipment asset from generation to distribution should operate optimally. Intensive use of Smart sensors results in a huge volume of data sets which offer abundant opportunities for power monitoring, demand-side management, and combining renewable energy sources. These data sets can be utilized to improvise the performance and operation of power grid after efficient analytics. The challenge of the hour is to extract the useful information and effectively apply in managing the electric utilities. Large utility providers carry out scheduled maintenance on equipment which is inefficient and expensive. The use of Predictive maintenance enables them to allocate resources leading to reduction in cost and reducing service disruptions. This paper discuss how big data will play an integral role in this transformation.*

**Keywords—***Internet of things, Smart Sensors, MEMS, Big data.*

## # I. INTRODUCTION

In the power sector, with an increasing use of ICT and the idea of smart grid, digitalization has become a reality. This digital revolution has covered all the facets of energy chain from, generation to distribution [1]. On the other side, there are various challenges for power systems related to cost, efficiency and use of renewable sources. These challenges along with the popularity of big data create new opportunities in improving the power industry. The future generation power industry will be more data oriented which will lead to solving problems through automated strategy and real time optimization with precise prediction through data analytics. [2]– [4].

The equipments in the power system such as Transformers should be capable of stepping up and down the transmission voltage efficiently, and protection devices like circuit breakers should interrupt fault currents. Under normal working conditions, these utilities do not operate optimally due to ageing and degradation, as a result the assets become damaged. To overcome these issues and attain normal operating conditions, scheduled maintenance of equipments is carried out. The conventional maintenance is mostly reactive, and takes care of problems as they occur. The exceptional growth of big data is generating huge opportunities for power system to implement predictive maintenance and thus reinforce their comprehensive maintenance [5].

The reactive maintenance cannot be completely eliminated as there are situations where immediate action is required. A combination of conditional maintenance and preventive measures can lead to a more proactive and effective strategies.

## II. A COMPREHENSIVE APPROACH TO MAINTENANCE

Fig.1 depicts the various components of a comprehensive maintenance approach in the power industry. A reactive or condition based maintenance program does not depend upon the pre-defined schedule or time, rather depends on the operating conditions of the utility or equipment. In this approach the equipment is fixed as it is down, and is highly dependent on operational data collected from various sensors installed on the equipments like transformers and circuit breakers. Conversely scheduled maintenance in principal is a periodic approach where the equipments are repaired or replaced at defined time periods. This approach could include replacing various components or equipments based on number of operations. Proactive maintenance removes the fault at an early stage and restores the equipments and prevents large system failures. With the advancements in the sensor technologies and the advent of internet of energy, online predictive maintenance has proved to be an essential component of a comprehensive approach to maintenance in the power industry. It involves real time monitoring of equipments and comparing its health with the ones with ideal operating conditions. It makes use of algorithms which detects operational inconsistencies and warns of approaching problems through automated alarms. However the overall health of the plant, grid or facility cannot be completely achieved without integrating reactive, periodic, proactive and predictive techniques.

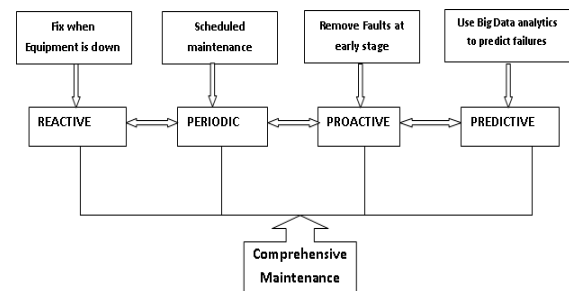


Fig. 1: Components of Comprehensive maintenance

### III. PREVENTIVE MAINTENANCE WITH IOT

Predictive maintenance and condition based monitoring is becoming extremely easy and affordable with the revolution in the Industrial IoT [6, 10]. There are four major constituents of this change. Fig.2 shows the constituents of the predictive maintenance with IoT.

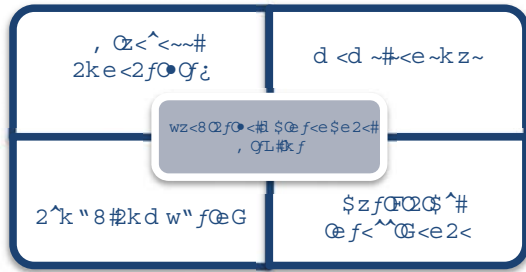


Fig.2 Predictive Maintenance with IoT

#### A. Wireless Connectivity:

With the increasing use of mobile and Wi-Fi connectivity, there is persistent growth in wireless sensor technologies enabling them to sense and transmit almost all equipment parameters. The wireless Sensors helps to collect the data automatically and is also inexpensive.

#### B. MEMS Sensors:

The cost of sensing has drastically reduced with the Smartphone revolution. Small sized low cost MEMS sensors are readily available and are inexpensive [9]. MEMS sensors are easy to incorporate into systems, they have small thermal constant and can resist shock, radiation, and vibrations.

#### C. Cloud Computing

The development of a new environment in the field of virtualization, storage and connectivity has made cloud computing highly secure, robust and inexpensive. This gives power system an extra edge in monitoring and scheduling [8].

#### D. Artificial Intelligence (AI):

The recent trends depicts that Artificial Intelligence has now become conventional. It is almost impossible to handle the time series sensors data manually. Predictive maintenance takes huge amounts of data which together with use of AI and predictive maintenance software is easy for analytics, converts that data into useful data sets and avoid data overload.

The above technologies prove to be vital even when used in isolation, but when combined together, have the ability to transform the industrial world.

### IV. TRANSMISSION & DISTRIBUTION IMPROVEMENT USING PREDICTIVE ANALYTICS

With the use of predictive maintenance strategy, T&D utilities can make smart decisions to carry out the maintenance. The cost of maintenance can be reduced with enhanced and accurate planning and avoid the maintenance which is not immediately required. The predictive analytics also gives an insight of the utilities which are not performing well and gives the report of the factors leading to its unsatisfactory operation. This technology can prevent various system failures by providing early reports of the gradual changes which otherwise might have gone unobserved.

The life of the equipment is thus extended, expenses are reduced and the asset efficiency is increased with the use of predictive analytics.

### V. COMPREHENDING BIG DATA IN PREDICTIVE MAINTENANCE

With the increasing use of modern control techniques, and smart sensor technologies, the utilities are required to take measures to use and analyze the collected data for making informed choices in maintenance decisions [7]. A lot of utilities are not able to utilize most of the data collected from smart devices, smart grids and sensors and hence predictive maintenance remains a practical application [11].

T&D utilities can build up their maintenance strategies by using data analytics solutions and take smart and effective actions to get the best out of every utility.

### VI. CONCLUSION

The role of big data is increasing in predictive maintenance of power industry. This paper discusses the scope of Internet of energy applied to the predictive maintenance. It is evident that the data analytics is increasing the efficiency of the maintenance department, and thus improving the system operation.

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# Design and Development of Agrobot using Arduino

Vatsala Sharma  
 Department of Electronics &  
 Communication Engineering  
 College of Technology and  
 Engineering, MPUAT  
 Udaipur, India  
[vatsalasharma01@gmail.com](mailto:vatsalasharma01@gmail.com)

Mansi Agarwal  
 Department of Electronics &  
 Communication Engineering  
 B.M. Institute of Engineering  
 and Technology, GGSIPU  
 Sonipat, India  
[mansiagarwal410@gmail.com](mailto:mansiagarwal410@gmail.com)

Sukreeti  
 Department of Electronics &  
 Communication Engineering  
 B.M. Institute of Engineering  
 and Technology, GGSIPU  
 Sonipat, India  
[sukreeti90@gmail.com](mailto:sukreeti90@gmail.com)

**Abstract**—Agriculture is the main profession for a majority of people living in India. So, advancement in the field of agriculture is directly proportional to the advancement of the nation. Also, making the process of agriculture automated makes it efficient, less prone to errors and more flexible. This research paper explains the development of the prototype of such a robot named Agrobot (agricultural robot). Agrobot is designed for automatic ploughing of fields, seed sowing and irrigation of fields as a result human effort and time will be reduced as well.

**Keywords**—Agriculture, Agrobot, Arduino, Electromechanical

## I. INTRODUCTION

Agriculture in India is a source of employment for 50% of population in India. It contributes approximately 17% to 18% of India's GDP as of 2018 report (1). Hence advancements in the field of agriculture will not only help improve the GDP but also pave the way for people to do more of smart work than manual work (2).

The tasks performed in agriculture, e.g. Seeding, harvesting, irrigation or ploughing are mainly manual jobs (3). They take up a lot of human effort and manpower. Making these tasks automatic or robotic based, saves a lot of time and manpower (4). All this saved human effort could be then put up to other more important tasks.

Keeping all these factors in mind, we did a little research and tried to develop a robot called AGROBOT. The AGROBOT is first of its kind. It performs the functions of harvesting, seeding and irrigation. Previously, there have been made attempts to develop a robot that performs either of these functions. The previous attempts are available in many forms (5). Some of them are mechanical. Electromechanical (6) while some are IoT (Internet of Things) or embedded based (7). Table 1 shows a few examples of arduino based agriculture robots that have been made in recent years.

This AGROBOT is an embedded system based made in an attempt to integrate all the features of agriculture processes in one device which is not implemented till date as per our best knowledge. With the help of agrobot, all these functions can be performed automatically.

Our AGROBOT is based on Arduino UNO (8). A LCD screen of 16\*2 is attached for displaying the on going

process (9). A plougher is attached at the back end of the AGROBOT for ploughing. The middle left portion has a seed dispenser mounted to it while the middle left part has a irrigation pump mounted on it (10). The irrigation pump is a dc motor connected to a water tank which has a pipe in it which goes through the base of the AGROBOT to the downward section for performing the process of irrigation. The quantity of water to be supplied is kept in check with the help of Moisture Sensor (11). It measures the moisture content of the soil and decides if the soil needs irrigation or not. This way we try our part on saving water. There is also one Ultrasonic sensor detects hindrances or objects in the path of the AGROBOT. This sensor is the basis of a free and safe motion of the bot in a practical field. Both these sensors are placed in the front end of the bot on a rectangular slot. (12).

Table 1: Proposed Agrobot models till date.

S.NO	TITLE	YEAR	FEATURES
1	Sensor based seed sowing bot (3)	2019	Seeding
2	Design and development of seed sowing AGROBOT [10]	2018	Seeding
3	Automatic seed sowing & irrigation agrobot using arduino (1)	2018	Seeding , Irrigation
4	Agricultural Automation System with Field Assisting Robot-AgroBot (16)	2018	Seeding, Harvesting, Ploughing
5	Automated Agrobot*, Indian Journal of Science and Technology (6)	2017	Seeding , Harvesting , Ploughing
6	Precision Agriculture Robot for seeding function (13)	2016	Seeding
7	Development of Agricultural and Seeding Equipment (14)	2014	Seeding
8	Automated Irrigation System Using a Wireless Sensor Network and GPRS Module (15)	2013	Irrigation

The next section II entitled proposed design in which the block diagram of the prototype is explained. It also describes the implementation of the proposed design with the help of algorithm and flow chart. Following section III entitled results and discussion depicts the challenges faced during the implementation and future advancements that can be done in the design.

## II. PROPOSED DESIGN

### A. Block Diagram and Working

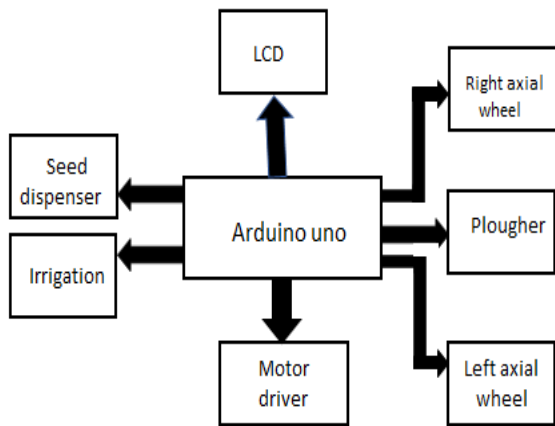


Fig 1:Block diagram

The main components of the prototype are represented with the help of the block diagram as shown in figure 1. Arduino is the heart of the agrobot prototype design proposed in the paper. We used Arduino UNO for our design. All the connections between Arduino and the bot are made through the breadboard. The three major functions—ploughing, seed sowing, and irrigation of the agrobot—are performed by certain blocks represented as plougher, seed dispenser, and irrigation respectively.

The plougher is attached at the back end of the robot. It is connected with a servomotor. The plougher moves in an up and down motion. When the plougher is not used, we move it upwards, and when it is required to plough, we keep it downwards.

The seeder consists of a box which has two holes in it. One is at the top so that the farmer can put the seeds inside it. Another is at the bottom so that the seeds can come out. Inside the box is a rotating shaft that makes it possible that only one seed will come out at a time. This rotating shaft derives power from a 12rpm DC motor.

Irrigation is done through a pump and DC motor. A thin PVC pipe flows the water from the pump to the ground.

All these motor wires are connected with a push button on the breadboard. Whenever a button is selected by the user, the dedicated function begins to execute.

A 16\*2 LCD screen displays the name of the function that is being performed. Two wheels at the back and one castor wheel are provided for the motion of the agrobot. Jumper wires have been used for connections.

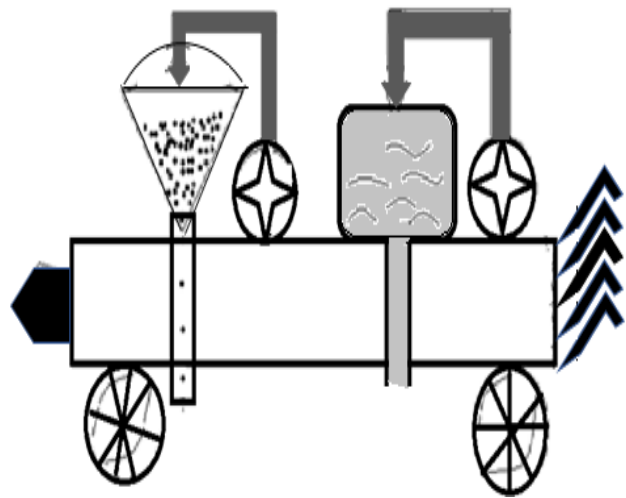


Fig 2: Proposed design

### B. Implementation

Algorithm that is used to implement the operations of the proposed design is as follows:

Step 1: Start

Step 2: Initialize the system on Arduino Uno

Step 3: Check which push button is activated. If no push button is pressed, then STOP

Step 4: If push button 1 is selected, start ploughing. Servomotor is initialized and plougher is activated. Ultrasonic sensor will detect obstacles and decide the location of turning as decided by the programming sequence.

Step 5: If push button 2 is selected, start seeding.

The DC motor is turned ON and the dispenser sends one seed at a time.

Step 6: If push button 3 is selected, start irrigation.

Moisture sensor checks the value of moisture in soil and then decides whether irrigation is required or not.

Ultrasonic sensor will detect obstacles and decide location of turning as decided by the programming sequence.

Step 7: If power is still ON, go to step 3 else if power is switched off the operation currently being performed is stopped and motion of the agrobot is stopped.

The algorithm can be implemented as per the requirement of the user. The operation of the proposed design can also be explained with the help of a flow chart as shown in figure 2.

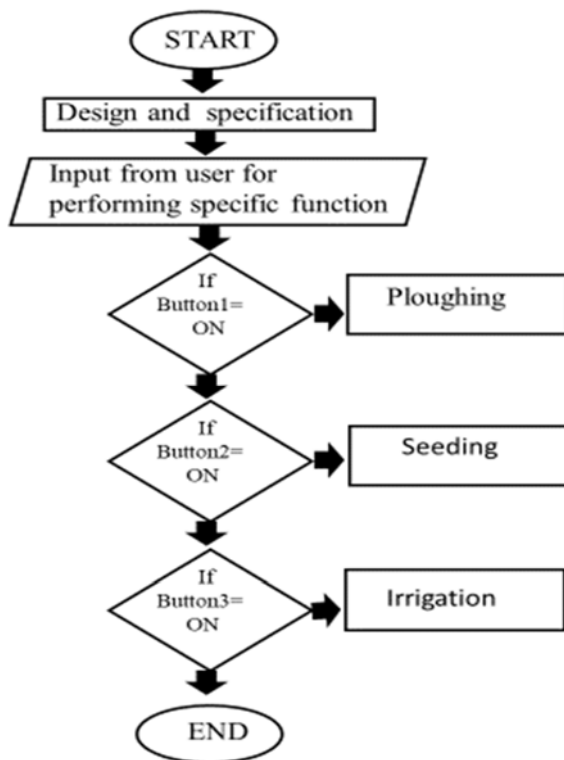


Fig 3: Flowchart

In addition to this an IR sensor and an ultrasonic sensor are also used for the purpose of irrigation monitoring and obstacle detection in the path of agrobot (12).

### III. RESULTS & DISCUSSION

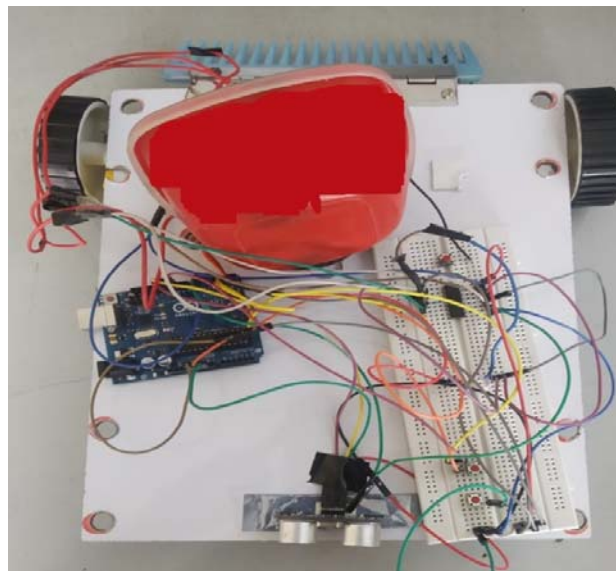


Fig 4(a): Prototype of Agrobot (top view)

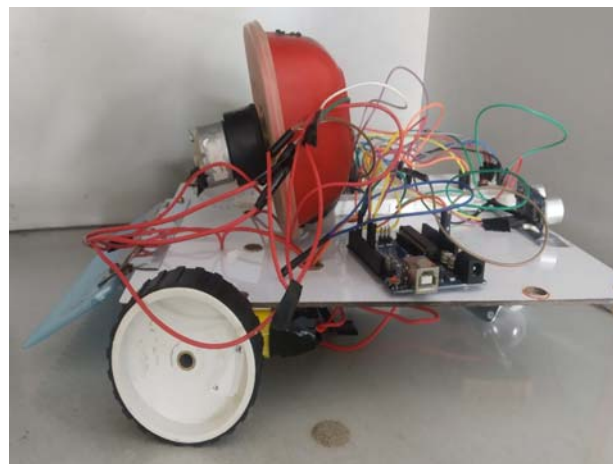


Fig 4(b): Prototype of Agrobot (side view)

The AGROBOT performs all its functions. The code was written in C language in Arduino. The BOT performed all functions but had some glitches.

Following were the issues we faced -

1. Too many seeds came out at once.
2. Weight of the BOT was not balanced.
3. Pump had to be half full to work.

The Project Agrobot is a success. It can be implemented at a large scale to benefit the farmers of the society. Currently, the farmers are buying separate machinery for these functions. Implementing all of them in one unit saves a lot of cost and makes it easier for more people to purchase it. The efficiency could be increased to a great extent with this bot. With little variation, this project can be made even more beneficial.

We can implement solar plant and run the whole Agrobot on solar energy. A solar cell panel could be made overhead and run by solar energy. This might cause the problem of excessive weight but if handled properly, this could be a revolutionary development in the field of agriculture. This way we can also contribute to the environment. Further, the developed design can be enhanced by modifying it according to the principle of IOT (Internet Of Things) by online monitoring the processes.

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# Secured Smart Home Using IoT

Pardeep Tyagi

*Associate Professor CSE  
B.M. Institute Of Engineering  
& Technology  
Sonapat, Haryana, India*

Kunal

*Computer science and Engineering  
B.M. Institute Of Engineering  
& Technology  
Sonapat, Haryana, India*

Baljit Kaur

*Computer science and Engineering  
B.M. Institute Of Engineering  
& Technology  
Sonapat, Haryana, India*

Sumit Paropkari

*Computer science and Engineering  
B.M. Institute Of Engineering  
& Technology  
Sonapat, Haryana, India*

**ABSTRACT-** Internet of Things (IoT) makes real the idea of remotely connecting and monitoring real world entities (Things)[1] through use of the Internet. This concept is used to make our home smarter, safer and automated. This project focuses mainly on bringing security and automation down to the same table. We have used various modules to make our home smarter and safer with more reliability and lesser efforts. This project is a step to make our smart and secure home. ESP8266 and ESP32 microcontroller have been used in this project and it is connected to our smart devices with Google Assistant using the internet to control home appliances like fan, light, air conditioner, television. For Security: We use RFID cards to lock and unlock doors to automate door locks. We use face recognition on ESP-32 microcontroller also connected with Google Assistant.

**Keywords – RFID, IoT, Internet, ESP32, ESP8266, OLED Display.**

## 1. INTRODUCTION

Our main focus in this project is on home automation and security system, to automate home appliances and to provide security to our home. This project will allow us to use Home Automation and Home Security on a whole as one. [5] Previously separate applications were used for Home Automation and Home Security System so we are solving this issue by providing a single project to look after both security and home automation. This system will allow us to open or close our sliding home main gate, by RFID, button or web server, or with the camera module using the face recognition method. [6] We can turn off and on the LEDS of our home through web server by enabling it from smart mobile phone on need. We can also perform such operations using Google Assistant. [9] Radio Frequency Identification card is secure and unique for everyone, that's why we have also used it in our project so that only authenticated person may enter through the door.

A smart Door lock is an electromechanical lock which is designed to perform locking and unlocking operations on a door when it receives such instructions from an authorized device using a wireless protocol or a camera module mounted on the entrance or the RFID tag to execute the authorization process. In a smart home, smart locks allow a homeowner to enter their home or provide others access without requiring a traditional key. Instead, the user uses their Smartphone or a RFID tag or detects their face on the camera module mounted on the entrance of home to wirelessly verify and mechanically unlock the door. Smart locks are an extension of home automation into home security. The introduction of the smart lock doesn't only provide the home automation but an extra security option for the users. This will prove to be widely useful for the wide range of users in different ways from home door locks to almirah locks and other security locks. The use of Google Assistant provides another luxury of having access to the home appliances without moving a leg. This project provides a balance between the automation and security. It also improves Convenience, comfort, energy efficiency and security.

## II. MOTIVATION

This project is going to bring both security and automation under one banner. There have been such projects in the past that were in particular based on the either the automation of home or making the home secure, but this is an effort to bring both the things down to the same table. Here we look to provide the biometric authentication system along with the basic home automation module. This would not only be a safe and secure module but would also have ease of access and a sense of reliability for the customer.

The face recognition module will not only be secure and reliable but this would be a step towards

the modernization of the smart homes. With the help of Google Assistant or Alexa we would be able to control the basic functionalities of our house and keep an eye on the intruders in our house using the camera module we are using for the face recognition on the door or entrance of the house.

### III. OBJECTIVE

- To make our home smart.
- To make our smart home secure.

### IV. RELATED WORK

- Sirsath N. S, Dhole P. S, Mohire N. P, Naik S. C & Ratnaparkhi N.S. [2] These authors in their paper “Home Automation using Cloud Network and Mobile Devices” proposes a Home Automation system that employs the integration of multi-touch mobile devices, cloud networking, wireless communication, and power-line communication to provide the user with remote control of various lights and appliances within their home. This system uses a consolidation of a mobile phone application, handheld wireless remote, and PC based program to provide a means of user interface to the consumer.
- Basil Hamed’s “Design & Implementation of Smart House Control Using Lab VIEW”, [3] the main objective of this Paper is to design and implement a control and monitor system for smart house. Smart house system consists of many systems that controlled by Lab VIEW software as the main controlling system in this paper. Also, the smart house system was supported by remote control system as a sub controlling system. The system also is connected to the internet to monitor and control the house equipment’s from anywhere in the world using Lab VIEW.
  - Deepali Javale, Mohd. Mohsin, Shreerang Nandanwar “Home Automation and Security System Using Android ADK”, [4] the prime objective of this paper is to assist handicapped/old aged people. It gives basic idea of how to control various home appliances and provide a security using Android phone/tab. The design consists of Android phone with home automation application, Arduino Mega ADK. User can interact with the android phone and send control signal to the Arduino ADK which in turn will control other embedded devices/sensors.
- Pooja Patel, Mitesh Patel, Vishwa Panchal and Vinit Nirmal “Home Automation using Internet of Things” [7] The main aim of the project is to develop a system that will provide remote control of home appliances and also provide security against the mishaps when the home host is not at

home. This paper is mainly concerned with the automatic control of light or any other home appliances using internet. It is meant to save the electric power and human energy. This project is made with the help of controller and raspberry pi. The various appliances connected to the micro controller and sensor is connected using wireless network.

### V. METHODOLOGY

We have used Node MCU ESP8266 Microprocessor for the purpose of automatic door lock that unlocks using the RFID tag or the button on the web server on your smart mobile phone. Given below is the block diagram of the interfacing of the Node MCU with the RFID and OLED display that would display the status of the attempt made to open the door.

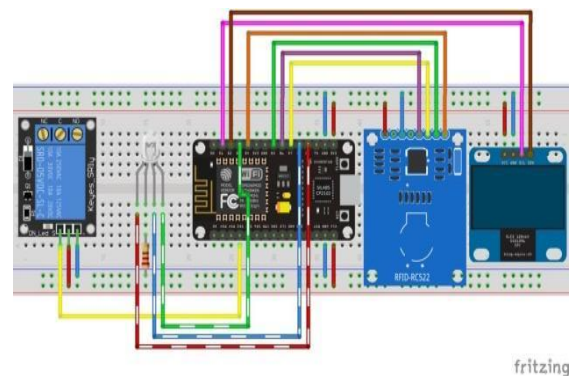


Fig1. ESP 8266 interfacing with other modules

Relay is used as a switch in the entire project to provide the required power to the door lock to perform the required operations. ESP32 CAM module is used for the purpose of the door unlocking using the face recognition method. Whenever an enrolled face is detected by the camera module, the IO2 pin of the esp32 is set high and the output is sent to the relay which takes it as a signal to switch on and the electromechanical gate will be opened and will be again shutted in some time if no enrolled face is detected. Given is the block diagram of door unlock system using esp32 cam module and relay as switch.

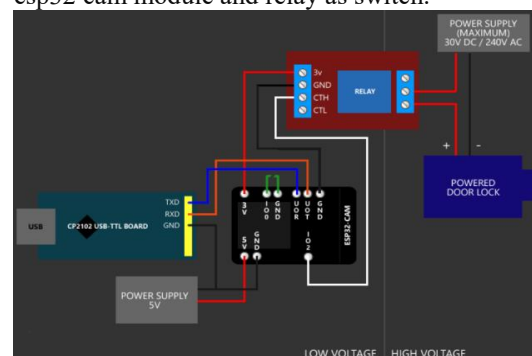


Fig 2. ESP32 and relay with door lock

Entire house would be connected with the smart phone and the owner would be able to access to the application through the use of Google Assistant and the web server interface on their mobile phones. Owner would be able to enroll his face in the camera module and make it use the face recognition module to unlock the door by recognizing the owner's face automatically and click the images of the intruders who try to enter into the house by some means. This would make our house smart and secure at the same time.

The face recognition thing works with the help of ESP32 CAM module and the RFID is connected directly to the ESP8266 Node MCU which is also connected to the ESP32 chip. ESP8266 can be used as a host or even as a slave to some other microchip. Whenever an attempt is made by using some RFID tag on the scanner then the authenticity of the user is checked and if it is the original user then a signal is sent to Node MCU to unlock the door lock and reflect the status on the OLED display connected to it and if the user is not authentic then to not allow door unlock and reflect unauthorized user message on the OLED display.

Node MCU comes with 13 General Purpose I/O Pins. It also comes with an on-board Wi-Fi module and that allows us to access it from our smart phone by connecting it to the Node MCU's Wi-Fi and monitor our home appliances from the web server and even lock and unlock our home door with a button on the mobile phone.

Face Recognition and Detection thing happens with the help of ESP32 camera module. [8] Initially, the owner's face is enrolled and later whenever the enrolled face is detected the signal is sent to relay and it is taken as a switch on signal by relay which opens the electromechanical lock and it is shutted down in some time if no enrolled face is detected. If some intruder tries to sneak in the house, ESP32 can give the intruder's alert or even may store the intruder's picture in the microSD chip that can be added to the dedicated slot available in the module.

## VI.CONCLUSION

We have successfully created a device which has both the functionality in it i.e. home security and home automation. This device has the ability to operate through an RFID card, face recognition, Google Assistant and web portal to control our home appliances like door lock, fan, light, air conditioner, television and many more and we also monitor all the action taken by the device on OLED display.

## VII. FUTURE WORK

This project can be extended on a bigger level for using in the offices or the hospitals. This could be used for the monitoring in the restricted areas in banks or some other places. It would be a better option than the CCTV cameras as they store the entire data and don't automatically detect the intruder while this project would be able to do so. It can store the images of intruders in the microSD card that can be added to it. This also provides an option of video streaming on your smart device that is better than having a dedicated CCTV for the same reason. This project can be further extended to use in the bigger buildings to improve security and lessen the human effort.

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# Security: A Big Challenge in Internet Of Things

Nitin Bhatia<sup>1</sup>  
Student,ECE Department  
BMIET  
Sonipat, India  
[Nitinbhatia135@gmail.com](mailto:Nitinbhatia135@gmail.com)

Sudhir Vasesi<sup>2</sup>  
Associate Professor,ECE Department  
BMIET  
Sonipat, India  
[vasesi27@gmail.com](mailto:vasesi27@gmail.com)

Sonika Vasesi<sup>3</sup>  
Assistant Professor,CSE Department  
BMIET  
Sonipat, India  
[sonikavasesi@gmail.com](mailto:sonikavasesi@gmail.com)

**Abstract:** Today we have unlimited IOT devices and by the year 2022 we will live in an era of IOT world. In order to facilitate this emerging domain, we have to pay attention to the security of IoT. In this paper we have discussed various technologies including encryption mechanism, communication security, protecting sensor data , cryptography and studies the challenges.

**Keywords:** IOT, cryptography, attacks, security.

## I. INTRODUCTION

Internet is basically system of interconnected computers through network. But now its use is changing with changing world and it is not just confined to emails or web browsing. Today's internet also deals with embedded sensors and has led to development of smart homes, smart rural area, e-health cares etc. and this introduced the concept of IoT.

Internet of Things refers to interconnection or communication between two or more devices without human-to-human and human-to-computer interaction. Connected devices are equipped with sensors or actuators perceive their surroundings. IOT has four major components which include sensing the device, accessing the device, processing the information of the device, and provides application and services. In addition to this it also provides security and privacy of data.

## II. CHALLENGES IN IOT

The Internet Society (ISOC) has once released the list of challenged being faced while deploying IOT and these are:

### A. Security

Due to increasing number of connected devices day by day, security has become the most essential and significant challenge for IOT.

### B. Privacy

Challenge for privacy is increasing due to demands in data integration with environment without people being actually using it.

### C. Standards

Without proper standards for developers and manufactures a lot of problem is generating in designs of product. There is also need of standardization of methods and interface coupled with IPv6.

## III. ISSUES IN IOT SECURITY

### A. Lack of Compliance on the part of IOT Manufactures

Almost hundreds of IOT devices are being built every day. The main threat to IOT Security is that manufacturers do not pay attention on security while manufacturing [6]. They continue to make devices with poor security.

### B. High jacking Your IOT Devices

Ransomware has been named as one of the serious malware. In this hacker who infected the device of user will demand a ransom fee for decryption key .This attack usually occurs on devices with poor security.

### C. Botnet Attacks

To perform a botnet attack, a hacker creates a group of bots by infecting them with malware and directs them to send thousands of requests per second to bring down the target. IOT Security began after the Mirai bot attack in 2016. Multiple DDoS(Distributed Denial of Service) attacks using hundreds of IP cameras, home routers were infected and directed to bring down the DNS that provided services to platform like GitHub, Twitter and Netflix.

## IV SECURITY ARCHITECTURE

Different layer of this architecture are:

### A. Perceptual layer

Also known as recognition layer. The main component of this layer is sensor which detects and



gives response to information from the external environment[1]. This layer also consists of equipments like GPS and RFID reader.

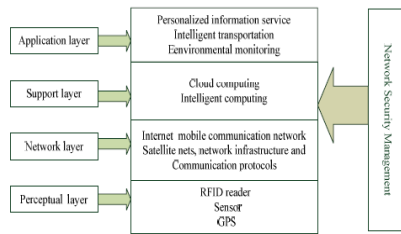


Fig 1. Security Architecture

**B. Perceptual layer**

Also known as recognition layer. The main component of this layer is sensor which detects and gives response to information from the external environment[1]. This layer also consists of equipments like GPS and RFID reader.

**C. Network Layer**

The main function of this layer is transmission of information from recognition layer and after that initialisation, classification and polymerisation of information. This layer uses internet, communication protocols etc for exchange of data over devices.

**D. Support Layer**

This layer performs the task of combining network and application layer.

**E. Application Layer**

This layer is at terminal layer through which users can use internet of things by the interface of laptops, mobiles etc.

**V IOT SECURITY**

The security functions which are required to protect IoT devices are[3]:

**A. Authentication**

To check the identity of communicating device.

**B. Secure Communication**

To give protection to the data being transmitted.

**C. Secure execution of code**

To protect the data in process.

**D. Secure storage**

We also need to give protection to the data at rest.

**VI CRYPTOGRAPHY**

Encryption is the key requirement for IOT devices. They are used to securing the communication protecting it from eavesdropping etc.

**A. Symmetric key encryption**

Encryption and decryption keys are identical. RC5, DES, 3DES, and AES are all forms of symmetric key encryption.

**B. Public Key encryption**

Encryption key is published publicly for anyone to use and encrypt data. Only the receiving party has a private key used to decrypt the message. This is also known as asymmetric encryption.

**C. Cryptographic hash**

Maps data of an arbitrary size to a bit string (called the digest). This hash function is designed to be “one way”. Essentially, the only way to recreate the output hash is to force every possible input combination (it cannot be run in reverse). MD5, SHA1, SHA2, and SHA3 are all forms of one-way hashes as shown in Fig 2.

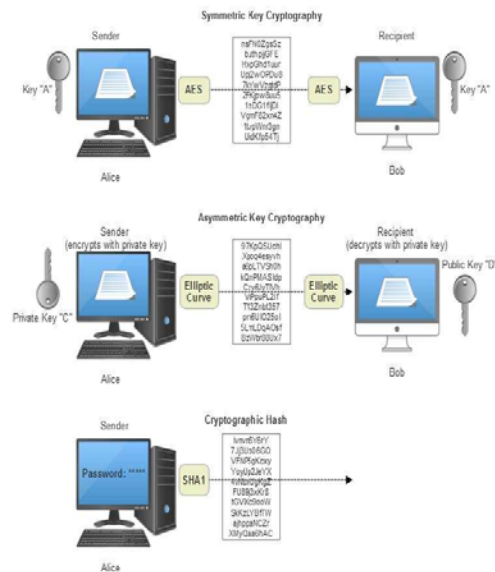


Fig 2. Cryptography

**VII CHALLENGES IN SECURITY**

**A. Secure Constrained Devices**

Many IOT devices are made with limited storage, memory and processing capability. So these

devices are more vulnerable to different attacks like side channel attacks, power analysis attack [2].

*B. Authorize And Authenticate The Device*

Devices must establish their authentication before accessing any resource on network. But many devices fails when it comes to device authentication[2]. For example weak passwords may lead to hacking of device easily.

*C. Secure Communication*

This ensures that communication between device and cloud is secure. Using separate networks to isolate devices also helps with establishing secure, private communication, so that data transmitted remains confidential.

*D. Secure Constrained Devices*

Many IOT devices are made with limited storage, memory and processing capability. So these devices are more vulnerable to different attacks like side channel attacks, power analysis attack[2].

*E. Authorize And Authenticate The Device*

Devices must establish their authentication before accessing any resource on network. But many devices fails when it comes to device authentication [2]. For example weak passwords may lead to hacking of device easily.

*F. Secure Communication*

This ensures that communication between device and cloud is secure. Using separate networks to isolate devices also helps with establishing secure, private communication, so that data transmitted remains confidential.

*G. Privacy Of Data*

After the data is transmitted it must be safely preserved at end of communication. Implementing data privacy includes redacting sensitive data before it is stored.

civil societies need to work collectively and take action to secure consumer IOT devices and associated services at every stage of their lifecycle.

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VIII MAIN SECURITY ATTACKS IN PAST

TABLE 1: LIST OF IOT ATTACKS

Attack Name	Date
Hacked Camera	Aug,2013
Linux.DarllOz	Nov,2013
Lizard Stressor	Jan,2014 & Jan 2015
Car Recall	July, 2015
Mirai Botnet	Oct,2016

IX CONCLUSION

IOT security is a global challenge requiring global collaboration. The Governments, industries and



# The Internet of Things and Revolutionize Laboratory Practice

Dr. Shilpi Saxena  
Professor, Applied Science  
[saxenashilpi076@gmail.com](mailto:saxenashilpi076@gmail.com)  
BMIET, Sonapat

Sandhya Pal  
ECE, 3<sup>rd</sup> year  
BMIET, Sonapat

**Abstract** - The Internet of Things (IoT) is a network of physical devices and a criterion which is a result of the combination of field of technology related to hardware and software. IoT explains how things in everyday life can have interaction and communication with other with the help of internet. In IoT things are designed with various controller and sensors and software application and suitable protocol stack enable them to talk to other objects. The objects in IoT can be any random thing such as people, homes, animal, vehicle or any physical thing which is part of our daily life. IOT connects appliances designed with electronic components software, hardware devices, sensors and actuators having connectivity for exchanging data.

**Key Words** -Internet of things, IOT, Applications of IOT, Operating systems of IOT. Chemical laboratories

## I. INTRODUCTION

Internet of Things (IoT) is an outcome of hardware and software. IoT presents a vast technology worldwide. Government sectors and industries are involved in different types of researches their implementation and businesses issues with IOT. IOT drops application domain consisting human and defense sectors. IOT explains how everyday things have interaction and communication with other things with the help of internet. In IoT objects are designed with various controllers and sensors and many applications of software's and suitable protocol which enable them to talk to other objects [1]. Today it is possible to enlighten the connectivity over larger network storage and computation, which in turn gives right to build different technical solutions. IOT have applications like SmartPurchasing, in urban and rural areas there is Management of Infrastructure, Health Monitoring and Emergency Notifying Systems and Transportation system are implemented with the help of Iot Therefore, it ishas become necessary to learn about the new technology that has been boomed in the society. In general, IoT can be defined as a combination of Sensors, Actuators

Connectivity, People & Processes. IoT is the combination of smart devices with smart services to create more applications like for example healthcare, home that are smart enough to detect any danger, digital farming, interactive form of agricultural activities etc. IoT provides real-time services and is a big example time saving, many costly and efficient resources and even labor hard work [2]. The IOT also helps in sensing the network worldwide providing different opportunities for connection of the physical word into computer systems and results in higher efficiency, more accuracy and good economic benefit. it also results in reduced manual intervention. IOT also results in unification of technologies such as low power embedded systems, cloud computing, big data, machine learning and networking. The two solutions for the networking technologies in IOT are either to expand the existing network or to build a separate network from the scratch. Radio-frequency identification (RFID) was invented by Kevin founded the genuine AUTO ID as a necessity for the (IOT) Internet of Things. If people and objects in daily life are equipped with identifiers, smart pcs could handle and store them. Other IOT enabling technologies are nanotechnology, sensors and smart networks [3]. Presently we are living in the era where "users or we can say labors" of the Internet will be in billions. Humans will become the minority and be regarded as generators that receive traffic. Instead there will be jam among objects and various kinds of devices that creates a much wider range of series of Internet of Things.

## II. CHARACTERISTICS OF IOT

The Fundamental characteristics of IOT are as follows:

**A. Interconnectivity:** With regards, we can interconnect anything with the communication and global network information.

*B. Things related services:*IOT can provide “thing” in relation with services associated with it, such as protection of our privacy and consistent semantics among physical things in association with their virtual things.

*C. Heterogeneity:*The models in IOT are heterogenous because of different hardware applications, networks and platforms based.

*D.Dynamic changes:*The device change its state dynamically when connected or disconnected through other devices which includes location and speed.

*E.Enormous scale:* The number of devices need to be managed are large in number which makes the management critical for interpretation and generation.

*F. Safety:*It is the main aspect of IOT, as it must be designed by keeping all the safety measures in mind.

*G. Connectivity:* It enables the network to be accessible and compatible. Network provides access while ability to consume and produce the data refers to compatibility. compatibility.

*H. Naming and Addressing:* Devices should have unique names and addresses in IOT. Efficient conversion of addresses should take place.

### III. APPLICATIONS OF IOT

IOT the usage of IoT is vast in numbers and research is going on to harness the IoT. The usage of IOT are almost everywhere including manufacturing, transportation, health services, security, and many other. Modern buildings across the world are becoming complex in terms of their infrastructures including facilities and other services so the need for an intelligent system to cope with all these emergency situations is also growing

*A. Smart Homes:*Smart homes has become the ladder of the success in the residential complexes and explains that smart homes will also become common as smart phones of today’s era. Products of smart homes ensures safety, time saving, money and time

*B. Wearables:*They are in explosive demand across the world. These Devices have great investors like Google, Samsung. These are installed with software’s including sensors for collecting data and storing information.

*C. Connected cars/smart cars:* Digital technology has focused on innovation of automobile internal structures. A connected car is a car which is capable of handling its operations, maintenances as well as comfortability of passengers [5].

*D. Smart Industry:*It is the new buzz in the industrial sector which is also called as Industrial Internet of Things. Smart machines are the major philosophy responsible for IIOT because of their accuracy and consistency than humans.

*E. Smart Agriculture:*Increase in worlds population results in increase of food supply. Farmers are using advanced techniques and methods to increase the supply of food with the help of government.Smart farming is one of the fastest growing application in the field of IOT [6].

*F. Smart Cities:*For generating curiosity among the world’s population city is one of the major factors responsible for it. smart energy management systems, automation of transport, smart surveillance, security of urban areas and monitoring of environmental factors are examples of IOT of smart cities [7].

*G. Smart Retail:*Retail has an enormous advantage of IOT. The customers get connected through retailers in a way that enhances the in-store experience. Beacon technology and smart phones have helped retailers to make the requirements of the customer in a much better way.

*H. Energy management:*Power grids in the future will be highly useful. Smart gridding is becoming famous worldwide. It will also detect power outages sources more quickly and there will be more efficient way of distribution of energy systems [8].

*I. Smart Healthcare:*For wellbeing of people healthcare should be bearing enormous potential for better healthcare services and companies [9]. Researches show healthcare will achieve massive demand in upcoming years. The collected data will be managed in a private and protected way and provide tailor made strategies for curing illness [10].

*J. Smart Poultry and Farming:*Animal husbandry is all about better poultry farming.Health and wellbeing of the cattle are being monetarized with the help of IOT

*K. Smart Dust:* Sensors uses the nanotechnology level for deploying the billions or millions of applications. Sensors are the devices that can used to monitor very small particles also.

Other applications of IOT includes smart parking for automobiles, detection and regulation of congestion in traffic areas, smart lighting of cities and buildings, smart management of waste, river flood detection, landslides and earthquake in advance.

#### IV. CATEGORIES OF IOT

Internet of things can be classifying into two types that is Industrial IOT and Consumer IOT.

*A. Industrial IOT:* Factory involve sensors connected to internet then it refers to the part of Industrial IOT. It involves connection of devices to both IP network as well as global network. Specific technologies are used for connecting the nodes. IIOT failure results in life-threatening and many other emergency situations. The devices are tied to GPS enables consumptions for continuous update location and movements. IOT generates medium or high-level data while IIOT develops massive data that single turbine processes huge amount of data which includes big data, cloud computing, machine learning as necessary computation operations. In future IIOT will enhance our lives and entire supply chain.

*B. Consumer IOT:* Refrigerators or thermostats are will be linked to the internet services that means it refers to the Consumer IOT. Link of communication within the models is done within the locally networked areas and communication to outside internet is done through gateway. Bluetooth, ZigBee or WIFI is responsible for local communication. Consumer IOT refers to the usage of “smart objects” which are everyday things from appliances used in homes automations etc. devices can alert users when there is monitoring of activities or situations. All the smart home appliances smart doors and windows, smart garages etc. are a part of Consumer IOT.

#### V. REVOLUTION OF LABORATORY WITH THE HELP OF IOT:

All lab components and equipment's will be in linked with proper connection and controlled process, through 'intelligent', auto-cleaning benches of lab to ensure smart safety that can ensure safety from dangerous chemicals to the technicians and assistants while performing the experiments in the laboratory. However, this is the first try was to make a whole laboratory digitally supported and interactive. Lab's efficient chemicals are stored in -

80 °C freezers and containers which are monitored using a system that automatically notifies Harvard's Operations Center when a freezer is over temperature. Tetra Science is another field that uses a Wi-Fi module, which has the size like a deck of playing cards, that can be tied up either to an external sensor or with the help of an instrument port.

Sensors can monitor carbon dioxide level, oxygen level, temperature and humidity including vibration, force, intensity of light and mass air flow. This type of equipment can supplement internal sensors to ensure that crucial hardware such as incubators containers and hypoxic chambers are performing according to the expectation or not. Direct connection with an instrument port data that allows devices to ensure balance level, pH meters, and even high-performance liquid chromatographic systems are to be taken care and controlled. Not only can scientists and researchers can control those instruments but they can also stream data to various software connected electronic lab, as well as can track the workload that is being done on the instrument and for how much time Experiments done; Taya says. “The goal is a holistic software which tie people, data and devices together.”

#### VI. CONCLUSION

IoT gradually brings an ocean of technologies in our daily lives, which in turn helps us in making our life simpler and more comfortable, though various advanced technologies and applications. There is enormous usage of IoT applications the domains like mining, habitat automation, education, healthcare, establishment, industrial setups, transportation services, governance, etc. IoT may have abundant benefits, but there are some drawbacks in the governance and level of implementation in IOT. The observations done in the literal are that (1) No standard definition has been defined over worldwide (2) Architectural level requires Universal standardizations (3) Technologies are varying from source to source, so needs to be opera table (4) Standard must be defined for global use of IOT. Further the different IOT enables connectivity methods and enabling technologies and connectivity layers-service layer, global connectivity and local connectivity.

#### VII. FUTURE ASPECTS

The future of IoT can be seen in the top five themes that can be seen in the future of IoT is listed below take a look at it:

#### *A. People will get addicted to Tech connections*

Suggestions are made that the usage of the IoT based devices is increasing. It will influence the people in the coming decade. Some of the unique things that will make the people device addictive and users would not be able to resist to stay away from these devices the convenience, comfortability and the benefits will make the boom in the society of technical devices. In the future, people will be going to select the connectivity that ensures more flexibility over security. Connecting the society, friends and the upcoming techs with comfortability and needs will be becoming more crucial. People will also keep personal data of theirs and their favorites in these devices, and also will trade the safety issues and security for their needs and convenience. The youngsters the present generation the adults everyone will be highly addicted making IOT a big huge interconnection. While man won't be able to cope without all these facilities and comforts.

#### *B. Sayno to Unplugging!*

Disconnection to the internet these days is very difficult. There will be threats distrust that some people will not be able to connect to the internet platform. There will be lack of knowledge or maybe some other issues but in some cases, there will be highly dependency on internet.

The surveys inform: penalization through businesses with the employees who are in direct connection with the internet services or not in direct contact. Being the most active in the present situation the IOT will be make social media famous and reformed. There are so many stories and rumors where it can be seen things that people tried to disconnect from internet but were failed to do so. As no one will be able to detach themselves from these services as everyone will be surrounded by these things and detachment from these devices can make life impossible to live in such an era.

#### *C. Increase in Internet participants*

People who will try to detach themselves from the internet but they won't be able to detached themselves instead it will double the usage of their social media and other digital media day by day.

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## VIII. REFERENCES

# Literature Review of Advances in Micro strip Patch Antenna

Vatsala Sharma  
 Department of Electronics &  
 Communication Engineering  
 College of Technology and  
 Engineering, MPUAT  
 Udaipur, India  
[vatsalasharma01@gmail.com](mailto:vatsalasharma01@gmail.com)

Kamal Nayanam  
 Department of Electronics &  
 Communication Engineering  
 B.M. Institute of Engineering  
 and Technology, GGSIPU  
 Sonapat, India  
[knayanam@gmail.com](mailto:knayanam@gmail.com)

Mansi Agarwal  
 Department of Electronics &  
 Communication Engineering  
 B.M. Institute of Engineering  
 and Technology, GGSIPU  
 Sonapat, India  
[mansiagarwal410@gmail.com](mailto:mansiagarwal410@gmail.com)

**Abstract**—Micro strip antennas have many advantages in communication system. It is required in high performance wireless applications. But micro strip antennas do have some considerable drawbacks like narrowband performance due to its resonant nature. Extensive study has been done on micro strip patch antennas in the recent past, it still has many scope for improvement in the near future. To overcome this problem, number of techniques and methods have been suggested and investigated, keeping in mind that the basic advantages of micro strip antenna should not be altered, such as light weight, low profile, simple printed circuit structure and low cost. The area of investigation includes modified geometrical shape of the patch antenna, use of dipole, use of resonators and many other factors or parameters. This paper provides a brief review of the work done in the field of single layer micro strip patch antenna.

**Keywords**—micro strip antenna, narrowband, dielectric constant, patch antenna

## I. INTRODUCTION

Nowadays, due to their several key advantages over conventional wire and metallic antennas, micro strip antennas have been used for many applications, such as Direct Broadcasting Satellite (DBS) systems, mobile communications, Global Positioning System (GPS) and various radar systems (1). Their advantages include low profile, light weight, low cost, ease of fabrication and integration with RF devices, etc. They can also be made conformal to mounting structures (2). However, when they are applied in the frequency range below 2GHz, the sizes of conventional rectangular micro strip patches seem to be too large, which makes it difficult for them to be installed on televisions, notebook computers or other hand-held terminals, etc. Several techniques have thus been proposed to reduce the sizes of conventional half-wavelength micro strip patch antennas (3). Material of high dielectric constant has been used. However, this will lead to high cost and high loss (4). Also, poor efficiency due to surface wave excitation is another drawback of this method.

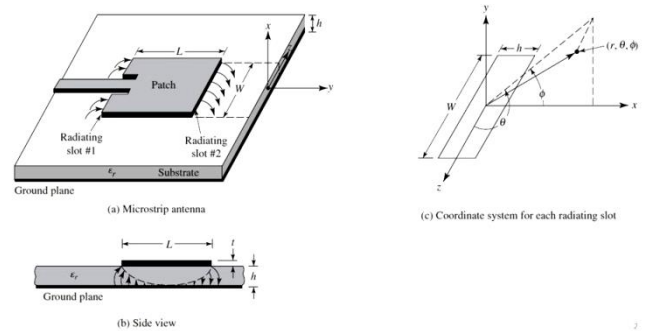


Fig 1. Micro strip antenna and coordinate system

## II. METHOD OF ANALYSIS OF MICRO STRIP ANTENNA

The preferred models for the analysis of micro strip patch antennas are the transmission line model, cavity model, and full wave model (which include primarily integral equations/Moment Method). The transmission line model is the simplest of all and it gives good physical insight.

### A. Transmission Line Model

This model represents the micro strip antenna by two slots of width  $W$  and height  $h$ , separated by a transmission line of length  $L$ . The micro strip is essentially a non-homogeneous line of two dielectrics, typically the substrate and air.

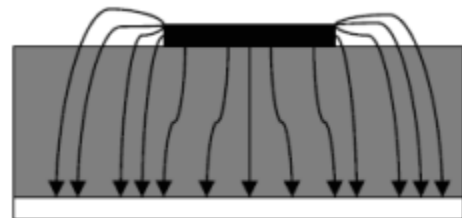


Fig. 2. Electric field lines between patch and ground plane.

Hence, as seen from figure 2 most of the electric field lines reside in the substrate and parts of some lines in air. As a result, this transmission line cannot support pure transverse electric- magnetic (TEM) mode of transmission, since the phase velocities would be different in the air and the substrate. Instead, the dominant mode of propagation would be the quasi-TEM mode. Hence, an effective dielectric



constant ( $\epsilon_{re}$ ) must be obtained in order to account for the fringing and the wave propagation in the line. The value of  $\epsilon_{re}$  is slightly less than  $\epsilon_r$  because the fringing fields around the periphery of the patch are not confined in the dielectric substrate but are also spread in the air as shown in Figure above. The expression for  $\epsilon_{re}$  is

$$\epsilon_{re} = \frac{\epsilon_r + 1}{2} + \frac{\epsilon_r - 1}{2} \left[ \sqrt{1 + \frac{12h}{w}} \right]^{0.5} \dots \dots \dots (1)$$

Where  $\epsilon_{re}$  = Effective dielectric constant,  $\epsilon_r$  = Dielectric constant of substrate,  $h$  = Height of dielectric substrate,  $w$  = width of the patch

In order to operate in the fundamental TM<sub>10</sub> mode, the length of the patch must be slightly less than  $\lambda/2$  where  $\lambda$  is the wavelength in the dielectric medium and is equal to  $\lambda_0/\sqrt{\epsilon_{re}}$  where  $\lambda_0$  is the free space wavelength. The TM<sub>10</sub> mode implies that the field varies one  $\lambda/2$  cycle along the length, and there is no variation along the width of the patch. In the fig. shown below, the micro strip patch antenna is represented by two slots, separated by a transmission line of length  $L$  and open circuited at both the ends. Along the width of the patch, the voltage is maximum and current is minimum due to the open ends. The fields at the edges can be resolved into normal and tangential components with respect to the ground plane (15).

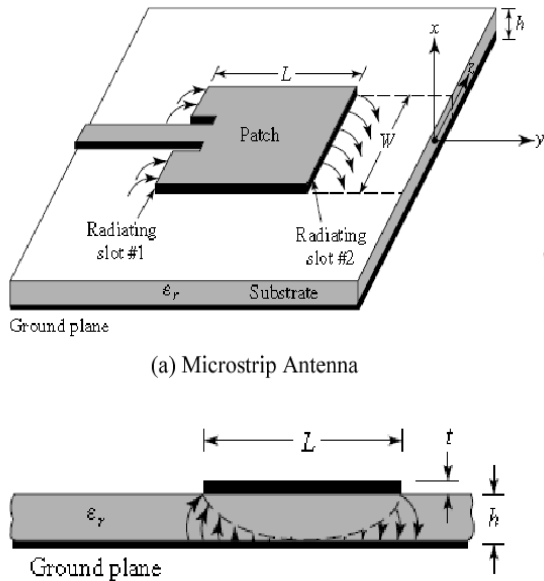


Fig. 3.(a) Top view & (b) Side view of micro strip antenna

It is seen from figure 3 that the normal components of the electric field at the two edges along the width are in opposite directions and thus out of phase since the patch is  $\lambda/2$  long and hence they cancel each other in the broadside direction. The tangential components (seen in figure 3), which are in phase, means that the resulting fields combine to give maximum radiated field normal to the surface of the structure. Hence the edges along the width can be represented as two radiating slots, which are  $\lambda/2$  apart and excited in phase and radiating in the half space above the ground plane. The fringing fields along the width can be modeled as radiating slots and electrically the patch of the micro strip antenna looks greater than its physical

dimensions. The dimensions of the patch along its length have now been extended on each end by a distance  $\Delta L$ , which is

$$\Delta L = .412h \frac{(\epsilon_{reff} + 0.3) \left(\frac{w}{h} + 0.264\right)}{(\epsilon_{reff} - 0.248) \left(\frac{w}{h} + 0.8\right)} \dots \dots \dots (2)$$

The effective length of the patch  $L_{eff}$  now become,

$$L_{eff} = L + 2\Delta L$$

For a given resonance frequency  $f_r$ , the effective length of the width  $W$  is

$$W = \frac{c}{2f_r} \left( \frac{\epsilon_{re} + 1}{2} \right)^{-0.5} \dots \dots \dots (3)$$

Table 1: Advantages & disadvantages of micro strip patch antenna

Sr. No.	Advantages	Disadvantages
1	Low Weight	Low efficiency
2	Low profile	Low gain
3	Thin profile	Large ohmic loss in the feed structure of array
4	Required no cavity backing	Low power handling capacity
5	Linear and circular polarization	Excitation of surface waves
6	Capable of dual and triple frequency operation	Polarization purity is difficult to achieve
7	Feed lines and matching network can be fabricated simultaneously	Complex feed structures requires high performance array

The advantages and disadvantages of single layer micro strip patch antenna are tabulate in table 1. In order to minimize the disadvantages of low efficiency, gain, power etc. researchers have lead to some advancement in the design and feeding methods of micro strip patch antennas.

### III. RECENT DEVELOPMENT ON SINGLE LAYER MICRO STRIP ANTENNA

From last few decades, world scientists are constantly trying to improve the performance of micro strip antenna. The area of research includes geometrical change of shape of patch, parameter variation of substrate being used, use of multilayer are name to few and number of feeds.

Give below is the list of few research papers along with the concept applied and the result achieved applying the concept along with the additional advantage if any, in table 2.

Table 2: Advanced in design of micro strip patch antenna

Title	Year	Publisher	Concept	Result	Advantage
Enhance bandwidth of micro strip patch antenna loaded with high permittivity dielectric resonator	2002 (6)	Microwave and optical technology letters vol.35, no.4	A high permittivity dielectric resonator of suitable resonant frequency was loaded over the patch, the % bandwidth of the antenna was increased by more than 5times without much affecting its gain and performance.	Much more improved bandwidth was obtained when the dielectric resonator was placed on the feed line.	This method will not adversely affect other properties of antenna especially its gain and efficiency.
Single layer Capacitive feed for wideband probe-fed micro strip antenna elements	2003 (7)	IEEE	A single layer capacitive feeding mechanism consisting of small rectangular probe fed patch which is capacitively coupled to the radiating element can be used to obtain wideband operation for probe-fed micro strip antenna on thick substrate.	10dB return loss bandwidth in excess of 25% can be obtained. Given that this configuration only requires a single substrate layer, the three structure that have been described in this communication prove to be suitable for a wide range of application that requires wideband operation at low cost.	All the elements reside on a single layer and that it is very easy to fine tune the input impedance.
Simulation and measurement of broadband micro strip patch antenna for 3G wireless communication	2003 (5)	IEE (Institute of electrical engineers)	A dual shorted coplanar patch antenna and a E-shape patch antenna by introducing thick substrate with low permittivity broad band behavior of proposed patch antenna can be easily achieved. By optimizing the geometry size can be minimized considerably.	By modifying the geometry of the patch and using shorting pins, the size can be successfully minimized. Likewise by electro magnetically coupling two resonators and altering the geometry of rectangular or circular path, wider bandwidth can be achieved.	
Broadband micro strip patch antenna with V-slot	2004 (8)	IEE proc. Microwave antenna propagation.	A micro strip antenna incorporating a V-shape slot on its patch is introduced and studied for its impedance bandwidth and radiation characteristics. It is shown that antenna is inherently broadband and by optimizing the V- parameters its performance can be improved.	Bandwidth as high as 54% is achieved with suitable pattern characteristics such as gains and cross polarization within its band.	It also add additional parameters, the V-angle and the interrelation of its truncation width and arm length, that can be used for optimized performance.
Design of a single layer E-shape micro strip patch antenna.	2005 (9)	IEEE	Significant reduction of antenna size can be realized when the E-shape patch is used instead of the conventional rectangular micro strip patch antenna. Antenna is designed to function in the frequency band of 4.5-8.5 GHz.	A bandwidth of approximately 57.36% for $VSWR \leq 2$ is obtained.	The bandwidth is remarkable as far as the simplicity of geometry of antenna is concerned.
Performance of single layer multimode micro strip patch antenna with reconfigurable radiation pattern	2009 (10)	IEEE	Generation of triple modes ( $TM_{11}$ , $TM_{21}$ , $TM_{31}$ ) on a single layer substrate material is proposed. Combination of co-axial probe is enough for generating the dominant $TM_{11}$ mode. To isolate the modes on the patch circular slits have been created in the patch.	This paper presents a multimode antenna design on a single layer substrate. It consist of a concentric circular patches generating $TM_{11}$ , $TM_{21}$ , $TM_{31}$ modes.	The antenna can be used to generate limited beam scan performance circular polarization and multiple phase centers giving an option for multifunctional communication applications.
A compact single layer dual band micro strip antenna for satellite application	2011 (13,14)	IEEE	A compact single layer single fed dual frequency micro strip antenna with a high frequency ratio is proposed. It has a broadside and symmetrical radiation pattern suitable for space born applications. The prototype was fabricated on a Rogers RT/ duroid 5880 substrate with a relative permittivity of 2.2 and thickness of 1.58 mm.	The dual band behavior was achieved by a shorting pin at 1.7-1.706 and 8.011-80277GHz with a frequency ratio of 4.75	Antenna is miniaturized by 46% compared to conventional rectangular patch. Suitable for array design or as a reflector feed in satellite application.
A novel cavity backed wideband micro strip single layer patch	2012 (11)	IEEE	In order to increase bandwidth two kind of special shape patch are employed. The first is E-shape and second is modified E-shape with cutting three slots on the E-	The first E-shape can realize 45% impedance bandwidth for $VSWR \leq 2$ . The modified E-shape can achieve 13.5%	Low cross polarization, low profile characteristics, high

antenna.			shape patch. The radiating patch is fed by micro strip line and they are both etched on the top side of thin substrate.	impedance bandwidth for VSWR $\leq 1.5$ .	radiation efficiency.
Bandwidth improvement of rectangular micro strip antenna by using single dipole stub	2013 (12)	International journal of engineering and advanced technology (IJEAT)	Two different radiating elements which are connected together through a matched section and these elements are embedded on a single layer structure. This new structure offers a dual band micro strip antenna by controlling the resonant frequency of these two elements a much improved bandwidth is obtained approx 21%	The bandwidth ratio of resonant antenna will improve with increase in length of dipole.	
Characteristic Mode Analysis of a Class of Empirical Design Techniques for U-Slot Micro strip Patch Antennas	2016 (16,17)	IEEE Transactions on antennas and propagation	Dielectric substrate used is FR-4 substrate at operating frequency 4 GHz.	Bandwidth utilization 31% with 5Dbi gain and -22DB return loss	Impedance bandwidth achieved nearly 30%. The achieved gain is also less so by using some technique like stub matching, impedance matching.

#### IV. DISCUSSION AND CONCLUSION

Geometrical shape variations of micro strip antenna can change the bandwidth, gain, radiation pattern etc. Enhancement of bandwidth of a conventional micro strip patch antenna is proposed in this paper. So we need to optimize the performance parameters of the micro strip antenna like resonance frequency, quality factor along with the geometrical changes being made to enhance the performance of micro strip antenna.

The principle of working, concept, result and advantages of micro strip antennas are discussed in this paper. The areas of further improvement and development include the geometrical shape variations of patch being used, uses of parasitic elements and dipole stub. It has also been shown that just changing the geometry of the micro strip antenna need not to be fruitful all the time. So optimization of parameters like quality factor, dielectric constant etc., needed to be done to enhance the performance of micro strip antenna. This paper has shown that the micro strip antennas are still very promising for many wireless communication applications.

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# DESIGN AND DEVELOPMENT OF COMPLEMENTARY SPLIT RING RESONATOR FOR ISM BAND OPERATION

Ravinder Kumar  
Asst. Prof. Dept. of ECE  
BMIET, SONEPAT

Himani Tomar  
Asst. Prof. Dept. of ECE  
BMIET, SONEPAT

Sakshi  
Research Scholar  
BMIET, SONEPAT

**ABSTRACT**—In this novel paper a CSRR is designed for ISM band operation at frequency 2.47 GHz. Antenna used for above purpose is miniaturize and reduction in the single element is more than 75 %. The purposed antenna has been designed and simulated using high frequency structural simulator (HFSS) which is based upon the finite element method. The parametric study has been done to show the impact of resonator in ground plane. Main purpose of designing antenna is to stabilizing radiation pattern and to reduce the return loss < -10 DB.

**Keywords**—CSRR, MIMO, ISM, HFSS

## I. INTRODUCTION

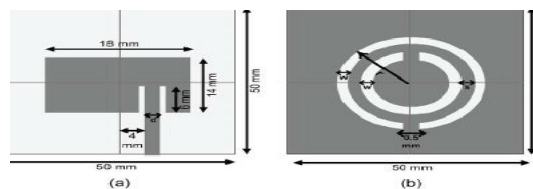
With the introduction of modern technology of 4G wireless standard use of devices for various frequency bands have been increasing day by day. These devices have to perform different type of operation used for various types of wireless technological network. (1) So with the advent of such type of technology microstrip patch antennas are widely used to solve different types of network problems.

As far as modeling of compact antennas is concerned miniaturization techniques are used which can provide low Bandwidth antenna efficiency and antenna gain. Also elements are placed close which provides poor diversity problems. [2] As high data rate and efficiency are required for future need of communication services, the requirement of MIMO antenna have been increasing. Thus for MIMO antenna system designing it is important to employ antenna miniaturization that keeps the antenna design simple and it compromises with other parameters of antenna at a minimum. These materials provide negative permittivity and negative permeability. CSRR is a negative image of split ring resonator made by removing the copper in the shape of an SRR from a copper sheet which is generally considered to be a ground plane of antenna. (3) It interacts with electrical field results in negative permittivity near around a frequency which is known as resonance frequency. This paper presents a design of four-element patch antenna system in the form of MIMO. Resonant frequency of the antenna element is near about 2.47

GHz which is the frequency of ISM band. In the earlier work CSRR patch antennas were used in a single antenna. Such antennas were never analyzed for MIMO antenna system. In this design the CSRR patch antenna elements are easy to design and easily correlated with other systems. The total dimension of the design is kept at the minimum so that it confirms to the dimension of wireless mobile sets and other devices like laptops and tablets.

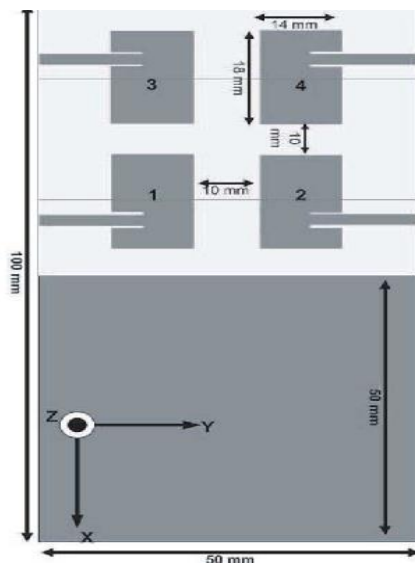
## II. MIMO ANTENNA DESIGN

Designing of antenna is done using HFSS. (4) The substrate used in design is FR4 with a dielectric constant of 4.4 and a thickness of 0.8mm. The dimensions were chosen keeping in view that when four such elements were to be used in MIMO system; they fit well in the area used for standard mobile devices board size. The feeding of antenna is excited by microstrip feed line to match it with 50 ohm. The resonant frequency of patch antenna with CSRR is related to dimension of resonator. These dimensions include radius of outer ring 'r', the width of each ring 'w', the spacing between the rings 's' and the width of the slit in the rings 'd'. This system is oriented in such a way that the slits of the rings are facing the radiation edges of patch antenna. The slit of outer ring is facing the edge of patch is excited by the microstrip line. Once the design of single patch is finalized, four similar patches are placed together on the same FR4 substrate to make a four element MIMO antenna system. (5) The geometry of MIMO antenna design system is shown in figure 1.



**Figure 1:** (a) Top View (b) Bottom View

As the radius of CSRR, ( $r$ ) is increasing the resonant frequency of design antenna decreased. Increasing the width of rings ( $w$ ) and spacing between the two rings ( $s$ ) results in increase in resonant frequency of antenna. Thus by changing these parameters antenna is designed to operate at 2.47GHz as resonant frequency. A 2X2 (four element) MIMO antenna system is designed shown in figure 2 in an area of 50X50 mm<sup>2</sup>. The spacing between the patch antenna elements is 10mm. The additional space is filled with a ground plane, which can be used to mount other electronic devices and integrated circuits for making a complete design within the standard board size. Top and bottom layer of proposed antenna are shown in figure 2.

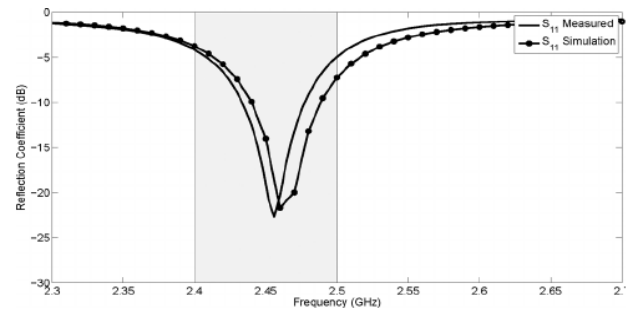


**Figure 2: Top view of 2X2 MIMO antenna System**

While designing a due care have been taken regarding Single Patch Reflection Coefficients, reflection coefficient and isolation of MIMO antenna, current distribution, (6) TARC (total active reflection coefficient) and the Correlation coefficient.

### III. RESULTS

The Novel antenna explains about is designed with HFSS and the scattering parameters of Multiple Input Multiple Output antenna are measured using network analyzer. The result obtained for scattering parameters using simulation as well as measurement of MIMO antennas are in close proximity to each other as shown in figure 3.



**Figure 3: Simulated and measured reflection coefficient of designed antenna**

### IV. CONCLUSION

A miniaturize compact size antenna with CSRR is designed and analyzed. The proposed antenna completely fulfills most of the requirements of new generation wireless applications. The implemented methodology can be reused and optimized at other frequency band.

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# Theorems in generalized metric spaces

Dr. Anita Dahiya  
Associate Professor, Dept. of Mathematics,  
BMIET  
Sonipat, India.  
E-mail: [anitamalik76@gmail.com](mailto:anitamalik76@gmail.com)

Babita Antil  
Assistant professor, Dept. of ECE  
BMIET,  
Sonipat, India.  
E-mail: [babita.antil@gmail.com](mailto:babita.antil@gmail.com)

**Abstract--In this paper we set up some common fixed point theorems for mappings fulfilling  $\alpha$ - $\psi$ - $\phi$ - contractive condition in generalized metric spaces. Presented theorems extend and generalize many existing results.**

**Keywords--generalized metric space,  $\alpha$ - $\psi$ - $\phi$ -contractive condition of integral type.**

## I. INTRODUCTION

The metric fixed point theory is extremely valuable and essential theme of nonlinear analysis. In addition, it's outstanding that fixed point theory has entranced numerous analysts since 1922 with the observed Banach fixed point theorem. In fixed point theory contraction principle is a standout amongst the most essential hypotheses in traditional functional analysis. truth be told, Branciari [1] presented an idea of generalized metric space by supplanting the triangle inequality by a more general inequality. He demonstrated the Banach's fixed point theory in such a space. For more detail one can allude to [3– 8]. In 2012, Samet et al.[2] presented another class of contractive type mappings known as  $\alpha$ - $\psi$  contractive type mapping. It is likewise realized that normal fixed point theory are speculations of fixed point theorems. either by unwinding the condition on contractivity or pulling back the prerequisite of completeness or here and there even both. In this way, finished the previous couple of decades, there have been numerous specialists who are occupied with generalizing fixed point theorems to coincidence point theorems and common fixed point theorems. In this paper, we demonstrate some basic settled point hypotheses for a bigger class of  $\alpha$ - $\psi$ - $\phi$ - contractions in generalized metric spaces and enhance the outcomes acquired by Rosa and Vetro [11].

## 2. Preliminaries

Presently we give some fundamental definitions and theorems which are valuable in demonstrating our primary outcomes. Let  $\mathbb{R}^+$  denote the set of all positive real numbers and  $\mathbb{N}$  denote the set of all positive integers.

**Definition 2.1.** Let  $X$  be a non-empty set and  $d : X \times X \rightarrow [0, +\infty[$  be a mapping such that, for all  $x, y \in X$  and for all

distinct points  $u, v \in X$  each of them different from  $x$  and  $y$ , one has

- (i)  $d(x, y) = 0$  if and only if  $x = y$ ,
- (ii)  $d(x, y) = d(y, x)$ ,
- (iii)  $d(x, y) \leq d(x, u) + d(u, v) + d(v, y)$  (rectangular inequality).

Then  $(X, d)$  is called a generalized metric space (or shortly GMS).

We note that (iii) of Definition 2.1 does not ensure that  $d$  is continuous in each variable, see [8]. Also, in a GMS the notions of convergent sequence and Cauchy sequence are the same as in a standard metric space.

**Definition 2.2.** Let  $(X, d)$  be a GMS,  $\{x_n\}$  be a sequence in  $X$  and  $x \in X$ . Then a sequence  $\{x_n\}$  in GMS is said to be convergent to  $x$  if and only if  $d(x_n, x) \rightarrow 0$  as  $n \rightarrow +\infty$ . We denote this by  $x_n \rightarrow x$ .

**Definition 2.3.** Let  $(X, d)$  be a GMS,  $\{x_n\}$  be a sequence in  $X$  and  $x \in X$ . Then a sequence  $\{x_n\}$  in GMS is said to be Cauchy sequence if and only if, for each  $\varepsilon > 0$ , there exists a natural number  $n(\varepsilon)$  such that  $d(x_n, x_m) < \varepsilon$  for all  $n > m \geq n(\varepsilon)$ .

**Definition 2.4.** Let  $(X, d)$  be a GMS. Then  $(X, d)$  is called GMS complete if every GMS Cauchy sequence is GMS convergent in  $X$ .

We note that a convergent sequence in a GMS is not necessarily a Cauchy sequence, see again [8].

We denote by  $\Psi$  the set of functions  $\psi: [0, +\infty[ \rightarrow [0, +\infty[$  satisfying the following hypotheses:

- ( $\psi_1$ )  $\psi$  is continuous and non decreasing,
- ( $\psi_2$ )  $\psi(t) = 0$  if and only if  $t = 0$ .

We denote by  $\Phi$  the set of functions  $\phi: [0, +\infty[ \rightarrow [0, +\infty[$  satisfying the following hypotheses:

- ( $\phi_1$ )  $\phi$  is lower semi-continuous,
- ( $\phi_2$ )  $\phi(t) = 0$  if and only if  $t = 0$ .

In [9], Lakzian and Samet set up the accompanying fixed point theorem including a pair of altering distance functions in a generalized complete metric space.

**Theorem 2.1.** Let  $(X, d)$  be a Hausdorff and complete GMS and let  $A : X \rightarrow X$  be a self mapping satisfying

$$\psi(d(Ax, Ay)) \leq \psi(d(x, y)) - \phi(d(x, y))$$

for all  $x, y \in X$ , where  $\psi \in \Psi$  and  $\phi: [0, +\infty[ \rightarrow$

$[0, +\infty[$  is continuous and  $\phi(t) = 0$  if

and only if  $t = 0$ . then  $A$  has a unique fixed point.

**Definition 2.5.** Let  $X$  be a non-empty set and  $A, B : X \rightarrow X$ . The mappings  $A, B$  are said to be weakly compatible if they commute at their coincidence point (i.e.  $ABx = BAx$  whenever  $Ax = Bx$ ).

**Definition 2.6.** A point  $y \in X$  is called point of coincidence of  $A$  and  $B$  if there exists a point  $x \in X$  such that  $y = Ax = Bx$ .

In [10], Di Bari and Vetro established the following fixed point theorem.

**Theorem 2.2.** Let  $(X, d)$  be a Hausdorff GMS and let  $A$  and  $B$  be self-mappings on  $X$  such that  $AX \subseteq BX$ . Assume that  $(BX, d)$  is a complete GMS and that the following condition holds:

$$\psi(d(Ax, Ay)) \leq \psi(d(Bx, By)) - \varphi(d(Bx, By))$$

for all  $x, y \in X$ , where  $\psi \in \Psi$  and  $\varphi \in \Phi$ . Then  $A$  and  $B$  have a unique point of coincidence in  $X$ . Moreover, if  $A$  and  $B$  are weakly compatible, then  $A$  and  $B$  have a unique common fixed point.

### 3. Main results

In 2014 Rosa and Vetro [11] proved the following theorem:

**Theorem 3.1.** Let

$(X, d)$  be a GMS and let  $A$  and  $B$  be self mappings on  $X$  such that

$$AX \subseteq BX \text{ and } \alpha : X \times X \rightarrow$$

$[0, +\infty[$ . Assume that  $(BX, d)$  is a complete GMS and that the following condition holds:

$$\psi(\alpha(Bx, By) d(Ax, Ay)) \leq \psi(M(x, y)) - \varphi(M(x, y))$$

for all  $x, y \in X$ , where  $\psi \in \Psi$  and  $\varphi \in \Phi$  and

$$M(x, y) = \max\{d(Bx, By), d(Bx, Ax), d(By, Ay)\}.$$

Assume also that the following conditions hold

- (i)  $A$  is  $B$ - $\alpha$ -admissible;
- (ii) there exists  $x_0 \in X$  such that  $\alpha(Bx_0, Ax_0) \geq 1$ ;
- (iii)  $X$  is  $\alpha$ -regular and for every sequence  $\{x_n\} \subset X$  such that  $\alpha(x_n, x_{n+1}) \geq 1$ , we have  $\alpha(x_m, x_n) \geq 1$  for all  $m, n \in \mathbb{N}$  with  $m < n$ ;
- (iv) either  $\alpha(Bu, Bv) \geq 1$  or  $\alpha(Bv, Bu) \geq 1$  whenever  $Bu = Au$  and  $Bv = Av$ .

Then  $A$  and  $B$  have a unique point of coincidence in  $X$ . Moreover, if  $A$  and  $B$  are weakly compatible, then  $A$  and  $B$  have a unique common fixed point.

In this paper, we extend and generalise the above theorem by proving some common fixed point results for two self-mappings satisfying an  $\alpha$ - $\psi$ - $\varphi$ -contractive condition.

**Definition 3.1.** Let  $A, B : X \rightarrow X$  and  $\alpha : X \times X \rightarrow [0, +\infty[$ . The mapping  $A$  is  $B$ - $\alpha$ -admissible if, for all  $x, y \in X$  such that  $\alpha(Bx, By) \geq 1$ , we have  $\alpha(Ax, Ay) \geq 1$ .

If  $B$  is the identity mapping, then  $A$  is called  $\alpha$ -admissible.

**Definition 3.2.** Let  $(X, d)$  be a GMS and  $\alpha : X \times X \rightarrow [0, +\infty[$ .  $X$  is  $\alpha$ -regular if, for every sequence  $\{x_n\} \subset X$  such that  $\alpha(x_n, x_{n+1}) \geq 1$  for all  $n \in \mathbb{N}$  and  $x_n \rightarrow x$ , then there exists a subsequence  $\{x_{n_k}\}$  of  $\{x_n\}$  such that  $\alpha(x_{n_k}, x) \geq 1$  for all  $k \in \mathbb{N}$ .

**Theorem 3.2.** Let  $(X, d)$  be a GMS and let  $A$  and  $B$  be self-mappings on  $X$  such that

$AX \subseteq BX$ . Assume that  $(BX, d)$  is a complete GMS and that the following condition holds:

$$\psi(d(Ax, Ay)) \leq \psi(M(x, y)) - \varphi(M(x, y)) \quad (3.1)$$

for all  $x, y \in X$ , where  $\psi \in \Psi, \varphi \in \Phi$  and

$$M(x, y) = \max \left\{ \begin{array}{l} d(Bx, By), d(Bx, Ax), d(By, Ay), \\ \frac{d(Bx, Ax)d(By, Ay)}{1+d(Bx, By)}, \frac{d(Bx, Ax)d(By, Ay)}{1+d(Ax, Ay)} \end{array} \right\}.$$

Then  $A$  and  $B$  have a unique point of coincidence in  $X$ . Moreover, if  $A$  and  $B$  are weakly compatible, then  $A$  and  $B$  have a unique common fixed point.

Let  $X$  be a non-empty set. If  $(X, d)$  is a GMS and  $(X, \preceq)$  is a partially ordered set, then  $(X, d, \preceq)$  is called a partially ordered GMS. Then  $x, y \in X$  are called comparable if  $x \preceq y$  or  $y \preceq x$  holds. Let  $(X, \preceq)$  be a partially ordered set and  $A, B : X \rightarrow X$  be two mappings.  $A$  is called an  $B$ -nondecreasing mapping if  $Ax \preceq Ay$  whenever  $Bx \preceq By$  for all  $x, y \in X$ .

In the setting of partially ordered GMS spaces, we obtain the following theorem.

**Theorem 3.3.** Let  $(X, d, \preceq)$  be a partially ordered GMS and let  $A$  and  $B$  be self-mappings

on  $X$  such that  $AX \subseteq BX$ . Assume that  $(BX, d)$  is a complete GMS and that the following condition holds:

$$\psi(d(Ax, Ay)) \leq \psi(M(x, y)) - \varphi(M(x, y)) \quad (3.2)$$

for all  $x, y \in X$  such that  $Bx \preceq By$ , where  $\psi \in \Psi, \varphi \in \Phi$  with

$$\psi(t) - \varphi(t) \geq 0 \text{ for all } t \geq 0, \text{ and}$$

$M$

$$= \max \left\{ \begin{array}{l} d(Bx, By), d(Bx, Ax), d(By, Ay), \frac{d(Bx, Ax)d(By, Ay)}{1+d(Bx, By)} \\ \frac{d(Bx, Ax)d(By, Ay)}{1+d(Ax, Ay)} \end{array} \right\}.$$

Assume also that the following conditions hold:

- (i)  $A$  is  $B$ -nondecreasing;
- (ii) there exists  $x_0 \in X$  such that  $Bx_0 \preceq Ax_0$ ;
- (iii) if  $\{x_n\} \subset X$  is such that  $x_n \preceq x_{n+1}$  for all  $n \in \mathbb{N}$  then there exists a subsequence  $\{x_{n_k}\}$  of  $\{x_n\}$  such that  $x_{n_k} \preceq x$  for all  $k \in \mathbb{N}$ ;
- (iv) for all  $u, v \in X$  such that  $Bu = Au$  and  $Bv = Av$  then  $Bu$  and  $Bv$  are comparable.

Then  $A$  and  $B$  have a unique point of coincidence in  $X$ . Moreover, if  $A$  and  $B$  are weakly compatible, then  $A$  and  $B$  have a unique common fixed point.

**Proof.** Define the mapping  $\alpha : X \times X \rightarrow [0, +\infty[$  by

$$\alpha(x, y) = \begin{cases} 1 & \text{if } x, y \in fX \text{ and } x \preceq y \\ 0 & \text{otherwise.} \end{cases}$$

The reader can show easily that  $T$  is an  $B$ - $\alpha$ -admissible mapping. Now, let  $\{x_n\}$  be a sequence in  $X$  such that  $\alpha(x_n, x_{n+1}) \geq 1$  for all  $n \in \mathbb{N}$  and  $x_n \rightarrow x \in X$  as  $n \rightarrow +\infty$ . By the definition of  $\alpha$ , we have  $x_n, x_{n+1} \in BX$  and  $x_n \preceq x_{n+1}$  for all  $n \in \mathbb{N}$ .



Since  $BX$  is complete, we deduce that  $x \in BX$ . By (iii), there exists a subsequence  $\{x_{n_k}\}$  of  $\{x_n\}$  such that  $x_{n_k} \leq x$  for all  $k \in \mathbb{N}$  and so  $\alpha(x_{n_k}, x) \geq 1$  for all  $k \in \mathbb{N}$  and so  $X$  is  $\alpha$ -regular. Moreover,  $\alpha(x_m, x_n) \geq 1$  for all  $m, n \in \mathbb{N}$  with  $m < n$ . Denote by  $\Lambda$  the set of functions  $\gamma : [0, +\infty[ \rightarrow [0, +\infty[$  Lebesgue integrable on each compact subset of  $[0, +\infty[$  such that, for every  $\epsilon > 0$ , we have

$$\int_0^\epsilon \gamma(s) ds > 0.$$

As the function  $\psi : [0, +\infty[ \rightarrow [0, +\infty[$  defined by  $\psi(t) = \int_0^t \gamma(s) ds > 0$ .

belongs to  $\Psi$ , we obtain the following theorem.

**Theorem 3.4.** Let  $(X, d)$  be a GMS and let  $A$  and  $B$  be self-mappings on  $X$  such that

$AX \subseteq BX$  and  $\alpha : X \times X \rightarrow [0, +\infty[$ .

Assume that  $(BX, d)$  is a complete GMS and that the following condition holds:

$$\int_0^{\alpha(Bx, By)d(Ax, Ay)} \gamma(s) ds \leq \int_0^{M(x, y)} \gamma(s) ds - \int_0^{M(x, y)} \delta(s) ds$$

for all  $x, y \in X$ , where  $\gamma, \delta \in \Lambda$  and

$$M(x, y) = \max \left\{ \frac{d(Bx, By), d(Bx, Ax), d(By, Ay), d(Bx, Ax)d(By, Ay)}{1 + d(Bx, By)}, \frac{d(Bx, Ax)d(By, Ay)}{1 + d(Ax, Ay)} \right\}$$

Assume also that the following condition holds;

- (i)  $A$  is  $B$   $\alpha$ -admissible;
- (ii) there exists  $x_0 \in X$  such that  $\alpha(Bx_0, Ax_0) \geq 1$ ;
- (iii)  $X$  is  $\alpha$  regular and for every sequence  $\{x_n\} \subset X$  such that  $\alpha(x_n, x_{n+1}) \geq 1$ , we have  $\alpha(x_m, x_n) \geq 1$  for all  $m, n \in \mathbb{N}$  with  $m < n$ ;
- (iv) either  $\alpha(Bu, Bv) \geq 1$  or  $\alpha(Bv, Bu) \geq 1$  whenever  $Bu = Au$  and  $Bv = Av$ .

Then  $A$  and  $B$  have a unique point of coincidence in  $X$ . Moreover, if  $A$  and  $B$  are weakly compatible, then  $A$  and  $B$  have a unique common fixed point.

Taking  $\delta(s) = (1 - k)\gamma(s)$  for  $k \in [0, 1[$  in theorem 3.5

We obtain the following results.

**Theorem 3.5.** Let  $(X; d)$  be a GMS and let  $A$  and  $B$  be self-mappings on  $X$  such that

$AX \subseteq BX$  and  $\alpha : X \times X \rightarrow [0, +\infty[$

Assume that  $(BX, d)$  is a complete GMS and that the following condition holds:

$$\int_0^{\alpha(Bx, By)d(Ax, Ay)} \gamma(s) ds \leq k \int_0^{M(x, y)} \gamma(s) ds$$

for all  $x, y \in X$  where  $k \in [0, 1[$ . Assume

also that the following condition holds;

- (i)  $A$  is  $B$   $\alpha$ -admissible;
- (ii) there exists  $x_0 \in X$  such that  $\alpha(Bx_0, Ax_0) \geq 1$ ;
- (iii)  $X$  is  $\alpha$ -regular and for every sequence  $\{x_n\} \subset X$  such that  $\alpha(x_n, x_{n+1}) \geq 1$ , we have  $\alpha(x_m, x_n) \geq 1$  for all  $m, n \in \mathbb{N}$  with  $m < n$ ;

- (iv) either  $\alpha(Bu, Bv) \geq 1$  or  $\alpha(Bv, Bu) \geq 1$  whenever  $Bu = Au$  and  $Bv = Av$ .

Then  $A$  and  $B$  have a unique point of coincidence in  $X$ . Moreover, if  $A$  and  $B$  are weakly compatible, then  $A$  and  $B$  have a unique common fixed point.

**Example 1.** Let  $X = [0, 1]$  and  $A = \{1/5, 1/6, 1/7\}$ . Define the generalized metric  $d$  on  $X$  as follows:

$$d\left(\frac{1}{5}, \frac{1}{6}\right) = d\left(\frac{1}{7}, \frac{1}{6}\right) = \frac{3}{5}, \quad d\left(\frac{1}{5}, \frac{1}{7}\right) = d\left(\frac{1}{6}, \frac{1}{7}\right) = \frac{2}{5}$$

$$d\left(\frac{1}{5}, \frac{1}{7}\right) = d\left(\frac{1}{7}, \frac{1}{6}\right) = \frac{6}{5} \quad d(x, y) = |x - y| \text{ otherwise}$$

Clearly,  $(X, d)$  is a complete GMS. Let

$A : X \rightarrow X$  and  $\psi, \varphi : [0, +\infty[ \rightarrow [0, +\infty[$  be defined by

$$Ax = \begin{cases} \frac{1}{4} & \text{if } x \in A \\ 1 - x & \text{if } x \in [0, 1] \setminus A \end{cases}$$

$$\Psi(t) = t \text{ and } \varphi(t) = \frac{t}{5}$$

Finally, consider  $\alpha : X \times X \rightarrow [0, +\infty[$  given by

$$\alpha(x, y) = \begin{cases} 1 & \text{if } x, y \in A \text{ or } x = y \\ 0 & \text{otherwise} \end{cases}$$

Then  $A$  and  $\alpha$  satisfy all the conditions of Corollary 1 and, hence,

$A$  has a unique

fixed point on  $X$ , that is,  $x = 1/7$

We note that if  $X$  is endowed with the standard metric

$$d(x, y) = |x - y| \text{ for all } x, y \in X, \text{ then there do not exist } \psi, \varphi : [0, +\infty[ \rightarrow [0, +\infty[$$

where  $\psi \in \Psi$  and  $\varphi \in \Phi$  such that

$$\psi(d(Ax, Ay)) \leq \psi(M(x, y)) - \varphi(M(x, y)) \text{ for all } x, y \in X$$

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# Propagation of Neuronal Signal under Physiological Stress

Shashibala Agarwal  
IGDTUW, Delhi  
shashibala.agarwal@gmail.com

Dr Maria Jamal  
IGDTUW, Delhi  
jamalmaria@yahoo.com

Prof Pramod Kumar  
MAIT, Delhi  
parmodk2003@yahoo.co.in

**Abstract**—The paper presents the study of stress effect on propagation of neural signal. The electrical model of neural membrane is derived. Also inhibitory and excitatory functions are discussed. The structure and topology of neurons are presented. The various excitation functions, which represent the different level of stress, are presented. The study is useful for health advisory consultant and cardiologist. The paper reconcile the two fields: neuron model on one hand and signal progression on the other hand.

## I. INTRODUCTION

Physiological stress is a state of mind in which external and internal condition challenges the homeostasis of a cell. Stress can be due to environmental changes or change in inner chemistry of hormones or with ageing[1]. Information in bio-system is transferred through propagation of electrical or electrochemical signals in neuronal network[2]. This signal followsthe specific pattern which gets disturbed due to stress, if presented any. The neural net over which signal propagate constitute four elements i.e. Resistor, Capacitor, Inductor andMemristor. Memristor is a nonlinear characteristics & high performance two terminal circuit element. It is a voltage-dependent resistance, which means that electric properties of the material vary with potential difference. It relates magnetic flux linkage with electric charge ( $d\phi = M dq$ ).However, under stress condition the electrical & electrochemical characteristics changes. This result change of time variation neuron signal shape and magnitude. Thereby may change the behavior of person. In this paper, the authors have presented the effect of stress on propagation of Neuronal signal. Stress signals of various types are defined which may vary the neuronal signal.

The physiological stress has become a common phenomenon in society. The students, Youth & adults are facing the stress of different types & level. The

students may face stress due to exam. The youth may face stress due to job, promotion, & competition. The adult may face stress due to promotion & workload. Such type of stress is like ramp excitation function in a system. Whereas the stress due to sudden shock or bad news also create a stress on the neuro signal. Such type of stress can be considered as impulse type excitation function. K.S and Lee W.H [1] have discussed the mental stress assessment based on pulse excitation function. Sharma. N. and Gedeon. T [2] have carried out a survey for stress recognition and classification techniques. Hsiu-Sen Chiang [3] has developed a rule-based reasoning model for mental stress assessment using fuzzy combining and associative Petri net methodologies. Sharma N. & Gedeon T. [4] proposes a model for estimating stress signal for an observer of real-life events. Segev I. &Parnas I. [5] presents theoretical and experimental demonstrations of the postsynaptic effects of the interactions between two adjacent synapse. Qinali Xu, New T.L and Guan C. [6] proposes a novel cluster-based analysis to evaluate perceived stress using physiological stress. Sung S.H, and Kim D.K [7] proposed a stress classification model using Deep belief Networks. Khoystate F, GrassiaF, Saighi S and Levi T [8] present a real-time biomimetic neural network to optimize the Hodgkin-Huxley equations adapted for Field Programmable Gate Array (FPGA) implementation for bio-hybridization. Murphy S.D andKairiss [9] have developed a computationally efficient representation of a single neuron that does not compromise the biological dynamical behavior. It acts as a temporal neural network. McEwen BS, et al. [10] review provides summary of the mechanisms and mediators through which stressors alter brain structure and function. Kocic I, et al. [11] studies the relation between changes in action potentials and activation of several ionic currents during hypoosmotic stress in guinea-pig ventricular myocytes. Guillamon A., et al. [12] analyze the linear

estimation of synaptic conductance and give a mathematical explanation of the errors.

## II. STRUCTURE & TOPOLOGY OF NEURONS

Human Brain is one of the very complicated organs. It comprised of cells called neurons. Chain of neurons is like a cable which receives and sends information all over the body using electrochemical and electrical signals. The neurons communicate with each other through synapses. Neurons can be classified of three types: Sensory neurons, Motor neurons, and Inter neurons. Fig.(1) shows the structure of a typical neuron.

A typical neuron consists of dendrites, nucleus, axon and body (soma). It consists of chemically active structures immersed in watery material called cytoplasm which is bounded by a layer called as membrane. The intracellular & extracellular fluid is separated by this membrane, which acts as a diffusion barrier. Dendrites are like a tree with branches which act as receiving antennas. Synapses are like a junction point to contact other neurons. Axon is a long fiber which transmits electrical signals. It is surrounded by more watery cytoplasm and is bounded by a fatty material called myelin. In neuron, dendrites being receiving end, axon as transmitting axis and connected to other neurons through receptors, operates in unidirectional.

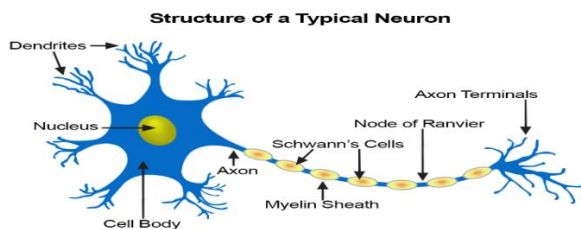


Fig. 1: Structure of a typical neuron.

Neuron functions because of potential difference between intracellular and extracellular fluid across the membrane (due to the difference of ionic concentration of sodium and potassium between two fluids). Topology relates the output and input of model neurons. Neuron's behavior and electrophysiological features and events can be studied with such connections. Fig.2 shows the basic topologies of neuron connections. Fig. 2(a) shows the

conversion topology, the dendrites and soma of one neuron, receives signal from axons of two or more neurons. Fig 2(b) present the divergence topology, here two or more neurons receive the signal from axon of one neuron. Fig 2(c) and (d) show the series and parallel topology. In forward topology Fig 2(a)-(d), no neuron (series & parallel topology) pass its output to itself. Fig 2(e)-(h) is called the feedback topology, here the output of a neuron is returned by any channel or set of channel to its input. Fig 2(f) and (g) represents the positive feedback, here the input channel and the output channels are of same type (excitatory, or inhibitory). Fig 2(h) are negative feedback, here the two channels (output & feedback) are different one is excitatory & other inhibitory. Neuron topologies predict the relation between active states of two sets of neurons. The dynamics of neurons networks become a highly complex.

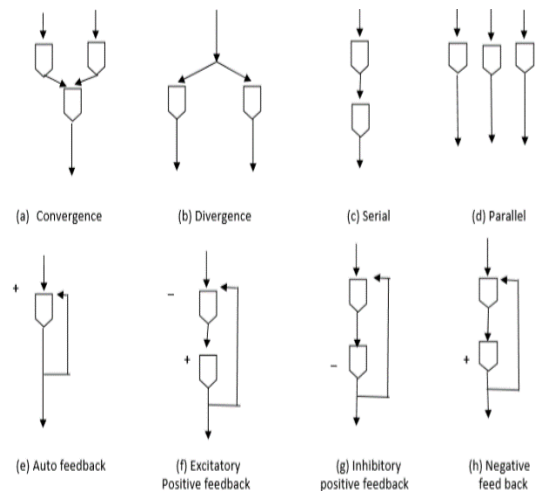


Fig.2 Different Topologies of Neurons

## III. INHIBITORY AND EXCITORY FUNCTIONS

The cell is an input output device. The input consists of two types of synapses: excitatory and inhibitory. The excitatory input or synapses tend to make the cell fire. The inhibitory inputs try to dampen or control the output. The excitatory cell tends to excite the post synaptic cell by generating locally a positive potential, and the inhibitory cell tries to inhibit the post synaptic cell by generating locally a negative voltage. The output will be look like spikes. The set of spikes at the soma will flow along the axon, make connection through synapses to the post synaptic cell.

Excitatory potential function is the post synaptic potential whereas inhibitory potential is the post synaptic action potential. In the former the post synaptic cell potential probability decreases whereas in the later there is a increase of post synaptic action potential. The excitatory potential moves from resting potential of about -6mv towards threshold potential. If the multiple action potential are fired, there summed up through the temporal submission to reach a threshold and trigger a action potential. If the membrane potential is more negative i.e. moving away from the threshold potential, it is called inhibitory post synaptic potential. Equation (1) and (2) represents the excitatory function and inhibitory function. Fig. 3 represents the excitatory and inhibitory potential events.

$$h_e = A a e^{-at} \quad \dots\dots\dots (1)$$

$$h_i = B b e^{-bt} \quad \dots\dots\dots (2)$$

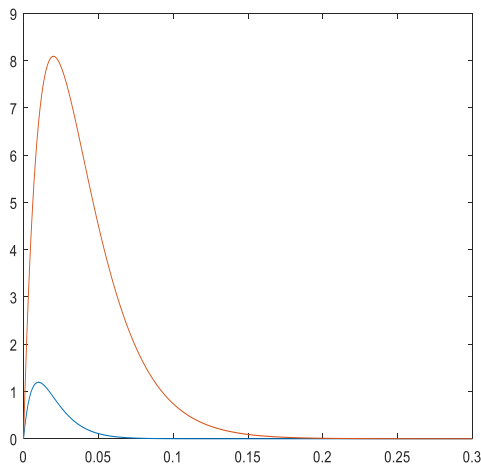


Fig. 3: Represents the excitatory and inhibitory potential events.

#### IV. MODELLING NEURO NETWORK

##### A. Mathematical Model

Neural net is information transmission network over which the neuron signal information is propagated. It is an electrical cable, formed by the multineurons. The intercellular fluid(Na<sup>+</sup>, K<sup>+</sup>, Cl<sup>-</sup>) and extracellular fluid (Na<sup>+</sup>, K<sup>+</sup>, Cl<sup>-</sup>) of the cell membrane are of conductive nature whereas cell membrane is an

insulating medium acts as a dielectric, thus form a capacitor. The resistive property of the conducting fluid formed resistance in the neural network. Since the external and internal fluid are of conductive nature, a current can propagate inside or outside the axon. The interior fluid provides a resistance to propagation of current depending on the fluid conductivity & radius and length of the axon.

If ρ<sub>i</sub> is the conductivity of the interior fluid, a and l are the radius & length of the axon then resistance R<sub>i</sub> is given by equation(3) below

$$R_i = \rho_i / \pi a^2 \quad \dots\dots\dots (3)$$

Similarly, the capacitor is formed between the exterior & interior fluid & membrane as dielectric, is given by equation(4)

$$C = K \epsilon_0 A / T \quad \dots\dots\dots (4)$$

Where A is the surface area of the membrane & T is the thickness of the membrane dielectric. Generally, the thickness of cell membrane is about 5-6x10<sup>-9</sup> m. However the membrane is not a perfect insulator. Hence a leakage current across the membrane occurs. If R<sub>m</sub> is the leakage resistance of the membrane material than the equivalent resistance can be shown in fig. 4(a).

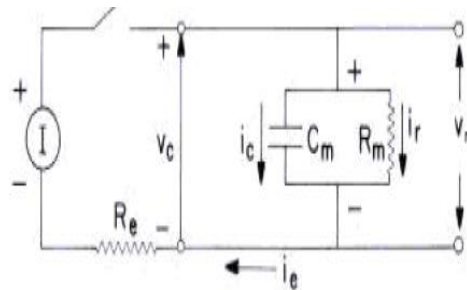


Fig.4(a): Single neuron circuit model for membrane and loop current.

When a large number of neurons are interconnected through axon or dendrites they form like an electrical transmission line. Fig. 4(b) shows the lumped electrical components of distributed network of multi neuron network.

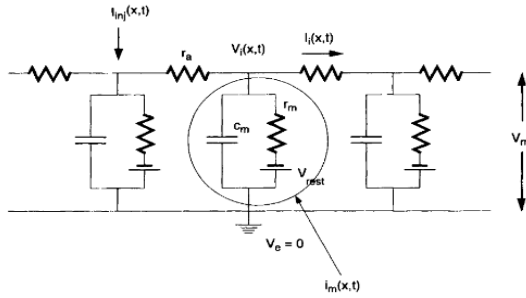


Fig.4(b): Lumped electrical components of distributed network

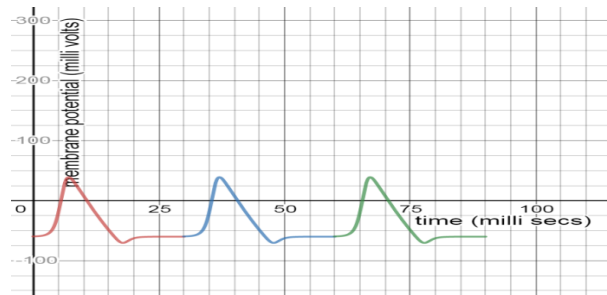


Fig.4(C): Neuron signal at in space and time

$$f(x) = \frac{ksin(\frac{w(x-p)}{t})}{w(\frac{x-p}{t})} * \frac{(\frac{(x-p)+b}{t} - |\frac{(x-p)-c}{t} + h|)}{\{(\frac{(x-p)-d}{t})g + o\}} + m \{ 0 < x < x_o \}$$

(5)

### B. Electronics model of neuron

In Section IV A, it is observed that the neuron network has active and passive components. The current due to ion channels frame the active component while the resistor and capacitor are the passive components.

(A neuronal signal has an active component i.e. current by ion channels and passive components i.e. capacitor and resistor. A circuit model is studied to analyze the effects of capacitance & membrane resistance changes in ionic channels & membrane potential. The design circuit relies on FitzHugh-Nagumo (FHN) circuit model of a neuron. Here, electronic neuron model is using 3 transistors for FHN type neuron model which is based on the work of Hodgkin-Huxley formulation and produces similar results with simpler design. The FitzHugh-Nagumo scheme replaces the fast Na current of the HH model

with a simplified fast, depolarizing, activation process, and replaces the slow Na inactivation and slow, re-polarizing, K current by a single slow inactivation process. The circuit produces a constant train of simulated action potentials (AP) when a constant current is applied. Adjustment of the capacitors of the leak and outward current sections allow the circuit to fire at an identical rate to any documented neural population. Fig 5 shows the basic electronic model of a neuron.

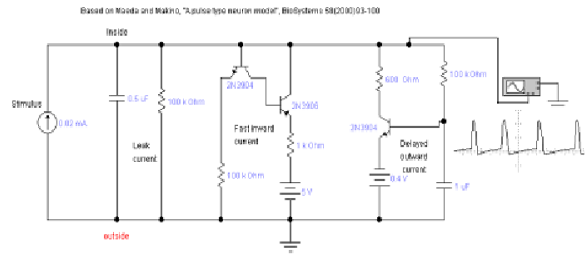


Fig.5: Electronic model of Neuron

The neuron cell membrane is represented as a resistor in parallel with capacitor. Variable parameters were external input voltage and resistance, R1. Cm and Rm represented the membrane capacitance and leakage resistance, respectively. The membrane potential Vm, and the refractory equivalent potential V1 were measured at Cm and C1, respectively. When external input current raised Vm to exceed the threshold regulated by the voltage 0.8V, the base and emitter voltage of bipolar transistor T1 the current flowed from constant voltage source to the capacitor via T2. Thus an oscillation was produced. The current also flowed into C1 those voltage was proportional to the integral of current with respect to time. When V1 exceeded the threshold regulated by the base emitter voltage of bipolar transistor T3 the delayed outward current flowed from C1 to the ground via T3 such that re-polarizing phase in an action potential was obtained.

### V. STRESS EXCITATION FUNCTIONS

Stress is a form of pressure on biological system which changes the ions concentration, depend on the pressure level. The pressure level on the biological system or cell may be increased due to

(i) A spontaneous and sad, unexpected occurrence of events, such as death of a young loved of close relation, electric shock etc. Such a pressure level can be represented by an impulse function. Mathematically, it can be written as equation (3)

$$\int_{-\infty}^{\infty} \delta(t) dt = 1 \dots \dots \dots (6)$$

The laplace transform it can be written as  $\delta(s) = 1$

Such type of pressure on biosystem, called as impulse stress has maximum detrimental effect on neuro network. In such situation the person may even loose conscious momentary or for sometime.

(ii) The pressure on the biosystem if increases linearly and slowly which create the stress and vary the ions concentration slowly, may be called as **Ramp** stress function. Stress or pressure experienced by the student due to the examination is the example of such stress. As the time lapses and the examination approaches near and near the stress level increases. The ramp stress function can be represented by equation

$$r(t) = 0, t \leq 0 \dots \dots \dots (7) \\ = Kt, t > 0$$

The laplace transform of such function can be written as  $R(s) = K/s^2$

(iii) The other form of stress defined is **Step** stress function, which can be represented by equation (5)

$$r(t) = 0, t < 0 \dots \dots \dots (8) \\ = K, t \geq 0$$

The laplace transform of such function can be written as  $R(s) = K/s$

(iv) The stress function can also be represented by sigmoidal stress function, which can be given by equation (6)

$$R(x) = \frac{1}{1+e^{-x}} \dots \dots \dots (9)$$

The Graphical Representation of these stress excitation function is shown in fig.6 (a), (b),(c), and (d) Where r(t) is input pressure level or stress level.

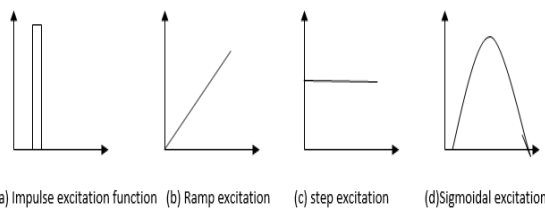


Fig. 6: Graphical representation of stress excitation functions

## VI. STRESS APPLICATION TO NEURAL SIGNAL

Stress pulse simulates the neuan membrane. This results the change of conductance and rate of exchange of sodium, potassium ions. Thus propogation of currents inside cell, membrane currents and capacitive current for a sgment of an axon is shown in fig.(7)

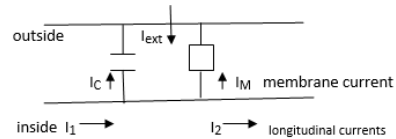


Fig.7 (a): Current across membrane

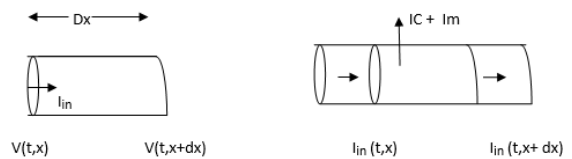


Fig.7(b): Longitudinal potential and currents over an axon

Thus, the current across the membrane [ ] vary, and given by eqn. (10).

$$Cm \frac{\partial^2 V(t,x)}{\partial t} = -J_m(t,x) + J_{ext}(t,x) + \left(\frac{1}{2\pi r_{in}}\right) \frac{\partial^2 V(t,x)}{\partial x^2} \dots \dots \dots (10)$$

Rate at which capacitor is gaining/losing charge per unit area      ionic current densities through membrane ( $J_m = J_{Na} + J_K + J_L$ )      external stimulus      rate of build up of charge along inside membrane surface because of longitudinal currents

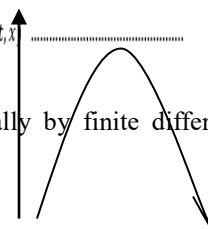
The number of ions that moves across the membrane are small compared to the ions in the interacellular and extracellular fluids and so the concentrations and hence reversal potential can taken as constants ( $E_{Na} = +50.0mV$ ;  $E_K = -77.0mV$ ;  $E_L = -75.6mV$ ).

When the interior potential does not depend upon the location x, along its length:  $V(t,x) = V(t)$ . Therefore, the eqn.(10) becomes:

$$\frac{\partial^2 V(t,x)}{\partial x^2} = \frac{\partial^2 V(t)}{\partial x^2} = 0 \dots \dots \dots (11)$$

Thus, eqn.(10) becomes  $Cm \frac{\partial V(t,x)}{\partial t} = -J_m(t,x) + J_{ext}(t,x)$  ..... (12)

Eqn.(12) is solved numerically by finite difference method.



If the physiological stress is strong enough to produce the sufficient charge injected into the neuron, an action potential is generated as shown in fig.8.

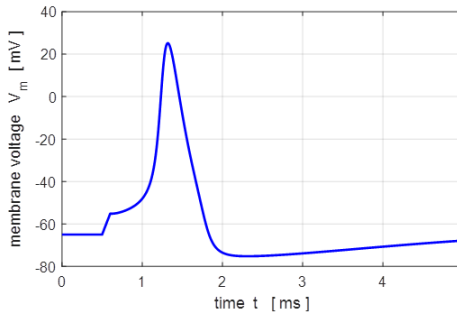


Fig.8: Action potential produced by external current pulse ( induced due to stress)

Electrical activity in neurons is sustained and propagated by ion currents through neuron membranes as shown in figure 4. Most of these trans-membrane currents involve four ionic species: sodium  $\text{Na}^+$ , potassium  $\text{K}^+$ , calcium  $\text{Ca}^{2+}$  and chloride ( $\text{Cl}^-$ ). The concentrations of these ions are different on the inside and outside of a cell. When the neuron is excited by single pulse current , represented as pulse stress, this changes the electrochemical gradients which are the major driving forces of variation of currents in cell activity. Fig.(9) shows variation of four currents as a result of single excitation pulse. Fig.(10) and (11) show the variation of membrane voltage and conductance due to stress input in terms of single pulse with respect to time.

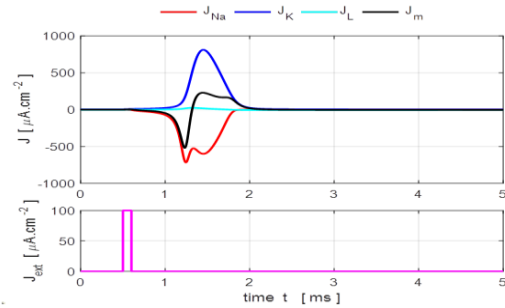


Fig.9: Currents due to  $\text{Na}^+$ ,  $\text{K}^+$ , leak current and cell membrane, excited by single pulse.

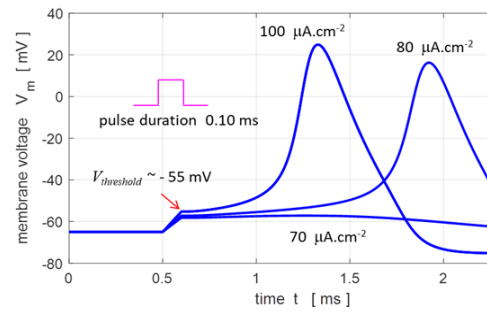


Fig.(10): Effect of external stimuli on Membrane voltage.

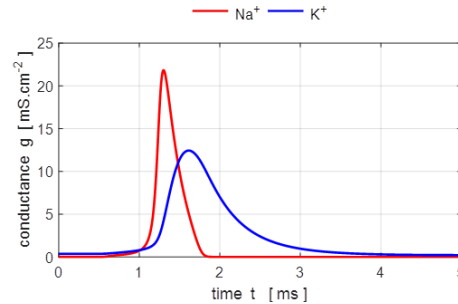


Fig.11: Conductance variation due to stress

## VII. CONCLUSION

The very small current pulse produced due to stress may change the conductance of the membrane to produce a large  $\text{K}^+$  and  $\text{Na}^+$  currents. The potassium current is positive as the  $\text{K}^+$  ions move from inside to outside of cell whereas the sodium current is negative as  $\text{Na}^+$  ions move into the cell across the membrane. Action potential does not vary if the area of pulse remain same i.e. pulse height is reduced to half whereas its width is doubled. The study is useful to estimate the level of stress on human.

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# *Advanced System for Transport Management And Challan Detection*

Kritish Kumar  
kritishkumar1998@gmail.com  
G.B.Pant Engineering College,  
New Delhi, India

Akshay Verma  
[akshayverma2500@gmail.com](mailto:akshayverma2500@gmail.com)  
G.B.Pant Engineering College, New  
Delhi, India

Ankit Srivastava  
[ankitsrivas14@gmail.com](mailto:ankitsrivas14@gmail.com)  
G.B.Pant Engineering College, New  
Delhi, India

Rohit Anand  
[roh\\_anand@rediffmail.com](mailto:roh_anand@rediffmail.com)  
G.B.Pant Engineering College,  
New Delhi, India

**Abstract-** Radio frequency identification (RFID) technology has moved from insignificant applications into mainstream applications that can be used to handle the manufactured goods and materials to identify objects with a very high speed and to record metadata or control individual target through RF waves. By attaching RFID reader to the Internet terminals, the readers can recognize, trace and observe the objects attached with tags automatically in real-time. So, with the help of RFID Technology and other add-on technologies such as Wi-Fi and Arduino, we can't only reduce manual load and increase automation but also provide better user experience, keeping people free from daily troubles at Parking Lots, Challans and the need of worrying about Vehicle documents and Transportation challans. This would further lead to the peace of mind and thus indirectly would increase an individual's productivity and also would help the Government to maintain transparency in Challans by introducing automatic challan system. Through this, we can easily cut down manual labour, introduce smart systems, increase operational efficiency in various smaller transportation divisions that are often neglected (such as parking, challans and documentation), reduce the time delays while travelling, transact Cashless and digitally, decrease the traffic congestion, decrease the air and noise pollution caused by long slow entering vehicles in the parking lots and make challans automatically for red light jumping and overspeeding. This paper presents the overall design of the transport management system with low cost and wireless system.

## 1. INTRODUCTION

In past few years, radio frequency identification (RFID) technology [1,2] has moved from non-recognized

applications into more conventional and recognized applications that assist to handle the manufactured goods and materials without so much delay. RFID enables identification from a distance and unlike some other technologies based on bar-code techniques; it is able to achieve this without line of sight. RFID tags support a broader set of unique IDs than bar codes and can incorporate additional data such as manufacturer, product type and even measure environmental factors such as temperature. In present days, many types of RFIDs exist but at the highest level, RFID devices may be categorized into two different types: active RFID devices and passive RFID devices. Active RFID devices need a power source—they're either attached to a powered infrastructure or need energy stored in an integrated battery. Passive RFID devices are of interest because these tags don't require batteries or maintenance. The tags also have an uncertain life of operation and are so much compact that they are suited for a practical adhesive label. A passive tag is made up of three parts: an antenna, a chip (made up of semiconductor) attached to the antenna and some form of encasing.

## 11. HOW TO USE RFID TECHNOLOGY?

In this paper, we use RFID reader and tag [3] for sending the information of the vehicle to the server through the Wi-Fi module that may also be used for checking the documents [4]. We use RFID technology for the Automatic Challan system; this challan system has two applications:

- Automatic challan system for crossing traffic light: The central concept is that if the red light is activated and if in that time the car crosses the red light then automatically challan would be generated. After

generating the challan, the fine would be added to the main bill.

- Automatic challan system for over speeding of vehicle:

The function of this type of system is to detect the infringement of traffic continuously [5]; the system continually measures the vehicle speed and compares the measured speed with the specified speed limit of that particular location to identify the over-speed. In this system, Global Positioning System (GPS) technology is used for the speed measurement. GPS performs measurement and provides speed and coordinates of that location. The next step is to compare & measure the speed with the specified speed limit supplied by the database of coordinates and their corresponding speed limit. If the vehicle's measured speed is lesser than the specified speed limit carried from the database, it means that the driver is not disobeying the speed norms. But if he goes beyond the speed limit, then a 30-second notification message is gleamed within the vehicle via buzzer and LCD to give the awareness to the driver about the disobeyed offence after that challan is initialized.

We can also use this system in challans so that traffic police can easily make challans and the challans are sent directly to the server. This system can be used in documentation system so that the vehicle owner is not required to carry documents like pollution certificate, registration certificate, license information etc. All the information is stored in the server so that the driver can drive without any hesitation. It is useful for traffic police as well; they can directly scan the RFID tag mounted on the vehicle and check information regarding the vehicle in the presence or the absence of the owner. If any information is discarded, then the challan is generated quickly. This system is fast as compared to the other systems because, in this system, everything is available at one place without carrying documents or going on different websites. It is more efficient compared to other systems.

### 111. IMPLEMENTATION

#### *Working of Red light Jump Challans:*

Traffic signals can be connected to the server using the Internet of Things (IoT). In similar way, RFID readers at stop line of lanes are also connected to the server using the same technology. The traffic signal and the RFID reader both are connected directly as well so that they can interact. When the signals turn to red, RFID readers get activated. If any vehicle crosses the stop

line, the reader gets car information that may be processed at the server to generate a challan electronically. As soon as the signal turns to green, readers will be off and traffic can pass smoothly. This whole process is shown in figure 1.

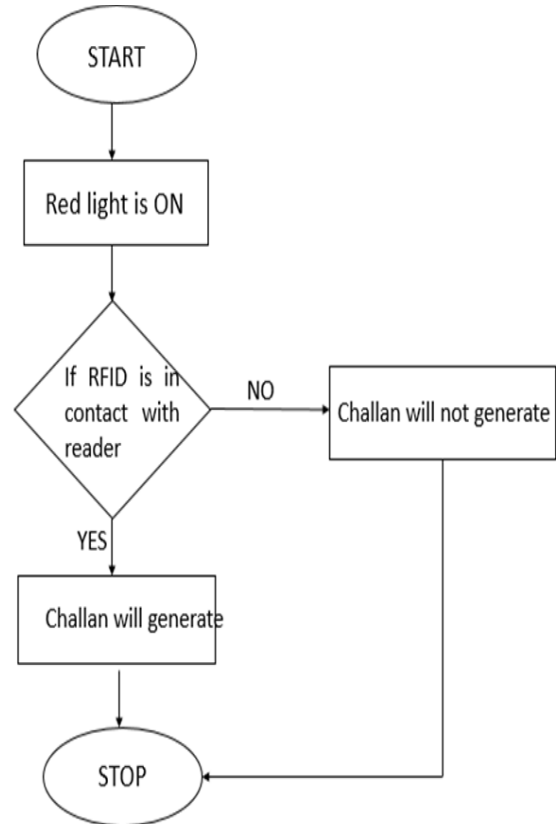


Fig 1. Flow chart for Automatic Challan System for Crossing Traffic Light

*Working of Over-speeding Challans:* An advanced system for cars can be designed where the GPS system will help to measure the speed of a car without interacting with the speedometer of the car [6]. Various roads can be equipped with an RFID reader to read the car's RFID tag; at the end of the road, another reader will again read the card. By using distance and time, speed can be calculated. If it comes out to be higher than the allowed limit, then the system will proceed with the challan through the server. The complete process is clearly shown in figure 2.

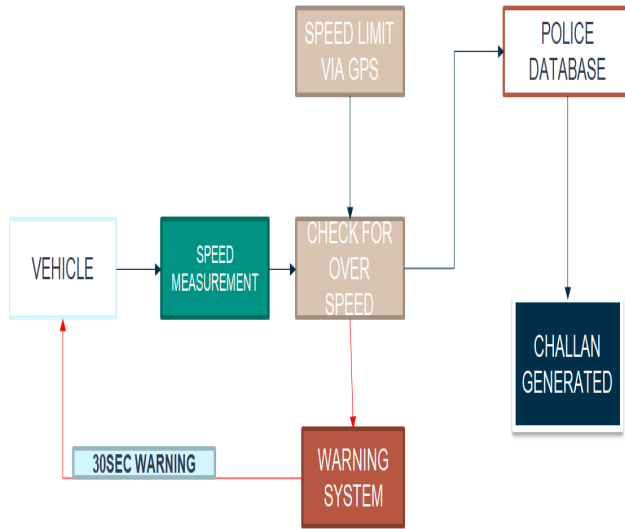


Figure 2. Block Diagram for Automatic Challan System for Over-speeding of Vehicle

#### IV. ANALYSIS

The use of the smart devices in daily life increases the quality of life and also helps in solving the problems efficiently in less time that results in increasing the comfort, cost reduction, energy saving, security and safety. As a result, the brilliance and intelligibility of these all devices is developing at an exponential rate while offering much higher cost-effectiveness and simplicity with their connectivity. The interconnectivity of virtually every object is now possible through the Internet, human social networks and machine-to-machine communications.

#### V. APPLICATIONS

The rate at which more people are adapting to the automation options is high. This is relative to the fact that most of the vehicles and transport systems like paying challan at home without visiting any regional office after verifying the documents of the vehicle and its owner directly through RFID reader and automatic challan system without manual labour. This is an approach that provides users with more comfort.

There are many applications of this smart system [7,8]:

1. This smart system may be used in every toll for the fast transactions in less time so that vehicle does not need to stop then go.
2. This smart system can be used in a security system for making online transactions safe while paying challan and parking dues.
3. This system may be used in every red light so that automatic challan is generated without any manual work.
4. This system can also be used for detecting the speed of a vehicle.

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# A Review of Renewable Energy Resources and Future Aspects

. Shilpi Saxena

Professor, Applied Science

#####[saxenashilpi076@gmail.com](mailto:saxenashilpi076@gmail.com)

BMIET, Sonapat

Navtesh Batra

CSE, 3<sup>rd</sup> year

BMIET, Sonapat

**Abstract-**The world is turning into a global village due to the continual requirement of energy by all population across the world, while the earth in its form cannot change. A majority of the population rely heavily on oil, natural gas and coal for their energy needs. These fuels diminish lots of resources, leaving them environmentally damaged to recover. The main forms of renewable energy currently used are biomass energy, hydroelectricity, wind energy, solar energy, and geothermal energy. The need for energy to satisfy human socio-economic development, welfare and health is increasing. Returning to renewables is an excellent approach to meet energy demand of future generations. Despite such opportunities, there are challenges which interrupt the sustainability of these resources.

**Key words - Renewable Energy, Clean Technologies, Sustainability, Energy Resources, Future Energy.**

## I. INTRODUCTION

The subject of renewable energy (RE) concerns experts as well as the general public increasingly. Renewable energy sources can perform an important role by addressing the issues of fossil fuel depletion and global warming. Fossil fuels, nuclear resources, and renewable resources are the three main sources of energy. RES like solar, wind, biomass, geothermal, and hydro-power are utilized to reproduce energy and are therefore extensively useful to combat energy crises.

Renewable energy resources are considered clean energy resources and are critically important due to their environmental-friendly nature. With the increase in awareness of a clean environment, it is believed that traditional dependence on fossil fuels has led to carbon dioxide (CO<sub>2</sub>) emissions, greenhouse gas (GHG) problems and environmental pollution. RES can cover domestic energy requirements with zero potential with zero services of air pollutants and GHGs. To fulfil the excessive energy demand there is currently a global tendency to

replace conventional fuels with RES. There are many challenges, such as GHG emissions, CO<sub>2</sub> emissions, climate change and energy security, that have resulted in RE seeking to fulfill a growing need in today's environment. Unlike fossil fuels, RES provides environmental protection, a pollution-free environment, energy security and economic benefits. It is vital for present and future generations to rely on RES, so that energy requirements can be met. To achieve this, policy-making and exploring public opinion is required to promote the use of RE. This paper aims at drawing useful insights on the use, challenges faced, and the awareness on using RES and the acceptance of renewable energy technology (RET). RES has provided so many benefits to the territories and regions with social benefits.[1]. This paper aims to study the worldwide need of RE, types of RES used at domestic scale and draw useful conclusions on use and acceptance of RET and RES.

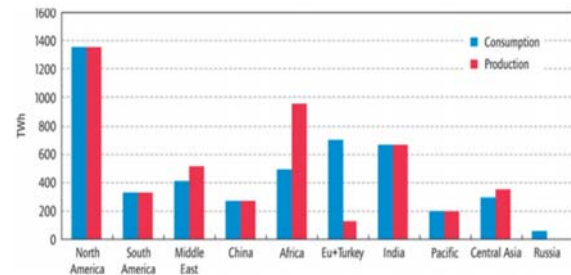


Fig.1. Consumption and Production of Resources around the world

## II. TYPES

### A. Solar

Solar Energy converts sunlight into heat electric power or high temperature water from capturing

radiant energy. Solar cells can convert sunlight into electricity through photovoltaic systems.

#### *Benefits*

It is functionally endless. There is very high supply of solar energy that obsolete fossil fuels. Solar energy can improve medical conditions and environmental factors. Solar energy could also eliminate energy costs, and reduce your energy bills.

#### *Current Limitations*

People need to have the ample sunlight and space for arranging solar panels in their homes, thus limiting who can realistically adopt this technology at the individual level.

#### *B. Wind*

Wind farms trap the wind flow energy and convert into electric power with the help of turbines. The systems that generate power can run many commercial sectors while systems having single turbine can run only pre-existing sectors.

#### *Benefits*

Wind energy is very useful to nature as it does not pollute the environment and does not release toxic gases like carbon dioxide and harmful toxins that can harm the surroundings. There are many benefits in economic sector with the help of wind energy as it opens up ample of job and training opportunities.

#### *Current Limitations*

Wind farms are built in remote areas, far from the hustle bustle of cities, where there is so much requirement of electric power. Wind energy must be transported using transition lines which leads to higher costs. Wind turbines can harm birds that can be killed by hitting the blades of turbine.

#### *C. Hydroelectric*

Water stored in dams can be used to generate electricity by driving the turbines called the hydropower pump storage plant. Hydropower uses a channel to funnel water through. A hybrid combination of renewable energy generators at an off-grid location can be a cost-effective.[2]

#### *Benefits*

Hydroelectric power is very versatile that can be generated via both large and small scale projects. This energy is environment friendly.

#### *Current Limitations*

Hydroelectric power disrupts waterways and negatively affects the aquatic animals, alter the tide levels, and migration paths for many fishes.

#### *D. Ocean*

Oceans can produce 2 types of energy: thermal and mechanical. Thermal energy relies on warm water surface temperatures, while mechanical energy uses the tide flow to generate energy, created by the rotation of earth and gravity from the moon.

#### *Benefits*

Since, most populated cities are near oceans, local population can easily use it. It has an estimated ability to produce 2640TWh/yr from an untapped energy resource.

#### *Current Limitations*

Those who live in states that are not situated near to these resources cannot have access to this energy. Many oceans delicate ecosystems are disturbed by this imbalance. Large machinery built to capture this form of energy can harm the sea life habitat and ocean floors.

#### *E. Biomass*

Bioenergy is a renewable energy derived from biomass. It is the organic matter coming from recently living plants and organisms. Energy can be generated by burning biomass, or harnessing methane gas which is produced by the natural decomposition of organic materials in ponds.

#### *Benefits*

Production of carbon dioxide in the environment because of the use of the biomass can affect it but it is balanced as the plants consume same amount of carbon dioxide which does not harm the environment.

### Current Limitations

We don't yet have widespread technology that can use biomass in lieu of fossil fuels.

### III. APPLICATIONS

Renewable energy sources release very little greenhouse gases and so are better for the environment. Electricity contributes in maximum emissions of greenhouse gases, changing how we get our energy is crucial in the fight against global warming. Stability of renewable energy resources could make access to energy more stable in the future. Renewable energy is flexible as it can run large areas and even single homes. Also, renewable energy projects create a large number of jobs and have a great impact on economy.

### IV. CHALLENGES

Renewable energy plants fluctuate wind and solar energy that can produce much more electricity as compared to other days. The areas that have good access to sunlight are much more suitable for solar plants and moreover solar plants requires much larger areas to get setup and the costs of setup is very high.

Using these resources complexity increases as various optimization methods are used, as they depend too much on the climate [3].

Despite these disadvantages, renewables are proving an important of the energy mix of today and of the future. Most renewable sources can only be used in hybrid versions, owing to relatively high intermittencies [4].

### V. CONCLUSION

The objective of this paper was to highlight the importance of RES and the RET. RES such as solar, wind and biomass are mostly used in the manufacturing of domestic products; namely, windmills to produce electricity, water pumps and heat and power generation, etc. The application of RES such as solar is worldwide. Biomass assists to absorb dangerous gases such as CO<sub>2</sub> and can also be used for electricity and as a fuel. Wind is another useful RE resource that can be used to produce electricity and power generation. It is possible to power the world with the help of WWS resources [8].

We should take necessary precautions while consuming earth's resources. The current use of natural gas and fossil fuels and increasing global population has caused the depletion of earth's resources. The effects on the environment threatens the sustainability of the earth. Renewable energy steam has increased reduction of emission in remote areas [9]. The oil reserves are diminishing, and currently, energy production depends too much contributing in release of harmful greenhouse gases. Release of harmful pollutants has direct consequences, including global warming. High use of fossil fuel resources has damaged the climate extensively and leads to the acidic ocean [10]

### VI. FUTURE SCOPE

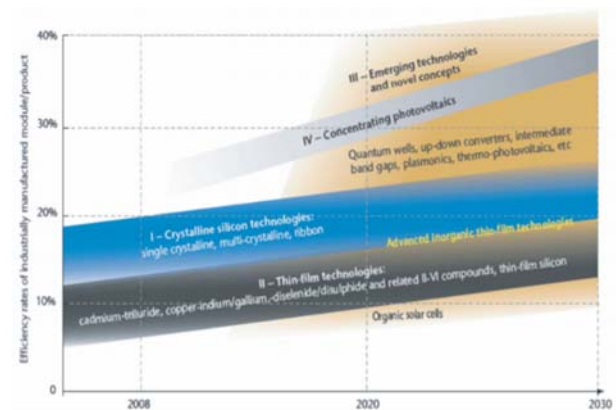


Fig. 2. Exponential Rise in Technologies over the years

#### A. Bioenergy

Bioenergy is one of the oldest forms of non-food energy. The population is very high in 2015 and the nation expected it to rise to at least 9 billion by the year 2050. Biomass has the greatest potential to contribute to the modern era which helps in developing the country all over the world [5].

#### B. Hydro Electricity

Hydroelectricity cannot be readily stored. Most of the world's remaining technical potential for hydropower will be utilized by 2050.

By not using the hydro energy during sunny periods, the natural flow-of-river fills up the reservoir for later use [6]. As the technologies continue to improve, and as fresh water becomes scarce and fossil fuel energy prices rise, renewable energy desalination becomes more viable economically [7].

Extreme rainfall events are expected to increase in frequency. The soil erosion potential runs counter - clockwise with rainfall intensity , thereby increasing the sedimentation rates of water reservoirs, shortening their service lives.

### *C. Wind Energy*

If the linear increases in output from 2008-2015 continue in coming decades, wind could be expected to supply 3985 TWh (14.3 EJ) globally in 2050, compared with the 2015 output of 841 TWh (3.0 EJ). This growth represents a more than four-fold increase. A great care is required to less the danger to the air engines birds and the people walking on the ground. Sea locations will be ample if there is a lot of rise in the wind energy resources.

### *D. Solar Energy*

Globally the production and growth has highly exponential and the future predictions are not useful. Few ambitious schemes have been presented to avoid this problem. First is Solar satellite power (SSP). It involve a fleet of satellites, placed so as to receive 24-hour insolation. The electricity produced would first be converted to microwave energy, then passes in the form of beams to receiving stations, and lastly converted back to electricity again. The costs of photo voltaic cells of has decreased exponentially with time, because of continuous improvement in the materials used.

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# Solar and Peltiers Plate based Hybrid Power Generation

<sup>1</sup>Sandeep Singh  
Asstt. Professor  
Vaish College of Engineering  
Rohtak, India

<sup>2</sup>Dr. Umesh Gupta  
Associate Professor  
Vaish College of Engineering  
Rohtak, India

**Abstract**—The renewable sources of energy can be produced by several techniques; for instance, energy from wind, energy from sunlight, nuclear etc. there are few restriction from every source in order to produce electricity. The solar based energy is the most widely utilized energy form to generate electrical power. However, solar methods can be applied only in the presence of sunlight. Therefore, the present work proposes a hybrid power generation system using solar technology and Peltier plate. Hence, the peltier plate is used for electrical power generation in absence of sunlight. The accumulated power generated by the solar and peltier hybrid model is stored in battery. The battery used is an rechargeable battery which can be used for long period of time. Further, the battery is connected to an inverter, where the inverter design is regulated by means of AC motor.

**Keywords**— Solar plate, Peltier plate, power generation, electrical energy, solar energy

## I. INTRODUCTION

The energy of sun is the most important source of power due to its easy convenience, cleanliness and self-effacing energy assets. Today there are many energies which are generated from sun and sun based cells have been given more thoughts because of the scene created and the general public. (Neophytou, 2015) The sun powered cell is a type of gadget or an instrument which transfers the sun energy radiations into electrical energy which is dependent on the photovoltaic impact. Mono-crystalline silicon (mc-Si) sun generated cell is a piece of silicon sunlight based cell family and it has many positive conditions like low upkeep cost, high unwavering quality, quiet and eco-accommodating. (Yeung *et al.*, 2011)

The general execution of sun based cell unequivocally relies upon the ecological parameters, for example, light force or irradiance, tracking edge and cell temperature. A few Advantages are, low upkeep cost, unwavering quality, normally accessible, sun oriented energy is liberated from contamination, no fuel cost, simple to replace. (Ozden *et al.*, 2015)

Photovoltaic cells convert Photons to Electrons. These Photovoltaic cells are made with extraordinary materials called as semiconductors, for example, silicon, which is currently utilized. Fundamentally, when the daylight strikes any cell a little certain part of it is retained inside the semiconductor material. (Ozden *et al.*, 2015) This implies the energy which is consumed from the light is moved to the semiconductor. This energy thumps all the electrons to lose permitting them to stream uninhibitedly. (Polozine, Sirovinskaya and Schaeffer, 2014)

## II. PELTIER MODULE

A peltier module (thermoelectric) is a gadget that comprises of a p-type and n-type semiconductors. This structure can be

utilized to change over thermal based energy to electricity by utilizing a guideline known as the Seebeck impact. A thermoelectric (TE) generation of power happens when a voltage is created from a temperature distinction across two diverse semiconductor materials. This process is known as the Seebeck effect. At the point when a voltage is applied to a circuit shaped by two semiconductors a temperature contrast will be made over these two intersections. This is known as the Peltier impact. (Toberer, 2019)

Peltier based devices regularly comprise of two earthenware plates that associated by electrical transmitter to semiconductors legs (p and n type) thermoelectric generator comprise number of legs (N and P types) and each pair legs shapes a thermoelectric couples. (Zhang and Zhao, 2015)

Warming one side of a thermoelectric material makes the electrons push away from the hot end toward the virus end thus, an electrical current is happen. The great thermoelectric materials ought to have: Large Seebeck coefficients, High electrical conductivity and Low warm conductivity (Wu *et al.*, 2013)

One of the energy is sun based believers brilliant light into electrical energy and peltier plate changes over heat energy into electrical energy. The close planetary system gives power during seasons copious daylight while the thermoelectric generator framework gives force and warmth as required during seasons with deficient sun based. Hybrid framework which expands cell life, improves execution, and gives operational advantages under various ecological conditions. The battery is utilized here can be revived with the two age inputs like sun based and peltier (Zhang *et al.*, 2013)

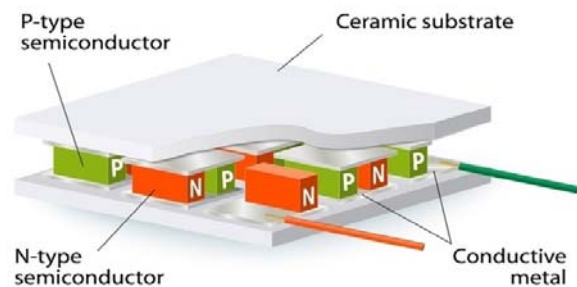


Fig. 1. Thermoelectric Module

## III. RESEARCH METHODOLOGY

The powered cells of sun gets filled in by photons in day and hit the panels which are based on the solar energy which are engrossed by semi conducting materials, for ex., silicon electronics (-ve charge) are thumped free from their molecules, which leads to an electric potential contrast. Current beginnings coursing through the material to drop the potential and this power is caught. Due to the unusual

structure of sun based cells, the electrons are allowed to move in a single path. A various sun oriented cells changes over sun powered energy into a working measure of direct current (DC) electricity. (Hajji *et al.*, 2014)

The peltier plate changes the thermal energy into electrical energy which utilizes the see beck impact. When the heat is integrated into the petlier plate then the one side of the plate gets hot and the opposite side gets cold which shows that the temperature of the both side of the plate is different and this is known as See beck impact. (Daud *et al.*, 2012)

The yield of the both solar powered and peltier plate is associated with the battery through the charging circuit. The charging circuit works as a voltage controller, for example the way toward changing over factor voltage to consistent managed voltage. The fundamental capacity of a controller is to keep the battery from being cheated by the cross breed framework. At the point when a battery is completely energized, the controller will either stop or hinder the measure of current streaming into the battery from the creating frameworks. Battery can be utilized for capacity reason. Consequently this crossover framework will work at day time just as at evening. The yield of the battery is DC that can be legitimately associates with any DC load. Move the slide switch that is available on the charging circuit board to run the DC engine. (Meng *et al.*, 2015)

Right now the sun based exhibit feeds of DC and peltier plate of DC to the battery-powered battery. Subsequently this framework will work at day time just as at evening time. The inverter is utilized for changing over DC to AC and the battery is associated with an inverter board to change over created DC into AC voltage. The pulse generator produces pulses and its given to the MOSFET. A stage up transformer is introduced to get low voltage from two MOSFET's and the transformer will step up the voltage the transformer high voltage for example optional side is associated with the AC machines for example AC engine.

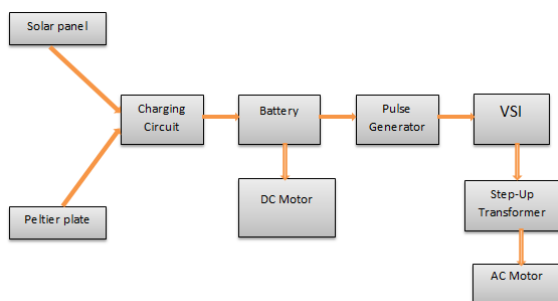


Fig. 2. Proposed Hybrid model

#### IV. RESULTS OUTCOMES

The inverter is connected to the battery so that the generated DC is converted in AC form. This generated voltage of AC can be fed to AC appliances with the help of transformer and ON switch. The needed supplies are kept ON and further the battery installed stores the energy. The output DC voltage obtained is around 13.2 V DC volts on simulation.

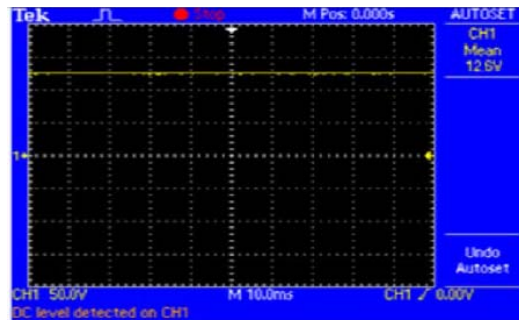


Fig. 3. DC Voltage Waveform

The above figure 3 shows the voltage waveform of peak to peak magnitude of 65 volts with frequency 52.15 Hz

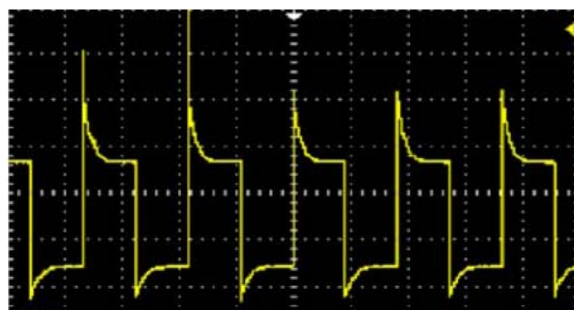


Fig. 4. AC voltage output

The PWM pulse is of magnitude peak to peak 25.08 mV, 5.13 KHz

#### V. CONCLUSIONS

A circuitry is made to produce electrical power from the solar source and peltierplate. A model is created and simulated that is capable of operating both the DC and AC motor from the combined power developed by the two sources. The generated voltage potential is in form of DC which is sufficient to run the DC motor. This is stored in a battery attached in the circuit. The DC voltage of 13 volts is generated in the model. Further, this energy is converted in AC form which is capable to run AC motor. The AC output obtained showed peak in PWM of 25.08 mV at the frequency of 5.13 KHz. This is sufficient electrical output which can run the AC motor. Hence, the hybrid model of solar and peltier plate can be applied where there is insufficient power generation depending on the solar sources only.

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# Solar technology using artificial intelligence methods

Dr. Ankit Bansal<sup>1</sup>  
Associate Professor  
Vaish College of Engineering  
Rohtak, India

Dr. Umesh Gupta<sup>2</sup>  
Associate Professor  
Vaish College of Engineering  
Rohtak, India

Mohit Kumar Agrawal  
Associate Professor  
Vaish College of Engineering  
Rohtak, India

**ABSTRACT**—The methods regarding artificial intelligence has significance role in modeling, evaluations as well as predicting the performance parameters and control comprising renewable energy. Rather than the complication arises by human beings is not overcome manually. The AI methods have the key to provide the information to find out the design and mechanism of solar energy system for example solar radiation, temperature and wind data. There is no data availability for some location or somewhere there has a poor quality of data, insufficient long series, etc. To control these problems the techniques appear to be a strong hold. The given paper provides a review of the techniques is used in AI with neural networks, fuzzy logic, and genetic algorithms.

**Keywords**—Solar energy, Artificial intelligence, Energy systems, Photovoltaic, Renewable Energy

## I. INTRODUCTION

### A. Non-Renewable energy sources

The term used to define as non-renewable energy resources is the sources which won't be replenished. This energy resource comes from the fossil fuels which are generally known as coal natural gas and petro-chemical sources i.e. oils. This energy sources are not used for long time purpose and it is also contains hazardous chemicals for contribution of bad climatic condition for example releasing of carbon dioxide into the air when they utilize. As it responsible for bad environment and it's better to switch-off to the renewable energy sources.

### B. Renewable energy sources

Renewable energy is define as the resources, which are refilled by nature on their time period such as sun light , wind , river tides , waves and geothermal heat. The mostly used as a vital part of renewable energy sources are Solar, wind and water. Those energy resources come naturally and finite time scale nature for example solar energy gets from sunlight. As we depends on the energy to fulfill our daily needs such as power, water and fuels for our modes of transportation. The other advantages of this energy over non- renewable energy are it is chemical free and act as an eco- friendly environment. Right now merely ten percent of energy comes from renewable energy resources. Some of the disadvantages is many of them are expensive and not in the budget. For example using energy from the wind might be great in an area that is really windy all year-round, but it wouldn't work so well in an area with very little wind.

### C. Solar energy

Solar energy has gained an impressive technological side of an energy portion, As an earlier it is used as small photovoltaic cells now it is represented by CSP (Concentrated solar photovoltaic cell) used to feed the electricity grid. The cost of solar energy technologies are also dropped over a past few decades. There was a difference in cost in power consumption in 1990's regarding power band solar modules has decreased from about \$27,000/kW to \$4,000/kW. The installation cost of PV system \$16,000/kW to \$6,000/kW. These figures of rapid expansion cost of photovoltaic systems can be calculated from the policy instruments, That is the increased fluctuation of fossil fuels prices and the environmental expanse the greenhouse emissions (GHG).

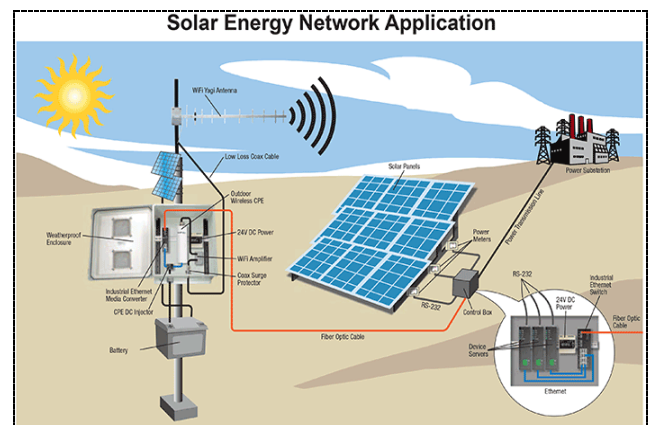


Fig.1 Solar network

### D. Artificial Intelligence:

Artificial intelligence is a portion of the computer science helps or enhances the development of machines. Working procedures includes in this branch is almost manually. For Example speech recognition, problem solving techniques i.e. is learning and planning. The most impressive part of the Artificial Intelligence as it takes less time. The terminology used in commonly known as the characteristics of human brains, which are ability to reason, discover and generalize from earlier experience. Some of the programmers have checked the efficiency and performance levels of human beings and professionals such as in field of medical diagnosis, computer search engines, and voice and handwriting recognition.

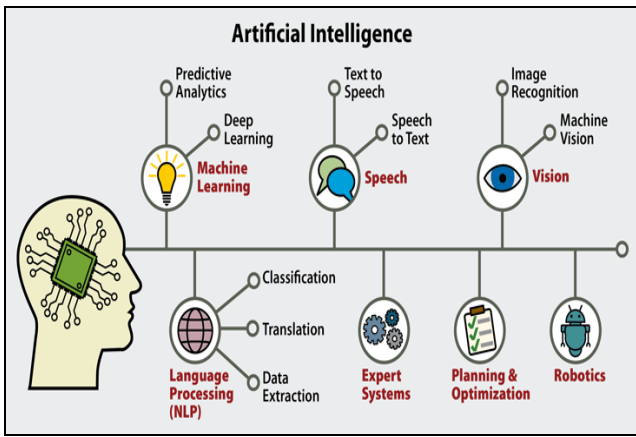


Fig.2 AI system

## II. LITERATURE REVIEWS

(Belu, 2019) Artificial intelligence (AI) is kind of role play in modeling. The term itself relates as analysis, prediction performance control of the renewable energy. Methodology shows the working procedures of the artificial intelligence to command, speculate and the presentation of energy systems. Somewhere the energy systems are a bit of complexity as it includes lots of differential equation large power and gets lots of time. The techniques also used to learn key information pattern with multidimensional information domains the solar energy forecasting data like radiation and wind analysis. To know the poor data and insufficient long series where there are the measurements are inexistent the Artificial intelligence techniques are helpful. Those techniques in solar energy stressed on neural networks, fuzzy logic and general algorithm. These methods discussed in this chapter.

(Kalogirou&Arzu, 2010) Various AI techniques used in a number of solar energy systems have been reviewed. Available literature summaries published in this area is also presented. Artificial techniques approaches also replacement methods in the field of economics, engineering, recognition, leveraging and prediction as it is also used to control of complex systems. AI techniques also have been useful in a wide range of solar energy applications.

(Bermejo et al., 2019)The energy generates from renewable sources put through the dynamically changes in environmental parameters and providing strength to the operating conditions. This is a very pertinent issue to be considered while developing reliability studies, modeling and strength degradation and projecting renewable energy production. To that end, Artificial Neural Network (ANN) models meant to be a very interesting tool, in power generation with strong reliability in power generation. This documents provides the error free data of the literature while using of the ANN. The calculating behaviour in energy production for renewable energy sources. Attention is to provide in the scope of main variables considered. The purpose is to offer the readers an overall picture per energy source, estimating the significance that this tool has achieved over the last years, and identifying the potential of these techniques for future dependability analysis.

(Kobbacy, 2012) Lots of attempts and experiments have been made earlier to apply Artificial Intelligence (AI) techniques for working in the field of maintenance management to attain more productive and effectual to make it achieve the goal. There are various techniques used in AI which range from classic systems to utilize reasoning to the more awkwardly techniques used in genetic algorithms. In simple language the use of AI is to replace human intelligence with machine intelligence. There has been an effort in last few decades which move towards developing hybrid intelligent management systems in operations that use more than one AI technique. This is more practical implementation of AI in maintenance fields. This represents the specific applications in the field of maintenance.

(Chehri&Mouftah, 2013) The concept of smart home energy management involves the integration of various appliances with a smart control unit capable of bidirectional wire line or wireless communication between the controller and the utility. There has a few issues regarding the similarity between different appliances, various smart controllers and communication protocols. In this paper the concept of a smart energy control for the utilization with increasing the use of solar energy to reduce the clash on the power grid without effecting the satisfying demands of house appliances. To reduction the consumption of energy while respecting a fixed comfort for that we approach fuzzy-based energy which works on management control in order to less consumption of energy sources. The results demonstrated that the proposed EMS controller provides a better strategy compared to the conventional method for cost saving (almost 20%).

(Ashtaputre&Bhoi, 2019) The competency of Solar PV panel is greatly affected due to the accumulation of dust, dirt and sea salt on panel. This paper aims at developing a low-cost automatic robot which will smartly clean the panel. The project is divided into two parts: Cleaning System and Monitoring System. Cleaning task is completed as per data received from monitor. Wireless technology has been completing in order to collect all the data from individual panel. The power outputs is examined thoroughly and depending on the information collected at each node. This is remotely operated system that can access in any part of the world.

(Gligor et al., 2018) The intention of the paper is to find out the possibility of using artificial intelligence in photovoltaic energy production forecasting. This is an energy management and production module of energy presented to approach the solution provides the electricity based on current available solar radiation data in real life time. The purpose is to provide a result which shows the production of on past and recent based solar radiation through feeding neural network and data on the based conclusions.

(Zandi&Mazinan, 2019) The use of solar cells despite being free of contamination and unlimited in terms of the amount of energy is considered as a costly way to generate energy. Two main factors may be enumerated as follows. First of all, the amount of sunlight and ambient temperature

affected the amount of energy received from sunlight by solar panels, as long as the amount of sunlight changes overnight in line with changing weather conditions and the second one is the low efficiency of the energy conversion. The reason for the low electrical energy which is not linear and has variation in output voltages and also variation in current as per the change of the radiation, there has been change of temperature of operating environment as change in electric charge respectively. Solution for this is to track the point of maximum PV algorithm and push the system point to the optimal point. The main objective of this calculation presented here is to present a method that in the high speed and exact point of junction the maximum power is also consider. So far, a large number of available methods have been used to increase the efficiency of solar cells. Some of these are associated with problems in the tracking process or they respond slowly. The investigated outcomes verify the effectiveness of the approach performance proposed.

### III. METHODOLOGIES OF AI TECHNIQUES

From the earlier three decades the methods and techniques of AI to power and renewable energy have been played a major and important role. Among these, artificial neural networks, fuzzy logic, expert or knowledge based systems have been the most successful. Presentations of AI techniques to power and renewable energy systems has been an active area of research for over three earlier decades and achieved the successes.

#### A. Artificial neural networks

Artificial Neural Networks working procedures somehow resemble to human brain that works on information processing systems consists of internally layers of neurons or processing elements. Artificial Neural Networks (ANNs) are information-processing systems inspired by models formulated from the workings of the brain. An ANN consists of interconnected layers of neurons or processing elements. The information is passed between these units each of its different weight and strength. The data is passed from layer or connections, which characterized by its different weight and strength of its own. In addition to activate the function is associated to the limit amplitude of neuron. To achieve desired relationship between the input and output of neurons. In order to know the relationship of input and output of the network, values must be derived for the connection to activate the functions of weight. This process is also known as supervised training.

ANN's while implemented is not for any specified task. Rather than, they are trained in respect to the sets of information upto an extent where they learn the patterns to be utilized in form of inputs. After the training process the fresh patterns are presented for forecasting and categorization. ANN's might learn to identify the patterns automatically in the information from real systems, programmes of computers, physical models etc. They can handle many inputs and produce answers that are in a form suitable for designers or further processing.

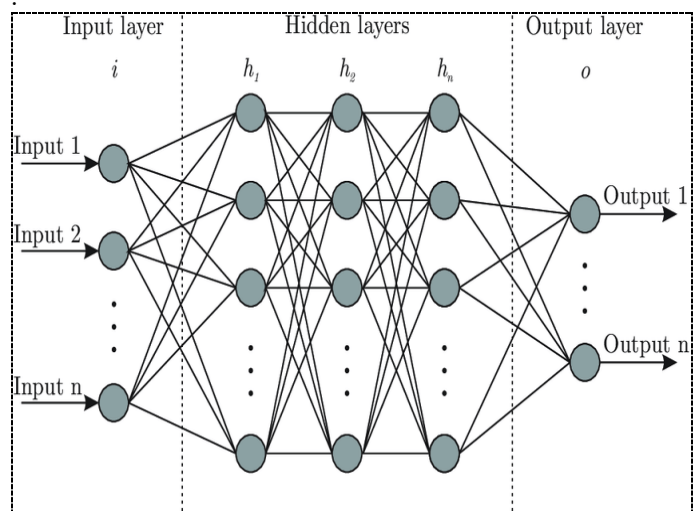


Figure 1: An example of an artificial neural network

#### A. Multi-Layer Perceptron (MLP)

MLPs are perhaps the most common type of feed forward network. Neurons in input layers that act as a buffer for distributing the input signals shown in fig as  $x$  to the neurons in the hidden layers there are two incoming connection which is associated is its and weight and the output value is the summation of it and the processing units of are internally connected with its weight.

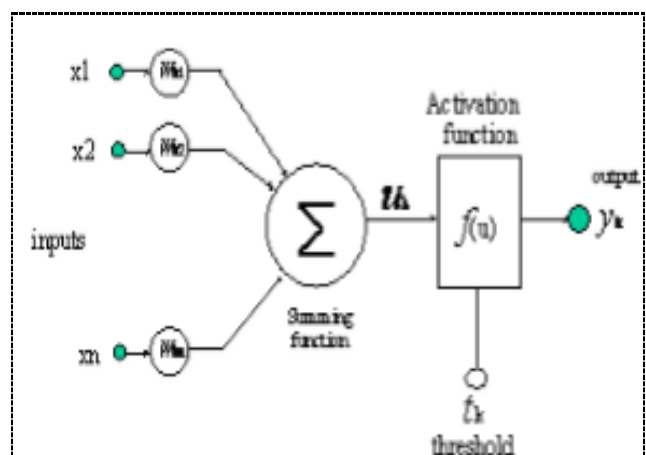


Figure 2: A simple processing element diagram

#### B. Fuzzy logic

The ideology behind Fuzzy logic was illustrated by professor at a university in California. He showed that fuzzy logic is not a procedure of control, but also a technique of processing information by permitting partial members sets instead of complete sets of membership. This theory was not in practice in the 1970's as there where no high end computers to perform this operation.

The theoretical details regarding Fuzzy logic is dependent on connected membership of grade as per the inspiration

regarding the procedures of identifications as well as perception in humans. Fuzzy logic can deal with human perception not computational perception i.e. uncertainty, vague, partially true and without sharp boundaries. It also allows the computing problems. It provides an effective means for the resolution of multiple criteria. All the new computational method is the utilization of identification, pattern recognition, and optimization.

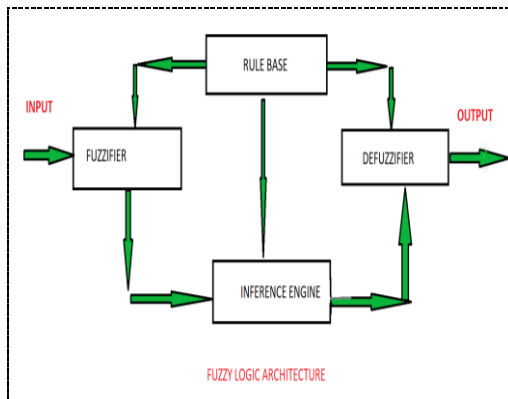


Figure 3: A Fuzzy logic structure

It has two different meaning. It is works on logical system which is extension of different logic more than one or two. In other sense, Fuzzy logic is sets of theory which relates to the classes of objects with a unsharpened boundaries in which membership is a matter of degree.

1. The concept behind Fuzzy logic is a mathematical one without making the situation complex; Fuzzy logic makes it easy and simple initiative to approach.
2. Fuzzy logic is as flexible as add more than one or more job to any co-ordination from starting to end.
3. If you look closely enough everything is not specific, Moreover things are depends on the close inspection rather than make it unspecific it make this things to its end.
4. An (Adaptive neuro fuzzy invention) ANFIS is made to create a model of non-linear functions of arbitrary complexity which works on match any input and output data to fuzzy system. This is found on as easily on tool box of fuzzy logic software.
5. Fuzzy logic can be made of just opposite to neural networks which require not highly experienced person or an expert.
6. Fuzzy logic can be made opaque and impenetrable models to use training an data just opposites of neural networks without an expert. Fuzzy logic makes you dependant to work with those who already knows how to work in the system.
7. Fuzzy logic develops conventional control techniques. It doesn't replace any theory unnecessary whereas in some case fuzzy logic make the work system simplify to make it bigger.
8. Fuzzy logic is works on manual languages so it is meant to be a natural and this statement makes it the working structure of fuzzy logic easy to use (MATLAB) is also found in tool box of fuzzy logic.

#### Other techniques of AI

*Genetic algorithms:* GA's acts as the model black box an advantage when detailed information is unavailable. It is robust and computationally easy to use and effectively well. An important factor or strength of GA's is contained parallelism as a large numbers of code sequences are indirectly sampled than they are actually tested.

*Hybrid system:* Hybrid system as it names more than one or more technologies present in this system either as part of an integrated method of problem solution, or to perform a particular task that is followed by a second technique, which performs some other task.

#### IV.CONCLUSION

The present paper deals with solar based technology using artificial intelligence methods. Solar energy being a renewable source is utilized in most of the applications in present time in industries as well as households. Several related works in converting solar energy in to electricity is mentioned in the literature. The research scholars have used different AI techniques in solar based energy such as GA, artificial neural networks etc. The conclusions drawn illustrates that the AI techniques seem to offer alternative methods for modeling, forecasting and prediction of solar radiation in many regions of the world that lacks complete data. Like air temperature, wind speed, humidity etc. and may be used the solar energy system. This shows the potential of AI as a design tool in the optimal sizing of PV systems. The number of applications presented here is neither complete nor exhaustive, and interested readers are strongly encouraged to consult the rich references included in this paper.

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# A Review on Ocean Energy Harvesting and Its Impact on Marine Life

Asst. Prof. Pardeep Kumar  
Department of Mechanical engineering  
BMIET, Sonapat  
drpardeeptushir@gmail.com

Aakash Dhall  
Department of Mechanical engineering  
BMIET, Sonapat  
aakashdhall786@gmail.com

Alok  
Department of Mechanical engineering  
BMIET, Sonapat  
alok.singh.2440@gmail.com

Ajay Yadav  
Department of Mechanical engineering  
BMIET, Sonapat  
ay40525@gmail.com

**Abstract**—Ocean energy extracting is a new form of Renewable energy, very few technologies are worked upon. The affects of these technologies on environment is not taken into consideration because of the command unpredictability regarding its evaluation. Ocean wave energy is one of the amplest and widely dispersed renewable energy resources. But due to the cost and efficiency problems it is not widely used. This paper focus on the study of triboelectric generators (TEGs) and benefits of energy harvesting along with the typical wave energy convertors (WECs) based on electromagnetic generators. And also take their environmental effect into consideration.

**Keywords**—Ocean Renewable Energy, Turbo-electric Generators, Wave Energy Convertors, Ocean Thermal energy convertor

## I. INTRODUCTION

This paper focus on the renewable energy; i.e. energy that is not used up after utilizing. In this, a type of renewable energy i.e. Ocean/marine energy corresponds to the variations in energy from ocean waves, currents and temperature differences. As oceans occupy 71 percent of the surface of the Earth and due to that about 71 percent of sun's energy gets absorbed in them and gravitational pull from sun and moon produces low and high tides in the ocean. The sound generated in the ocean by the splashing of waves is nothing but the wastage of energy. To harvest this energy WECs and TEGs are studied.

## II. LITERATURE REVIEW

**Edgar Mendoza et al. (2019)**, shown the tangible and intangible impacts of ocean power projects on biophysical systems, it is important to minimize the potential negative impacts on physical marine systems. The results of environmental impact evaluation of OEC devices, plants and processes depend to a large extent on their mode of operation and location. The submergence, location, operation and emissions of the device were considered, and focus negative impacts and set apart impacts that are not related to a given plant, process or device, e.g. for floating devices, no attention should require to local seabed impacts but on transport patterns of surface may be relevant.

**Guohui Wang et al. (2019)**, shown that the implementation of transformation of marine heat energy may increase the time and range of Underwater vehicle. The challenge in the system is in the maintaining size and system incorporation to increase energy-conversion performance. Here it is suggested that the OTEC for underwater vehicles

uses phase-changing materials to absorbs ocean thermal energy from heat near-surface and convert it to the potential energy stored in a hydraulic accumulator, which is again converted into electrical energy for the power supply by using hydraulic generator, motor and other components. Based on its working principle, the heat to electricity power generation system efficiency model is created.

**Mathew B.R. Topper et al. (2019)**, shown that change in the predicting OEC's array Energy Cost is much more significant than that of other energy generation types because of the combination random action of weather conditions. In this study a new way to predict cost of energy and a way for finding decrease of variability through investment in components. Here, the DTOcean technology method is designed to measure variance by replicating array design, function and deployment with higher complexities than other versions. By using this a study of improved electrical connectors and cables shows reductions in reduce cost of energy up to 2.51% and reductions in the variability of LCOE of over 50%.

**DahaiZhanga et al. (2019)**, shown solution for cost-effectively harvesting the strength of lower frequency sea waves triboelectric nanogenerator (TENG). WEC designed using multi-grating triboelectric nanogenerator model. It was demonstrated that the MG-TENG design is created with an open-circuit voltage of more than 140 V along with 60  $\mu$ A rectified short-circuit current, compared to previous achieves 12.3  $\mu$ A. The MG-TENG was used in a stand-alone triboelectric layer configuration for continuous and constant output power, low-frequency wave energy harvesting is therefore more applicable. It is likely to happen that array installation of MG-TENG WECs is a potential solution of power supply problem in marine environment.

**Yan Wu et al. (2019)**, shown teeterboard-like hybrid nanogenerator (named as THNG) is made for synthesizing energy from low frequencies tidal waves . The design consists a multi-layered TENG and electromagnetic generator on teeterboard structure. From this design, the TENG unit can be a light-weight, full-package structure that can be easily activated by ocean waves with a low-frequency and it demonstrates useable performance without environmental impact. TENG 760 V peak voltage alongside peak EMG current 10 mA at the optimum condition. This can, light more than 200 LEDs. This work presents a new and innovative approach for large-scale low-frequency (<0.8Hz) blue energy harvesting.

**Kai Tao et al. (2019)**, shown Origami-inspired TENG evolved into folded thin film electret. It may be shaped

smoothly by 2 stripes of liquid crystal polymer (LCP) using paper folding. It is confirmed productive for the energy production from both impulse excitations and sinusoidal vibrations which is universal in the natural habitat. 2-sided corona discharge method is being used to optimize the density of charge produced by thin films from the electret. The flexible TENGs can be attributed to the strong elastic property of self-rebounded spring structures based on origami design integrated into various devices. Like smart floors, clothes, watches and shoes for wearable energy harvesting applications. Activated by impulse excitation of gentle finger tapping, instantaneous open-circuit voltage 1000 V and short-circuit current of 110  $\mu$ A, were obtained.

**Dane Sequeira et al. (2019)**, shows diagonal gimbal pendulum as well as tests how it is used to harness power from tides at the ocean. The system's is observed working under stationary as well as adaptive scenarios, escape behavior for constant excited systems potential function of the energy is analyzed. These results were then used for a stochastic multi-frequency case for simulating an area where the ocean tides provide excitation. The limitations placed on the system's space enable future studies for depth analysis on design and performance using optimization.

**Alexandre Dijoux et al. (2019)**, shown that OTEC is considered as an energy resource. Use of temperature difference between colder deeper sea water versus warm surface seawater in coastal sea to produce electricity using thermodynamic motor cycle. The Organic Rankine Cycle (ORC) is used for this application, the observation of an OTEC power plant's changing behavior could be of considerable interest for science. Using a dynamic heat exchanger model, Moving Boundary Model (MBM) to distinguish the moving monophasic and diphasic sections. And, experiments have been done on an onsite OTEC prototype located in Reunion Island and compared to simulations. The case being studied is an increase of 1 °C of the hot water during 3 minutes resulting to a relation between measurement and simulation.

**RistiyantoAdiputra et al. (2019)**, shown that cold water pipe is most-challenging component of OTEC which is floating framework used for moving deep water to shore. The design analysis is considered to select the pipe material, configuration and supporting system. The analytical solution is originally constructed by understanding the dynamics of the pipe components. And, using ANSYS software, a complete integrated study of the fluid-structure relationship between the pipe and the fluid is performed. To test the practicality of the experimental solution, the data gathered from the empirical solution are aligned with those from numerical methods. CWP operation in the complete-scale model was detected for OTEC power station. The results are that Fiber Reinforced Plastic (FRP) is the most suitable material.

**S. Draycott et al. (2019)**, shows the process of advanced ocean environment replication from the sea to the tank. Simulation of tide, and combined wave-current conditions is established within Flo Wave Ocean Energy Research Facility. Result is shown that using this new technology, and simulating more of the real complexity of ocean conditions, makes it possible to better understand and test offshore clean energy sources.

### III. RESEARCH GAP

In the above researches the recent trends of Ocean Energy are not explained, neither the effects on marine life and achieving the goals of sustainable development. So, this paper will try to focus on these aspects also.

### IV. OBJECTIVE OF THE STUDY

**Following are the objectives of the study to:**

- 1) *Explains Ocean Renewable Energy as sustainable development*
- 2) *Understand how Ocean energy harvesting can be a renewable energy tool.*
- 3) *Evaluate challenges, opportunities posed by Ocean Renewable Energy.*
- 4) *Analyze recent trends of Ocean Renewable energy.*

### V. RESEARCH METHODOLOGY

In this study the descriptive research design has been used and data is collected from secondary sources only. Information used in writing this paper is collected from secondary sources of like various research publications, published newspapers, articles, UNO Reports journals-online & printed, magazines, websites and books. The information is collected from libraries and websites also.

### VI. GOALS OF OCEAN RENEWABLE ENERGY

The Ocean Renewable energy corresponds to the variations in energy from ocean waves, currents and temperature differences.. The goal is to harvest the wastage of energy occurring in the oceans and by harvesting to improve life sustainability, for future generations and lay down clear guidelines and targets for all countries to adopt in accordance with their own priorities and the environmental challenges of the world at large so that they can achieve the target of sustainable development and a future with renewable energy.

### VII. RECENT TRNDS OF OCEAN ENERGY

The current business and environment trends are to renewable as quickly as possible. A new target for getting to sustainable i.e. has been adopted in the European Union in this regard. To generate 100 per cent of renewable energy in Europe by 2050. And reduce Fossil Fuel energy to build a sustainable world. Different types of turbo-electric nuclear generation and marine tidal energy conversion are being researched all over the world in terms of ocean energy.

### VIII. CHALLENGES OF OCEAN ENERGY

1) *New Concept:* Ocean energy is a totally new idea in Indian scenario. Although the level of awareness among industries about it is increasing slowly but there are still many areas left in India where this term has not yet been achieved.

2) *Lack of Standardization:* It has been found that there are few countries in the world that really concentrate in the true sense on the Ocean Renewable Energy, while in all others few resources are researched and worked on.

3) *Long Term Investment: One thing investors should bear in mind when investing in Ocean Renewable Energy is that this investment is long term because it will certainly be a source of return, but it will take a little longer time.*

## IX. OPPORTUNITIES OF OCEAN ENERGY

1) *Bio-friendly: The engineers must take into account the effect of their technology on marine life and make it biofriendly.*

2) *Social Responsibility: Renewable energy from the ocean can lead to social responsibility and sustainable development. To create a better future for future generations.*

3) *Competitive Advantage: As the area is relatively new, so there will be a competitive advantage for having a viable product.*

4) *Cost Reduction: With product iterations the cost of extracted energy will be decreased by spending time and money.*

## X. FINDINGS

Studying an OTEC power plant's evolving actions could be of major interest for research, and developing less expensive and high-efficiency products.

It has been found that the methods are still in laboratories, and are not properly tested and applied in the real world to make energy generation even easier. In addition, with the use of fossil fuels, which contributes to carbon emissions and contributes to global warming, they are now showing more concern about the safety of the environment since today the environmental issues have reached an alarming level. Today it is very clear to everyone that green life style is the most acceptable and safer lifestyle for present and future generations to ensure better wellbeing.

## XI. CONCLUSION

It is concluded that great care should be taken when building and repairing the generator systems on the ocean site and making it more marine-friendly. The noise should be reduced along with the vibrations because they directly influence the marine life. And some type of sensors should be mounted in the devices to enable the marine life to move through and alongside it. The system must be small enough

not to affect the marine life and produce as much energy as it can. In future, the studies should be on harnessing the amount of power that can make the coastal population's energy consumption self-sufficient, helping to create a more sustainable society with a circular economy.

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# *The Influence of Cultural Factors on Consumer Buying Behaviour in Tricity*

RamandeepBawa  
Research Scholar, University School of Management Studies,  
RayatBahra University  
Mohali, Punjab, India  
bawa.raman92@icloud.com

Dr.KavitaAggarwal  
Associate professor, University School of Management Studies  
RayatBahra University  
Mohali,Punjab,India  
Kavita3427@gmail.com

**Abstract**—The Social component is inspected to perceive how they influence the acquisition of Fast Food, Clothes, Beverages in Tricity. Information for the examination are acquired through organized survey controlled by the specialist and some exploration colleagues. An aggregate of 82 polls are managed out of which 70 are appropriately filled and returned. Devices utilized for factual analysis incorporate Measurable Bundle for Sociologies. SPSS 17, Microsoft Excel expectations (2015), Numerical Relapse Analysis and Relative Significant List (RII). Discoveries uncover that social factors apply huge impacts on the buy and consumption of Fast food, beverages etc. The investigation additionally found that beside the social variables, age and salary likewise influence the amount of selected commodities obtained and consumed. In light of these discoveries the examination presumes that social elements, age and salary impact the amount of pork acquired and consumed. The investigation at that point prescribes that these components ought not be underestimated; rather they ought to be recognized and contemplated since buy and consumption of Fast food, beverages Clothes depend on them.

**Keywords**—cultural factors, buying behavior, selected commodities, age, income.

## I. INTRODUCTION

Culture and consumption have had a remarkable relationship in present day world (hemapatil and Bblakkapa, 2012). They further contend that given this relationship and the way that the world economy is turning out to be progressively cross-cultural, a comprehension of how culture impacts consumer conduct by advertisers will be critical, all the more with the goal that culture is a ground-breaking power in directing human conduct. Corner and Shepherd in Koutroulou and Tsourgiannis (2011) saw that cultural and monetary elements, consumer's character, mentalities, qualities and feelings influence consumers' dynamic procedure with respect to nourishment selection. Similarly, Speiers, Gundala and Singh (2014), noticed that consumer conduct is affected and spurred by components, for example, culture, character, way of life, pay, perspectives, helpers, emotions, information, ethnicity, family, values, accessible assets, suppositions, encounters, peer bunches and different gatherings.

Talking in a similar vein, Sethi and Chawla (2014) included that specific factors—the purchasers qualities, mental factors just as social and cultural variables impact the purchasing procedure of consumers.

Culture, subculture and social class are known to have significant effects on individuals conduct since they are amazing drivers in the arrangement of mentalities, convictions and qualities (Blythe, 2008).

So also, Kotler and Armstrong (2013) saw that individuals in a specific culture hold certain convictions and qualities which will in general oppose change. This clarifies why certain consumption conduct is difficult to change once created. Hallowed consumption as indicated by Solomon (2011), happens when certain articles and occasions are "set apart" from typical exercises and approached with deference are devoured. This status of selected commodities encroaches on its advertising and consumption. Anyanwu (1993) sees that some group doesn't eat fast foods on strict ground, adding that any organization endeavoring to change this demeanor will come up short. He be that as it may, encourages organizations wishing to prevail right now remember this and to coordinate the creation and offer of different merchandise which will speak to them.

Different factors prone to affect on the promoting and consumption of selected commodities are salary, age and stage in life-pattern of the consumer. Kotler and Armstrong (2013) noticed that individuals change the merchandise and enterprises they purchase over their lifetimes, including that preference for nourishment, garments, furniture and entertainment are frequently age-related. The ramifications of this is as individuals become more seasoned, their interest and consumption of selected commodities decrease.

## II. OBJECTIVES

The following are the objectives which helps us to find out the factors which affect the purchase behavior of consumers towards pork in quickly growing market of Tricity.

- 1) To analyze the knowledge and awareness levels of consumers towards Fast food, Beverages, Clothes.
- 2) To study the buying behavior of consumers towards selected commodities.
- 3) To give suitable suggestions to improve the buying power of consumers for these products in India.

### III. DATA AND METHODOLOGY

The study utilized both primary and secondary sources of data. Primary data were collected via questionnaire administration. The questionnaire was designed to reflect the opinions of the respondents on pork consumption. Secondary data were obtained from textbooks, journals and internet.

A total of 82 questionnaires were accidentally distributed among the respondents out of which 70 were duly completed and returned. Multiple Regression Analysis was used in analyzing continuous data like income, age and quantity while Relative Important Index (RII) was used on categorical variables itemized in the questionnaire.

Weights of 4, 3, 2 and 1 were assigned on Liker scales designated as strongly agree, agree, disagree and strongly disagree respectively. The analysis was also aided by the use of Statistical Package for Social Science SPSS 17 and Microsoft Excel (2013). The scores assigned to each factor by the respondents were entered and consequently, the responses from the 70 questionnaires were subjected to statistical analysis for further insight. The contribution of each factor to the buying behavior of respondents to selected commodities were examined and the ranking of the attributes in terms of their criticality as perceived by the respondents was done using Relative Important Index (RII).

### IV. MODEL SPECIFICATION

In examining the influence of cultural factors on buying behavior of pork, multiple regression analysis is used

$$RII = (\sum fx) / (\sum f) - 1 \dots\dots(1)$$

Where  $\sum fx$  = Total weight given to each attribute by respondents

$\sum f$  = Is the total number of respondents in the sample

K = Is the highest weight on the Likert scale here k = 4.

$$y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_k x_{ki} + \varepsilon_i, \quad i = 1, 2, \dots, n \dots\dots\dots(2)$$

Where: k is the number of explanatory variables,  
 $\beta_0, \beta_1, \beta_k$  are the parameters of the model  
 $\varepsilon_i$  is the random error term

$$Quantity = \beta_0 + \beta_1 age + \beta_2 income + error \dots\dots(3)$$

Multiple Linear Regression Model relates a response variable Y to more than one explanatory variables. Its main purpose is to find which explanatory variables contribute to the variation of the response variable.

Its adoption is based on the fulfillment of the normality assumptions below:

In this case the response variable is quantity bought per time while the explanatory variables are age and income.

### V. NORMALITY TEST

One of the assumptions of using Least Square Regression is that errors of the residuals must be normally distributed. This is shown in the plotted p-p plot and histogram. If the points on the p-p plot approximately form a straight line, it indicates normality. Also if the histogram exhibits symmetrical shape then the data is normally distributed probability plot looks like a straight line. Therefore Normality assumption looks valid.

The histogram looks relatively symmetric about zero and bell shaped; hence the Normality assumption is valid.

Normal P-P Plot of Regression Standardized Residual

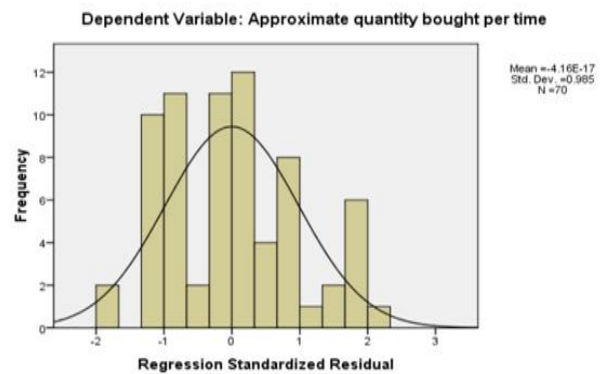
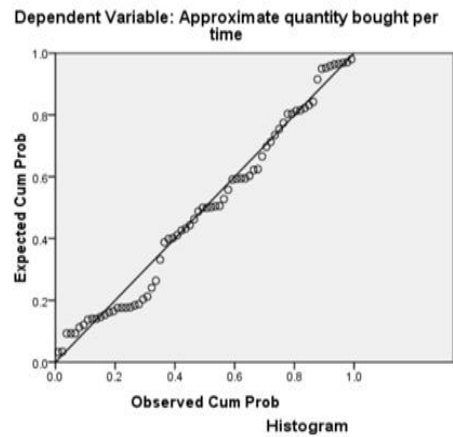


Fig 1: Normal P-P plots of regression standardized residual

Results are shown in table 1 to 6

**Table1:** Contribution of Cultural Norms to Buying Behavior

<b>Cultural Norms</b>									
<b>ITEMS</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>SUM</b>	<b>ΣFX</b>	<b>MEAN</b>	<b>RII</b>	<b>RANKING</b>
Cultural norms specify certain behaviours in specific situation.	0	1	35	34	70	243	3.471	0.868	1 <sup>st</sup>
Cultural norms prohibit certain behaviours in specific situation.	0	9	48	13	70	214	3.057	0.764	4 <sup>th</sup>
Violation of cultural norms results in sanctions or penalties	2	13	32	23	70	216	3.086	0.771	3 <sup>rd</sup>
My cultural norms shape my buying behaviour	2	10	37	21	70	217	3.100	0.775	2 <sup>nd</sup>

**Table2:** Contribution of Cultural beliefs to buying behavior

<b>Cultural Beliefs</b>									
<b>ITEMS</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>SUM</b>	<b>ΣFX</b>	<b>MEAN</b>	<b>RII</b>	<b>RANKING</b>
Culture influences belief systems	0	7	32	31	70	234	3.343	0.836	1 <sup>st</sup>
Belief systems influence consumption behaviour	0	6	40	24	70	228	3.257	0.814	2 <sup>nd</sup>
Belief systems affect buying behaviour	4	7	32	27	70	222	3.171	0.793	3 <sup>rd</sup>

**Table 3:** Contribution of Cultural Values to Buying Behaviour

<b>Cultural Values</b>									
<b>ITEMS</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>SUM</b>	<b>ΣFX</b>	<b>MEAN</b>	<b>RII</b>	<b>RANKING</b>
Cultural values affirm what is desirable	0	10	38	22	70	222	3.171	0.793	1 <sup>st</sup>
Cultural values give rise to norms & associated sanctions which In turn influence buyingbehaviour.	1	12	33	24	70	220	3.143	0.786	2 <sup>nd</sup>

**Table 4: Contribution of Cultural Symbols to Buying Behaviour Cultural Symbols**

ITEMS	1	2	3	4	SUM	$\Sigma$ FX	MEAN	RII	RANKING
Different cultures attach different meanings to colours, animals, shapes, numbers and music									
Inability to recognize the meaning assigned to a symbol can affect the marketing of such product.	0	5	27	38	70	243	3.471	0.868	1 <sup>st</sup>
Our cultural symbols affect my buying behaviour	1	3	41	25	70	230	3.286	0.821	2 <sup>nd</sup>
	3	9	39	19	70	214	3.057	0.764	3 <sup>rd</sup>

**Table 5: Contribution of Cultural Languages to Buying Behaviour**

Cultural Language	1	2	3	4	SUM	$\Sigma$ FX	MEAN	RII	RANKING
There is a direct positive relationship between culture and language.	1	3	38	28	70	233	3.329	0.832	3 <sup>rd</sup>
Persuasive marketing communications can influence consumer buying behaviour	0	5	33	32	70	237	3.386	0.846	2 <sup>nd</sup>
Language barrier is one obvious problem that marketers who wish to go into foreign markets must contend with.	1	5	25	39	70	242	3.457	0.864	1 <sup>st</sup>

**Table 6: Contribution of Ritual to Buying Behaviour**

Rituals	1	2	3	4	SUM	$\Sigma$ FX	MEAN	RII	RANKING
A ritual is a set of symbolic behaviours which occur in fixed sequence	1	3	40	26	70	231	3.3	0.825	3 <sup>rd</sup>
Gift - giving is an example of ritual	2	4	34	30	70	232	3.314	0.829	2 <sup>nd</sup>
The rituals of my culture affect my buying and use of certain products	1	7	22	40	70	241	3.443	0.861	1 <sup>st</sup>

## VI. EFFECT OF AGE AND INCOME ON BUYING BEHAVIOR

With P-value of 0.051 and 0.059, the hypothesis of no relationship will not be rejected, it means respondents' age and income respectively do not have a significant linear relationship with buying behavior at 5 percent level of significance. Although with regression estimates of -0.016 for age and 0.004 for income, it is obvious that age has an inverse relationship while income has a positive relationship (though low) with buying behavior of pork meat. In the model a unit increase in age of pork purchased.

### Coefficients<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	
		B	Std. Error	Beta	T
1	(Constant)	1.300	.234		5.567
	Age of respondent	-.016	.008	-.277	-1.986
	Income	.004	.002	.268	1.925

The predicting model or regression equation is now  
 $Quantity = 1.3 - 0.016age + 0.004income$

## CONCLUSIONS

The findings of the study suggest that cultural factors exert great influence on buying behavior of selected commodities in Tricity. The study equally establishes that aside from cultural factors, factors like age, income also influence the quantity of selected commodities bought and consumed.

1) Cultural factors should not be taken for granted rather, they should be identified and studied since costumers purchase and consumption of selected commodities.

2) Since age and income have great consequences on purchase and consumption of these goods , producers and marketers of selected goods are enjoined to segment their market along the lines of age and income in order to be guarded on which subset to serve profitable.

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# Household and family prespective -Determinants of Sustainable Consumption & Development

<sup>1</sup>Kanika Budhiraja

Research Scholar, MMIM, Maharishi Markandeshwar  
(deemed to be) University  
Mullana, Ambala (India)  
[Email-kanikarelan@yahoo.com](mailto:Email-kanikarelan@yahoo.com)

<sup>2</sup>Dr.Meenu Gupta

Associate Professor, MMIM, Maharishi Markandeshwar  
(deemed to be) University  
Mullana, Ambala (India)

**Abstract:** *The paper basically aimed at establishing coordination between sustainable consumption, development and families' wellness. The study focused on evolution of novel concepts like the family structure, its role, functions, the safety of family members, education of individuals, and Old notions like value of life, well being of families and status of living. These notions have been comprehensively analysed together with the comparison of different ways to assess GDP in order to understand as a whole the perception of families in context to sustainable consumption and development. The other part of the paper highlights the justification and an outline of, applying Household-Level Needs with the Consumer System. Theoretical study also convey the structure of families and their decision making into suitable pattern of customer acceptance and conduct which further affect the assessment of sustainable consumption plans. The consumer modelling framework of household families is vibrant in economical terms and also measures their consumption scenario in social terms. This section of the research provides the linkage between the well being and needs of human being together with interdependency of families' situation concerning their need satisfaction and the role of social networks affecting the levels of need satisfaction. The last part of the paper includes the study of the methods (for sustainable development & consumption) used to assess the GESDI and the GSDP which disclosed the major elements of standard of life, family strength, societal fair dealing, and rights of citizens, living quality, and wellness of families. This study provided a valuable platform to broaden learning regarding these components included in the measuring the parameters, their meaning, and comprehensively coordinating them with sustainable development. The research is descriptive in nature and reviewed literature in relevant context to further explore the concepts relating family perspectives as determinant to sustainable consumption & development.*

**Keywords—** Families, Household, Needs, Sustainable Consumption & Development

## I. INTRODUCTION

The concept of sustainable development has two aspects attached to it named as sustainable consumption and production. The first aspect i.e., sustainable consumption implies demand side and Sustainable production implies the supply part. The focussed elements in demand side are customers' selection for goods and services to meet the essential requirements and improvise the status of living whereas the supply part includes the societal, economic and

ecological effect of development process. The very important aspect of sustainable development i.e., production, is concerned to assure that the reserves used to produce the goods and services (which are purchased by the families for consumption), are to be recycled in such a manner that lessens the load on the environment holding capability and would also not adversely affect the further generations in any ways [20]. The other vital aspect i.e., Sustainable consumption focussed on decision making of the individuals while consuming the goods & services. It also refers to the satisfaction of fundamental requirements of the individuals' needs with no deterioration in environment capability to satisfy the demands of current and future generations. In simple words, while making any decisions, consumers should pay due considerations not only to environmental factors, but also analyze its effects on the wellness of other citizens [7]. The role of families is very critical in sustainable development as this social component of environment works from the side of production (by providing the labour for wages) and also from the side of consumption (buying goods from those wages). In lieu of moral and ethical viewpoints, it is important to consider family's role (of production & consumption) in context to transformation of kids into youth and each family member's role in society [1]

The next phase is to integrate the behavior of households and assess its impact to frame the demand based structure. This structure will be helpful in formation of SC policies to further anticipate the customer acceptance. The research also highlighted the new elements to be included in the evaluation of Gross Sustainable Development Product (GSDP) and Gross Environment Sustainable Index. The theoretical study on households or family structure is done with the relevance to need satisfaction and to analyze the interdependencies between the members in families and their levels of desires. The paper intended to present the role of social networks on escalating the needs of families and justification of social changes in the behavior of people to gratify their needs.

## II. LITERATURE REVIEW.

Williams (1991) explained that monetary security is a component of numerous factors in mix including: salary, gifts

and other benefits, budgetary resources, human resources, societal assets, fixed goods and services and so forth. Unpaid work in the house is also a part of financial prosperity. In spite of the fact that it is not included in national records, unpaid work represents over \$17 trillion around the world, with ladies contributing 80% of the weight; which means that 13 trillion dollars are not evaluated in gross total of world economy as this high proportion of females' work is not paid, or low paid. The study was based on the use of secondary data with research design descriptive in nature.

Jager (2001), highlighted that regardless of information on family consumption, it is difficult to foresee future advancements due to the unpredictability of the family unit framework. Simulation of various units offers the techniques to show signs of improved learning of the significant social elements of the family unit. A meta model of conduct of customers has been used to create computer based simulation of customer behaviour. This implies CONSUMAT approach.

Sehgal (2002), studied the requirement for such an extended structure has been recapped, which is defined as Life Cycle Sustainable Development (LCS D). After that, the possibility of setting up of an extended frame of "Zones of Protection" has been investigated which relates to the extent of sustainable advancement. At the end, a scientific methodology for LCS D: fundamental information sources and analysing techniques were proposed, which, can give an ability to distinguish and assess decisions, from a person to society.

CSOCD Report, (2018), the family is perceived in the Universal Declaration of Human Rights as "the common and basic unit of society" and "qualified for security by environment and the State." All endeavors to accomplish the 2030 target for Sustainable Growth should fundamentally stress the importance of the family due to its capacity as basic instructor, financial driver, and guarantor of social wellbeing. Family dependability is a fundamental part of social security and social assurance. Indeed, even with regards to harmony and security, the point of family strength is a fundamental thought to be considered in priority

### III. RESEARCH GAP

The research executed in the past has not been in large number for the relevant domain and that too conducted in developed nation like US, Canada, etc. This present study is bifurcated into three major phases, i.e. first phase focussing on families perspectives, second phase highlighting consumer framework of families based on interdependencies on needs and lastly Measures to examine sustainable development with their comparative analysis. None of the research with this comprehensive study (taking all three phases) based on extensive review work has been done so far.

### IV. OBJECTIVES OF THE STUDY

1. To highlight the family's protective role in providing a nurturing environment for the happiness, and integral human development.

2. To analyze the Standard of Living of human's Families in context to sustainable consumption & Development.
3. To understand different forms of Well Being of individuals or Families and its linkage to sustainable development.
4. To consider and learn the role of family structure in sustainable development.
5. To study interdependence of human/ families concerning their need satisfaction and the role of social networks in escalating those needs.

### V. RESEARCH METHODOLOGY

1. Research design will be Descriptive in nature
2. Secondary analysis is done to collect particular and relevant content about the research title i.e. "Household And Family Perspective -Determinants Of Sustainable Consumption & Development"
3. Secondary data analysis includes gathering of content from review done in past (literature work) in required domain and other pertinent data like, data from CSOCD Session report at UN Headquarters on Family Stability for achieving Sustainable Development )
4. Facts were gathered from Research papers, reports, online articles and e-books, etc.

### VI. HUMAN FAMILY

It is being perceived that from the minute we are conceived, we are bound to be in association with other people [13]. In today' time, home financial matters, has dependably been related to relationships but has frequently centred on connections within the families thus leading to increased nuclear families. This thought should be extended to incorporate the 'human family' which means the relationships between individuals involving the total populace – the gathering of humans called humankind. Jackson noticed that individuals want to connect with each other, at the family as well as, at the society level. Associations with instructors, spiritual gurus, groups, colleagues, and so on construct a feeling of harmony - a character amid the individuals from a crowd. He takes this harmony to a more elevated amount, that of countries and societies, encouraging those examining harmony to enlarge it to the worldwide level – 'the human family'. Regard for the value of every individual in the human family makes relation between individuals. Jackson draws the benefit of all is the togetherness of societal situations which make it feasible for individuals to achieve their maximum capacity in a convenient manner. This universal providence implies that it is the ideal opportunity for all individuals from the human family to have a goal to achieve their maximum growth with this increasing feeling of societal bonding. In current era, this concept of human family is strongly connected to the impression of sustainability as the strength of this firm human family adds on to the notion. For each cast & customs has its own value to contribute, its skills to

put in, its own power to attach to the entire of humankind's advancement on the developmental way to finishing of its fortune" Clay (1997) everybody has a justifiable position, and inborn duties, in the zone of "family". The human family, the individuals of the world, should stand firm and associated with each other, and as a whole assume a key job in ensuring these worldwide association/bonding contributing further to development of all in each aspect.

#### A. Status Of Life Of Families Or Individuals:

The idea of personal satisfaction or quality of life is certainly multifaceted, perplexing and extremely conceptual [6]. For example, somebody who has altered their utilization patterns to guarantee that their decisions will make a superior value delivery for themselves, the nature, and further generations might be observed by others as having a reduced quality of life since they have excluded themselves from the contemporary focused attribute of consumer culture. Somebody may sense that a nonappearance of aggression and maltreatment in their lives prompts an enhanced status of living despite the fact that they have less tangible assets, cash, or home; but freedom from ill-treatment and mental peace has upgraded the status of their routine life. Since quality of living is the most important parameter to adjudge the life of humans, it must be better seen, particularly in connection to prosperity [9].

#### B. Standard Of Living Of Families:

Approach of life is frequently compared with quality of living however it isn't something very similar. A person's or family's way of life is a real indication of the goods and services which they can buy. One's expenses on these goods & services make up the aggregate sum of cash spent to keep up (or attempt to keep up) a way of life, which differs from individual to individual [25]. A few people's way of life incorporates just basic nourishment, apparel, safe house and wellbeing. Other individuals hope to eat at costly cafés, wear branded garments, live in colossal homes and travel broadly. The benchmark set today for standard of living is one of the contributors to level of sustainable development, as the demand & consumption patterns arise from standard of living and the upgraded consumption & demand patterns boost up the sustainable development rate. [17] Recommended that when an individual becomes aware of the way of life of his own group, the person grasps the societal framework as they intentionally or unknowingly choose if to admit on to these standards as the reason for buying the products and services. Way of life is a standard of utilization, NOT pay or salary. It is currently being contended that a fundamental cost for basic living is one's right! This could be accomplished by an ensured yearly income subsequently making food everyone's right [30]

#### C. Well- Being:

Well being is defined by Webster's dictionary as the state of enjoyment, contentment, peace and happiness. Research made in Canada on freedom of adulthood reveals that well being is related to independence which basically implies the capability to have command over his/her life [24]. Fleck in

his research in 1980, pointed out four roles of families in context to old concept of well being. These are:

- (a) Make available basic necessities like food, apparel, home
- (b) Providing for physical, academic and mental growth of members;
- (c) Facilitating every member with equal chance to be satisfied & treating all the members at par & chance for every member to be contented and close to all other family members. Four traditional forms of wellbeing have been discussed as:

- **Financial and Physical Well Being:** Monetary and physical prosperity are dependent on the person's and family's effectiveness in the managing & controlling things at home. For a member and the family to be in a monetarily stable state and in command for things utilized or expended in the home, has for some time been perfectly maintained by home experts [16]. Attempting to cover the expenses of regular living includes choices identified with safe house, attire, education, retirement and customs fulfillment. In addition to these expenses will be the costs identified with medicinal services, and costs of financial security and physical wellbeing. The evaluation tool of financial well being for a country is the GDP, the absolute value of the total number of goods and services delivered in one year in a nation. Increase in cost of production is also being taken in consideration while calculating real GDP. He proposed that another idea, the net economic welfare (NEW), is a superior too to measure variables related with status of living in addition to GDP.
- **Physical well-being:** Taking out time to have a concern on our body, fitness, physical wellness keeping up the dependability of the human body by ensuring it and giving nutrition is the fundamental goal. Physical prosperity is affected by individuals and materials on one's wellbeing and improvement, regardless of whether it is good or bad.
- **Social and Emotional Well-Being:** Social prosperity is related to the social requirements of the family played out every day in relational connections inside the family and with the bigger network, including the work environment. It is the social liberty of the family as a grouping in comparison to mental well being which is the sensitive space of a person in the family [29].
- **Emotional wellness** additionally manages the psychological status of relatives. Feelings are firm, moderately uncontrollable sentiments that influence one's conduct with everybody encountering a wide exhibit of feelings. This part of prosperity is coordinated with a relative's sentiments, thoughts, and practical implications to life and how these feelings influence their everyday lives and lives of other people [24]. By socialization, youngsters cover or change general social qualities and societal standards winding them up with their own character. Kids' advancement, youth development, family mentoring, and family life training are profession paths are centered on fulfilling everyday mental needs of the person in a family environment.

- **Political (personal power) well-being.** Another new part of well being is the individual political aspect with political implying to family and individual strength and independence dependent on good and moral freedom instead of governmental political functions. Political prosperity, or an interior feeling of power and self-governance, is understood as being responsible for one's life, having the option to and having the opportunity to decide, monitoring and ready to foresee the results of one's activities on one's self as well as other people.

*D. Family As An Agent Of Sustainable Social And Economic Development:*

In number of social, economic and cultural functions, family plays a vital role. While discussing the concept of sustainable development, it becomes indispensable to highlight family role in boosting this scenario. Despite the numerous modifications that have modified their jobs and capacities, families keep on giving the accepted support to the mental, monetary and physical help necessary to the development and advancement of their members, especially babies and kids, and for the care of dependent family members, including the old, and sick. [12] In an expansive sense, families can, and regularly do, teach, instruct, encourage and help their group members, accordingly putting resources into their future development and playing the role of an indispensable asset for improvement [23]. Family's function can be described as:

- Families are significant components of sustainable growth at all stages of society and their commitment around there is undeniable for its victory
- The explicit elements of families include setting up mental, financial, social and frame between family members [18].
- Providing a name, position and upgraded standard of living to relatives, particularly to kids. This will boost up the demand and consumption level of society as a whole.

VII. PROGRESS INTEGRATING HOUSEHOLD-LEVEL NEEDS INTO THE CONSUMER SYSTEM

A. *Well Being*: The efforts of people to upgrade their living conditions can be identified with intensity of individuals to fulfil their desires. Numerous meanings of desires are being utilized and the idea of need has various implications (Gasper, 1996). To start with, it very well may be addressed as a verb and a noun. The verb 'need' more often means needing a specific thing as an essential for certain conduct, without knowing the in depth reason of that wants. The 'need' here as a noun has numerous implications, which can be categorized in three classifications [10]. First, need is identified with wants. The second significance implies to needs as an outer (ecological) necessity for accomplishing an end. Below table describes the Basic needs and corresponding satisfaction & dissatisfaction feelings arising from those needs. The arousal of these needs leading to demand by

consumers in turn contributes to sustainable consumption levels indirectly

TABLE I : CATEGORIZATION OF FEELINGS ACCORDING TO TYPOLOGY OF NEEDS

Basic need	Satisfaction of needs: positive feelings	Dissatisfaction of needs: negative feelings
Subsistence	satiated, repleted	hungry
Protection	safe	in danger, anxiety
Affection	love/being loved	hate/indifference
Understanding	intellectual well-being, smart, clever	intellectual frustration, dumb, stupid
Participation	belonging, related, involved	lonesome, isolated, forsaken
Leisure	playful, relaxation	boredom bored, weary, stressed
Creation	creative, inspired	uninspired
Identity	self-assured, confident, positive self-image	uncertain, insecure, negative self-image
Freedom	free, independent	entangled, chained, bounded, captured, tied

Source: "Household level Modelling for Sustainable Consumption, Norris & Jager

- B. *The interdependency of human/ families concerning their need satisfaction*: Interdependencies amongst individuals are apparent in numerous forms. The nearest interdependencies identify with the single family, most of them comprising of guardians and their kids. On the dimension of the family numerous assets are distributed, for example, food, home, economic assets, and other function jointly performed adding to the wellness of the relatives, like sharing relaxation time. Families can be comprehended as the source of human growth, as the family environment healthily raises the kids to adulthood [14]. Essentially, the fulfilment of most human needs is to a great extent subject to the family circumstance. Kids specifically depend on their relatives for survival, assurance, love, interest, sympathy and relaxation needs. Absence of good eating stuff and rightful shelter may lose the healthy sustenance of a family, high burden on guardians may restrain them to spend time together, and because of that kids are being left to child care crutches for upbringing, which might be results in partial qualitative growth. Poverty additionally at the family level not just has bad effects on prosperity of the relatives, yet it also leads to worrying conditions for the wellness of next ages.
- C. *Need Satisfaction and Role of Social Networks*: The discussion above disclosed that individuals are frequently inspired to expand their wellness, however may end up in a condition which is far less positive. A real procedure that lies at the base of these activities is social evaluation. For instance, the need to have a TV may have been prompted by family, companions, or group members [4]. Taking a look at the "Hollywood lives" of the affluent people on TV is not provoking the family towards such a life, as this appears to be plainly impossible. But, a mobile phone and branded footwear are considerably more in reach, and if individuals in their immediate neighborhood as of now have these things, the inclination to get them gets a lot more firm [8.] In light of social communities, the attention goes on expanding one's pay, to get away relative poverty, and causes individuals to move far from their native

places, and to attempt to build their way of living in different regions. It appears that particularly young fellows are the ones that choose to move. The globalization of the industrial segment is accepted to further escalate movements, as the challenge among rural and urban regions progressively moves towards competition amidst urban territories [15]. As an outcome, urban communities may thrive, fall apart and rise over in connection with monetary growth and endeavors of districts to draw in new trades by upgrading business atmosphere. Consequently there might be a challenge among urban areas, and this challenge may center at various segments of business prompting rise in sustainable development and yet will have few negative results as well.

### VIII. HOW COMPARISON OF INDICATORS FOR ASSESSING THE DEVELOPMENT

The final division of the study analyse the comparison of different approaches to evaluate the sustainable development from the perspectives of families, where family as social institution and Human Family are important elements of in assessing the development and therefore should be included in the formula used to evaluate the individual and social growth.

**ECONOMIC COMPONENTS:** compute economic wellness and financial prosperity Wealth is the sole determine of wellness and this contributes to calculate GDP which is the basic parameter but GDP doesn't include the factors like health, suicide rates, crime, poverty etc. Criticism – It doesn't necessarily mean that with the rise in GDP, well being would also rise. One cannot suppose that the economy is improving just due to the fact that high amount of cash is used –up.

**SOCIETAL INDICATORS** - compute societal wellness and prosperity – Taking care of all family members, Concern for elders at home, intentional society duties and lot of customs and traditions add to wellness but frequently are performed without any payment.

#### A. Some Other Alternatives /Measures To Take Into Account Social Aspects (Used By Canada)

**FISH (Fordham Index of Social Health (FISH))-** evaluates large number of social and financial indicators , example, child exploitation, newborn mortality rate, school drop outs, adolescents suicides, family health insurance, financial support to elderly, etc. This index was earlier used by US also [27].

**Genuine Progress Indicator (GPI)- USED BY US & CANADA-** GPI includes work unpaid at home, pollution, distribution of income, environmental break downs, defense expenses, crimes, etc.

**Net Economic Welfare** -. Calculated by adding it to gross national product, which includes the worth of relaxation time deductions such as environmental damage. It tries to add value to national income by considering costs of pollution, crime rates, other bad elements growing in economy so as to find the actual level of national income [31].

#### B. Efforts to Capture the Sustainability Aspects:

- **Gross Sustainable Development Product (GSDP)** - evaluates the price of growth and development. It is referred to as the overall value of manufacturing within an area in a specific time frame and is assessed on the basis of deals related to the market prices for final produce in the economy. It is formulated to substitute the GDP [31]. The GSDP calculates:
  - Economic effects of ecological and wellbeing reduction or enhancement
  - Impact of individuals' acts on nature, resources reserves and monetary growth.
  - Nature of environment, individuals, assets and improvement and effect of modifications in these on the National wealth.
  - Welfare, status of living and financial advancement of future youths.
  - Expenses on pollution, wellbeing, medical and natural disasters.
- **Gross Environmental Sustainable Development Index (GESDI)** - evaluates the superiority of expansion and development More than two hundred indicators of values not related to money are assessed & sorted out by four categories: People - (incorporates measurements of social, financial, mental, physical and education, rights, community, harmony) Available assets, Environment and Financial Growth. Table 2, gives a study on comparison of these lists and displays graphically as to what to incorporate into the measures. Additionally, there are different factors that are not yet estimated in these indices, like Loss of respectfulness in groups, Power of societies and Diseases due to changed way of living

TABLE II : Categorization Depicting the comparison of major parameters included in different indices

	FISH	GPI	HDI	GSDP	GESDI
infant mortality	*		*		
child abuse	*				
child/elderly poverty	*				
teen suicide	*				
drug abuse	*				
high school drop outs	*				
unemployment and underemployment	*	*			
health insurance coverage	*				
highway deaths due to alcohol	*	*		*	
homicides/crime	*	*			
food stamp distribution	*				
housing	*				
income inequality/distribution	*	*	*		
unpaid work (household, volunteer)		*			
family breakdown		*			
resource depletion		*	*	*	*
pollution		*			
defense expenditure		*			
long term environmental damage		*			
changes in/loss in leisure time		*			
life span of consumer durables and public infrastructure		*			

Source: "The Family perspective in Sustainable Consumption and Development, Mc Gregor, 2000

## IX. CONCLUSION

The present research is basically an in-depth research over the past work done in context of family perspectives and sustainable consumption/development. The study reveals that family and Human Well Being are one of the important constituents of sustainable consumption. It has been studied that sustainability has two aspects, namely, Sustainable Development and Sustainable Consumption which can be addressed as Supply and demand sides respectively. The paper has focussed more on sustainable consumption in consideration to family needs, demands, well being, health consumption, poverty, standard of living of humans, quality of life of families, changing psychological needs and other needs of individuals, satisfaction level of human beings in typology of those needs, etc. The study in later part highlighted the household level modelling of consumer behaviour by correlating the needs and well being with the level of satisfaction and dissatisfaction amongst the individuals. The composition of family, members, child and adolescents development, their requirements affect the level of satisfaction. The desires and need of family and individuals is also affected by social networks, prevailing updated television knowledge which in turn also led to the desire of higher income amongst adolescents. The final part of the research focuses the indicators for measuring social value, value of well being and include other parameters like family consumption, poverty, crimes, pollution, environment safety, income satisfaction of individuals etc.. The study however shows that GDP doesn't include all these aspects in its valuation. There are indices like FISH, GPI, NEW, GESDI and GSDP for assessing the sustainability considering above parameters included in these indices but these indices are currently used by US and Canada. Thus it can be concluded that in today's time, it has become imperative to consider sustainable development along with consumption by assessing family, human well being their needs, and various other social factors affecting sustainable consumption or demand.

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# Mechanical scheduling using Artificial Intelligence

VineetKumar<sup>1</sup>

Asstt. Professor,

Vaish College of Engineering, Rohtak, India

Dr. Umesh Gupta<sup>2</sup>

Associate Professor,

Vaish College of Engineering, Rohtak, India

**Abstract**—Manufacturing intelligence deals to resolve the problems which arise during scheduling and improve their efficiency with the help of computer programs. Manufacturing is the field where the application of machines learning is easy but in some particular domain. This paper evaluates some techniques of the manufacturing domain and by examines the applications in which it has been successfully deployed. Recently added some programs added on this application has discussed on this papers which approaches and currently available. Basically manufacturing scheduling is a part of operational research which is solved by discrete methods. The wide area covered in this paper is process planning, operation management, dynamic scheduling and manufacturing scheduling

**Keywords**—Production Scheduling, hybrid artificial intelligence systems, design engineering, process planning, assembly line balancing, dynamic scheduling, operations management.

## I INTRODUCTION

The software system mentioned in these papers simulates the operations of manufacturing of the product in the factory in providing schedules for the manufacturing resources. The factory needs a developed software system which simulates the operation of the company and the also it needs a virtual factory framework allows the exchange of date related to the particular product, process and resources. It needs a digital scheduling experiments with data comes from the manufacturing unit to validate the proposed method and implemented the operational system. Recent manufacturing units have to handle the increased speed to manage it and handle it properly in recent growing market. Producing a large number of different product models and variants, and having a fast response to customer orders within a volatile environment are requirements in order for factories to be efficient and responsive. Manufacturing scheduling is the principal where in the planning phase as well as the operation of manufacturing systems. It is an immediate efficiently allocating the available machinist jobs, or operations within jobs and subsequent time phasing of these jobs on individual machines. The mentioned areas are further specified in manufacturing operations are process, design, installation, assembly and dispatch.

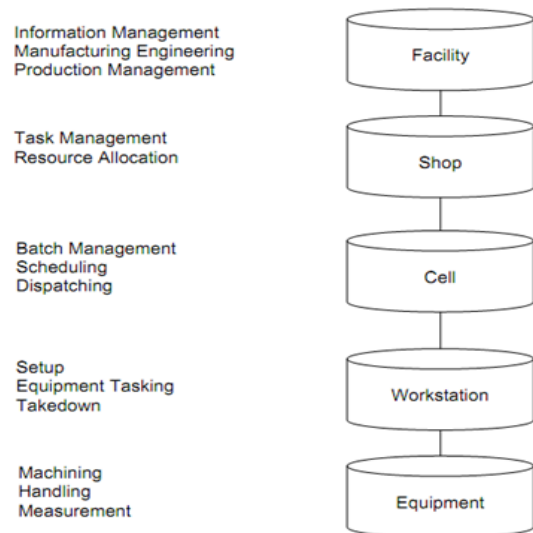


Figure 1: Basic flow process in Mechanical scheduling

## II LITERATURE

*Matheus E. Leusin (2018)* The paper includes a novel with a conceptual framework that deals with the procedures of manufacturing plant through a multi-agent architecture. The given framework based on several industrial jobs with an independent control, which is more flexible and to deal even in uneven condition with an ease to implement and modification in real industrial cases. The application of the job is virtual for an industrial case, which enabled the verification of its possible in relation to existing processes.

*D T Pham (2004)* The concepts used in manufacturing scheduling demonstrated by mathematically with given links to commercial databases and well-designed user friendly interface with some limitations. In some methods data sets mentioned have tens of thousands training illustrations within a short span of time and example of efficient to machine learning data sets.

*N. Shivasankaran (2014)* MATLAB abbreviate as an Artificial neural network used by scheduling process in automobile workshop. as considered almost a month in and out process at the workshop as the input, and output



data and on base of those data neural network creates and successfully works.that is fully verified and satisfactory for the workers limits schedule. Whereas final output was different rather than perfection. It is very reliable in any manufacturing industry where the production is repeated and frequent jobs are done. On the other hand manual scheduling can be avoided by implemented methods. with the greater accuracy.

*TaravatsadatNehzati(2011)*The methods of elements of Neural networks, GA and Fuzzy techniques for scheduling for flexible manufacturing system has been presented here. The paper provides the FMS procedure to rectify the problems arises during manufacturing scheduling rectified by the computer program. Whereas there is some information is not given in design procedure. On the contrary the entire neural network based methods have a design proceed it is very hard to find the complexity during manufacturing as it is resolved by the fuzzy version based on some experienced knowledge and it is already tested solution working on fuzzy network and background . As one of the neural network and hybrid Artificial intelligence based operation used in inductive training.

*MinakshiKumari(2017)*The technology provides assurance that this technology drives a mechanism which is uniformly distributed in all area of manufacturing. Assigning the power of decision making and maintaining consistency among all of them is the working procedure of this technology. So it will be easy to make a decision to support which is able to help to achieve the target of manufacturing. The recent papers enlightens the area of using the techniques of this technology to move parallel the scheduling and maintenance programs both as well as in other shop floor too.

### III METHODOLOGY UTILIZED IN MECHANICAL SCEDULING

#### A. Production Scheduling (*The Job-Shop Scheduling Problem*)

The production scheduling problems is the most important problems in the manufacturing area or job functioning area of manufacturing field as it effect the whole supply and dispatch performance. The JSP involves a set of programs which have its own chain of operations for a given time period as to find the problems occurs during the manufacturing process is requires lot of time without deliberate its causes.as it has willful algorithm problems for the rectification of this problems an optimal solution provided a complete methods in a given time period through the operational research to deal with it.

#### B. Hybrid artificial intelligence systems

In the research of computational mechanical scheduling problems a research field of system based

programs names as hybrid artificial intelligence system (HAIS) having a combinations of agent ban intelligent systems which consists of neural network , general algorithm, fuzzy logic and agent based methods which is capable to handle the complexity in manufacturing roughness, vagueness and high dimensionality. They will provide the expert knowledge and providing raw data to solve the problem prominently. Now this research expanding almost in every artificial intelligence manufacturing unit.

#### C. Design Engineering

The design engineer normally works in the field of drawing and the calculation of overall job works and reaching the parts. This community has its purpose to working on the calculation as well as designing works independently with the scientific methods. Working of surveying the theories, design techniques and calculation methodologies. Another survey on the same topic was conducted by a few years later. Besides summarizing and reviewing the developed design models and methodologies, the said papers investigated the nature and the characteristics of the design process, classified the design models into categories and located possible research opportunities. The next portion regarding the design regarding the design process is to represent the models ie, solid modeling and then find out the best solutions and recovery of previous design into the new and existing design. .By implementing the new techniques that is the combination of artificial intelligence is taken into consideration. The fusion of design is a major problem and to resolve artificial neural networks is an utilized and genetic algorithm to find out the better solution for manufacturing field. By approaching the Hybrid Genetic Algorithm with fuzzy optimal system the problems regarding design is flexible and optimal. This approach enables the designs of flexible optimal system by applying fuzzy constraints. Moreover, generalized upper bounding is applied in order to structure the representation of the chromosomes in the genetic algorithm. This proposed job work is the human and computer interaction define the fitness function of solutions incorporating both multi-criteria evaluation and constraint satisfaction. to present a synthetic mixed discrete fuzzy nonlinear programming optimization method that combines the fuzzy formulation with a GA and a traditional gradient-based optimization strategy. This method can find a global compromise solution for fuzzy optimization problems containing mixed-discrete design variables. By providing a approach towards the design and to solve the main objective function. of fuzzy methods to design variables the function on the basis of integration of a knowledge base, ANN, GA, and CAD/CAE/CAM in a single environment are used in various stages of design.

#### D. Process planning

In a complete manufacturing unit the process planning works as a takes a input gives us an output from the

design characteristics to complete a production plan. The requirement of this plan is an objective to make the sequencing of operations. In numerous plans we should take an optimal plan should be selected. It contains various tasks that are dependent on the types of different product which is in processing unit. It is described as per the requirement of processing unit of manufacturing plant on a particular product. As it is the link between design and manufacturing units called GUARDS, based on unsupervised machine learning and evolutionary algorithms (EAs) in order to optimize the control of a manufacturing process. Evolutionary algorithms (EAs) in order to optimize the control of a manufacturing process. . The system learned to select the optimal process plan according to the form of computer aided design files. And the input of part specifications in the form of CAD files. They used an object-oriented approach in the form of features. It was an object that defined specific operations and contained all of the relative functional, geometrical, and technological data. Knowledge-based reasoning was used for the generation of plans, which were then optimized with the help of GA. A binary-coded EA was employed for the evaluation task. The solution was represented as a string of all of the plant's parameters, and the objective of the algorithm was defined according to user's preferences.

#### E. *The Assembly Line Balancing Problem*

This line balancing problem is known as assembly line is made up of a number of job areas which is arranged in either series and in parallel, shows the work flow and resulting the growth of production system. Production item single in a single pattern and mixed pattern where a subset of tasks of known duration are performed on them. The assembly line configuration system design includes deciding an ideal task of a subset of errands to each station of the plant satisfying certain time and priority limitations .to put it plainly, the objective is to accomplish a gathering of assignments that limits the wastefulness of the linearity all out personal time and that regards every one of the imperatives forced on the undertakings and contestations. These problems in assembly line balancing and in mass manufacturing a major role while the area of installation of line and reassemble it. Hence it looks like a very complex problem known to be a NP-hard of greater relevance for workers and executives also . The problems includes in modeling is known as Assembly lining problem. And if it is consider the works of each tasks to single way in the way that all the limits is cleared and there is no workload manually and the manufacturing time cycle moves parallels. Two versions of this problem are known involving the assignment of tasks to stations so that the number of stations is minimized for a given production rate aiming to maximize the production rate. At the point when different contemplations are added to those of the family, the subsequent issues are known by the name of General Assembly Line Balancing Problems A nonexclusive arrangement plot for the field of ALB considering various variations is additionally given in an ongoing paper. It is in this manner an exceptionally mind

boggling combinatorial enhancement issue (known to be NP-hard) of extraordinary pertinence for administrators and experts. The main group of scholastic issues displaying this circumstance was known as Simple Assembly Line Balancing Problem and it just considers the task of each assignment to a solitary station so that all the priority limitations are fulfilled and no station outstanding burden time is more noteworthy than the line process duration.

#### F. *The Dynamic Scheduling Problem*

Planning issues have been generally considered in the course of the most recent decades. Because of the multifaceted nature and the assortment of such issues, most works consider static issues in which exercises are known ahead of time and imperatives are fixed . In any case, each planning issue is dependent upon surprising occasions. In these cases, another arrangement is required in an ideally brief timeframe considering these occasions and being as close as conceivable to the present arrangement. The principle vulnerabilities experienced in a genuine assembling framework are the accompanying: machine breakdowns including questionable fix times; expanded need of employments; and changes in due dates and request undoings. At whatever point a surprising occasion occurs in an assembling plant, a planning choice must be made progressively about the conceivable reordering of occupations. This process is known as "rescheduling." The main objective of rescheduling is "to find immediate solutions to problems resulting from disturbances in the production system. The problem can be defined as follows: let  $A = (1, \dots, n)$  be a set of activities, and  $R = (1, \dots, r)$  a set of renewable resources. Each resource  $k$  is available in a constant amount  $R_k$ . Every action  $i$  has a span  $p_i$  and requires a consistent sum  $r_{ik}$  of the asset  $k$  during its execution. Appropriation isn't permitted. Exercises are connected by priority imperatives, and asset limitations require that for every timeframe and for every asset, the all out interest of asset doesn't surpass the asset limit. The goal considered here is to discover an answer for which the end time of the calendar is limited. Over the most recent couple of years, mixture dynamic planning frameworks have been utilized for taking care of this perplexing issue. Scheduling problems have been widely studied over the last decades. Due to the complexity and the variety of such problems, most works consider static problems in which activities are known in advance and constraints are fixed . However, every scheduling problem is subject to unexpected events. In these cases, a new solution is needed in a preferably short time taking these events into account and being as close as possible to the current solution.

## IV FUZZY LOGIC

Designed for specially to resolve the problems and vagueness with a mathematical representation to deal with imprecise basic problems. Fuzzy logic is started earlier than fuzzy tools , to determine the estimated results in limiting case. It is basically based on matter of degree.

The knowledge is taken as a collection of elastic or equivalent and collections of variable's. It is proven that fuzzy tools are suitable for unpredictability and finding the estimated value

### V CASE STUDY

In the implementation part in this paper, fuzzy logic control will be used based on Madman fuzzy logic inference system. However, below are the definitions of the fuzzy relations for the inputs and outputs. The inputs: Number of Pizza (P) and service time(T)

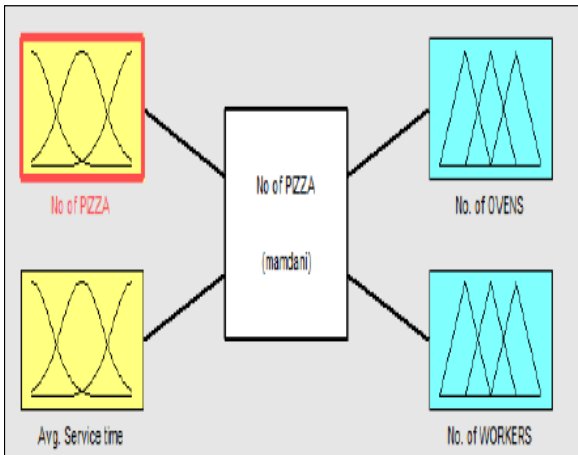


Figure 2:Fuzzy sets showing input and output (Pizza)

The outputs: Number of Ovens (O) and number of Workers (W)

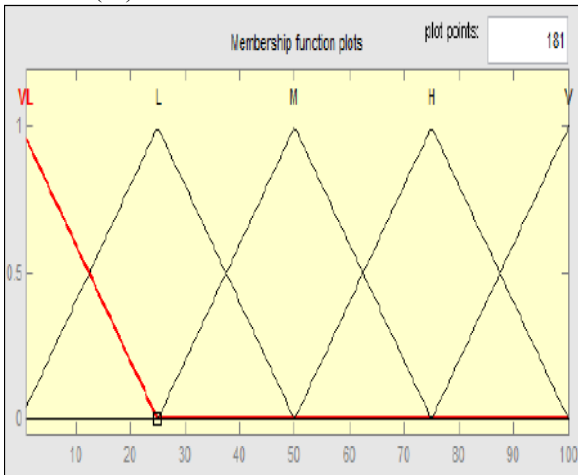


Figure 3:Fuzzy sets showing input and output (Workers)

Triangular membership functions have been used in all the fuzzy relations (RP, RS, RO, RW), as shown above. However, to control the output, the rules should be generated; these rules will follow the logic or the heuristic knowledge. The calculation will be applied for the following Outputs

1. Number of ovens required

2. Number of workers required for the Prescribed amount of ovens.
3. Number of ovens and workers can be seen below table

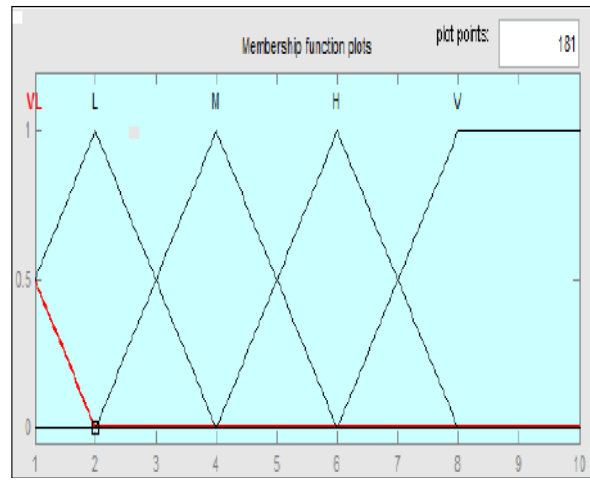


Figure 4: Fuzzy relation showing input and output

Table 1: Required service time

Number of Pizzas	Service Time required for the processing				
	VL	L	M	H	VH
VL	VL	VL	VL	VL	VL
L	VL	L	L	L	M
M	VL	L	M	H	H
H	L	L	H	H	H
VH	M	H	H	H	VH

Fuzzy inference system consists of four steps:

1. Fuzzification of the inputs: the input is transformed from numerical value into linguistic term. the membership function for the triangular fuzzy function given before can be used to do so, substituting the right values for a1,a2,a3. After this step the input will look like  $N' = .6/L + .3/M + .2/H \dots \text{etc.} \dots \dots \dots \text{Equation 1}$
2. Fuzzification of the output: the output is calculated from the inputs in terms of fuzzy linguistic term.
- 3- Transfer the fuzzy subset of the set of linguistic terms for the output to a fuzzy subset of the set of numerical values. In order to do this it needs to use fuzzy composition using the Max-Min Rule:  $N = .6/L + .3/M + .2/H \dots \text{etc.} \dots \dots \dots \text{(Equation 1)}$   
Transfer the subsets of the fuzzy regarding the sets of linguistic terminology for the output regarding the subset

of a fuzzy sets based on numerals. Hence, this is possible by utilizing the Max-min Rule in order to construct the fuzzy set.

$$\left[ \begin{array}{l} \mu_{M^*}(y) = \max_{t \in T_M} \{ \min [ \mu_M(t), \mu_M(t, y) ] \} \\ \text{for all } y \in Y_M \end{array} \right]$$

.....Equation 2

## VI RESULT

MATLAB program will allow the user to adjust the two inputs continuously and the output will change corresponding to the change in the inputs. As mentioned in the above figures when the input was 50 Pizzas and the service time was 10minutes, then the number of ovens needed was 4and the number of the workers was 3. From the second output screen when the number of pizzas has been changed to 25 and the service time to 7, the output to finish this job was almost 2.

## VII CONCLUSION

In this new era of research field the Artificial intelligence is normally used as it has some proven techniques given their capabilities to confront or resolve involving impression , uncertainty vagueness and high – dimensionality. Rather than that lots of problems that arise in manufacturing field related to operations can be resolved by optimization programs. As many of them successfully resolved or rectified by the approaches of General intelligence. However, many others are specially complicated and they demand hybrid approaches. In this contribution we reviewed the capability of AI to deal with this sort of problems with a very good performance in four different operations management domains: design engineering, process planning, assembly line balancing, and dynamic scheduling. The objectives of this paper has been achieved by determining the number of the Ovens and workers needs for a certain job in food manufacturing system specially the pizza production, which will reduce the waste in money and give a better customer satisfaction. MATLAB software has been used for the implementation stage and code has been developed to achieve the final results. Fuzzy based control system could be useful for other manufacturing systems and can be applied to increase the performance of production lines. However, using fuzzy control might be helpful for complex systems comparing with other methods and applying this method for other industries would give high accuracy.

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# Computational Analysis Elastically Supported FGM Composite Cylindrical Shell Panel with Random Material Properties and Thermomechanical Loading

<sup>1</sup>Rajesh Kumar  
Deptt of Mechanical Engineering  
NIMS University  
Rajasthan, UP, INDIA  
[rajeshtripathi63@gmail.com](mailto:rajeshtripathi63@gmail.com)

<sup>2</sup>Ajay Partap Singh  
Deptt of Mechanical Engineering  
IIMT University  
Meerut, UP, INDIA  
[partap10@gmail.com](mailto:partap10@gmail.com)

**Abstract-** In present paper, effects of elastic foundations on the stochastic postbuckling response of functionally graded materials laminated composite cylindrical shell panel subjected to thermomechanical loading are investigated. Random system parameters such as the material properties and foundation stiffness parameters, coefficients of thermal expansions are taken as independent random variables. The higher order shear deformation theory and von Karman nonlinear kinematics is used for basic formulation. A  $C^0$  FEM with FOPT earlier applied by author for graphite epoxy laminate investigation is extended for shell panel subjected to thermomechanical loading to find (mean and variances). The effects of random material properties with foundation stiffness parameters, plate thickness ratios, plate aspect ratios, radius to width ratios, support conditions, fiber volume fractions under environmental conditions of laminated cylindrical shell panel are presented. The approach work is validated with those available in the literatures and independent Monte Carlo simulation. Applicability of this study is in Aerospace Engineering.

**Key points:** Cylindrical shell panel, Foundations, Uncertain parameters, FGM.

**Corresponding author:** Rajesh Kumar, E Mail: [rajeshtripathi63@gmail.com](mailto:rajeshtripathi63@gmail.com), +919560115944.

## I. INTRODUCTION

In this research direction, Bindu et al [2] investigated the thermal Post buckling of FGM shell. Yang et al. [3] investigated the thermo-mechanical post-buckling of FGM shells with temperature-dependent properties. Hui-Shen Shen[4] investigated the buckling and post buckling of anisotropic laminated cylindrical shells with piezoelectric fiber reinforced composite actuators. Yang et al. [9] evaluated the second-order statistics for elastic buckling of FGM plates with randomness in the material properties using stochastic

FEM via first-order shear deformation theory in conjunction with FOPT.

However, no work dealing with thermomechanical investigation of the laminated shell supported on flexible support with uncertainties is reported in the literature up to this time.

## II. MATHEMATICAL FORMULATION

### A. Displacement field model

A typical composite laminated cylindrical shell panel with its coordinate definitions and material direction of a typical lamina are shown in Fig. 1. It is assumed that laminates are composed of ceramic and matrix layers and are perfectly bonded together. Composite cylindrical shell panel of radius  $R$ , thickness  $h$  and subjected to in-plane loads.

In the displacement model given above,  $\bar{u}$  and  $\bar{v}$  are dependent on the derivatives of the out-of-plane displacement  $w$ . The strain vector would have second-order derivatives of the out-of-plane displacement hence for FEM analysis . 5 DOF with  $C^1$  continuity is transformed into 7 DOF with  $C^0$  continuity due to conformity with the HSST [5]. In this process artificial constraint are imposed, which should enforced variationally through a penalty approach. However, the literature [7] demonstrates that without enforcing these constrained, the accurate result using  $C^0$  continuity can be obtained.

Singh, B.N et a l[11] investigated post buckling response of laminated composite plate on elastic foundation with random system properties.

Chinmay et al.[12] studied Nonlinear buckling analysis of pyrothermoelastic composite shell panels using finite element method.

Thermoelastic stability analysis of laminated composite plates An analytical approach investigated by Ramesh et al.[13].

Shen, Hui-shen [14] investigated the hygrothermal effects on the post buckling of axially loaded shear deformable laminated cylindrical panels.

The displacement model given can be written in modified form as:

$$\begin{aligned}\bar{u} &= u + f_1(\zeta)\phi_1 + f_2(\zeta)\theta_1 \\ \bar{v} &= \left(1 + \frac{\zeta}{R}\right)v + f_2(\zeta)\phi_2 + f_2(\zeta)\theta_2 \\ \bar{w} &= w\end{aligned}\quad (1)$$

where  $\theta_1 = w_{,\xi_1}$  and  $\theta_2 = w_{,\xi_2}$

The displacement vector for the modified model can be written as

$$q = (u \quad v \quad w \quad \theta_2 \quad \theta_1 \quad \phi_2 \quad \phi_1) \quad (2)$$

where  $(\cdot)$  denotes partial differential.

Thermal strains with the displacement of  $k^{\text{th}}$  layer is expressed in [5].

The thermal expansion and contraction coefficients due to temperature in the longitudinal ( $\alpha_1$ ) and transverse ( $\alpha_2$ ) directions of the fibers using transformation matrix and  $\Delta T$  is the change in temperature in the shell panel subjected with uniform temperature rise can be defined as  $\Delta T = T - T_0$ .

### B. Stress- Strain Relations

The constitutive law of thermo-elasticity for material under consideration relates the stresses with strains in a in-plane stress state for the  $k^{\text{th}}$  ceramic and matrix laminate consisting of  $N$  layers, oriented in any arbitrary orientation with respect to the reference axes.

Detailed micromechanical model approached is expressed in [1].

### C. Total potential energy of the nonlinear state of the system

Let the shell panel system properties be subjected to some reference in-plane thermal loading  $q_i^{\text{ref}}$ . The shell panel is assumed to be nonlinear elastic with a stochastic elasticity tensor field  $C_{ijkl}$ . The total potential energy corresponding to the nonlinear state of the system for uncertain stiffness can be written as .

$$\Pi(u_i^{\text{ref}}) = \frac{1}{2} \int_{\Omega} C_{ijkl} \varepsilon_{ij}^{\text{ref}} \varepsilon_{kl}^{\text{ref}} d\Omega - \int_{\Gamma_1} q_i^{\text{ref}} u_i^{\text{ref}} d\Gamma_1 \quad (3)$$

$(i, j, k, l = 1, 2, 3)$

where  $\Omega$  denotes the unreformed configuration of the shell panel and its boundary is denoted by  $\Gamma = \Gamma_0 \cup \Gamma_1$ ,  $\Gamma_0$  denotes the Dirichlet part and  $\Gamma_1$  denotes the Neumann part of the lateral boundary of the plate.  $\varepsilon_{ij}^{\text{ref}}$  denotes the non linear strain tensor defined by Eq. (4) and  $q_i^{\text{ref}}$  is the boundary traction. In the present analysis, the reference loads  $q_1^{\text{ref}} = q^{\text{ref}}$  and  $q_2^{\text{ref}} = q_3^{\text{ref}} = 0$  are taken.

The exact solution minimizes  $\Pi$  on the set of all kinematically admissible functions denoted by  $V$ , i.e.  $u_i \in V$  such that,  $V = \{u_i \in H^1(\Omega); M(u_i) = 0, \text{ on } \Gamma_0\}$  where  $M(\cdot)$

is an operator defined by the edge condition. This yield

$$\delta \Pi(u_i^{\text{ref}}) = \int_{\Omega} C_{ijkl} \varepsilon_{ij}^{\text{ref}} \delta \varepsilon_{kl}^{\text{ref}} d\Omega - \int_{\Gamma_1} q_i^{\text{ref}} \delta u_i^{\text{ref}} d\Gamma_1 = 0 \quad (4)$$

The total potential energy due to perturbation of the system can be written as

$$\delta \Pi(u_i^p) = \int_{\Omega} \sigma_{ij}^{\text{cr}} \varepsilon_{ij}^p d\Omega + \frac{1}{2} \int_{\Omega} \sigma_{ij}^p \varepsilon_{ij}^p d\Omega - \int_{\Gamma_1} q_i^{\text{cr}} u_i^p d\Gamma_1 \quad (5)$$

$(i, j = 1, 2, 3)$

where  $\sigma_{ij}^{\text{cr}}$  is the current thermal linear state of stress (pre-buckled) due to the critical load  $q^{\text{cr}}$  and is given by  $\sigma_{ij}^{\text{cr}} = \lambda_{\text{cr}} \sigma_{ij}^{\text{ref}}$ . Upon substituting the perturbation strain  $\varepsilon_{ij}^p$  from Eq. (5) and linearizing the above equation, we arrive at the following expression

### D. Discretization

In the present study a  $C^0$  nine-nodes isoparametric finite element with 7 DOFs per node is employed. For this type of element, the displacement vector and the element geometry are expressed as

$$q = \sum_{i=1}^{NN} \varphi_i q_i; \quad \xi_1 = \sum_{i=1}^{NN} \varphi_i \xi_{1i}; \quad \text{and} \quad \xi_2 = \sum_{i=1}^{NN} \varphi_i \xi_{2i} \quad (6)$$

where  $\varphi_i$  is the interpolation function for the  $i^{\text{th}}$  node,  $q$  is the vector of unknown displacements for the  $i^{\text{th}}$  node, NN is the number of nodes per element and  $\xi_{1i}$  and  $\xi_{2i}$  are Cartesian Coordinate of the  $i^{\text{th}}$  node.

Adopting Gauss quadrature numerical rule, the element linear and non-linear stiffness matrices and geometric stiffness matrix respectively can be obtained.

The total strain energy ( $\Pi$ ) of laminates for whole domain can be expressed and the displacement relation as

$$\Pi(u_i^p) = q_i K_{ij}^L q_j + q_i K_{ij}^{NL1} q_j + q_i K_{ij}^{NL2} q_j + q_i K_{ij}^{NL3} q_j - \lambda_{\text{cr}} q_i K_{ij}^{(G)} q_j \quad (7)$$

## III. GOVERNING EQUATIONS

Now find  $\lambda_{\text{cr}}$  and  $u \in V$ ,  $u \neq 0$  such that  $\Pi$  is minimum. This yields .

$$\left( K_{ij}^L + K_{ij}^{NL} - \lambda_{\text{cr}} K_{ij}^{(G)} \right) q_j^k = 0 \quad (8)$$

After simplification of Eq. (8) we get the generalised eigen value problem

$$\left( K_{ij} - \lambda_{\text{cr}} K_{ij}^{(G)} \right) q_j^k = 0 \quad (9)$$

where,  $K_{ij} = K_{ij}^L + K_{ij}^{NL}$  with  $K_{ij}^{NL} = \frac{1}{2} K_{ij}^{NL1} + K_{ij}^{NL2} + \frac{1}{2} K_{ij}^{NL3}$

here  $K_{ij}^L$ ,  $K_{ij}^{NL1}$ ,  $K_{ij}^{NL2}$ ,  $K_{ij}^{NL3}$ ,  $K_{ij}^{(G)}$ ,  $q_j^k$  are linear, non linear, geometric stiffness matrices and displacement vector, respectively defined in appendix.

The  $K_{ij}$  and geometric stiffness matrix  $K_{ij}^{(G)}$  are random in nature, being dependent on the system geometric and thermo-elastic properties. Therefore the eigenvalue and eigenvectors also become random. The Eq. (8) is the governing equation

for the thermal buckling analysis of laminated composite shell panel. In deterministic environment the solution of this equation can be obtained using standard solution procedure i.e., direct iterative method or reputation method subspace iteration method etc. However in random environment matrices  $[K_{ij}]$  and  $[K_{ij}^{(G)}]$  are random in nature and therefore eigen value and eigen vector are also random. It is therefore not possible to obtain deforming load force from Eq. (9). To achieve this, a probabilistic approach i.e.  $C^0$  non linear FEM in conjunction with first order perturbation technique is used to solve the uncertainties of Eq. (9).

This investigation used as independent input uncertain variables (RVs).

Any arbitrary uncertain part can be expressed as the sum of its expected average and zero average. Uncertain part, expressed by 'd' and 'r', respectively .

$$K_{ij} = K_{ij}^d + K_{ij,r}, \quad K_{ij}^{(G)} = K_{ij}^{(G)d} + K_{ij}^{(G)r}, \quad (10)$$

$$\lambda_i = \lambda_i^d + \lambda_{i,r}, \quad q_j = q_j^d + q_{j,r}$$

$K_{ij}^d$  and  $K_{ij}^{(G)d}$  are the mean elastic stiffness and the geometric matrices of the structure respectively.  $K_{ij,r}$  and  $K_{ij}^{(G)r}$  are the first order partial derivative of elastic stiffness matrix and geometric stiffness matrix of the structure respectively.

By substituting Eq. (9) in Eq. (8) and expanding the random parts in Taylor's series keeping the first order terms and neglecting the second and higher order terms, and employing nonlinear Green's Strain displacement relationship the finite element system are obtained:

#### A. Mean buckling analysis

After the geometric matrix is available, the system stiffness matrix is modified by geometric matrix to solve the eigen value problem posed by Eq. (10). This is generalizes eigen value problem where  $K_{ij}^d$  and  $K_{ij}^{(G)d}$  are symmetric matrices and are generally found to be positive definite. In some cases  $K_{ij}^{(G)d}$  can be positive semi-definite which can overcome by shift invert transformation. In such cases the right most eigen value gives the minimum value of the mean buckling load parameter. The critical or minimum mean buckling load of the structure is obtained by multiplying the load parameter  $\lambda_{cr}^0$  with reference load.

#### B. Variance of buckling analysis

The first order equation is used to obtain the first order partial derivatives of eigenvalue with respect to the basic random variables which are then used to the buckling load covariance. Having solved the Eq (10) for minimum mean eigenvalue  $\lambda_{cr}^d$  and corresponding mean eigen vector  $q_i^d$ . This gives

$$q_i^d (K_{ij}^d + \lambda_{cr}^d K_{ij}^{(G)d}) q_{i,r} = -\lambda_{cr,r} (q_i^d K_{ij}^{(G)d} q_j^d) - q_i^d (K_{ij,r} + \lambda_{cr}^d K_{ij,r}^{(G)}) q_j^d \quad (11)$$

Since both  $K_{ij}^d$  and  $K_{ij}^{(G)d}$  are symmetric, the left hand side equals zero by definition of the zeroth order equation. By employing  $K_{ij}^{(G)d}$  orthonormal conditions, the first term on the

right hand side equation reduces to  $\lambda_{cr,r}$ . The expression for the first order derivative of the eigenvalue is the written as

$$\lambda_{cr,r} = -q_i^d (K_{ij,r} + K_{ij}^{(G)r}) q_j^d \quad (i, j = 1, 2, \dots, n; r = 1, 2, \dots, R). \quad (12)$$

It may be noted again that the Eigen vector in the ibid expression is

$$\lambda_{cr} = \lambda_{cr}^d(b_l^d) + \frac{\partial \lambda_{cr}^d(b_l^d)}{\partial b_l} (b_l - b_l^d) \quad (l=1, 2, \dots, R) \quad (13)$$

The statistics of critical load can be examined by first squaring and then expectation of the (10). The statistics of buckling load can then be obtained by multiplying the statistics of critical load parameter with the mean reference load.

## IV. NUMERICAL FINDINGS

A Lagrange isoparametric element with 567 DOFs for this HSDT model has been used for discretizing the laminate and (8 × 8) mesh has been used throughout the study [5].

However, the results are only presented taking *COV* of the system property equal to 0.10 [6] as the nature of the SD (Standard deviation) variation is linear and passing through the origin. Hence, the presented results would be sufficient to extrapolate the results for other *COV* value keeping in mind the limitation of FOPT [6]. The basic random variables such as  $E_1, E_2, G_{12}, G_{13}, G_{23}, \nu_{12}, \alpha_1, \alpha_2, \beta_2, k_1$  and  $k_2$  and are sequenced and defined as

$$b_1 = E_{11}, \quad b_2 = E_{22}, \quad b_3 = G_{12}, \quad b_4 = G_{13},$$

$$b_5 = G_{23}, \quad b_6 = \alpha_{11}, \quad b_7 = \alpha_{22},$$

$$b_8 = \beta_2, b_9 = k_1, b_{10} = k_2$$

The dimensionless critical buckling load for cylindrical shell panel is expressed as .

$$\lambda_{cr} = \frac{N_{cr} b^2}{E_{22} h^3},$$

where,  $N_{cr}$  is the dimensional thermal buckling load [ $E_{22}$  is taken at  $\Delta C = 0\%$ ,  $\Delta T = 0^\circ C$ ].

The dimensionless foundation parameters used for the analysis can be illustrated as [1].

$$k_1 = K_1 b^4 / E_{22} h^3; \quad k_2 = K_2 b^4 / E_{22} h^3;$$

SUS304/Si3N4 of FGMs properties for TID material properties are used for computation [4].

The assumed basic random input variables (b<sub>i</sub>) are sequenced.

$$b_1 = E_c, \quad b_2 = E_m, \quad b_3 = \nu_c, \quad b_4 = \nu_m,$$

$$b_5 = n, \quad b_6 = \alpha_c, \quad b_7 = \alpha_m, \quad b_8 = k_1$$

$$, b_9 = k_2, \quad b_{10} = k_c \quad \text{and} \quad b_{11} = k_m$$

where  $E_c, E_m, \nu_c, \nu_m, \alpha_c, \alpha_m, k_1, k_2, k_c, k_m$  and  $n$  are Young's moduli, Poisson's ratios, coefficient of thermal expansion, Winkler and Pasternak elastic foundations, thermal

conductivity of ceramic and metal, respectively and volume fraction index.

For the computation of results following dimensionless postbuckling parameters are used and expressed as:

$\lambda_{T_{cr}} = \alpha(\Delta T)_{cr} \times 10^3$ , where  $\lambda_{T_{cr}}$  are dimensionless mean postbuckling load and temperature parameters. In the ibid expression,  $N_{cr}$  and  $(\Delta T)_{cr}$  are the specific postbuckled loading and temperature, respectively. In the ibid expression  $(\Delta T)_{cr}$  is expressed as  $\lambda_r \Delta T$  where  $\lambda_r$  is the specific thermal loading force parameter and  $\Delta T$  is considered as  $T_c=400$  and  $T_m=300$ . ( $T_c - T_m$ ). For the mean dimensionless postbuckling analysis of FGM plate, the dimensionless parameters  $\lambda_{cr}$  and  $\lambda_{T_{cr}}$  are used. While for the calculation of coefficient of variance (COV), the dimensional mean  $N_{cr}$  and  $(\Delta T)_{cr}$  are used.

#### A. Validation results for mean thermal postbuckling load

In order to validate the accuracy of present deterministic FEM results, an example is solved and compared with available in the literatures.

#### B. Numerical Examples: mean and coefficient of variation of thermal buckling temperature

Table 1 shows the comparison of post buckling loads of FGMs cylindrical shell subjected to thermal loading ( $a/h=100$ ,  $a=0.6$ ,  $b=0.3$ ,  $R=1$ ), uniform temperature distribution having TD and TID material properties CCCC support with Bindu et al.[2] and Yang et al.[3]. It is seen that present results are in good agreements with published work.

In another comparison is made of buckling loads for cylindrical shell under thermal environments without electrical loading conditions ( $R_1/h=200$ ,  $b^2/R_1h=100$  and  $h=1.2$ ).SSSS support as presented in Table2.It is further seen that present results for mean thermal buckling loads are in good agreements with published results of Shen [4] and Lal et al. [8].

#### C. Comparative results for probabilistic hygrothermal deformed loading

The findings for the *coefficients of variations* of the deformation due to randomness in laminates ( $b_i$ , ( $i=1, \dots, 4$ ) for CCCC, bi-axial compression laminate with ( $n = 0.2$  and  $0.8$ ) and  $a/h = 10$ , is shown in Fig.2. and validated with investigated findings of [9] and.[10]. It is noticed that Direct Iterative based SFEM gave satisfactory results with the results of Yang et al. [9] using FSDT with semi-analytical approach in conjunction with FOPT. and Lal et al.[10].

Table 3 . Effects of aspect ratios ( $a/b$ ), random system property  $b_i$ ,  $\{i=(1 \text{ to } 11) = 0.10\}$ , on the dimensionless mean ( $T_{cml}$ ) and *COV* ( $\lambda_{cml}$ ) of thermomechanically induced

postbuckling load of functionally graded materials laminated composite cylindrical shell panel with uniaxial loading ( $N_x$ ),  $a/h=50$ ,  $R/b = 50$ , fiber volume index  $n=5.0$ , simple support conditions, initial temperatures  $T_c=400^\circ\text{C}$ ,  $T_m=300^\circ\text{C}$ ,  $\Delta T=(T_c-T_m)$ . Linear without foundations for  $a/b=0.5$ , ( $\Delta T=0^\circ\text{C}$ , ( $T_{crit})=6.0680$ , ( $\lambda_{crit})=0.0779$ ), ( $\Delta T=200^\circ\text{C}$ , ( $T_{crit})=16.8681$ , ( $\lambda_{crit})=0.0805$ ). It is observed that cylindrical shell panel mean is higher for higher aspect ratio especially for higher amplitude ratios and Pasternak elastic foundations without increase in temperature. It decreases further for increase in thermal condition for both supports. coefficient of variations increases when there is increase in thermal conditions and rise in  $a/b$  with  $W_{max}/h$ . There is sudden increase in mean for  $a/b=2$  so it is important for design point of view.

Table 4. Effects of fiber volume index( $n$ ), amplitude ratios ( $W_{max}/h$ ) and random system property  $b_i$ ,  $\{i=(1 \text{ to } 11) = 0.10\}$  on the dimensionless mean ( $T_{cml}$ ) and *COV* ( $\lambda_{cml}$ ) of thermomechanically induced postbuckling load of functionally graded materials laminated composite cylindrical shell panel resting on Winkler ( $k_1=100$ ,  $k_2=00$ ) and Pasternak ( $k_1=100$ ,  $k_2=10$ ) elastic foundations with simple support SSSS boundary condition and uniaxial loading ( $N_x$ ),  $a/h=100$ ,  $R/b=20$ . Linear without foundations for  $n=0.5$ , ( $\Delta T=0^\circ\text{C}$ , ( $T_{crit})=0.8861$ , ( $\lambda_{crit})=0.0779$ ), ( $\Delta T=200^\circ\text{C}$ , ( $T_{crit})=2.5336$ , ( $\lambda_{crit})=0.0929$ ). It is observed that mean and *COV* decreases on increase of fiber volume index ( $n$ ), however on increase of amplitude ratios mean and *COV* is more when cylindrical shell panel are without rise in temperature, however mean and *COV* is more for Pasternak elastic foundations. On rise in temperature the mean and *COV* further increases.

## V. CONCLUSION

The following conclusion can be drawn from this study:

1. The mean dimensional thermal buckling load of the laminated composite cylindrical shell panel is more affected with random change in  $E_c$ , and  $E_m$ . The strict control of these random parameters is therefore required for reliable design.
2. It is also observed for same support condition; the dimensionless thermal buckling load increases for Pasternak elastic foundations compared to Winkler elastic foundations. The different curvatures to side ratio have least impact on the dimensional hygrothermal buckling load for cross ply lamination scheme.
3. The dimensionless thermal buckling load is more effective for aspect ratios and fiber volume index( $n$ ) at higher temperature condition. This is because of increase in temperature decreases the stiffness, thus lowering the strength of the structure and its stability.



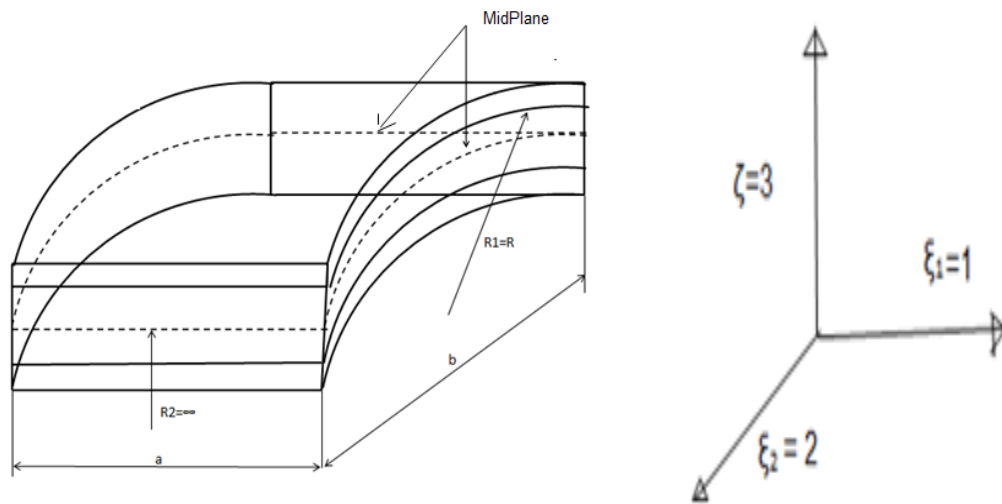


Fig. 1. Geometry of laminated composite cylindrical shell.

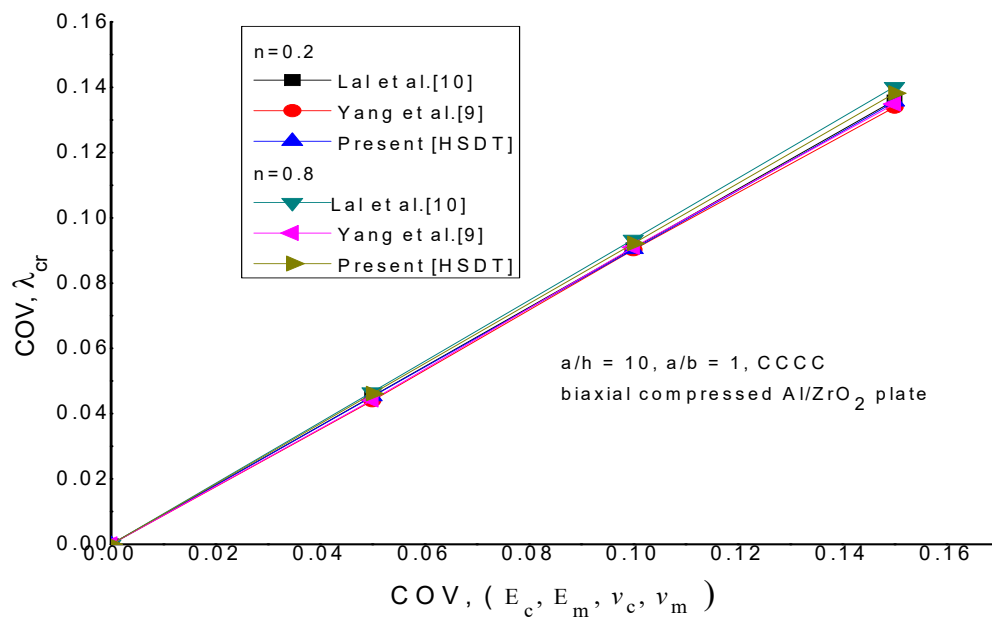


Fig.2 Validation study for the COV of the initial buckling load due to randomness in material properties

TABLE I.

Comparison of post buckling loads of FGMs cylindrical shell subjected to thermal loading ( $a/h=100$ ,  $a=0.6$ ,  $b=0.3$ ,  $R=1$ ), uniform temperature distribution having TD and TID material properties CCCC support .

n	TD			TID		
	Bindu et al. [2]	Yang et al. [3]	Present	Bindu et al. [2]	Yang et al. [3]	Present
0.0	2.9705	3.1742	2.7941	2.8606	3.7492	3.5371
0.5	2.5500	2.5941	2.4421	2.4763	2.9739	3.0909
2.0	2.0485	2.3209	2.2250	2.2243	2.6174	2.8178
10	1.6919	2.2018	2.0669	1.8301	2.4628	2.6196
Metal	1.7477	2.0284	1.8845	1.4839	2.2554	2.3578

TABLE II

Comparison of hygrothermal buckling loads for perfect  $[0/90^0]_s$  cross-ply laminated cylindrical shell panels under different environmental conditions ( $a/b=1.0$ ,  $a/R=1.0$ ,  $b/h=20$  and  $b=0.1m$ ).SSSS support.

Environmental conditions	$V_f=0.5$			$V_f=0.6$			$V_f=0.7$		
	Shen [16]	Lal et al. [15]	Present HSDT	Shen [16]	Lal et al. [15]	Present HSDT	Shen [16]	Lal et al. [15]	Present HSDT
$\Delta T=0^0C$ , $\Delta C=0\%$	228.846	219.101	227.2787	271.359	261.642	271.5154	324.794	315.254	317.5830
$\Delta T=100^0C$ , $\Delta C=1\%$	218.049	196.623	215.6810	259.249	234.715	254.0536	311.288	291.844	310.9933
$\Delta T=200^0C$ , $\Delta C=2\%$	206.802	188.268	193.4786	246.541	226.483	225.9491	296.986	272.483	272.2558
$\Delta T=300^0C$ , $\Delta C=3\%$	195.033	174.847	179.6436	233.143	209.016	208.7230	281.765	264.346	269.0400

TABLE III.

Effects of aspect ratios ( $a/b$ ), random system property  $b_i$ ,  $\{i=(1 \text{ to } 11) = 0.10\}$ , on the dimensionless mean ( $T_{cr1}$ ) and  $COV$  ( $\lambda_{cr1}$ ) of thermomechanically induced postbuckling load of functionally graded materials laminated composite cylindrical shell panel with uniaxial loading ( $N_x$ ),  $a/h=50$ ,  $R/b = 50$ , fiber volume index  $n=5.0$ , simple support conditions, initial temperatures  $T_c=400^0C$ ,  $T_m=300^0C$ ,  $\Delta T=(T_c-T_m)$ . Linear without foundations for  $a/b=0.5$ , ( $\Delta T=0^0C$ , ( $T_{cr1}$ ) =6.0680 , ( $\lambda_{cr1}$ )=0.0779 ), ( $\Delta T=200^0C$ , ( $T_{cr1}$ ) = 16.8681 , ( $\lambda_{cr1}$ )=0.0805 ).

$a/b$	$W_{max}/h$	$(\Delta T=0^0C)$ , SSSS Support				$(\Delta T=200^0C)$ , SSSS Support			
		$k_1=100, k_2=00$		$k_1=100, k_2=10$		$k_1=100, k_2=00$		$k_1=100, k_2=10$	
	0.2 0.4 0.6 $T_{cr1}$	Mean	$COV$	Mean	$COV$	Mean	$COV$	Mean	$COV$
0.5	0.3	10.4228	0.0857	16.1126	0.1401	11.8316	0.1441	18.2312	0.1599
	0.6	10.7709	0.0920	16.4578	0.1483	11.9555	0.1482	18.3985	0.1714
	0.9	11.3573	0.1046	17.0407	0.1626	12.1059	0.1586	18.6276	0.1905
	$T_{cr1}$	(10.3287)		(16.0194)		(11.7950)		(18.1787)	

1.0	0.3	10.4229	0.0857	16.1126	0.1401	11.8316	0.1441	18.2312	0.1599
	0.6	10.7709	0.0920	16.4578	0.1483	11.9556	0.1482	18.3985	0.1714
	0.9	11.3573	0.1046	17.0408	0.1626	12.1059	0.1586	18.6277	0.1905
	$T_{cr1}$	(10.3287)		(16.0194)		(11.7950)		(18.1788)	
1.5	0.3	22.0170	0.0789	32.9790	0.1505	19.5138	0.0941	30.2744	0.1388
	0.6	23.4536	0.0844	34.4117	0.1575	19.8372	0.1021	30.6030	0.1489
	0.9	25.8666	0.0948	36.8404	0.1700	20.3661	0.1178	31.1660	0.1672
	$T_{cr1}$	(21.6108)		(32.5746)		( )		(30.1923)	
2.0	0.3	43.8098	0.0781	61.7008	0.1686	28.9710	0.0868	44.7830	0.1406
	0.6	47.0019	0.0870	64.9852	0.1682	29.9391	0.0931	45.7439	0.1487
	0.9	52.3912	0.1018	65.1123	0.1769	31.5680	0.1055	47.3638	0.1631
	$T_{cr1}$	(42.9085)		(60.7783)		(28.7095)		(44.5238)	

TABLE IV

Effects of fiber volume index( $n$ ),amplitude ratios ( $W_{max}/h$ ) and random system property  $b_i$ ,  $\{i=(1 \text{ to } 11) = 0.10\}$  on the dimensionless mean ( $T_{cr1}$ ) and  $COV$  ( $\lambda_{cr1}$ ) of thermomechanically induced postbuckling load of functionally graded materials laminated composite cylindrical shell panel resting on Winkler ( $k_1=100, k_2=00$ ) and Pasternak ( $k_1=100, k_2=10$ ) elastic foundations with simple support SSSS boundary condition and uniaxial loading ( $N_x$ ),  $a/h=100, R/b=20$ . Linear without foundations for  $n=0.5$ , ( $\Delta T=0^\circ C$ , ( $T_{cr1}$ ) = 0.8861, ( $\lambda_{cr1}$ ) = 0.0779 ), ( $\Delta T=200^\circ C$ , ( $T_{cr1}$ ) = 2.5336, ( $\lambda_{cr1}$ ) = 0.0929 ).

$n$	$W_{max}/h$	$(\Delta T=0^\circ C)$				$(\Delta T=200^\circ C)$			
		$k_1=100, k_2=00$		$k_1=100, k_2=10$		$k_1=100, k_2=00$		$k_1=100, k_2=10$	
		Mean	$COV$	Mean	$COV$	Mean	$COV$	Mean	$COV$
0.5	0.3	1.4441	0.0928	2.1681	0.2217	4.1288	0.0995	6.1985	0.2235
	0.6	1.5014	0.0989	2.2250	0.2540	4.2914	0.1053	6.3598	0.2563
	0.9	1.5955 (1.4276)	0.1110	2.3185	0.3073	4.5616	0.1164	6.6285	0.3086
	$T_{cr1}$			(2.1517)		(4.0815)		(6.1516)	
2.0	0.3	1.3628	0.0868	2.0880	0.1688	3.9162	0.0995	5.9998	0.1729
	0.6	1.4103	0.0924	2.1350	0.1857	4.0517	0.1042	6.1342	0.1898
	0.9	1.4900	0.1038	2.2143	0.2140	4.2817	0.1140	6.3629	0.2172
	$T_{cr1}$	(1.3508)		(2.0761)		(3.8816)		(5.9656)	
5.0	0.3	1.3324	0.0875	2.0585	0.1410	3.8420	0.1071	5.9352	0.1487
	0.6	1.3773	0.0935	2.1029	0.1489	3.9702	0.1118	6.0624	0.1563
	0.9	1.4519	0.1059	2.1771	0.1633	4.1862	0.1217	6.2772	0.1698
	$T_{cr1}$	(1.3204)		(2.0466)		(3.8073)		(5.9009)	
10	0.3	1.3084	0.0886	2.0347	0.1221	3.7788	0.1138	5.8764	0.1336
	0.6	1.3528	0.0949	2.0788	0.1265	3.9063	0.1184	6.0028	0.1377
	0.9	1.4259	0.1080	2.1514	0.1355	4.1181	0.1283	6.2135	0.1458
	$T_{cr1}$	(1.2954)		(2.0219)		(3.7414)		(5.8393)	

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## Nomenclature

$A_{ij}, B_{ij}, etc$	: Laminate stiffnesses
$a, b$	: Plate length and breadth
$h$	: Thickness of the plate
$E_f, E_m$	: Elastic moduli of fiber and matrix, respectively.
$G_f, G_m$	: Shear moduli of fiber and matrix, respectively.
$\nu_f, \nu_m$	: Poisson's ratio of fiber and matrix, respectively.
$V_m, V_f$	: Volume fraction of fiber and matrix, respectively.
$\alpha_f, \alpha_m$	: Coefficient of thermal expansion of fiber and matrix, respectively.
$b_i$	: Basic random material properties
$E_{11}, E_{22}$	: Longitudinal and Transverse elastic moduli
$G_{12}, G_{13}, G_{23}$	: Shear moduli
$K_i$	: Linear bending stiffness matrix
$K_g$	: Thermal geometric stiffness matrix
$D$	: Elastic stiffness matrices
$M_{a_i}, m_{a_i}$	: Mass and inertia matrices
$n_e, n$	: Number of elements, number of layers in the laminated plate
$N_x, N_y, N_{xy}$	: In-plane thermal buckling loads
$n_n$	: Number of nodes per element
$N_i$	: Shape function of $i$ th node
$\bar{C}^e_{mat}$	: Reduced elastic material constants
$\{ \}^e$	: Vector of unknown displacements, displacement vector of $e$ th element
$u, v, w$	: Displacements of a point on the mid plane of plate
$\bar{u}_1, \bar{u}_2, \bar{u}_z$	: Displacement of a point $(x, y, z)$
$\bar{\sigma}_i, \bar{\epsilon}_i$	: Stress vector, Strain vector
$\psi_x, \psi_y$	: Rotations of normal to mid plane about the $x$ and $y$ axis respectively
$\theta_x, \theta_y, \theta_k$	: Two slopes and angle of fiber orientation wrt $x$ -axis for $k$ th layer
$x, y, z$	: Cartesian coordinates
$\rho, \lambda, Var(.)$	: Mass density, eigenvalue, variance
$\omega, \bar{\omega}$	: Fundamental frequency and its dimensionless form
$RVs$	: Random variables
$\Delta T, \Delta C,$	: Difference in temperatures and moistures
$\alpha_1, \alpha_2, \beta_1, \beta_2$	: Thermal expansion and hygroscopic coefficients along $x$ and $y$ direction, respectively.

# *Evaluation of Optimum Surface Roughness during Turning of AISI 316L Implant Material using CBN tool*

Pardeep Kumar  
Department of Mechanical  
Engineering  
DCRUST, Murthal  
Sonipat, Haryana, INDIA  
psharma.dcrust@gmail.com

Hemant Upadhyay  
Department of Mechanical  
Engineering  
BMIET  
Sonipat, Haryana, INDIA  
hd19upadhyay@yahoo.co.in

Rajnesh Kumar  
Department of Mechanical  
Engineering  
DCRUST, Murthal  
Sonipat, Haryana, INDIA  
Rajnesh.solanki@gmail.com

Ajay Kumar  
Department of Mechanical  
Engineering DCRUST, Murthal  
Sonipat, Haryana,  
[ajaydabas2@rediffmail.com](mailto:ajaydabas2@rediffmail.com)

**Abstract-**Implants are the metallic or non metallic material which is used for replace human bone during medical treatments. There are various materials such as ferrous and non ferrous used for bio implants but ferrous/metallic materials are more preferable in surgical industry. Therefore the present study investigates the optimum surface roughness during machining of AISI316L by using CBN tool.

**Keywords-**Implant material, Surface roughness, CBN, tool, AISI316L

## I. INTRODUCTION

Bio-Implant has improved the quality life of human being. Different parts in human body like elbow, shoulder, knee, dental and hip etc. is require to replace by implants after natural degradation or due to some accident [1]. Implants are used to fix and support the bone and sustain during healing processes. Different material such as alloys, polymer, ceramic, and composite are being used for implant, but metallic implants are widely used because of their various properties such as superior fatigue, fracture and tensile strength as compare to other implant material. AISI 316L is one of the most widely used metallic implant material. AISI 316L employed the numerous benefits over other materials such as broader accessibility, ability to resist corrosion, low cost and superior mechanical properties. It has been observed that surface integrity act as key criteria in the functional life of a implant [2]. Acayaba et.al establish a mathematical- model for during machinability of AISI316L with coated carbide cutting tool. Study raveled that there is a direct impact of feed rate on surface roughness while speed is inversely proportional to the surface roughness[3]. Therefore

the present investigation focus on surface roughness of AISI 316L using CBN tool.

## II. MATERIALS & METHODS

In the present investigation the work material is selected to because of its application in the biomedical industries. The work material AISI 316L is widely used as an implant material. This material possesses superior compatibility with human body[4-5]. CBN tool has been selected for the present study as a cutting tool. The various ranges of the selected parameters are given below in Table 1.

TABLE I.PARAMETERS

Machining Parameters				
Parameters	Unit	Levels		
	Cutting Speed	m/min	100	125
Feed	mm/rev	0.05	0.1	0.15
DOC	mm	0.05	0.09	0.13

Experimentation of machinability study have been performed under dry state condition and all the measurement are done in a lab condition at a temperature of 26° and humidity of 34% according to reference standards. The experimental setup for the present study is shown in figure 1.



Fig 1: Experimental Setup

A. Work Material

In the present work, AISI 316L has been selected, a round bar of diameter 50mm and length 125 mm have been used as a specimen by keeping in mind of L/D ratio.

B. Cutting Tools

Cubic Boron Nitride (CBN) tool is selected for the experimentation. Selected tool having a Specification of CCMT 09T3, Nose Radius = 0.4mm and Relief angle = 7°.

III. EXPERIMENTAL DESIGN

The main focus of the study is to evaluate the surface- roughness of AISI316L using CBN tool. The experimentation is carried out using prime machining parameters such as cutting speed, DOC, feed rate. The present study also evaluates the mathematical relationship between input variables and response parameters by using response surface methodology (RSM) technique. By using central composite design (CCD) technique total 20 experimentation have been designed.

IV RESULTS AND DISCUSSION

During this study adequacy of the suggested model have been verified through analysis of variance (ANOVA). Analysis of variance check the significance model terms on the basis of “Prob. > F” is smaller than 5%, R<sup>2</sup> shows the variation of response, CV predicts the reliability and precision of the model. [5-6]. Model found to be significant for the for the “F-value” 14.67 while insignificant lack of fit for the value of 2.34. #

A. Parametric Influences On Surface Roughness (R<sub>a</sub>)

To evaluate the variation of parameters on R<sub>a</sub> surface plots have been drawn. Figures 2 to figure 4 shows the variation of parameters on R<sub>a</sub> during turning experiments of AISI316L using CBN tools. It can be noticed from Figure 2 that there is increments in the R<sub>a</sub> values as feed rate increases. This can be explained in terms of that as feed rate increases there is increase in un-deformed thickness of chips and cause of ploughing of material which is the main cause of poor surface finishing.

While Figure 3. Illustrate that R<sub>a</sub> decreases with the increments in speed from 100m/min to 150m/min. The phenomenon can be explained in terms that at higher cutting speed there is thermal softening of material take place, which reduces the cutting forces during the cutting of metal. If there is decrease in cutting forces surface roughness will improves. These results can be correlated with the existing results of Noordin et al. [7]. Further figure 4 shows that better surface roughness can be achieved with combination of lower DOC and feed rate.

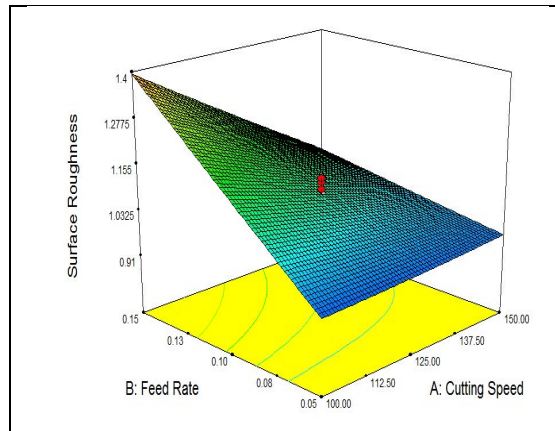


Fig 2: Effect of Cutting Speed and Feed Rate on Surface Roughness (R<sub>a</sub>)

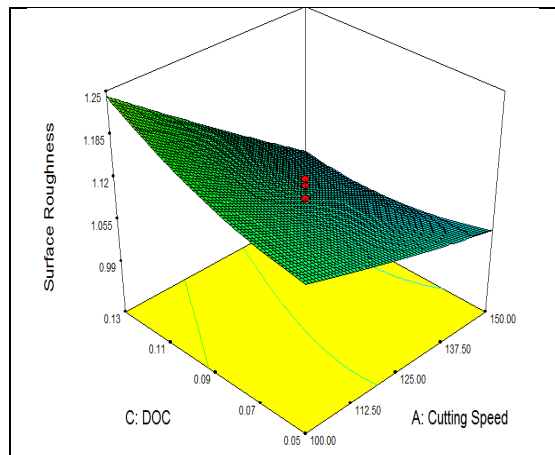


Fig 3: Effect of DOC & Speed on Surface Roughness (R<sub>a</sub>)

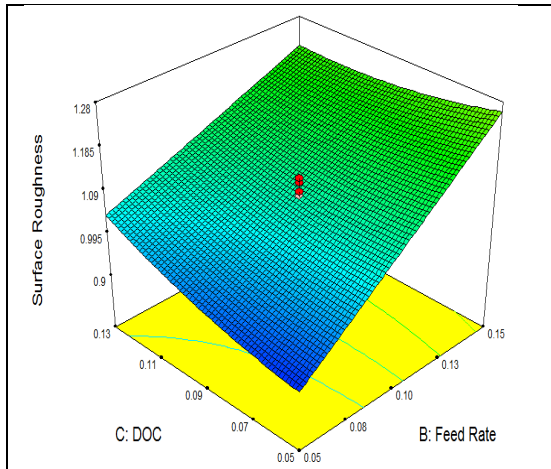


Fig 4: Effect of Feed Rate and DOC on Surface Roughness ( $R_a$ )

#### IV. OPTIMUM CUTTING CONDITIONS

To optimum machining parameters have been evaluated using RSM techniques. Table 2 shows the optimum solutions for machining of AISI 316L by using CBN tool.

No.	Cutting Speed	Feed Rate	DOC	Desirability	
1	118	0.08	0.09	1	Selected
2	136.52	0.13	0.12	1	
3	103.25	0.13	0.11	1	

#### V. CONCLUSIONS

The present study has been carried out to evaluate the optimum surface finishing. Dry turning of AISI 316L demonstrated that the a grinding finish can be achieved on the bio implant through the CBN tool. The present work shows that a fine surface finishing up to 0.88 micron can be achieved by

using the optimised results of this study. The specific conclusion from the study are as follows:

1. Study shows that there is a rapid increment in the value of surface roughness with the increments in the DOC and feed rate values, while surface roughness decreases with the rises in cutting-speed.
2. Feed rate and Cutting speed showed the major impact on surface roughness and observed to be most significant parameters.
3. The various optimum parameters are as: cutting speed (m/min) = 118, DOC(mm) = 0.09, feed rate (mm/rev) = 0.08.

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# Sixth Sense- Using Arduino, Speech Recognition & Application

<sup>1</sup>Annu Dhankhar  
Asst.Prof, CSE Dept.  
BMIET  
Sonipat, India

Sahib Singh  
Student, CSE Dept.  
BMIET  
Sonipat,India

Arsh Bir Singh  
Student, CSE Dept.  
BMIET  
Sonipat,India

**Abstract**— It is far more common to see strong offensive words used as emotionally arousing stimuli. When children enter the picture, cussing, abusing language and bad words becomes a problem for parents and a basis for censorship in media and educational settings. Considering that the presence of this problem is everywhere, it is interesting that psychology textbooks do not address the emergence of this behavior in the context of development or language learning. This is a very common question, and it's a tough one to answer because data we have for comparison purposes is prior to the 1970s. Today we are exposed to many form of sources to get influenced to swear due to lack of vocabulary without even noticing it. So to avoid these kind of drawbacks we need some controlling systems.

These aggressive words have a direct connection to our emotions. These non-voluntary swear words present emotion states like passion, fear or anger. They are also unequaled in their capacity to inflict emotional pain and incite violent disagreement. And once a person is in any such state he is not able to realize what he is speaking and hence can't control it in the future too. One such communication system to be used is Sixth Sense. This communication system can be used in all fields and will help the user to know and realize when he cusses. This system can be used by any persons who are unable to control their speech and want themselves to stop swearing unintentionally. Any person who uses a smart phone and wants to eliminate this bad habit can use this system based upon Android O.S and upon a GUI (Graphical User Interface) based voice command. This also uses an Arduino based voice controlled Shock provider. Which in a mounted Bluetooth HC-05 chip connects to android application that sends voice command to the device wirelessly. We can control a limited amount of known swear words at a time.

**Keywords**—Arduino, Speech recognition, Bluetooth module, Android application

## I. INTRODUCTION

This project is mainly designed for those people who swear unintentionally due to lack of vocabulary. Generally our friends and family helps us to solve this problem but this device will help to reduce the human labor. This project was inspired by necessity to stop swearing and the idea of voice based devices. One reliable project is home automation system. Other types of Automation Systems include Internet Controlled, RF Controlled or IR based Remote Controlled. Based on the application requirement we can prefer the type as each has its own advantages and disadvantages. In this project, by converting speech to text we can sense when target word was occurred. The main controlling component in the system is Arduino NANO R3, whose working is explained in later section. Our system has mainly two parts:

- Speech recognition
- Wireless data transfer system.

In this project sensing of swear words is done by using a voice controlled android application. Our system is an Arduino based system that can accept Voice commands and process them. That means one can switch the device either

ON or OFF.

## II. OBJECTIVE

The aim of the project, "SIXTH SENSE- Using ARDUINO, SPEECH RECOGNITION and ANDRIOD APPLICATION"Is to create a system that can act when a user says an abusive word. The system should be reasonable to cost, easy to use and easy to configure. The user should be able to control his speech by realizing each time he cusses. This project can be integrated as a single portable unit and allows the user to wirelessly control any other device which can be lights, fans, air conditioners, television, etc. HC-05 BM (Bluetooth module) is a light weight chip which can sense electromagnetic signals transmitted by android device. The words are sent to the control unit in the Arduino tha triggers ON/ OFF signal. These commands are converted into binary strings. The micro controller unit takes decision and triggers the required signal.

## III. BLOCK DIAGRAM AND FLOWCHARTS

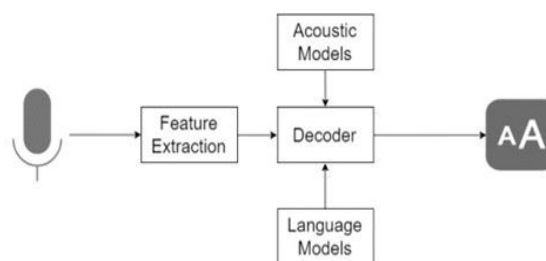


Fig. 1. Block diagram

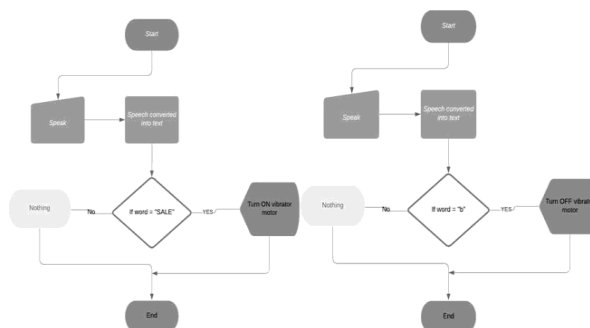


Fig. 2. Flow Chart

#### IV. HARDWARE AND SOFTWARE DESCRIPTION

First install the app called “6th sense” We have already installed Arduino software that recognizes the particular words a user wants to stop saying involuntary (2) and sends the information to the device through Bluetooth module connected to the board.(1,3,4) If you are connecting the module for the first time, it will ask for password i.e., 1234 or 0000. Open the app and follow the following images given below, like first click on “connect to Bluetooth device” and select your Bluetooth module HC-05 and check whether it is connected or not. Then to speak make a click on the mic icon and send the voice command to the HC-05 module.

After this, the HC-05 will serially communicate with the Arduino and then the task is performed as per the pre-defined commands.

#### V. BLUETOOTH MODULE

HC-05 module is an easily operable Bluetooth Serial Port Protocol module, which is designed for secure and authorized wireless serial connection setup. It uses CSR Blue core 05-External chip Bluetooth system with CMOS technology and Adaptive Frequency Hopping Feature.



Fig. 3. Bluetooth Module

Bluetooth can operate in the following two modes either Command Mode or Operating Mode. [16] In Command Mode we will configure the properties of Bluetooth like the name of signal, setting up a password or operating baud rate etc. Where as in Operating Mode transmission of data and reception between Bluetooth module and Arduino board takes place. It operates on a 5V battery supply and the signal pins require 3.3V.

##### A. ARDUINO Nano R3

**Arduino Nano R3** is a microprocessor that is compact and easy to use on breadboard. It is developed by Arduino.cc in Italy, based on Atmega168 (Arduino Nano V3.x).(5). It works identical to Arduino UNO, the only difference is that due to its compact size it has low configuration processor. It works on operating voltage of 5V, however the input voltage vary from 7 to 12V.(6). **Arduino Nano R3 Pinout** contains 14 digital pins, 8 analogue Pins, 2 Reset Pins & 6 Power Pins. They act as input pins when they are interfaced with sensors, but if you are driving some load then It can be used as output. Functions like pinMode() and digitalWrite() are used to control the operations while analogRead() is used to control analog pins for input and output. The analog pins measure the value from zero to 5V which has a total resolution of 10bits. Arduino Nano R3 has a crystal oscillator of frequency 16MHz. It produces a clock of precise frequency using constant voltage. This board use micro USB for connection with a computer, instead of Standard USB support. Tiny size and bread board friendly nature make this chip an ideal choice for most of the applications as wearable

devices can be designed that will be easy to carry, therefore size of the electronic components is of great concern. Flash memory is 16KB or 32KB, which depends upon the Atmega board. Atmega 168 has a capacity of 16KB of flash memory while Atmega 328 can deal with a flash memory of 32KB only. Code is stored in its flash memory. The 2KB of memory of flash memory is used for boot loader.(8)

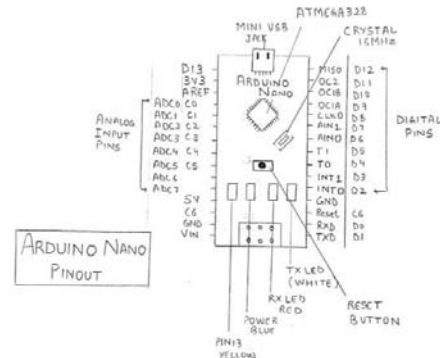


Fig. 4. Arduino Nano Pinout

#### VI. HARDWARE IMPLEMENTATION AND WORKING PRINCIPLE

The desired circuit can be created by using the components mentioned ahead. The heart of the system is Arduino which has a microcontroller. It has a 32KB flash memory, it is required to burn a boot loader. Boat loader is programmed with IS program controller.

This voice controlled Arduino system is powered by using a 9V battery. To control 9V current connected at the output pins of Arduino voltage regulator is connected. Android is developed by Andy Rubin and it operates on Linux Kernel OS. Because of huge and growing market we have used android as our preferred Operating system. And also it has an easy and user friendly interface. Here our main goal is to control our devices through voice commands, for that we are using the inbuilt feature available in all android phone. So user can easily access home appliances at his house.

A Bluetooth module HC-05 for wireless communication system is used as a remote which is connected to the control chip for receiving signals from Android Application. The Arduino device along with the Bluetooth module and circuit needs to be connected to the bread board. Then we need to install the Arduino app “6th Sense”. This application receives the voice commands from the user and convert its speech to text by Google API, then sends that information to Bluetooth module wirelessly. Microcontroller by receiving instructions from the Bluetooth module it gives a signal to the relay to control the device (either Switch ON/OFF). Simple LEDs and DC motors can be controlled directly.

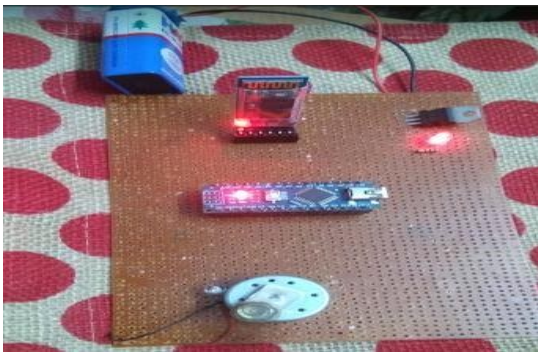


Fig. 5. Arduino turned ON through Voice RESULT

This project is successfully giving output to word (SALE) which was used as a trigger word (abusive). After recognizing the word Arduino Nano R3 send a signal to the motor that turns on the motor. To stop the motor or turning it off user 10

## VII. CONCLUSION

In conclusion, sixth sense help user to improve his/her problem of involuntary abusing. It uses google API to convert speech recognition and gives user a signal to alert him of using the specific word. The speech recognition system is coded into android application. It takes the input through mic attached to the audio jack. This device is targeted towards people who want to get rid of their problem of involuntary abusing. The specific words are stored in Arduino Nano microprocessor. And the output is also provided by the processor itself.

This system is limited by number of words that can be set for trigger due to limited number of input pins on the Arduino Nano R3. It can trigger by neighboring user as voice recognition is not available. It is a sensitive system and can be affected by strong winds or noises.

The scope of improvement can be suggested as following:

- iOS platform can be used to create the application.
- Abusive word record and database for further analysis.
- Output trigger will set on other attention lacking problems.
- The length of the input sting can be increased.

## VIII. ACKNOWLEDGEMENT

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# *E-COMMERCE IN CONSTRUCTION INDUSTRY*

Amarender Kadian  
Assistant Professor, Dept. of Civil Engineering,  
BMIET  
Sonipat, India  
[amarenderkadian013@gmail.com](mailto:amarenderkadian013@gmail.com)

**ABSTRACT-** In the 21<sup>st</sup> century, the interest in conduction of business transactions through digital medium or we can say electronic means i.e. through internet or any other dedicated networks is growing day by day and this process as a whole is termed as E-Commerce or Electronic Commerce. In this study we are discussing the various developments that took place in the E-Commerce, focusing on their usability in the construction industry with different barriers and challenges as well including future trends in E-Commerce and their advantages to different construction firms.

**KEYWORDS-** E-Commerce, Construction Industry, Internet

## I. INTRODUCTION

With the evolution of internet, the internet services revolutionized the process to store, view and exchange any sort of data and has also opened various new avenues for the market which in the past were almost inconceivable. The development of E-Commerce system has also made the globe a playground for the business firms to get recognized and get plunged into the global market, taking different new opportunities offered by the IT sector, with such revolutions in commerce, the trading firms as well as other industries including the construction industry focuses on the need for the business, letting them to move towards the advanced business tactics leaving behind their old traditional methods of doing business, this shifting on the other hand also improves the traditional business practices by letting the industry to innovate and update its products as well as the services along with the strategies for the sake of the ease of doing business by making them flexible benefitting both the consumer as well as the manufacturer.

With the arise in the electronic engineering, almost every business sector has taken the advantages of

the E-Commerce and the construction sector is no exception, the need for construction industry to adopt new ways for doing business has become very important considering the current digital era. As for each and every economy around the world, the construction industry has its own considerable share, as per reports from the World Economic Forum; the construction industry itself contributes to 6% to 8% of the global GDP, stating the importance of Construction Industry. To maintain such pace in the construction sector, the stagnation can be prevented by the adoption of new innovative and revolutionary technologies such as the E-Commerce.

In this paper, the progress in the adoption of such new technologies in construction industry is discussed along with its further classifications and other developments undergone in the construction industry with respect to the electronic commerce.

## II. CLASSIFICATION OF E-COMMERCE

### A. *Business To Business E-Commerce*

It is the most common form of E-Commerce refereed to those electronic means of transactions which happens between two or more businesses incorporating each and every transaction from both the manufacturer and the service providers i.e. considering any company using the internet to get and place any order from its suppliers, receiving invoices and making payments through the electronic media.

### B. *Business To Consumer E-Commerce:*

This form of E-Commerce is very similar to that of the traditional retailing methods, but with the use of internet to carry out business transactions. In this method, generally, it is assumed that the consumer has an access to the internet to place the demand

orders directly to the company or the supplier, reducing the number of intermediaries, achieving higher profits.

#### C. *Business To Administration E-Commerce*

This method of E-Commerce generally deals with the company and the administration including transactions between the business and government body. In present scenario, the E-Commerce method is in its very initial stage but it is expected to grow at a very large scale with the government initiatives by motivating and publicizing the awareness and development of E-Commerce in different sectors such as different departments of the government and other semi-government bodies.

#### D. *Consumer To Administration E-Commerce*

In E-Commerce, this particular method is one of the latest which has recently been developed from past very few years, with time the consumer to administration E-Commerce technique has started to emerge and most governments are planning to develop such initiative methods for the formation of joint ventures of the government with the industries, trade unions and consumer groups,

### III. REVOLUTION AND DEVELOPEMENTS OF E-COMMERCE

E-Commerce from the time of EDI or we can say exchanging of documental data from computer to computer in the very basic format to the present advanced E-Commerce system has grown and developed up to a very great extent. Earlier, EDI has provided new paths to the business sector for the communication and transferring of documental data from company to company benefitting the firms in a number of ways such as faster communication and exchanging of documents, providing paperless offices, reduced cost and time saving etc. but with all these advantages, the EDI had its own certain limitations as well like the unability to be corporate with the present company networks and also the communicating business had to agree on the very standard format supported by the EDI to electronically communicate to each other. The major problem businesses were facing with the EDI is that, for every new trader or trading firm added to the list of traders, a new translation program was mandatory to format the data to be shared to conform the standards of other business partners or clients making it a very expensive

process lacking flexibility and due to these limitations the Value Added Networks (VANs) came into the existence.

As the VANs was developed as a third party network to overcome the limitations of the EDI by electronic transmission of data to the client through the modem or through the phone lines, The working of VANs services makes it as a very successful alternate of the EDI, as the VANs receives data, sorts them according to the receiver and then stores them until they were picked up by the receiver.

In the early 1980's the use of such electronic data exchanging technologies were very popular and by the 1990's the construction sector also started taking benefits of the such revolutionary technologies. The use CAD for making drawings and developing other data also become popular in that time. The emergence of organizations such as EDICON provided platforms for generating awareness as well the guidance for the use of electronic data transfer mediums for even further development of such technologies for achieving even greater trading profits.

The EDICON witnessed the transformation of the EDI, from a technology with both its advantages and limitations, improving the interdisciplinary communications within the construction sector using the sets of messages which were specifically developed for their application in trading. As the EDI's exchanging formats for data were mostly used for the pilot projects, and it was also observed at that times that increase in the number of contractors or construction firms was not increasing, confirming the fact that the use of EDI in construction industry was very limited because of its very high development cost and other technical limitations and barriers.

The very exponential growth of internet in recent years itself is a revolution for all aspects of life in all its perspectives weather they are personal, social and commercial. Commercially, this growth of internet has demonstrated the increased uptake of the internet related technologies like access to the web and emails, impacting the business sector by introducing a number of ways to implement EDI, rather than those private Value Added Networks. With the development of internet, the data has started to be exchanged through the web in much

better way with the emergence of newer technologies such as XML (eXtensible Markup Language), the norms of exchanging data in the future has also started to change with the aim to develop a system which not only is extensible enough for the future needs but also is very flexible in nature to incorporate futuristic technologies to emerge further.

#### IV. E-COMMERCE IN CONSTRUCTION INDUSTRY

The construction industry is among those very few industries in which the uptake of E-Commerce had always been very limited in comparison with the other industrial sectors such as the information technology, automotive industry etc. the main factor affecting this limited uptake of E-Commerce in the construction industry is its fragmented nature. As any construction project generally is a set of complex activities involving a very large number of participants such as the clients, the architects, engineers, fabricators and the contractors. In general, construction projects are more of a team effort involving different activities and dialogues.

In construction industry usually the information is transferred in the most manual way which in general is a very slow process, such manual ways or we can say the traditional ways of information transfer involves production of very heavy paper works i.e. drawings and documentations and hence, the managements of such heavy paper work often becomes very difficult to handle and time consuming as well, whereas maintenance of data for the effective access when needed also is challenging task causing delays, In such ways the reliance on third parties such as govt. or private courier services also leads to not just delays but also adds to expenses in the project cost. Due to all such limitations of traditional ways of information transfer in this fast growing world, many construction companies are now focusing on more and more in the adoption of new data exchanging technologies just like the E-Commerce, depending upon the nature of the company and its interest in the adoption of new technologies such as E-Commerce, the benefits of E-Commerce may differ from company to company.

#### V. BENEFITS OF E-COMMERCE IN CONSTRUCTION INDUSTRY

##### A. *Company Promotion*

In current internet based modern era where most people around the globe uses internet for their vast number of activities including researches, social connectivity, trading, gaming etc., the internet has also evolved as a platform for companies to promote themselves by the dissemination of the companies details such as in case of construction industry, the companies can let people know about their previous completed projects, their team of architects, designers and engineers, details of the contractor and other services they have to offer etc. on the web to get more work.

##### B. *Product Promotion*

Apart from promoting companies, internet is also used as a medium which fulfills the purpose of increasing sales of any particular product of any company, through online promotion, by letting people to know about the specifications, quality and other important details on offer for people in a very creative way in the form of visual advertisements, pop-up advertisements on the web etc. specifying the manufacturing details, availability, cost and quality assurance.

##### C. *Project Management*

Online project management has started to become a new trend in the coming future in the construction industry, as a number of websites came into the existence which are designed to streamline the construction process by keeping an eye on the process to improve and integrate the procedure for designing and management purposes yielding a number of benefits to the users resulting in the faster completion of project by minimizing the delays in the process of communication and data transfer between the parties involved in the construction project.

##### D. *Project Collaboration*

The internet can also be used as a platform for collaboration between two project partners by online facilitating the process of collaboration, allowing the parties or partners to communicate and share information to each other easily in the real time without any un purposeful delays, defying the boundaries also letting the stake holders and other clients to exchange ideas and suggestions for the overall betterment of the project.

### *E. Online Tendering*

The internet has evolved as an very important tool for tendering purpose by facilitating and providing the necessary tendering information along with the project details online to target the customers from the construction industry while maintaining the transparency of the deal.

### *F. Miscellaneous Benefits*

Apart from the above discussed benefits of E-Commerce in the construction sector, there are also a number of other benefits of doing commerce electronically such as the reduction in paperwork with reduced number of errors and wider market reach etc.

## VI. ISSUES WITH E-COMMERCE

With all the discussed benefits of doing commerce electronically, there are also some issues with the E-Commerce which are needed to be addressed as soon as possible to uplift the faith and confidence of the people and companies in the adoption of E-Commerce.

The most common issues acting as barriers to E-Commerce are mainly classifies into the infrastructural issues, trust and reliability issues and regulatory issues.

## VII. INFRASTRUCTURAL ISSUES

Internet being the most important factor for E-Commerce, needs tele-communicational infrastructure whereas in the developing economies the tele-communicational infrastructures are not sufficiently developed to manage the advances in the technologies of doing commerce as compared to the developed economies.

### *A. Trust And Reliability Issues*

For most people around the globe, the trust and reliability are one of the major concerns related to the electronic commerce, as maintaining confidentiality of data from hackers and illegal invaders is very difficult to maintain for some developing and mostly under-developed economies with lesser facilities, at such places it becomes mandatory to identify and authenticate the communicating parties to know if the data integrity has been compromised or not.

### *B. Regulatory Issues*

These issues generally include un-clear regulations related to taxes, legalities and other ethical problems etc. in the adoption of electronic measures. In electronic commerce where security is one of the biggest concerns barricading the companies to adopt E-Commerce and other electronic trading measures.

## VIII. DISCUSSION

It is a very well known fact that using electronic commerce in construction industry has its own several benefits, as electronic solutions lets people to have wider reach in the market with the minimal efforts, E-Commerce lets the customer to reach thousands of the firms very frequently at the same time. The use of E-Commerce is still very limited in the construction industry, despite of all such limitations, the positive hope is that the construction industry has recognize the potential benefits E-Commerce has to offer for even further betterment of the construction industry in the coming future, To encourage construction industry to adopt E-Commerce, more and more efforts are required.

## IX. CONCLUSIONS

Currently in terms of usability of E-Commerce in the construction market, the trends are mixed, where there are also many companies which offers complete online services such as job searching sites as well as other sites to start e-business, on the other hand, there are those firms which haven't yet accepted internet as a tool to improve business by participating in a much wider online market.

The most positive sign for construction industry is such aspects is that, many companies now a days are investigating the potential benefits of the electronic trading, that will help them further in the stimulation and acceptance of the E-Commerce as a medium to process business transactions. The E-Commerce is expected to be considered as the solution for the problems related to the project communication and information dissemination, hence, changing the way of implementation and management of the projects in terms of collaboration, information transfer and reduction in cost. The issues with the E-Commerce are addressed and are sorted by implementation of new

legislations and higher standards of data encryption worldwide.

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